

# RADIO

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# WORLD

ILLUSTRATED

EVERY WEEK

## A Portable Radio Set with "Roller Skate" Attachment

By D. L. Brown



The Brown Hum Dinger DX accompanying the "Roller Skate" on a pleasure jaunt.

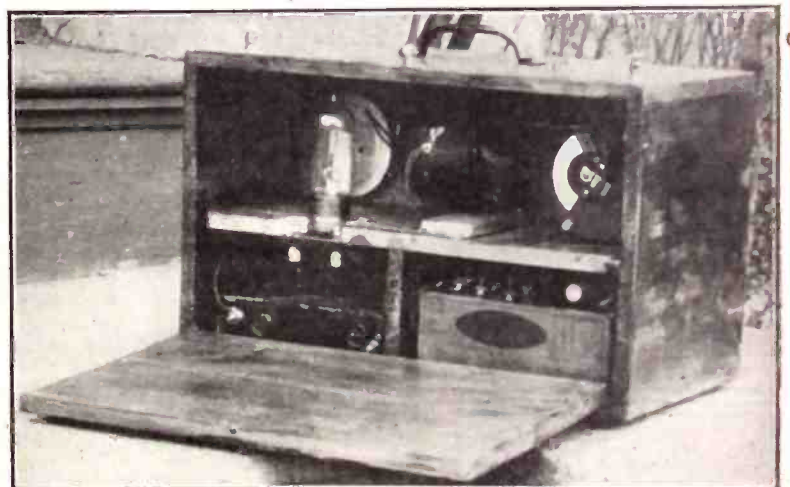
THE following is a non-technical description of the Brown Hum Dinger DX Portable Radio Receiver with the Roller Skate attachment. Let me say this is not intended to interest those who can afford an expensive outfit as the cost of the parts should not exceed \$20.00. It is best not to tell all we've heard with this set.

As will be noted from the diagram on page 12, the hook-up is entirely novel owing to the fact that the rheostat is in series with the plate circuit thereby eliminating the necessity for all potentiometers, variometers, taps, switches, etc. The two terminals at the upper northeast and northwest corners of our suit case set may be attached to anything handy, preferably a water pipe and the ordinary antenna of the outdoor species. These are interchangeable and we have heard a human voice when there was no connection whatever. The set works remarkably well on a loop

as well as the indoor attic type of antenna. However, with the regulation 150 ft. antenna 30 ft. high and a cold water pipe for a ground, the phones may be hung on the wall and the clocks down stairs regulated by the time signals heard down the stairway—that is, if one has a stairway. WJZ and WEAJ come in with sufficient volume to be clearly heard in an ordinary room with one of the head set phones attached directly to a phonograph horn.

The photograph of the front elevation of the Hum Dinger clearly shows that a set of Turney phones is attached to the terminals inside the front cover which just at this moment makes a convenient writing desk. A pencil and pad are kept handy for no one knows what may happen next. A roll of No. 18 bell wire 150 ft. long can be carried together with the phones closed

(Continued on page 12)



Rear view of the Brown Hum Dinger showing batteries, tubes and inductances and their distribution.

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Address: RADIO WORLD, 1493 Broadway, New York, N. Y.

## New York Electrical Interests Form Board of Trade

The electrical interests in New York City and vicinity have organized the Electrical Board of Trade of the City of New York with Arthur Williams, of the New York Edison Company as president and Charles L. Eidlitz as chairman of the board. Mr. Eidlitz recently was appointed arbiter of the electrical contractors' and dealers' interests in New York.

The Board of Trade will act as a clearing house for credits and other information desired by the trade. Membership will be held by representatives of the lighting companies, telephone and telegraph companies, manufacturers, jobbers, contractors, distributors, dealers and the electrical press within 25 miles of the City Hall. The purposes of the organization are: "To promote generally the interests of the electrical industry; to deal with problems concerning or affecting the industry; to represent the industry in public affairs or legislative matters affecting the industry; to be the central organization and headquarters for the entire electrical industry of the City of New York and territory; to promote the growth of the industry through the co-ordination of effort in the rendering of more extensive service to the public, based on the conviction that the most efficient service will elevate the industry to a plane that its usefulness deserves."

The Electrical Board of Trade shall not, however, it is stated, in any way deal with prices, "nor shall it foster combinations or agreements in restraint of trade."

The organization will be controlled by a Board of Governors consisting of three representatives elected from each branch of the industry, and will number 36 men, representing 3,000 firms, corporations and individuals.

The officers elected besides Mr. Williams and Mr. Eidlitz, are: Vice Presidents, Walter J. Drury, Western Electric Company; William C. Peet, Peet & Powers Company; Theodore Beran, General Electric Company; Treasurer, John P. Ryan, Cleveland & Ryan, and Secretary, John MacIntyre.

## From Cavite to Washington Direct

WIRELESS message from the Naval station at Cavite, P. I., addressed to San Francisco for relay to Washington was picked up in the Washington Radio Central recently and copied before the San Francisco operator indicated its receipt. Needless to say, it was not relayed to Washington. This message was copied without error over 11,500 miles of sea and land.

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BRAND NEW FADA ONE-SIXTIES. Regular price, \$120. Our price, \$105. We can give you equal reductions on any standard set or apparatus. Write us your wants.

DEALERS: Send for our proposition.

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VOLUME THREE OF  
**RADIO WORLD**

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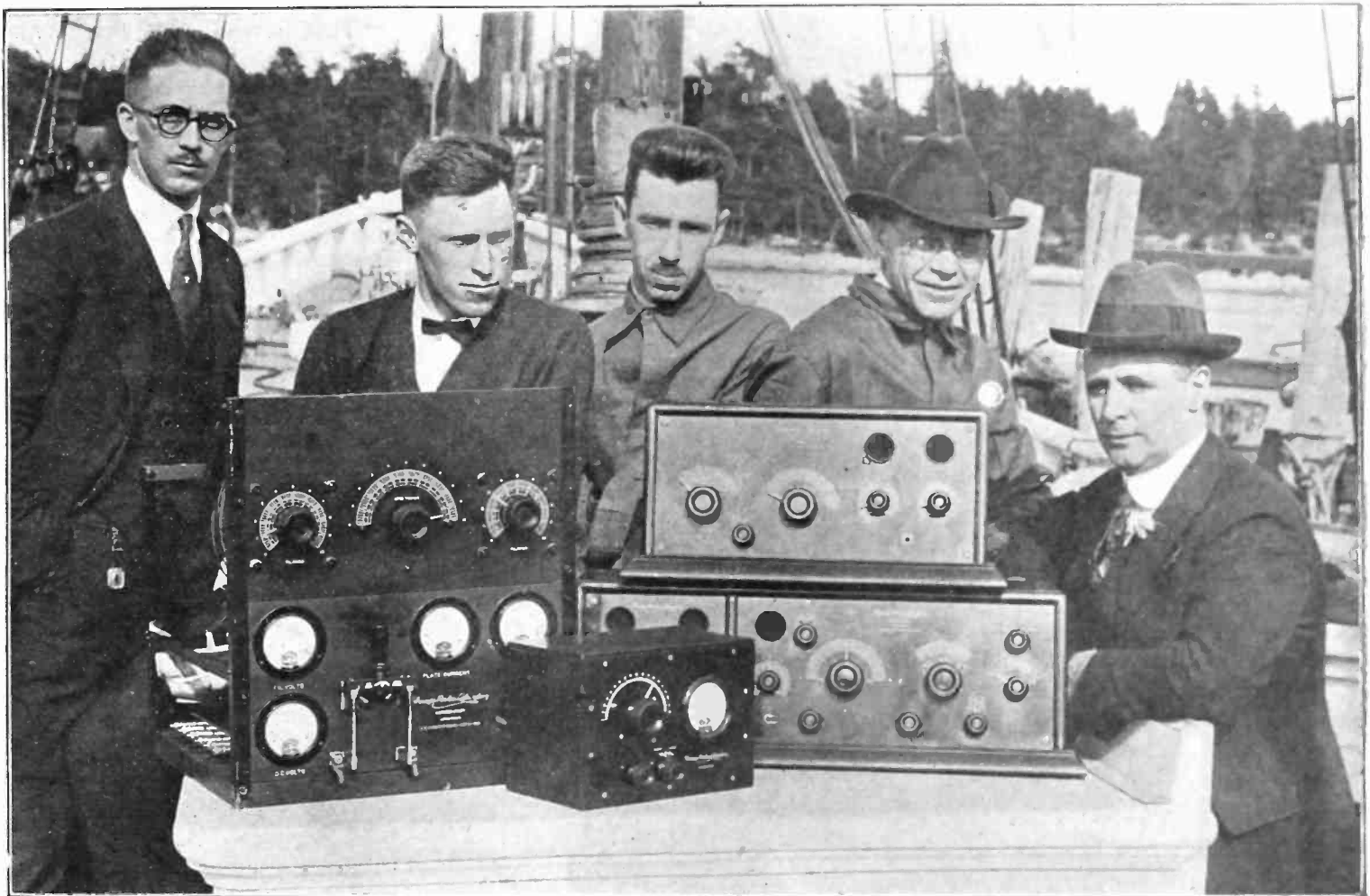
## Radio Equipment of Capt. MacMillan's Arctic Vessel "Bowdoin"

By Sheldon Fairbanks

*A Member of the Expedition*

**I**N equipping Captain Donald B. MacMillan's polar ship "Bowdoin" with radio apparatus for its trip to the Far North on June 23 several interesting problems presented themselves.

first time, communication to and from the polar regions from the United States will be possible. This belief also is shared by the ship's operator, Donald Mix, and by K. B. Warner, secretary, and F. H. Schnell, traffic manager, of



Radio equipment assembled on the deckhouse of Capt. Donald B. MacMillan's Arctic vessel "Bowdoin." The transmitter on the left and the two receivers and wave meter at the right were specially built for the trip. Standing back of the apparatus from left to right are F. H. Schnell, traffic manager, A. R. R. L.; Donald Mix, radio operator on the "Bowdoin"; K. B. Warner, secretary, A. R. R. L.; M. B. West, chief engineer of Chicago Radio Laboratory, in charge of installation, and Capt. Donald B. MacMillan, the well-known Arctic explorer.

The design and installation of the receiving and sending apparatus had to be of such a nature as to overcome the extreme temperatures to be encountered in the Arctic; also the schooner carries sails, and the rigging of the antennae presented some difficulty.

However, M. B. West, chief of the Chicago Radio Laboratory, who did the work, is confident that, for the

the American Radio Relay League, who have inspected the installation.

In the apparatus itself every precaution has been taken to permit of the expansion and contraction of the various parts to allow for extremes of temperature without interference with normal operation.

*(Continued on next page)*

# How to Get Results Out of Your Receiver

By O. I. See

**W**HEN you get it home, take a screwdriver, a pair of pliers and a hammer and see if all the connections are firmly soldered. To do this, first take the screwdriver and pry under each connection. If it sticks, take the hammer and hit it a swat. If it still remains connected try to twist it with the pliers. If all the connections withstand this test, you may be assured that they were soldered.

Next be sure to try your bulb by shaking it violently to see if it is solidly constructed. Bite the tip off under water and test the vacuum. If the tube fills up and there is no air bubble in the tube there was a good vacuum in it.

Make sure that your condensers are not shorted. If one of the plates seems to be too close to another, take your hammer and proceed to straighten it. In order to prevent bending the plate next to it, take a wedge, and shove it between the bent one and the straight one and hit it a good, healthy blow. Be sure to test the bearings and take all the plates apart to dust them and then put them back being sure that you leave out two or three of the washers so that you will always have a couple on hand if you lose any.

Try out all the wires on your variometers and variocouplers. There is sometimes a loose wire. In order to test them grab each wire with a pair of pliers and

give it a yank. If it doesn't stretch or break you may be assured that it is tight.

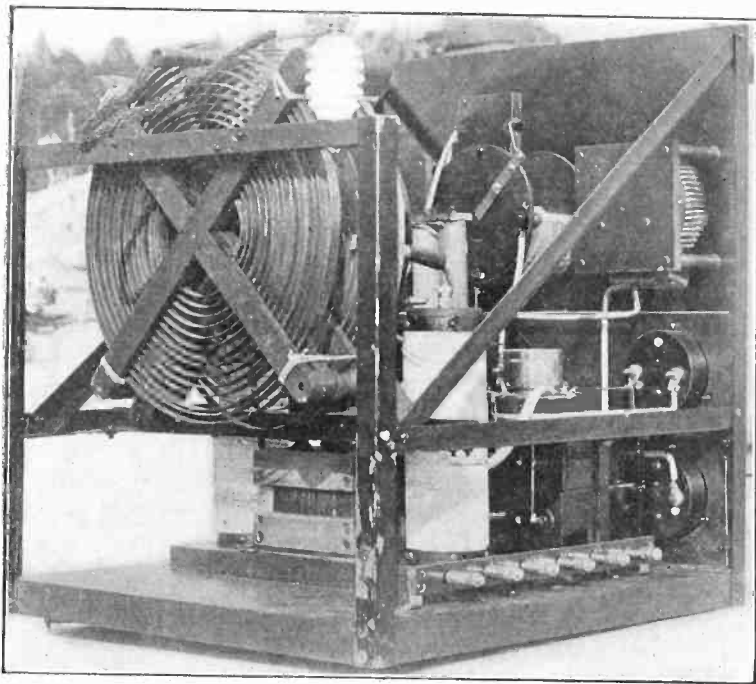
If you are using a storage battery it is always a good plan to let it stand a long while without water. This improves the plates as the acid gets stronger because of the water evaporating. It is also a good test of a battery to short circuit it with heavy wire. If the plates stand a good, long short circuit without buckling it was a good battery. There are very few batteries that will stand this test, so if yours doesn't, you may be sure that it is only average, and it is better to throw it away and get a new one.

## What is a "Safety Gap?"

By a safety gap we mean a small air gap, generally put across the antenna and ground connection of a receiving set to allow any heavy electrical charge that gathers on the aerial to discharge without damaging the receiving set. The safety gap in common use generally consists of a minute spark gap, with the terminals about 1/50 of an inch apart. This small gap will not protect the set against lightning, but is used where there is a transmitter set nearby, and can be found on most all commercial sets.

(Concluded from preceding page)

The antenna is rigged to the two masts, with all four wires leading on a slant forward of the foremast, the lead-in wire being taken off one end of a small spreader swung



Rear view of the specially designed and built transmitter with which the "Bowdoin" will keep in touch with civilization during her trip to the Far North. It is straight C. W. with a wave length of 200 to 600 meters.

about half-way between the top of the foremast and the tip of the bowsprit.

The lead-in insulator presented a peculiar problem, as with an interior temperature of 70 degrees above and a temperature outside of 70 degrees below a difference of 140 degrees is encountered. The slightest metallic connection between exterior and interior under such a great difference in temperature conducts the heat so rapidly that

it is almost impossible to prevent ice collecting on the inner end of the conductor. Therefore the insulator itself was constructed of three concentric tubes surrounding a long, slender brass rod. The outer tube is of specially treated wood; the next is of hard rubber, and the inner tube is of glass.

Because of the obvious necessity of fuel economy the power for the transmitter is decidedly limited. The power plant consists of duplicate 850-watt Delco gas-engine-driven generators, connected to a 160-ampere-hour, 32-volt storage battery. This battery must carry the regular ship's light load in addition to that of the radio transmitter, which alone requires 50 amperes at 32 volts. Consequently one of the gas-engine-driven generators must always be kept in operation while the radio transmitter is working.

The failure of the 32-volt battery would mean a complete breakdown of the radio transmitter. In consequence this equipment was selected with great care, and a very complete set of spare parts, chemicals, etc., has been provided.

The small B batteries, so necessary as a part of the receiving equipment, also presented a problem. These small batteries seldom have a life of more than one year, and the expedition will be gone longer than that; possibly, with unfavorable conditions, two or three years.

Therefore the manufacturer provided a large supply of especially selected cells, whose behavior during manufacture was carefully watched so as to insure the longest possible life. These were selected by observing thousands of the cells during the regular course of manufacture and selecting only those which had characteristics indicating the longest possible life.

In addition to providing B batteries for a period of time longer than the possible life of the best selected cells a complete set of parts, with the necessary chemicals, are provided, with minute instructions so that additional batteries can be manufactured aboard as needed.

Every possible precaution has been taken to insure against failure from any preventable cause.

# A Portable Single Tube Loop Receiver That Is Cheap and Reliable

By Robert L. Dougherty

**T**HE ideal portable receiver for all practical purposes is the one or two tube reflex set, but there is the drawback of the additional expense of the transformers and their added weight, which, when considered in terms of pounds per hiking mile, grow heavier with each step. With this idea in mind it was thought possible to contrive some means of using a single tube on a loop without the necessity of relying upon reflex reception for medium distance.

Of course, it must be realized that a single-tube receiver of the type described here will not bring in stations 1,800 miles away, as do the single-tube, single-circuit sets using antennae and ground. But if reception over medium distance of, say, 50 to 200 miles is desired this circuit will give complete satisfaction if care is taken in its construction and operation.

In this circuit there is a decided change from most loop circuits, as a tuner is used. The tuner should be specially wound, and should be made in the following manner: Procure a tube  $3\frac{1}{2}$  inches in diameter and 5 long. If a cardboard tube is to be used it is best to thoroughly impregnate it with paraffine or beeswax to prevent shrinkage and consequent loosening of the wire. On this tube are wound the two coils, L-1 and L-2, as shown in the diagram herewith. L-1 is 32 turns of No. 22 DCC wire, tapped every four turns, making eight taps in all. L-2 is 12 turns of the same size wire, wound  $\frac{1}{4}$ -inch away from the first winding, and tapped at the eighth and last turn. Care should be taken to see that the two coils are wound in the same direction. In the winding of these two coils do not make the mistake of shellacing them to make them hold. If you want to be sure that the turns will not slip put a strip of adhesive tape along the tube, and when the wire is wound on top, the tape will groove and prevent any slipping of the wire.

The seven-plate condenser is connected between the grid side of the loop and the switch S. This condenser is necessary to provide additional feed back when regeneration is found hard to promote with the plate coil. On local work this condenser will be found a great help in fine tuning, and on longer distance work will greatly increase the volume after the set is tuned in, although re-tuning may be necessary.

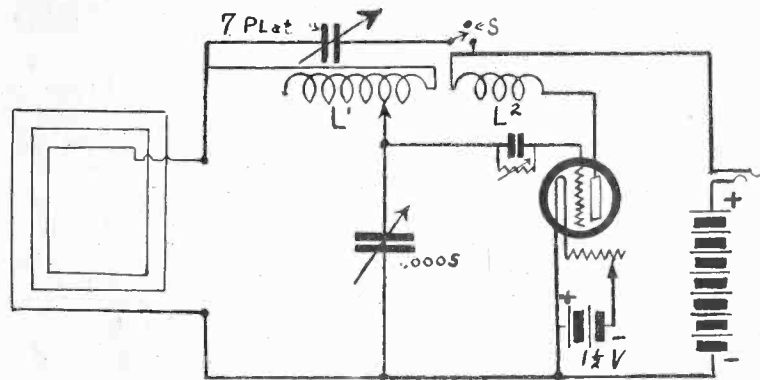
The variable condenser across the loop should be as shown in the diagram—one of .0005 mfd. capacity. It is not necessary that this be of vernier control, but, as with all single-tube circuits, it will help considerably in the tuning of the set. If it is not thought advisable to go to the added expense of purchasing one the simple button-dial control will suffice. The rest of the apparatus used is the same as in any set, and needs no explanation. As with any set that you construct you should only buy and use the best apparatus, and the wiring should be carefully insulated and soldered, particularly in a portable set, where it is subjected to the jars and jolts of handling and there is much more chance of breaking connections than in a regular table set.

The grid condenser should be .00025 with a variable grid leak. This is specified because of the fact that, if the dry-cell tube is used, it is generally very critical as to the leak value and much better operation can be obtained with one of the variable type.

When the set is assembled and you are ready for recep-

tion the loop is swung in the direction of the station desired, the tube turned on and the switch S placed on the open point. Then the condenser across the loop is turned until the station desired is heard. The switch for coil L-1 should be placed at about the middle tap, and the switch for L-2 is placed on the first or eighth turn. Then the condenser is again adjusted, this time also tuning with the coil L-1, and condenser switch S is placed in the circuit. Then the set is re-tuned as to the loop condenser. The entire tuning after this is done with the loop and the two condensers. If longer wave reception is desired, such as the 492 or 509 stations, the two coils are tuned up higher, using more inductance, and the same method of tuning is pursued. It will be found that, with some stations, better reception will be had by keeping the switch S on the open point.

The set can easily and neatly be mounted in a small case, such as is used for portable typewriters, and the controls neatly mounted on the outside of the box. In this way all the batteries can be mounted inside the cabinet, and with a portable loop such as described in the Vacation Number of



Schematic diagram of a convenient and easily made loop receiver that you can readily pack in one corner of your trunk and take away with you. The two coils L1 and L2 should be wound as specified in the accompanying text.

RADIO WORLD by Mr. Gordon a neat, compact and flexible loop receiver can be taken away with you on your vacation.

Care should be taken when mounting the tube to see that it is shielded from moving parts, otherwise you will arrive at your destination minus a tube and a good part of your temper. The current to run the set can well be furnished by a single dry cell for the filament and one of the small block-type B batteries for plate current, which will furnish enough current to operate the set over a period of two or three weeks if it is used three hours per day.

A good point about the receiver described is that, if an antenna and ground are available, they can be easily attached by simply using them in place of the loop, and, while the set is not designed for use with antenna and ground, good results can be had by their use, as it will then function as a single-circuit receiver.

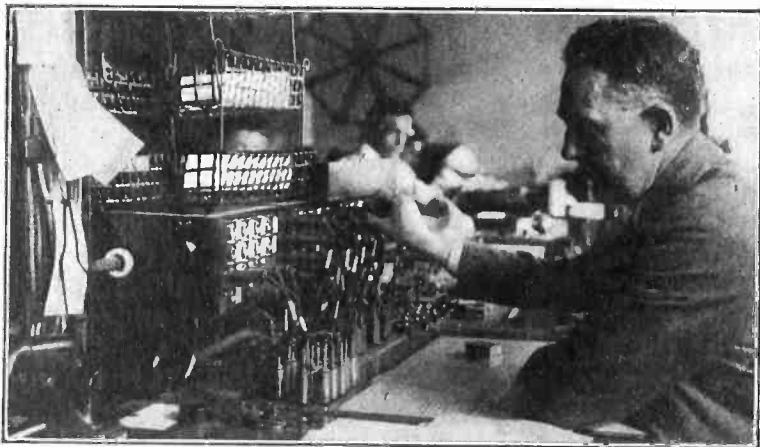
With this receiver, as with any other, of course, the final results depend upon the operator knowing his set and how to work it. There can be no hard and fast rules for the operation of any set. No matter how definite the instructions are they cannot cover all the points that will be necessary when you are tuning in. The best way to operate a set is just like running a car, which is to practice until you can do it without thinking about it, and then it becomes automatic.

# The Navy's Radio Central at Washington

By Carl H. Butman

**T**HE new radio central office of the Naval Communication Service in Washington, D. C., is located in the big Naval Building at 19th and B Sts., near the Lincoln Memorial—sixth wing, second floor, rear, to be exact, and is approached through the several offices of the Communication Service, one of which is that of Rear Admiral Ziegemeier.

From this office issue all Naval radio messages from the Capital. The transmitters at Arlington, Annapolis, Sayville, and several smaller stations are controlled directly from keys installed here. Annapolis and Say-



(C. International Newsreel)

Taking the romance out of radio by making it resemble a land telephone. The Radio Central control room in the Navy Department Building at Washington, D. C., where the channel lines of all the large transmitters of the United States are controlled. Chief Gunner J. J. Delany is at the board plugging in on the trunk lines which connect him with stations many miles away.

ville are high-powered, trans-continental and trans-oceanic stations; and Arlington, which is a link in the long coastal chain, is used for medium district communication with Norfolk, Charleston, Key West, New Orleans and Guantanamo and ships at sea, over spark, arc and tube sets.

Long distance reception from the many outlying stations of the Naval chain is secured through six big receiving sets, known as RB type tube receivers,

located in six separate rooms in different sections on the third floor of the Naval Building. From these sets leads run to the central switchboard and as many operating desks in the central office. The RB receivers pick up the messages on eight foot loops installed directly overhead on the roof of the building. These coils are directional and may be rotated from the rooms below by a rod when tuning in. Each set is put in operation, watched and shut down by a monitor engineer who makes continual rounds of the six separate rooms. A continuous watch is kept on these large sets, each covering a special station. One listens in on San Diego on 9,800 meters; another for San Francisco on 10,500; a third on San Juan on 8,785; a fourth for Balboa on 7,000; number five on French stations on 15,000 and number six is used for emergency, and experimental work and ships. Each inside wire leads from the switchboard to the operator's desk, where phones, typewriters and transmitting keys are installed.

The efforts of the Naval Communication Service are for reliability and efficiency in handling messages, and the sets and operators work on certain circuits all the time.

Two shorter wave sets, of SE 1420C-type, are installed in the central office, being connected with aerials on the roof above. These sets are used for receiving neighboring stations and ships on the Atlantic.

In Radio Central a busy scene confronts a visitor; some keys are clicking and some of the operators are typing messages from distant stations. Messengers come and go with dispatches from government officials to our representatives in foreign countries and our ships in the seven seas.

The long land line formerly used between the old receiving station at Bar Harbor and the Washington Office has been discontinued at large annual saving. Bar Harbor is now a coastal and compass station and handles no long distance messages, although the equipment is left in place in the event of emergencies or war requirements. Washington is literally the Naval Radio Central for the country today.

## Radio and the Woman *By Crystal D. Tector*

**F**RIEND HUSBAND told me the other day that he was going on a two weeks' fishing trip, and wanted to know if I would go along. I told him that I was perfectly satisfied to stay at home and buy my fish at the store, but that he could send me a couple of young trout to start a hatchery, so that next year he could go out in the backyard and catch all the fish he wanted. He laughed, and started in to pack his things, and then asked me if I minded if he took along my "pet Flewelling." Well, that was nerve if there ever was. Bad enough that I have to be a widow for two weeks without his taking the apple of my eye with him and leaving me all alone. I told him to get his own set out of the car and take that, but he said that he thought that mine was lighter and better. "You know I have to cross the lake in a canoe, and I don't want to take a chance of losing it." Oh, didn't I give it to him! Girls, I am going to start a club and propose that every woman build or get her own set, and never let hubby or his friends even listen to it or use it.

A school chum of mine whom I haven't seen in years dropped in the other day, and of course we started in to talk over old times and to recall all the old incidents of high-school days. After tea we went in to our "radio room," and she quite pleasantly remarked that she was taking the radio and advanced physics course at Barnard College. Well, you could have knocked me over with a half of a feather. "Why, G....., you used to hate elementary physics and math, and all those things." "I know that, K.....; but you see I married a dear boy who is just up to his shoulders in radio research work, and I am studying it so that I can help him or work with him." Well, that goes to show that it is not only the men who can show how the wheels of progress turn and what makes a signal audible in the loud-speaker. I think that I will get hubby to let me take it up when I am not busy with other things. Then maybe I can write a book and become famous.

\* \* \*

Isn't our new list of broadcasting stations just the thing?

# Tips on Loading Circuits for the Higher Wave Lengths

**E**VER since the new allocation of wave lengths a great howl has gone up from amateurs who have bought or built sets that will not reach the new higher wave lengths on which broadcasting is done. Quite a few have seriously considered junking their sets which have done such wonderful work for them in the past few months, and of course hate to do it, yet cannot think of any way in which to overcome the disadvantage under which they are working.

There is a very simple manner in which all of this can be overcome. It will also give the owners of such sets an insight into just what their sets really can accomplish.

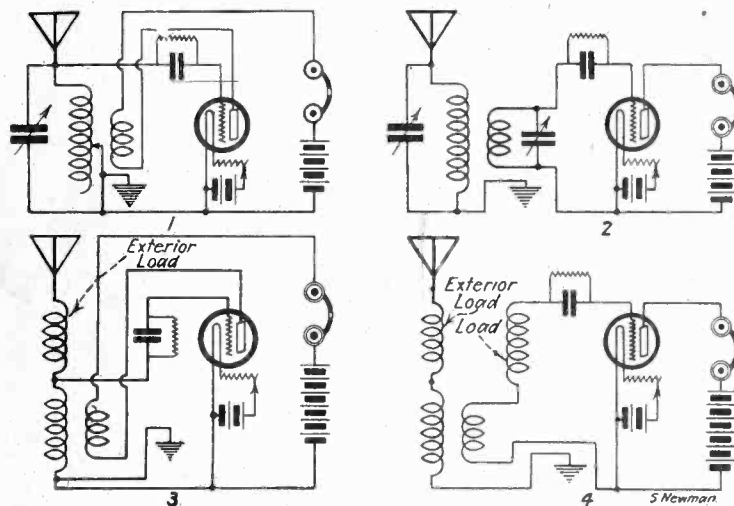
No matter what type of set it is, it can be loaded up to meet the wave length of any transmitter, whether it be 492, or 12,000. Of course on the single circuit sets this is rather a difficult thing to do; that is, if you are considering loading it up to the real long wave lengths. But if you want to cover the broadcasters, and a little bit more besides, you can do it so easily that you will laugh at yourself for ever thinking that you were going to junk the set.

The first and simplest method of meeting the new wave lengths and one that is necessarily limited is to use capacity shunted across the main inductance of your set. By using a 43 plate condenser in parallel with your set, you can fully meet the new waves and yet you won't have to drill a single hole in your panel because all you have to do is hook a condenser across the antenna and ground posts of your set. Simple, isn't it?

If your set is a double circuit affair, it will be slightly harder, as both circuits have to be loaded. This can be done, however, by the same method—simply shunt your condensers across the inductances in both the primary and secondary.

The next, and probably the most efficient method, is to load the circuit by means of extra inductance. If you are handy and want to save money, wind a coil about four inches in diameter and six to eight inches long with a layer of No. 22 SSC wire, and tap it off

every 20 turns for the first 100, and then every 40 turns after that to the end. That is a loading coil. Probably the most efficient of all, however, is the DL or honeycomb coil. In that case, it will only be necessary to insert an adapter in the antenna lead, and stick the coils in them. If it is a single circuit tuner, it will, of course, only be necessary to use one adapter. By this means you can get any desired wave, up to 20,000 by simply using the proper coils. If it is a double circuit tuner, it will be necessary to load the primary as well as the secondary, and if it is a triple circuit affair using a tickler and you want to go up beyond a reasonable amount (800-1000 meters) it would be best to load all the circuits.



Figs. 1-4. Various methods of loading both single and double circuits for higher wave lengths as explained in the accompanying text.

The accompanying diagrams show the four methods of loading the single and double circuit sets, both by means of capacity and by means of external loads which are the approved methods. The capacity method is only good for a very limited band, and a tuner that normally tunes to 400, when shunted by a 43 plate condenser will reach to about 700 efficiently. It is therefore seen that the best method is to load by inductance.

## Radio Is Not a Summer Luxury—It's a Necessity!

**D**O you appreciate the value of your radio set as a summer necessity? If you don't you should, because it is just as much good in the summer as it is in the winter. The mere fact that the distance over which you can receive and the transmitters can send is shortened in a degree is of minor importance.

The main thing of importance is that you should and will use radio this summer. Of course, you may not like to take your three or five tube set away with you, but why let a little thing like that stop you? With 600 odd broadcasters working every minute of the day and night, you ought to be satisfied to take a single bulb set, or even a crystal detector set away with you, and get programs that should satisfy even the most critical.

The thing of main importance is that the set you take be portable and at the same time sensitive enough to get something worth while. Well, you have been trying out single circuit sets all winter—now put one of them into a small cabinet, incorporate a dry cell bulb, furnish the current from three or four flashlight dry

cells hooked in parallel, with a small bloc type B battery, a good pair of phones, some wire for an antenna, and no matter where you go, you can keep in touch with the world through radio.

One of the main factors that has made summer radio possible is the small current dry cell tube. Heretofore it was necessary to have a storage battery or its equivalent to supply the filament. Now that is rendered unnecessary, because a small cell is all that is needed to supply such a tube for many hours.

When starting away, of course, one of the points to be considered is the antenna. You may be going camping, and if such is the case, just throw a stone with a string over a branch and pull up your insulated wire. Then when you decide to move all you have to do is take it down and roll it up. If you are going automobiling arrange your set in the back, on or under the dash, or along the running board. When you stop your car attach the wire to your set, and perform the same rites in installing your antenna as before.

# Conditions that Affect the Range of a Radio Receiver

By Kenneth Malcolm, A. I. R. E.

EVER since radio has come into popular use the universal questions seem to be "How far can my set receive?" and "How far can such and such a station transmit?" If a fixed and ideal set of conditions were available, the answer could be given with a fair degree of accuracy, at least theoretically, but practically there can be no definite answer because of so many variable factors that must be taken into consideration. There may be found cases in which two identical sets, with antenna in exact copy, located but a block apart, have given widely different results—one getting the

proaching instead of going in the opposite direction. Any combination of these factors would produce different results.

In radio work we have even more factors to contend with. First of all comes the power of the transmitter and the sensitiveness of the receiver. Under given conditions an increase of power or an increase in the sensitiveness of the receiving set will give a proportional increase in range. A broadcasting station may have a maximum range of 1,500 miles; but this distance is covered only with a two stage radio frequency amplifier set at the receiving end. A single tube set might only hear it 200 miles and a crystal set only 30 miles. Then again, the reverse is also true; a single tube set might be rated at 500 miles, but only from a station with one kilowatt rating. A 500 watt station might only be heard one-half that distance.

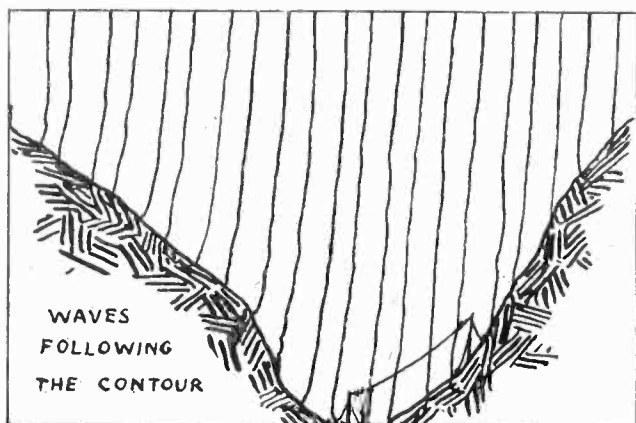
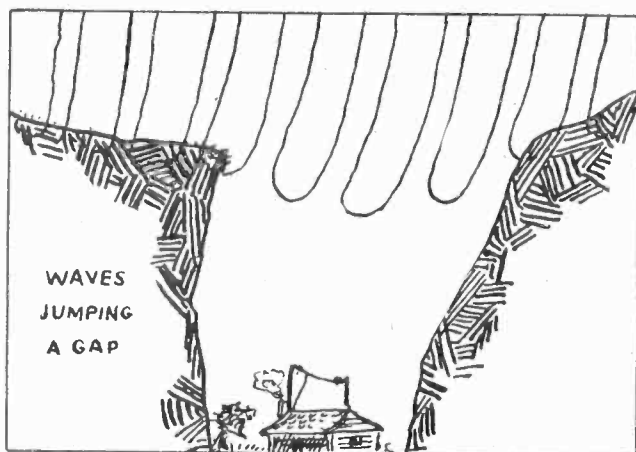
Next in importance comes the immediate environment—possibly this comes even before power and sensitiveness. An aerial situated between tall, steel frame structures will not bring in as good results as one that is located in the open, for the grounded steel frames absorb a large part of the energy before the waves reach it. It is also manifest that steel buildings affect the quality and range of the waves from a transmitting station. A station that promised to be one of the best in the city had to be dismantled, or at least used only for experimental purposes, because the steel in the building in which it was located and in neighboring buildings, had the tendency to distort the waves thereby preventing faithful transmission.

A curious case was reported quite recently by the army. A fine transmitter had been erected on a mountain after much hard work. They were able to radiate a good 2 kilowatts, but try as they might they could not reach their home station but fifty miles away. After much reasoning and an extended search they found that an iron mine in the vicinity was the cause of the trouble. It simply drained all the radiated energy into the earth.

Radio waves will pass much more readily over water than over land, the degree depending to some extent on relative dryness of the land. Then, too, there are fewer obstacles in the way when the waves pass over water. Ships at sea copy "press" many times over a distance of 1,500 miles with a comparatively ancient crystal set.

The condition of the atmosphere is a great factor that cannot be disregarded, for this is the operator who can at will switch you to either "local" or "long distance." It was the atmospheric conditions that enabled most of the long distance records to be made and broken. When you can get Davenport one night and only Pittsburgh the next night, you can in most cases blame it on the weather. Clear air is the best air; and water and dust particles are detrimental as they tend to absorb part of the energy of the advancing waves. Reception cannot be carried on as well in the day time as in the night because the sun's rays ionize the air particles and render them conductive, hence absorbent.

Considering all the variable factors it is not quite  
(Continued on next page)



Showing how radio waves will follow the topography of the country, but will jump sharp gaps between high walled places.

most distant DX stations and the other getting nothing but the locals. The difference lay in the immediate environment.

As an illustration of what is meant by variable factors, let us ask how far a locomotive whistle can be heard. Immediately the answer might occur "It depends upon the power of the whistle." Yes, that is true, but it also depends upon the nature of the surrounding country, the condition of the air, the direction of the wind, the direction the train is travelling, and the sensitiveness of the ear of the listener. In wide open country the sound could be heard much farther than in thickly wooded country or in the city. It could be heard farther if the air was clear and the wind blew in the direction of the listener; also farther if the listener's ears were very sensitive and the locomotive was ap-



# A Radio Set Personifying Portability

By Harvey Graham

WITH every amateur striving for portability and convenience in radio sets to take away for the summer it is not surprising that some very fine examples have been evolved. As far as portability goes that is very easy; but, for fine workmanship and novel arrangement, a portable set made by C. A. Pezet, of 46 West 65th Street, New York City, is the neatest and most compact yet seen.

With this set, the circuit and picture of which is shown herewith, several outstanding features at once make themselves apparent. One is that the set will operate without any antenna. It has been demonstrated, and exceptionally clear reception recorded, using the center post (No. 3) with a ground, such as a wire in a small lake, or even hooked to a telephone, or clipped on the foliage of a tree. The circuit

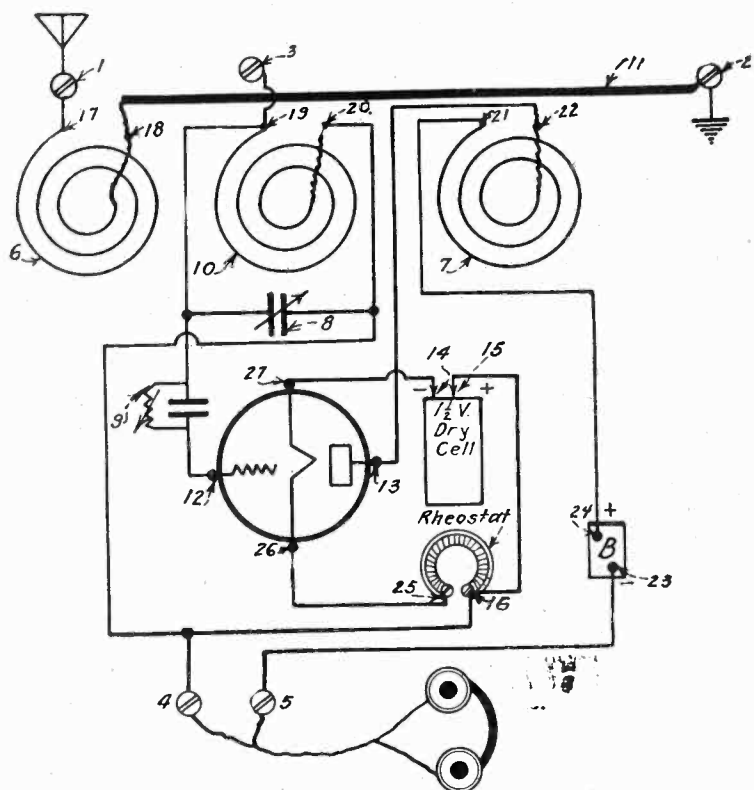


Diagram of the Pezet set using the specially made spiderweb coils which make its use without antenna possible.

has so many adaptabilities that it is possible to take it any place at all. You can use your bed-spring, or the frame of the car, or just drive a wire into the ground. It can also be operated at a regular three-circuit set with antenna and ground. When antenna is not employed the primary circuit is not used, and simply acts as a stabilizer and vernier tuner. Thus exceptional sharp tuning and selectivity is possible.

(Continued from preceding page)

fair to ask how far a certain set can receive. The only real way to find out is to try it under the actual conditions in which it will be eventually used. Even then, you will find that every set has what we might call a reliable and variable range; one that can be depended upon under all conditions, and a second that will work only when things are most favorable.

By reviewing the points mentioned, it may be inferred that a given receiving set will have its greatest range when the air is clear, at night, over water, and the transmitter is of the highest power and in the most

The secret of the whole set lies in the special spiderweb coils, wound with litz wire on a special former. The originator of the circuit spent many months before he finally determined the correct amount of inductance to be placed on each before it would work satisfactorily.

As can be seen in the drawing, the set, when used with antenna and ground, is an ordinary three-circuit spiderweb tuner, the tuning being accomplished by means of varying the coupling of the tickler and primary. It is when the third post (3) is used that the special advantage of this circuit is brought forth. When this is done it is seen that the ground connection is made to one side of the spiderweb that goes to the grid condenser and grid leak. Then, of course, the primary is of no use, the entire tuning being accomplished with the condenser across the secondary and the coupling of the tickler. The tuning is remarkably sharp and wonderfully clear reception is had, free from all distortion and noise. If interference is noticed tuning is done



The portable set being used by simply attaching a wire from the center post to the foliage of a convenient bush.

with the primary, and it stops, having been fully absorbed.

This entire set can be easily accommodated in a Corona typewriter cabinet or carrying case, as shown in the accompanying illustration, and because of the fact that a variable condenser of the book type is used the set can be accommodated, batteries and all, and there is enough space for two sets of phones and a spare box for odd parts, such as screws and clips. Enough wire can be carried on a small spool to form a convenient antenna should it be so desired.

When considering the work that this little set will accomplish and the small space it takes up, as well as its additional feature of not even needing an aerial for efficient operation, it can be claimed that the "essence of portability" has been reached.

favorable local environment. To the degree in which this perfect state of affairs is an actuality, will the goal of maximum possible range for a specific set be heard satisfactorily.

If your set does not give quite as satisfactory results as you might expect, don't condemn it immediately but look around and see if there is not some condition which you might better. Possibly a little change in the location of your aerial might transform a failure into a success. When on the hike keep to the water, the open spaces, and the mountain tops and stay out of the walled-in valleys.

# More New Broadcasters Assigned Wave Lengths

WASHINGTON, D. C.—Five new Class A stations were licensed during the ten days ending May 31, three Class C stations transferred to Class B status and 28 Class C stations transferred to Class A with specific district wave lengths. Class B stations now number 39; Class A, 146; Class C, 405, and Class D, broadcasting experimental, 1; a total of 591 stations.

## Five New A Stations Licensed

| Call | Station   | Frequency<br>Kcys. | Wave<br>Length<br>Meters | Power<br>Watts |
|------|---|--------------------|--------------------------|----------------|
| WABI | Bangor Railway & Elect. Co., Bangor, Maine            | 1,250              | 240                      | 50             |
| WCBA | Haimbach, Chas W., Allentown, Pa.                     | 1,070              | 280                      | 5              |
| KFIO | North Central High School, Spokane, Wash.             | 1,190              | 252                      | 50             |
| WABJ | Radio Laboratories, The, Dean Bldg., South Bend, Ind. | 1,250              | 240                      | 10             |
| KFIK | Gladbrook Electric Co., Gladbrook, Ia.                | 1,280              | 234                      | 20             |

## Twenty-eight Transferred from Class C to Class A

|      |  |       |     |     |
|------|--|-------|-----|-----|
| KFAV | Abbot Kinney Co., Venice, Calif.                     | 1,160 | 258 | 5   |
| WGAW | Albright, Ernest C., Altoona, Pa.                    | 1,150 | 261 | 100 |
| WOAG | Apollo Theatre, Belvidere, Ill.                      | 1,340 | 224 | 20  |
| WLAS | Central Radio Supply Co., Hutchinson, Kansas         | 1,230 | 244 | 20  |
| WBU  | City of Chicago, Chicago, Ill.                       | 1,050 | 286 | 500 |
| KFAT | Donohue, Dr. J. T., Eugene, Ore.                     | 1,090 | 275 | 50  |
| WPAJ | Doolittle Radio Corp., New Haven, Conn.              | 1,120 | 268 | 10  |
| WDAK | Hartford Courant, Hartford, Conn.                    | 1,150 | 261 | 100 |
| KFAU | Independent School Dist. of Boise City, Boise, Idaho | 1,110 | 270 | 10  |
| WSL  | J. & M. Elect. Co., Utica, N. Y.                     | 1,100 | 273 | 100 |

| Call | Station  | Frequency<br>Kcys. | Wave<br>Length<br>Meters | Power<br>Watts |
|------|--|--------------------|--------------------------|----------------|
| WCAY | Kesselman O'Driscoll Music House, Milwaukee, Wisc.         | 1,150              | 261                      | 500            |
| WGAL | Lancaster Elect. Supply & Const. Co., Lancaster, Pa.       | 1,210              | 248                      | 10             |
| WKAX | Macfarlane, W. A., Bridgeport, Conn.                       | 1,300              | 231                      | 15             |
| KFEV | Radio Elect. Shop, Douglas, Wyo.                           | 1,140              | 263                      | 100            |
| KDYM | Savoy Theatre, San Diego, Calif.                           | 1,190              | 252                      | 100            |
| KFHR | Star Elect. & Radio Co., Seattle                           | 1,110              | 270                      | 100            |
| WKAC | Star Publishing Co., Lincoln, Nebr.                        | 1,090              | 275                      | 100            |
| WBL  | T. & H. Radio Co., Anthony, Kansas                         | 1,150              | 261                      | 100            |
| WRW  | Tarrytown Radio Research Lab., Tarrytown, N. Y.            | 1,100              | 273                      | 50             |
| WRAR | Thomas, Jacob Carl, David City, Neb.                       | 1,330              | 226                      | 20             |
| WIAF | DeCortin, Gustav A., 10 Marlborough Gate, New Orleans, La. | 1,280              | 234                      | 10             |
| WTAW | Agriculture & Mech. College, College Station, Texas        | 1,180              | 254                      | 50             |
| WMAC | Page, J. Edw., Cazenovia, N. Y.                            | 1,150              | 261                      | 200            |
| KFDC | Radio Supply Co., Spokane, Wash.                           | 1,060              | 283                      | 10             |
| WQAW | Catholic Univ. of America, Washington, D. C.               | 1,270              | 236                      | 50             |
| WBAW | Marietta College, Marietta, Ohio                           | 1,220              | 246                      | 100            |
| WSAH | Leonard, A. G., Jr., Chicago, Ill.                         | 1,210              | 248                      | 500            |
| KFDU | Nebraska Radio & El. Co., Lincoln, Neb.                    | 1,250              | 240                      | 20             |

## Three Class C Stations Transferred to Class B

|      |  |     |     |     |
|------|--|-----|-----|-----|
| WBAV | Erner & Hopkins Co., Columbus, O.          | 770 | 390 | 500 |
| WOAI | Southern Equipment Co., San Antonio, Texas | 780 | 385 | 500 |
| WOAW | Woodmen of the World, Omaha, Neb.          | 570 | 526 | 500 |

# Radio Amateurs of Great Value in War

THERE is practically no end to the possibilities of radio for military use, an officer of the Signal Corps stated recently, adding that young men who wish to serve their country can do so in no better way than to become qualified in radio and to join the National Guard or Signal Reserve Corps of the Army.

There is no more interesting study for young Americans, he points out, than radio. It need not be taken up as a profession, but merely as a part of one's general education. Every one should become familiar with radio in "this electrical age," the officer insists, explaining that some of our leading radio engineers like "Eddie" Armstrong, started as amateurs.

As an instance of the work of former amateurs who served in the Signal Corps during the war, it is said that 73 per cent of the 400 radio men engaged in intelligence work were ex-amateurs. Not a single "leak" occurred in the service, which intercepted 73,000 enemy messages and recorded 175,000 bearings on enemy radio stations. The country and the Signal Corps is greatly indebted to these amateurs for their war work.

Although little is known of the work of the radio intelligence section of the Army during or since the war, it was one of the most spectacular. Radio direction finders were placed all along the lines, at a distance of about five miles from the actual front and spaced about twelve miles apart. These receiving sets located the enemy stations in operation, recorded their bearings by means of directional coils, not unlike modern radio compasses, and forwarded the bearings to headquarters where they were plotted on maps. The reports from many American radio observers enabled the

staff to keep an accurate check on practically all the German stations all the time.

Other radio receiving stations at Army Headquarters intercepted and copied all enemy code messages and telegraphed them back to General Headquarters where code experts worked them out, giving the staff valuable information as to the movements or intentions of the enemy.

On one occasion, when the Germans were planning a big offensive, the code all along the line was suddenly changed. The old code, known by the Americans for some time, became valueless. But one German officer could not decipher a long message sent him in the new code and asked his commander to repeat it in the old one. This was done and as the American intercepting stations copied both messages, the staff of experts at headquarters soon had a fair solution of the new code, which they eventually worked out in its entirety. The repetition of the message in both codes was more than they hoped for, and when the new code was transmitted to the French and British headquarters, the American radio intelligence service was credited with a big "scoop."

Many times, it is reported, enemy messages were intercepted, decoded and rushed to the troops at a threatened front in time for them to prepare for the projected attack.

Wonderful results were also accomplished by our advance listening-in stations in front line dugouts and trenches, where amplifiers with wires radiating to grounds in no-man's land were placed. Sometimes they were actually tied in on enemy phone lines. These stations picked up enemy phone conversations by induction, enabling our operators to copy orders and messages.

# RADIO PRIMER

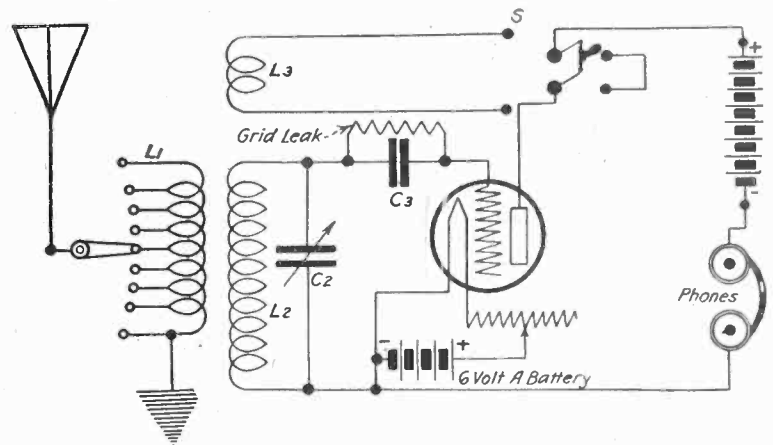
## For the New Army of Radio Beginners

By Lynn Brooks

**REGENERATION:** In order to understand regeneration it is first necessary to have a knowledge of how the ordinary vacuum tube works in the reception of signals. In the regular two-circuit tube set the energy is picked up by the primary circuit, consisting of antennae, primary coil and ground. Due to the proximity of the secondary coil there is a current induced in the secondary or grid circuit. Immediately there is a large variation of the current in the plate circuit, due to the fact that the grid, being charged positively, allows the negative electrons to flow to the plate. This circuit is supplied by the high voltage battery, and consists of the phones, high voltage battery and plate of the tube, and the filament of the tube, which is connected through the circuit from the minus of the high voltage battery. At the second when the grid is charged the current flow in the high voltage battery circuit (commonly called B circuit) is at its peak, and an exact reproduction of the signal emanated is heard in the phones. The strength of this current flow can be controlled in a small way by the heat of the filament. Up to a certain point (called the "saturation point") the filament throws off electrons in direct proportion to the amount of current flowing through it. After this saturation point is passed it will not throw off any more than a certain amount, and frequently the electron flow jams and ceases. These electrons, being negative in action, allow the current to flow in the plate circuit when the grid is positively charged.

Now if we introduce a coil in the plate circuit and couple it to the secondary or grid coil we can get what we call regeneration. A signal is impressed on the grid in the manner mentioned, and a variation of the current in the plate circuit takes place. The extra coil being in the plate circuit, whatever current flows in the plate circuit must of necessity flow through the coil. This coil is held in inductive relation to the grid or secondary coil. It is evident, therefore, that there will be a transference of energy from the plate coil to the secondary or grid circuit which will tend to back up or reinforce the original current in this circuit, causing a much greater amount of current to flow in the plate circuit than originally. This action occurs many times until the point is reached at which the tube

oscillates itself, at which time the original signal tone is lost and a mushy note takes its place in the tube. In controlling regeneration the amount of coupling used between the plate coil (tickler) and the grid coil (secondary) are the controlling features in the amount of regeneration or feed back, and the best point in this self-amplification scheme is the point at which the tube is doing its utmost just below the oscillation point, at which it "spills" over. When this point is reached the amplification due to regeneration is highest. To illustrate this action the hook-up herewith is given. It is a combination regenerative and non-regenerative hook-up. The switch in the plate circuit is the factor controlling the non-regenerative and regenerative hook-ups. By following the explanation given above the principle of regenerative and non-regenerative circuits can be easily followed. When the switch is on S the circuit is regenerative, the feed-back coil (L-3) of the plate circuit being in the plate circuit, and re-transferring the plate circuit energy back into the grid circuit to strengthen the original current in the circuit. When the switch is in the opposite position the circuit will not regenerate because the plate circuit has no means of feeding back.



Combination circuit illustrating feed-back and straight circuit. When switch is on S circuit is regenerative.

**ADVANTAGES OF REGENERATION:** It is possible by means of regeneration to get an enormous amount of self-amplification on one tube. With some signals, especially when the set is tuned properly, it is possible to receive signals with an amplification of one stage of audio-frequency amplification, and sometimes even more, all depending upon the manner in which the regeneration is handled. This is partly due to the fact that the principle of radio-frequency amplification is brought into play because the signals in the plate coil are super-impressed upon the signals in the grid circuit, which are of radio-frequency.

## The Daily Paper Radio Situation in New York City

The purchase by Frank A. Munsey of the New York "Globe" has stirred up things considerably as far as radio and the daily papers are concerned. Mr. Munsey, who thinks nothing of killing a publication that no longer interests him, divided the various "Globe" features between the "Sun" and the "Evening Telegram." The "Sun" gets the radio section and it is understood that for the time being at least the radio staff will remain intact. The "Evening Mail" expected to make considerable capital out of the fact that the "Globe" as a separate entity was no more. This gladsome view, however, was changed when the "Evening World" announced that it would almost immediately start a radio section to go with its Saturday edition. This move of the "Evening World" is really a triumph for radio. The Pulitzers have always figured that the "Morning World" and "Evening World" were primarily for news and

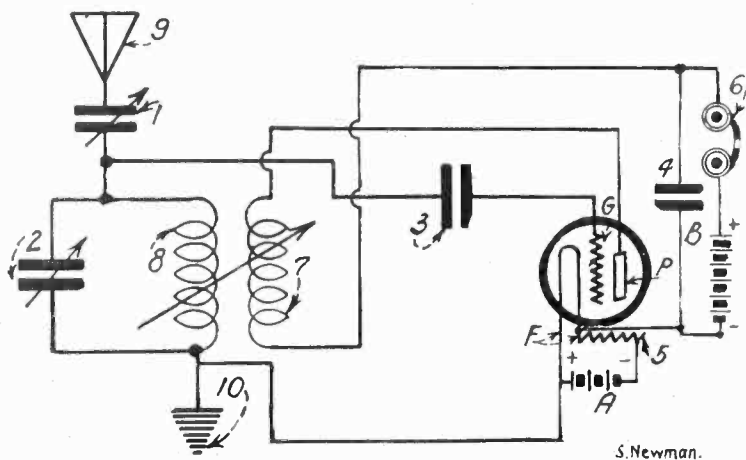
while they contained features, they are not regarded as feature papers in the same sense as the "Globe" was. For instance, some years ago, an attempt was made to have the "Evening World" establish a theatrical department on the order of Zit's department in the "Evening Journal," but Ralph Pulitzer put down his foot hard and declared that he would not consider the proposition. The determination of the "Evening World" therefore to publish a radio section is ample proof that the publishers have made a thorough investigation of radio, have made up their minds that it is here to stay, and that it is a good circulation getter.

All of which is good grist for the radio mill—for the more daily papers that are devoted to radio, the better it is for the whole science, art and business of radio, even tho these papers cannot be expected to cover the field outside their own distribution limits.

# A Portable Set with "Roller Skate" Attachment

(Concluded from front cover page)

up in the space between the panel and front cover. The filament rheostat can be seen in the lower right hand corner where it connects directly to the A battery. It will be noticed that the phone terminals are also located where the shortest possible wires serve for connections. The right hand dial controls a vernier condenser connected across the primary coil. This condenser is made of two circular brass plates about four inches in diameter, one screwed onto the back of the panel and the other soldered to the head of a  $\frac{1}{4}$ -inch stove bolt which is threaded through the panel. The dial is attached to the opposite end of the stove bolt. The one plate, therefore, rotates with the dial and owing to the threaded support moves toward or away from the stationary plate as indicated in the sketch. A spring contact rubs against the movable plate while the other connection is attached to the



S. Newman.

Circuit used by Brown in constructing his portable set. (1) 43 plate condenser. (2) Special 2 plate vernier. (3) Grid condenser (no leak). (4) Phone condenser. (5) Filament rheostat. (6) Phones. (7) Secondary of coupler. (8) Primary of coupler. (9) Antenna. (10) Ground.

(Concluded from cover page)

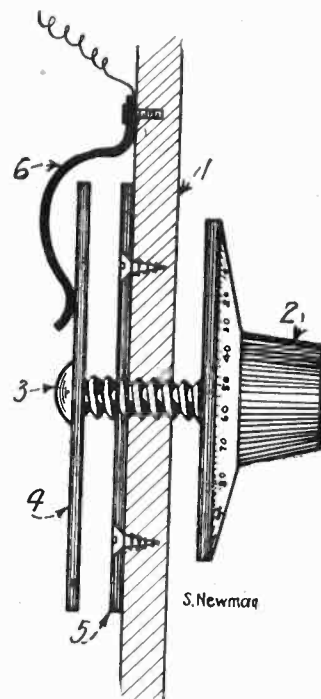
stationary plate. This condenser serves the same purpose as the ordinary vernier making it possible to choke off WHN and pick up WGY or vice versa. We have also tuned out both WJZ and WEAFF and picked up WGY without the usual squeals and yowls. This, however, requires considerable patience as one must hold one's breath and refrain from the slightest movement. Body capacity, of course, has a decided effect owing to the wood panel, used for its beautiful, in-grain effect. If when approaching the panel, Uncle Roxy of Capitol fame, comes in funnier, this indicates more capacity is required on the condenser. If it squeals and you miss one of his jokes turn it the other way quick and there you are. We have just been listening to him and his Mike broke down under the strain. Even the vernier condenser can't help that. The left hand dial controls the 43 plate condenser in series with the antenna. Most of the tuning is done with this dial. The center dial controls the rotor or tickler coil and thereby the amount of regeneration.

Needless to say, a WD-11 tube is used with a  $1\frac{1}{2}$ -volt A battery. The 45 volt B battery is located in a separate compartment. A  $1\frac{1}{2}$ -volt flash light bulb and socket are attached to the positive terminal of the B battery as a fuse. This ten cent ballast bulb is not even lighted by the small amount of current drawn from the B battery but would at once burn out should any wires be accidentally crossed. This would save my WD-11. The home made variocoupler is of the

basket variety. Exactly  $60\frac{1}{3}$  turns are used on the rotor or tickler coil and also on the primary which is the secondary as well. You may find that  $49\frac{1}{2}$  turns work equally well if too many turns are not wound on the water pipe ground connection. We are originally from Missouri and have very little faith in the electronic theory. At any rate, a little experimenting will prove that the correct number of turns may be used to tune from 200 to 600 meters without taps or switches. A condenser from an automobile ignition coil is used in place of the regulation grid leak and condenser.

Now the "Roller Skate" attachment or the little Saxon roadster as it was once known, comes in very handy as a counterpoise. The set was in actual operation when the photo was taken, the frame of the "Roller Skate" being used as a ground. WEAFF 25 miles away came in loud enough to be heard three or four feet from the phones. We measured it with a steel tape to verify this statement. The tape is in my right rear pocket. WJZ or WEAFF were tuned in or out at will. The 150 ft. roll of bell wire was used as an antenna. One end tied to a stone was thrown over a nearby tree. We would suggest tying the stone very carefully and keeping the wife and child well out of the way. Also do not attach the wire to the set till the stone stops—otherwise the concert may be all off. A sour high C caused the wife's sad expression.

To sum up, allow me to say this is a real Hum Dinger portable set. The batteries, phones, dials, antenna, etc., can all be enclosed and protected by the



Constructional details of the special vernier condenser used in the Brown circuit.

cabinet which is only 8x8x14 inches and weighs less than 20 lbs. When touring with the Saxon, the tube is removed from the socket and carefully wrapped in flannel if the weather is cold. This also obviates the necessity of shock absorbers on the car. The set will operate six pairs of head phones in series. We have attached three of them to an extension line running to different parts of the house and discovered that we could telephone one another while listening to the radio concerts.

# An Extremely Selective Single Circuit Receiver

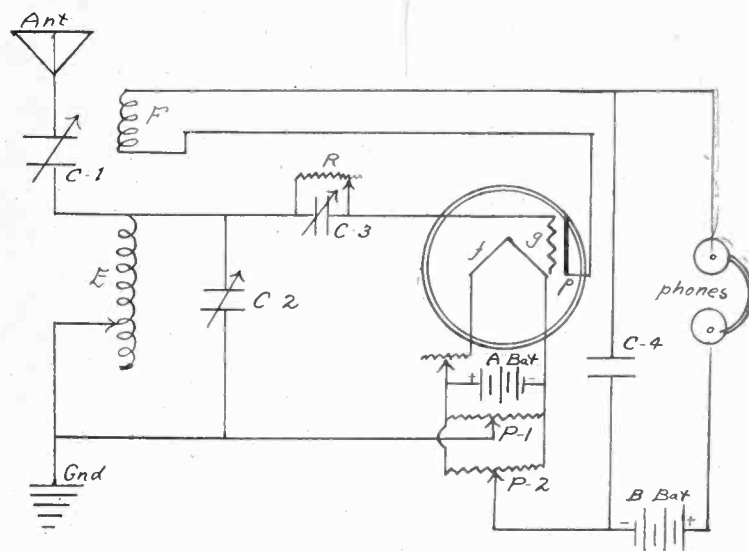
By C. White, Consulting Engineer

THE general tendency in receivers has been simplicity in control. In fact, the general demand has been for a radio set that would be selective and tune with only one dial. The combination of simplicity with reliability is not an easy matter, since certain advantages must be sacrificed in order to make a receiver simple, and it is a general rule that this is done at the expense of reliable operation. One of the most familiar simplified circuits is the well-known "flivver" circuit. Such a circuit tunes in with a single dial, or can be so constructed and operated to do so; but the secret of the whole circuit lies in a constant critical value of grid leak resistance. If the atmospheric conditions, such as moisture, change it is almost a sure guess that the value of your grid leak will change. In fact, I have seen flivver sets that work splendidly one night and on the next, for some reason, it would be almost impossible to secure any reliable results. Then after fooling around with the grid leak the circuit could be restored to its normal working condition. I am not in any way trying to hit the flivver circuit in the least, for I have heard many such circuits, and the results obtained on many were nothing short of remarkable considering the fact that they are simplicity itself. I am simply bringing forth the fact that many receivers that apparently have only a few external adjustments really depend upon other adjustments, such as the grid leak, to keep them in normal condition. Then, again, if a circuit only affords one method of tuning in, how are you going to tune in when interference is bad? There is only one method with a single control tuning set, and if conditions are bad when it is desired to have clear reception there is no other dodge or means left. With the type of circuit outlined in this article there are about twelve different ways to tune in a station, and if perchance poor results are obtained with two or more methods you still have some others left to try. In addition this set affords ample opportunity to experiment and find out just what the various controls do and how they alter reception under certain conditions. It will elevate the average amateur who builds it to the plane of an experimenter, and will not allow him to remain a dial turner until he sees fit to purchase another outfit.

Aside from the fact that the multiple controlled set allows flexible tuning and experimentation it is just as simple to build as any set, only it requires a few more parts. But when all its advantages are summed up it is well worth the trouble and expense of the extra parts. In fundamental theory the circuit is nothing more than the ordinary single-circuit regenerative with a tuning condenser C-2 shunted across the tuning inductance coil E. We can tune in by means of C-1 and E, or by means of C-2 and E, or, better still, by means of the three together. When using the latter method it is better to approximately tune in with C-1 and E, then use C-2 to put on the fine touches. In constructing the receiver you should take care to see that the movable plates of the condenser, C-2, are connected into the filament or ground side of the circuit instead of the grid side. By so doing it is possible to cut down body capacity to a minimum, since the shaft of the condenser is at the same ground potential as the operator's body. A variable grid leak resistance makes it possible to clarify the signal and at the same time raises the volume. You cannot imagine just how important this apparently small part of

the set is on the quality of reception. The variable grid condenser allows still further manipulation of the grid circuit constants, and by its adjustment the best detecting portion of the tube's characteristic is assured for use. The potentiometer P-1 renders a vernier action on the amount of regeneration and stability of the circuit. At first the action of the potentiometer P-1 will seem to only increase and decrease the volume, but by careful adjustment of the amount of regeneration on distant signals it is possible to use P-1 to an advantage in holding the tube stable and prevent it from falling over into oscillation. The action of P-2 is somewhat similar to the action of P-1, but it is not so fine. But by the careful use of the two we can assure smooth regeneration, accompanied with the minimum amount of tube noises.

The constants for the circuit illustrated are as follows: The condensers C-1 and C-2 are 11 or 13 plate air variables, with some sort of vernier either built in or externally



A single circuit set can be made super-selective by the use of two potentiometers as shown in this drawing.

connected. The coil E is the stator of a 180-degree coupler, and the coil F is the rotor. By varying the coupling smoothly through 180 degrees action of the coupler it is quite possible to vary evenly the amount of regeneration. The condenser C-3 is a three plate air variable, such as is commonly employed as a vernier. This condenser should have a maximum capacity of .0003 mfd. The leak resistance R should be one of the few panel types on the market. The panel mounting of this important part of the circuit permits ease in operation, thus obviating the necessity of diving into the wiring of the set to vary the leak resistance. The potentiometers P-1 and P-2 should have a resistance of 300 or more ohms. apiece. The condenser C-4 is a fixed mica condenser of .0025 mfd. capacity. In wiring up the set try to keep the grid wire as short as possible. This means that the tube must be mounted very near the variable grid condenser C-3.

For the amateur who really wants to know what varying the constants of the different parts of the circuit will do, this receiver allows ample room for successful experimentation, and still allows the receiver to be kept in the panel form. It is the ideal set for the amateur who likes to find out for himself the how and why of things.

# Latest Official List of Broadcasting Stations in the United States

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| Call | Station   | Frequency<br>Kcys. | Wave<br>Length<br>Meters | Power<br>Watts |
|------|---|--------------------|--------------------------|----------------|
| WLAX | Greencastle Community Broadcast-<br>ing Station, Greencastle, Ind.... | 1,300              | 231                      | 5              |
| WQAZ | Greensboro Daily News, Greensboro,<br>N. C. ....                      | 833                | 360                      | 30             |
| WSAJ | Grove City College, Grove City, Pa.                                   | 833                | 360                      | 100            |
| WHAH | Hafner Supply Co., Joplin, Mo....                                     | 833                | 360                      | 20             |
| WKPO | Hale Bros., Inc., San Francisco,<br>Cal. ....                         | 710                | 423                      | 500            |
| KGK  | Hallock & Watson Radio Service,<br>Portland, Ore. ....                | 833                | 360                      | 100            |
| WLK  | Hamilton Mfg. Co., Indianapolis,<br>Ind. ....                         | 833                | 360                      | 500            |
| WOAT | Hamp, Boyd Martell, Wilmington,<br>Del. ....                          | 833                | 360                      | 250            |
| WOAA | Hardy, Dr. Walter, Ardmore, Okla.                                     | 833                | 360                      | 20             |
| WDAK | Hartford Courant, Hartford, Conn.                                     | 833                | 360                      | 50             |
| KFDP | Hawkeye Radio Supply Co., Des<br>Moines, Ia. ....                     | 1,080              | 278                      | 100            |
| WEAS | Hecht Co., Washington, D. C. ....                                     | 833                | 360                      | 50             |
| WIAI | Heers Stores Co., Springfield, Mo..                                   | 833                | 360                      | 20             |
| KFGV | Heidbreder Radio Supply Co.,<br>Utica, Neb. ....                      | 1,340              | 224                      | 10             |
| WEAD | Henry Radio & Elect. Supply,<br>Atwood, Kan. ....                     | 1,120              | 268                      | 100            |
| KXD  | Herald Publishing Co., Modesto, Cal.                                  | 833                | 360                      | 5              |
| KQW  | Herrold, Charles D., San Jose, Cal.                                   | 833                | 360                      | 50             |
| WFAJ | Hi Grade Wireless Inst. Co., Ashe-<br>ville, N. C. ....               | 833                | 360                      | 50             |
| WHAO | Hill, F. A., Savannah, Ga. ....                                       | 833                | 360                      | 50             |
| WAAZ | Hollister Miller Motor Co.,<br>Emporia, Kan. ....                     | 833                | 360                      | 50             |
| KFBE | Horn, Reuben H., San Luis<br>Obispo, Cal. ....                        | 833                | 360                      | 10             |
| WJD  | Howe, Richard Harris, Granville,<br>Ohio ....                         | 1,310              | 229                      | 50             |
| WGL  | Howlett, Thomas F. J., Philadel-<br>phia, Pa. ....                    | 833                | 360                      | 250            |
| WDAI | Hughes Electrical Corp., Syracuse,<br>N. Y. ....                      | 833                | 360                      | 250            |
| WQAV | Huntington & Guerry, Inc., Green-<br>ville, S. C. ....                | 833                | 360                      | 100            |
| WHAY | Huntington Press, Huntington, Ind.                                    | 833                | 360                      | 10             |
| WEV  | Hurlburt-Still Electrical Co.,<br>Houston, Texas ....                 | 833                | 360                      | 250            |
| WJAG | Huse Publishing Co., Norfolk,<br>Neb. ....                            | 833                | 360                      | 100            |
| WFAN | Hutchinson Elect. Service Co.,<br>Hutchinson, Minn. ....              | 833                | 360                      | 100            |
| WLAZ | Hutton & Jones Elect. Co., Warren,<br>Ohio ....                       | 1,210              | 248                      | 10             |
| WNAM | Ideal Apparatus Co., Evansville,<br>Ind. ....                         | 833                | 360                      | 100            |
| KFAU | Independent School District of<br>Boise City, Boise, Idaho. ....      | 833                | 360                      | 5              |
| WGV  | Interstate Electric Co., New<br>Orleans, La. ....                     | 833                | 360                      | 100            |
| WOI  | Iowa State College, Ames, Ia. ....                                    | 833                | 360                      | 500            |
| WEAY | Iris Theatre, Houston, Texas. ....                                    | 833                | 360                      | 1,000          |
| KFDZ | Harry O. Iverson. ....  | 833                | 360                      | 5              |
| WJAD | Jackson's Radio Eng. Lab., Waco,<br>Texas ....                        | 833                | 360                      | 150            |
| WBAO | James Milliken Univ., Decatur, Ill..                                  | 833                | 360                      | 50             |
| WPAS | J. & M., Electric Co., Amsterdam,<br>New York. ....                   | 833                | 360                      | 20             |
| WLS  | J. & M. Electric Co., Utica, N. Y..                                   | 833                | 360                      | 250            |
| KFIB | Jenkins, Franklin W., St. Louis,<br>Missouri. ....                    | 1,230              | 244                      | 10             |
| KFFB | Jenkins Furniture Co., Boise, Idaho                                   | 833                | 360                      | 10             |
| WAAB | Jensen, Valdemar, New Orleans, La.                                    | 1,120              | 268                      | 100            |
| WCAC | John Fink Jewelry Co., Fort Smith,<br>Arkansas. ....                  | 833                | 360                      | 20             |
| WLAP | Jordan, W. V., Louisville, Ky. ....                                   | 833                | 360                      | 15             |
| WIAB | Joslyn Automobile Co., Rockford,<br>Illinois. ....                    | 833                | 360                      | 50             |
| WIAK | Journal Stockman Co., Omaha, Neb.                                     | 1,080              | 278                      | 200            |
| WOAP | Kalamazoo College, Kalamazoo,<br>Michigan. ....                       | 833                | 360                      | 100            |
| WMAX | K. & K. Radio Supply Co., Ann<br>Arbor, Mich. ....                    | 833                | 360                      | 250            |
| WCBB | K. & K. Radio Supply Co., Green-<br>ville, Ohio. ....                 | 1,250              | 240                      | 100            |
| WIK  | K. & L. Electric Co., McKeesport,<br>Pennsylvania. ....               | 833                | 360                      | 250            |
| WDAF | Kansas City Star, Kansas City, Mo.                                    | 730                | 411                      | 500            |
| WTG  | Kansas State Agricultural College,<br>Manhattan, Kan. ....            | 833                | 360                      | 1,000          |
| WCAE | Kaufmann & Baer Co., Pittsburgh,<br>Pennsylvania. ....                | 650                | 462                      | 500            |
| WJAT | Kelley-Vawter Jewelry Co., Mar-<br>shall, Mo. ....                    | 833                | 360                      | 25             |
| WJAP | Kelly-Duluth Co., Duluth, Minn. ....                                  | 833                | 360                      | 100            |
| WCAY | Kesselman O'Driscoll Co., Milwau-<br>kee, Wis. ....                   | 833                | 360                      | 100            |
| KFBK | Kimball-Upson Co., Sacramento,<br>California. ....                    | 833                | 360                      | 150            |
| WMAY | Kingshighway Presbyterian Church,<br>St. Louis, Mo. ....              | 833                | 360                      | 100            |
| KFFR | Kirk, Jim, Sparks, Nevada. ....                                       | 833                | 360                      | 10             |
| KFDL | Knight-Campbell Music Co., Den-<br>ver, Colo. ....                    | 833                | 360                      | 5              |
| WPAZ | Koch, John R., Charleston, W. Va.                                     | 1,100              | 273                      | 10             |
| WNAW | Kunzman, Henry, Fort Monroe, Va.                                      | 833                | 360                      | 5              |
| WKAV | Laconia Radio Club, Laconia, N. H.                                    | 833                | 360                      | 100            |
| WABA | Lake Forest College, Lake Forest,<br>Illinois. ....                   | 1,130              | 266                      | 100            |
| WABH | Lake Shore Tire Co., Sandusky, O.                                     | 1,250              | 240                      | 100            |
| WGAL | Lancaster Elect. Supply & Const.<br>Co., Lancaster, Pa. ....          | 833                | 360                      | 75             |
| WHAL | Lansing Capitol News, Lansing,<br>Michigan. ....                      | 1,210              | 248                      | 20             |
| KFIC | Laskowitz, Philip, Denver, Colo. ....                                 | 1,340              | 224                      | 15             |
| WABB | Lawrence, Dr. John B., Harris-<br>burg, Pa. ....                      | 1,130              | 266                      | 10             |
| KFBL | Leese Bros., Everett, Wash. ....                                      | 1,340              | 224                      | 10             |
| KFGH | Leland Stanford, Jr., University,<br>Stanford University, Cal. ....   | 833                | 360                      | 500            |
| WNAT | Lennig Bros., Co., Philadelphia, Pa.                                  | 833                | 360                      | 250            |
| WSAH | Leonard, Jr., A. G., Chicago, Ill. ....                               | 833                | 360                      | 500            |
| WGAU | Limb, Marcus G., Wooster, Ohio. ....                                  | 1,330              | 226                      | 20             |
| KMC  | Lindsay, W. W., Jr., Reedley, Cal. ....                               | 833                | 360                      | 100            |
| WKAS | Lines Music Co., L. E., Spring-<br>field, Mo. ....                    | 833                | 360                      | 50             |
| WDAR | Lit Bros., Philadelphia, Pa. ....                                     | 760                | 395                      | 500            |
| WGAN | Lloyd, Cecil E., Pensacola, Fla. ....                                 | 833                | 360                      | 50             |
| KFGB | Loewenthal Bros., Pueblo, Col. ....                                   | 833                | 360                      | 10             |
| WRAM | Lombard College, Galesburg, Ill. ....                                 | 833                | 360                      | 100            |
| KWH  | Los Angeles Examiner, Los An-<br>geles, Cal. ....                     | 833                | 360                      | 150            |
| KFCL | Los Angeles Union Stock Yards,<br>Los Angeles, Cal. ....              | 833                | 360                      | 500            |
| KFGC | Louisiana State University, Baton<br>Rouge, La. ....                  | 1,180              | 254                      | 100            |
| KMO  | Love Electric Co., Tacoma, Wash. ....                                 | 833                | 360                      | 10             |
| WWL  | Loyola Univ., New Orleans, La. ....                                   | 833                | 360                      | 100            |
| WOAR | Lundskow, Henry P., Kenosha, Wis.                                     | 833                | 360                      | 100            |
| WAOO | Lyradion Mfg. Co., Mishawaka, Ind.                                    | 833                | 360                      | 50             |
| WKAX | Macfarlane, Wm. A., Bridgeport,<br>Connecticut. ....                  | 833                | 360                      | 50             |
| KFCV | Mahaffey, Jr., Fred, Houston, Tex.                                    | 833                | 360                      | 50             |
| WWAY | Marigold Gardens, Chicago, Ill. ....                                  | 833                | 360                      | 500            |
| KFFQ | Marksheffel Motor Co., Colorado<br>Springs, Col. ....                 | 833                | 360                      | 10             |

| Call | Station  | Frequency<br>Kcys. | Wave<br>Length<br>Meters | Power<br>Watts | Call | Station   | Frequency<br>Kcys. | Wave<br>Length<br>Meters | Power<br>Watts |
|------|--|--------------------|--------------------------|----------------|------|---|--------------------|--------------------------|----------------|
| WBAW | Marietta College, Marietta, Ohio..   | 833                | 360                      | 250            | WGAY | North Western Radio Co., Inc.,<br>Madison, Wis. ....                | 833                | 360                      | 50             |
| WHAD | Marquette University, Milwaukee,<br>Wisconsin .....                              | 833                | 360                      | 100            | KGN  | Northwestern Radio Mfg. Co.,<br>Portland, Ore. ....                 | 833                | 360                      | 50             |
| WDAG | Martin, J. Laurence, Amarillo, Tex.  | 1,140              | 263                      | 100            | WMAK | Norton Laboratories, Lockport, N. Y.                                | 833                | 360                      | 500            |
| WOAC | Maus Radio Co., Lima, Ohio.....  | 1,130              | 266                      | 100            | WPG  | Nushawg Poultry Farm, New<br>Lebanon, Ohio .....                    | 833                | 360                      | 30             |
| WBS  | May, D. W., Inc., Newark, N. J....   | 833                | 360                      | 20             | WIAD | Ocean City Yacht Club, Ocean<br>City, N. J. ....                    | 1,180              | 254                      | 10             |
| KFAD | McArthur Bros. Mercantile Co.,<br>Phoenix, Ariz. ....                            | 833                | 360                      | 250            | WAAD | Ohio Mechanics Institute, Cin-<br>cinnati, Ohio .....               | 833                | 360                      | 25             |
| WTP  | McBride, Geo. M., Bay City, Mich.  | 833                | 360                      | 10             | WEAO | Ohio State University, Columbus,<br>Ohio .....                      | 833                | 360                      | 250            |
| KFHH | McCue, Ambrose A., Neah Bay,<br>Wash. ....                                       | 1,060              | 283                      | 50             | WKAK | Okfuskee County News, Okemah,<br>Okla. ....                         | 833                | 360                      | 100            |
| KFFX | McGraw Co., The, Omaha, Neb....  | 1,080              | 278                      | 250            | KFAH | Olesen, O. K., Hollywood, Cal....                                   | 833                | 360                      | 100            |
| KFEC | Meier & Frank Co., Alder St., Port-<br>land, Ore. ....                           | 833                | 360                      | 5              | KFCZ | Omaha Central High School,<br>Omaha, Neb. ....                      | 833                | 360                      | 300            |
| KFDB | Mercantile Trust Co. of California,<br>San Francisco, Cal. ....                  | 590                | 509                      | 750            | WAAW | Omaha Grain Exchange, Omaha,<br>Neb. ....                           | 833                | 360                      | 200            |
| WHAZ | Mercer University, Macon, Ga....   | 1,120              | 268                      | 50             | WGAM | Orangeburg Radio Equipt. Co.,<br>Orangeburg, S. C. ....             | 833                | 360                      | 50             |
| WOU  | Metropolitan Utilities District,<br>Omaha, Neb. ....                             | 833                | 360                      | 50             | KFDJ | Oregon Agricultural College, Cor-<br>vallis, Ore. ....              | 833                | 360                      | 50             |
| WFAW | Miami Daily Metropolis, Miami,<br>Florida .....                                  | 833                | 360                      | 50             | KDYQ | Oregon Institute of Technology,<br>Portland, Ore. ....              | 833                | 360                      | 10             |
| WKAR | Michigan Agricultural College, East<br>Lansing, Mich. ....                       | 833                | 360                      | 250            | WHAP | Otta & Kuhns, Decatur, Ill. ....                                    | 833                | 360                      | 20             |
| WBAF | Middleton, Fred M., Moorestown,<br>New Jersey. ....                              | 833                | 360                      | 100            | WJAR | Outlet Co., The, Providence, R. I..                                 | 833                | 360                      | 200            |
| WOAE | Midland College, Fremont, Neb....  | 833                | 360                      | 20             | WKAA | Paar, H. F., and Republican Times,<br>Cedar Rapids, Ia. ....        | 833                | 360                      | 20             |
| WEH  | Midland Refining Co., Tulsa, Okla.   | 833                | 360                      | 500            | WIAR | Paducah Evening Sun, Paducah, Ky.                                   | 833                | 360                      | 100            |
| WDAP | Midwest Radio Central, Inc., Chi-<br>cago, Ill. ....                             | 833                | 360                      | 200            | WMAC | Page, J. Edward, Cazenovia, N. Y.                                   | 833                | 360                      | 200            |
| WOS  | Missouri State Marketing Bureau,<br>Jefferson City, Mo. ....                     | 833                | 360                      | 20             | WOC  | Palmer School of Chiropractic,<br>Davenport, Ia. ....               | 620                | 484                      | 500            |
| WFAQ | Missouri Wesleyan College & The<br>Cameron Radio Co., Cameron,<br>Missouri ..... | 833                | 360                      | 50             | WOAH | Palmetto Radio Corp., Charles-<br>ton, S. C. ....                   | 833                | 360                      | 10             |
| WEAP | Mobile Radio Co., Inc., Mobile,<br>Alabama .....                                 | 833                | 360                      | 10             | WMAT | Paramount Radio Corp., Duluth,<br>Minn. ....                        | 833                | 360                      | 50             |
| KIN  | Monterey Elect. Co., Monterey,<br>California .....                               | 833                | 360                      | 100            | WNAB | Park City Daily News, Bowling<br>Green, Ky. ....                    | 833                | 360                      | 100            |
| KFCF | Moore, F. A., Walla Walla, Wash.   | 833                | 360                      | 50             | WABD | Parker High School, Dayton, Ohio.                                   | 1,060              | 283                      | 10             |
| WQAE | Moore Radio News Station, Spring-<br>field, Vt. ....                             | 833                | 360                      | 150            | WGAQ | Patterson, W. G., Shreveport, La...                                 | 833                | 360                      | 150            |
| KFCQ | Motor Service Station, Casper, Wyo.  | 833                | 360                      | 50             | KFHL | Penn College, Oskaloosa, Ia. ....                                   | 1,320              | 227                      | 10             |
| WABF | Mt. Vernon Register News Co., Mt.<br>Vernon, Ill. ....                           | 1,280              | 234                      | 250            | WOAV | Pennsylvania National Guard,<br>Eric, Pa. ....                      | 1,240              | 242                      | 100            |
| KGB  | Mullins Elect. Co., Wm. A., Tacoma,<br>Washington .....                          | 833                | 360                      | 100            | WPAB | Pennsylvania State College, State<br>College, Pa. ....              | 833                | 360                      | 1,000          |
| KGU  | Mulrony, Marion A., Honolulu,<br>Hawaii .....                                    | 833                | 360                      | 100            | WBAK | Pennsylvania State Police, Depart-<br>ment of, Harrisburg, Pa. .... | 833                | 360                      | 500            |
| KFGJ | National Guards Missouri, St.<br>Louis, Mo. ....                                 | 1,130              | 266                      | 100            | WTAC | Penn Traffic Co., Johnstown, Pa...                                  | 833                | 360                      | 150            |
| KFDU | Nebraska Radio Elect. Co., Lincoln,<br>Nebraska .....                            | 833                | 360                      | 20             | WNAV | Peoples Tel. & Tel Co., Knox-<br>ville, Tenn. ....                  | 833                | 360                      | 500            |
| WCAJ | Nebraska Wesleyan University<br>(Lincoln, Neb.), University<br>Place, Neb. ....  | 833                | 360                      | 20             | WJAN | Peoria Star Co., Peoria, Ill. ....                                  | 1,070              | 280                      | 100            |
| WAAM | Nelson Co., I. R., Newark, N. J....  | 1,140              | 263                      | 250            | WJAM | Perham, D. M., Cedar Rapids, Ia...                                  | 833                | 360                      | 20             |
| WAAM | Nelson Co., I. R., Newark, N. J....  | 833                | 360                      | 250            | WPAF | Peterson's Radio Co., Council<br>Bluffs, Ia. ....                   | 833                | 360                      | 10             |
| KDZK | Nevada Machinery & Elect. Co.,<br>Reno, Nevada. ....                             | 833                | 360                      | 25             | WOAZ | Penick Hughes Co., Stamford,<br>Texas .....                         | 833                | 360                      | 100            |
| WBBA | Newark Radio Lab., Newark, O....   | 1,250              | 240                      | 20             | WPAP | Phillips, Theodore D., Winchester,<br>Ky. ....                      | 833                | 360                      | 10             |
| WCAB | Newburgh News Printing & Pub.<br>Co., Newburgh, N. Y. ....                       | 833                | 360                      | 75             | WHAW | Pierce Elect. Co., Tampa, Fla. ....                                 | 833                | 360                      | 10             |
| WAAQ | New England Motor Sales Co.,<br>Greenwich, Conn. ....                            | 833                | 360                      | 100            | KFFY | Pincus & Murphey, Inc., Alex-<br>andria, La. ....                   | 1,100              | 275                      | 100            |
| KOB  | New Mexico College of Agri. &<br>Mech. Arts, State College, N.M.                 | 833                | 360                      | 500            | WCK  | Pine Bluff Company, The, Pine<br>Bluff, Ark. ....                   | 833                | 360                      | 500            |
| WLAW | New York Police Dept., New<br>York, N. Y. ....                                   | 833                | 360                      | 500            | WJAS | Pittsburgh Radio Supply House,<br>Pittsburgh, Pa. ....              | 833                | 360                      | 250            |
| WIAV | New York Radio Laboratories, Bing-<br>hamton, N. Y. ....                         | 833                | 360                      | 50             | WSAT | Plainview Electric Co., The, Plain-<br>view, Texas .....            | 833                | 360                      | 20             |
| WEAG | Nichols Hine Line Bassett Lab.<br>Edgewood, R. I. ....                           | 1,200              | 231                      | 10             | WKAH | Planet Radio Co., West Palm<br>Beach, Fla. ....                     | 833                | 360                      | 50             |
| KFCB | Nielsen Radio Supply Co., Phoenix,<br>Arizona .....                              | 833                | 360                      | 50             | KWG  | Portable Wireless Telephone Co.,<br>Stockton, Cal. ....             | 833                | 360                      | 100            |
| WIAT | Noel, Leon T., Tarkio, Mo. ....  | 833                | 360                      | 15             | KGW  | Portland Oregonian, Portland, Ore.                                  | 610                | 492                      | 500            |
| WLAC | North Carolina State College,<br>Raleigh, N. C. ....                             | 833                | 360                      | 750            | WQAO | Portsmouth Kiwani's Club, Ports-<br>mouth, Va. ....                 | 833                | 360                      | 15             |
| WPAK | North Dakota Agricultural College,<br>Agricultural College, N. D. ....           | 833                | 360                      | 250            | WMH  | Precision Equipment Co., Cin-<br>cinnati, Ohio .....                | 1,210              | 248                      | 10             |
| WEAM | North Plainfield, Borough of North<br>Plainfield, N. J. ....                     | 1,190              | 252                      | 50             | WQAR | Press Publishing Co., Muncie, Ind.                                  | 833                | 360                      | 10             |
| WLAY | Northern Commercial Co. of Alaska  | 833                | 360                      | 50             | KSS  | Prest & Dean Radio Research<br>Laboratory, Long Beach, Cal..        | 833                | 360                      | 10             |
| WRAL | Northern States Power Co., St.<br>Croix Falls, Wis. ....                         | 1,210              | 248                      | 100            | WQAS | Prince Walter Co., Lowell, Mass..                                   | 1,130              | 266                      | 100            |
| KJR  | Northwest Radio Service Co.,<br>Seattle, Wash. ....                              | 1,110              | 270                      | 100            | KSD  | Pulitzer Publishing Co., St. Louis,<br>Mo. ....                     | 550                | 546                      | 500            |

(To be continued next week)

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| Call | Station  | Frequency<br>Kcys. | Wave<br>Length<br>Meters | Power<br>Watts |
|------|--|--------------------|--------------------------|----------------|
| WLS  | J. & M. Electric Co., Utica, N. Y.                                 | 833                | 360                      | 250            |
| KFIB | Jenkins, Franklin W., St. Louis,<br>Missouri                       | 1,230              | 244                      | 10             |
| KFFB | Jenkins Furniture Co., Boise, Idaho                                | 833                | 360                      | 10             |
| WAAB | Jensen, Valdemar, New Orleans, La.                                 | 1,120              | 268                      | 100            |
| WCAC | John Fink Jewelry Co., Fort Smith,<br>Arkansas                     | 833                | 360                      | 20             |
| WLAP | Jordan, W. V., Louisville, Ky.                                     | 833                | 360                      | 15             |
| WIAB | Joslyn Automobile Co., Rockford,<br>Illinois                       | 833                | 360                      | 50             |
| WIAK | Journal Stockman Co., Omaha, Neb.                                  | 1,080              | 278                      | 200            |
| WOAP | Kalamazoo College, Kalamazoo,<br>Michigan                          | 833                | 360                      | 100            |
| WMAX | K. & K. Radio Supply Co., Ann<br>Arbor, Mich.                      | 833                | 360                      | 250            |
| WCBB | K. & K. Radio Supply Co., Green-<br>ville, Ohio                    | 1,250              | 240                      | 100            |
| WIK  | K. & L. Electric Co., McKeesport,<br>Pennsylvania                  | 833                | 360                      | 250            |
| WDAF | Kansas City Star, Kansas City, Mo.                                 | 730                | 411                      | 500            |
| WTG  | Kansas State Agricultural College,<br>Manhattan, Kan.              | 833                | 360                      | 1,000          |
| WCAE | Kaufmann & Baer Co., Pittsburgh,<br>Pennsylvania                   | 650                | 462                      | 500            |
| WJAT | Kelley-Vawter Jewelry Co., Mar-<br>shall, Mo.                      | 833                | 360                      | 25             |
| WJAP | Kelly-Duluth Co., Duluth, Minn.                                    | 833                | 360                      | 100            |
| WCAY | Kesselman O'Driscoll Co., Milwau-<br>kee, Wis.                     | 833                | 360                      | 100            |
| KFBK | Kimball-Upson Co., Sacramento,<br>California                       | 833                | 360                      | 150            |
| WMAY | Kingshighway Presbyterian Church,<br>St. Louis, Mo.                | 833                | 360                      | 100            |
| KFFR | Kirk, Jim, Sparks, Nevada  | 833                | 360                      | 10             |
| KFDL | Knight-Campbell Music Co., Den-<br>ver, Colo.                      | 833                | 360                      | 5              |
| WPAZ | Koch, John R., Charleston, W. Va.                                  | 1,100              | 273                      | 10             |
| WNAW | Kunzman, Henry, Fort Monroe, Va.                                   | 833                | 360                      | 5              |
| WKAV | Laconia Radio Club, Laconia, N. H.                                 | 833                | 360                      | 100            |
| WABA | Lake Forest College, Lake Forest,<br>Illinois                      | 1,130              | 266                      | 100            |
| WABH | Lake Shore Tire Co., Sandusky, O.                                  | 1,250              | 240                      | 100            |
| WGAL | Lancaster Elect. Supply & Const.<br>Co., Lancaster, Pa.            | 833                | 360                      | 75             |
| WHAL | Lansing Capitol News, Lansing,<br>Michigan                         | 1,210              | 248                      | 20             |
| KFIC | Laskowitz, Philip, Denver, Colo.                                   | 1,340              | 224                      | 15             |
| WABB | Lawrence, Dr. John B., Harris-<br>burg, Pa.                        | 1,130              | 266                      | 10             |
| KFBL | Leese Bros., Everett, Wash.  | 1,340              | 224                      | 10             |
| KFGH | Leland Stanford, Jr., University,<br>Stanford University, Cal.     | 833                | 360                      | 500            |
| WNAT | Lennig Bros., Co., Philadelphia, Pa.                               | 833                | 360                      | 250            |
| WSAH | Leonard, Jr., A. G., Chicago, Ill.                                 | 833                | 360                      | 500            |
| WGAU | Limb, Marcus G., Wooster, Ohio                                     | 1,330              | 226                      | 20             |
| KMC  | Lindsay, W. W., Jr., Reedley, Cal.                                 | 833                | 360                      | 100            |
| WKAS | Lines Music Co., L. E., Spring-<br>field, Mo.                      | 833                | 360                      | 50             |
| WDAR | Lit Bros., Philadelphia, Pa.                                       | 760                | 395                      | 500            |
| WGAN | Lloyd, Cecil E., Pensacola, Fla.                                   | 833                | 360                      | 50             |
| KFGB | Loewenthal Bros., Pueblo, Col.                                     | 833                | 360                      | 10             |
| WRAM | Lombard College, Galesburg, Ill.                                   | 833                | 360                      | 100            |
| KWH  | Los Angeles Examiner, Los An-<br>geles, Cal.                       | 833                | 360                      | 150            |
| KFCL | Los Angeles Union Stock Yards,<br>Los Angeles, Cal.                | 833                | 360                      | 500            |
| KFGC | Louisiana State University, Baton<br>Rouge, La.                    | 1,180              | 254                      | 100            |
| KMO  | Love Electric Co., Tacoma, Wash.                                   | 833                | 360                      | 10             |
| WWL  | Loyola Univ., New Orleans, La.                                     | 833                | 360                      | 100            |
| WOAR | Lundskow, Henry P., Kenosha, Wis.                                  | 833                | 360                      | 100            |
| WOAO | Lyradion Mfg. Co., Mishawaka, Ind.                                 | 833                | 360                      | 50             |
| WKAX | Macfarlane, Wm. A., Bridgeport,<br>Connecticut                     | 833                | 360                      | 50             |
| KFCV | Mahaffey, Jr., Fred, Houston, Tex.                                 | 833                | 360                      | 50             |
| WWAY | Marigold Gardens, Chicago, Ill.                                    | 833                | 360                      | 500            |
| KFFQ | Marksheffel Motor Co., Colorado<br>Springs, Col.                   | 833                | 360                      | 10             |
| WLAX | Greencastle Community Broadcast-<br>ing Station, Greencastle, Ind. | 1,300              | 231                      | 5              |
| WQAZ | Greensboro Daily News, Greensboro,<br>N. C.                        | 833                | 360                      | 30             |
| WSAJ | Grove City College, Grove City, Pa.                                | 833                | 360                      | 100            |
| WHAH | Hafner Supply Co., Joplin, Mo.                                     | 833                | 360                      | 20             |
| KPO  | Hale Bros., Inc., San Francisco,<br>Cal.                           | 710                | 423                      | 500            |
| KGG  | Hallock & Watson Radio Service,<br>Portland, Ore.                  | 833                | 360                      | 100            |
| WLK  | Hamilton Mfg. Co., Indianapolis,<br>Ind.                           | 833                | 360                      | 500            |
| WOAT | Hamp, Boyd Martell, Wilmington,<br>Del.                            | 833                | 360                      | 250            |
| WOAA | Hardy, Dr. Walter, Ardmore, Okla.                                  | 833                | 360                      | 20             |
| WDAK | Hartford Courant, Hartford, Conn.                                  | 833                | 360                      | 50             |
| KFDP | Hawkeye Radio Supply Co., Des<br>Moines, Ia.                       | 1,080              | 278                      | 100            |
| WEAS | Hecht Co., Washington, D. C.                                       | 833                | 360                      | 50             |
| WIAI | Heers Stores Co., Springfield, Mo.                                 | 833                | 360                      | 20             |
| KFGV | Heidbreder Radio Supply Co.,<br>Utica, Neb.                        | 1,340              | 224                      | 10             |
| WEAD | Henry Radio & Elect. Supply,<br>Atwood, Kan.                       | 1,120              | 268                      | 100            |
| KXD  | Herald Publishing Co., Modesto, Cal.                               | 833                | 360                      | 5              |
| KQW  | Herrold, Charles D., San Jose, Cal.                                | 833                | 360                      | 50             |
| WFAJ | Hi Grade Wireless Inst. Co., Ashe-<br>ville, N. C.                 | 833                | 360                      | 50             |
| WHAO | Hill, F. A., Savannah, Ga.   | 833                | 360                      | 50             |
| WAAZ | Hollister Miller Motor Co.,<br>Emporia, Kan.                       | 833                | 360                      | 50             |
| KFBE | Horn, Reuben H., San Luis<br>Obispo, Cal.                          | 833                | 360                      | 10             |
| WJD  | Howe, Richard Harris, Granville,<br>Ohio                           | 1,310              | 229                      | 50             |
| WGL  | Howlett, Thomas F. J., Philadel-<br>phia, Pa.                      | 833                | 360                      | 250            |
| WDAI | Hughes Electrical Corp., Syracuse,<br>N. Y.                        | 833                | 360                      | 250            |
| WQAV | Huntington & Guerry, Inc., Green-<br>ville, S. C.                  | 833                | 360                      | 100            |
| WHAY | Huntington Press, Huntington, Ind.                                 | 833                | 360                      | 10             |
| WEV  | Hurlburt-Still Electrical Co.,<br>Houston, Texas                   | 833                | 360                      | 250            |
| WJAG | Huse Publishing Co., Norfolk,<br>Neb.                              | 833                | 360                      | 100            |
| WFAN | Hutchinson Elect. Service Co.,<br>Hutchinson, Minn.                | 833                | 360                      | 100            |
| WLAZ | Hutton & Jones Elect. Co., Warren,<br>Ohio                         | 1,210              | 248                      | 10             |
| WNAM | Ideal Apparatus Co., Evansville,<br>Ind.                           | 833                | 360                      | 100            |
| KFAU | Independent School District of<br>Boise City, Boise, Idaho         | 833                | 360                      | 5              |
| WGV  | Interstate Electric Co., New<br>Orleans, La.                       | 833                | 360                      | 100            |
| WOI  | Iowa State College, Ames, Ia.                                      | 833                | 360                      | 500            |
| WEAY | Iris Theatre, Houston, Texas                                       | 833                | 360                      | 1,000          |
| KFDZ | Harry O. Iverson   | 833                | 360                      | 5              |
| WJAD | Jackson's Radio Eng. Lab., Waco,<br>Texas                          | 833                | 360                      | 150            |
| WBAO | James Milliken Univ., Decatur, Ill.                                | 833                | 360                      | 50             |
| WPAS | J. & M., Electric Co., Amsterdam,<br>New York                      | 833                | 360                      | 20             |

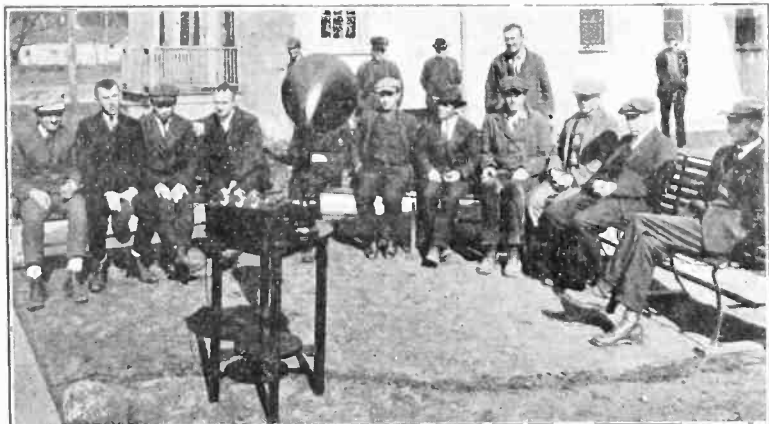


| Call | Station  | Frequency<br>Kcys. | Wave<br>Length<br>Meters | Power<br>Watts | Call | Station   | Frequency<br>Kcys. | Wave<br>Length<br>Meters | Power<br>Watts |
|------|--|--------------------|--------------------------|----------------|------|---|--------------------|--------------------------|----------------|
| WBAW | Marietta College, Marietta, Ohio..   | 833                | 360                      | 250            | WGAY | North Western Radio Co., Inc.,<br>Madison, Wis. ....                | 833                | 360                      | 50             |
| WHAD | Marquette University, Milwaukee,<br>Wisconsin .....                              | 833                | 360                      | 100            | KGN  | Northwestern Radio Mfg. Co.,<br>Portland, Ore. ....                 | 833                | 360                      | 50             |
| WDAG | Martin, J. Laurence, Amarillo, Tex.  | 1,140              | 263                      | 100            | WMAK | Norton Laboratories, Lockport, N. Y.                                | 833                | 360                      | 500            |
| WOAC | Maus Radio Co., Lima, Ohio.....  | 1,130              | 266                      | 100            | WPG  | Nushawg Poultry Farm, New<br>Lebanon, Ohio .....                    | 833                | 360                      | 30             |
| WBS  | May, D. W., Inc., Newark, N. J....   | 833                | 360                      | 20             | WIAD | Ocean City Yacht Club, Ocean<br>City, N. J. ....                    | 1,180              | 254                      | 10             |
| KFAD | McArthur Bros. Mercantile Co.,<br>Phoenix, Ariz. ....                            | 833                | 360                      | 250            | WAAD | Ohio Mechanics Institute, Cin-<br>cinnati, Ohio .....               | 833                | 360                      | 25             |
| WTP  | McBride, Geo. M., Bay City, Mich.  | 833                | 360                      | 10             | WEAO | Ohio State University, Columbus,<br>Ohio .....                      | 833                | 360                      | 250            |
| KFHH | McCue, Ambrose A., Neah Bay,<br>Wash. ....                                       | 1,060              | 283                      | 50             | WKAK | Okfuskee County News, Okemah,<br>Okla. ....                         | 833                | 360                      | 100            |
| KFFX | McGraw Co., The, Omaha, Neb....  | 1,080              | 278                      | 250            | KFAH | Olesen, O. K., Hollywood, Cal....                                   | 833                | 360                      | 100            |
| KFEC | Meier & Frank Co., Alder St., Port-<br>land, Ore.....                            | 833                | 360                      | 5              | KFCZ | Omaha Central High School,<br>Omaha, Neb. ....                      | 833                | 360                      | 300            |
| KFDB | Mercantile Trust Co. of California,<br>San Francisco, Cal.....                   | 590                | 509                      | 750            | WAAW | Omaha Grain Exchange, Omaha,<br>Neb. ....                           | 833                | 360                      | 200            |
| WHAZ | Mercer University, Macon, Ga....   | 1,120              | 268                      | 50             | WGAM | Orangeburg Radio Equipt. Co.,<br>Orangeburg, S. C. ....             | 833                | 360                      | 50             |
| WOU  | Metropolitan Utilities District,<br>Omaha, Neb.....                              | 833                | 360                      | 50             | KFDJ | Oregon Agricultural College, Cor-<br>vallis, Ore. ....              | 833                | 360                      | 50             |
| WFAW | Miami Daily Metropolis, Miami,<br>Florida .....                                  | 833                | 360                      | 50             | KDYQ | Oregon Institute of Technology,<br>Portland, Ore. ....              | 833                | 360                      | 10             |
| WKAR | Michigan Agricultural College, East<br>Lansing, Mich.....                        | 833                | 360                      | 250            | WHAP | Otta & Kuhns, Decatur, Ill. ....                                    | 833                | 360                      | 20             |
| WBAF | Middleton, Fred M., Moorestown,<br>New Jersey.....                               | 833                | 360                      | 100            | WJAR | Outlet Co., The, Providence, R. I..                                 | 833                | 360                      | 200            |
| WOAE | Midland College, Fremont, Neb....  | 833                | 360                      | 20             | WKAA | Paar, H. F., and Republican Times,<br>Cedar Rapids, Ia. ....        | 833                | 360                      | 20             |
| WEH  | Midland Refining Co., Tulsa, Okla.   | 833                | 360                      | 500            | WIAR | Paducah Evening Sun, Paducah, Ky.                                   | 833                | 360                      | 100            |
| WDAP | Midwest Radio Central, Inc., Chi-<br>cago, Ill. ....                             | 833                | 360                      | 200            | WMAC | Page, J. Edward, Cazenovia, N. Y.                                   | 833                | 360                      | 200            |
| WOS  | Missouri State Marketing Bureau,<br>Jefferson City, Mo.....                      | 833                | 360                      | 20             | WOC  | Palmer School of Chiropractic,<br>Davenport, Ia. ....               | 620                | 484                      | 500            |
| WFAQ | Missouri Wesleyan College & The<br>Cameron Radio Co., Cameron,<br>Missouri ..... | 833                | 360                      | 50             | WOAH | Palmetto Radio Corp., Charles-<br>ton, S. C. ....                   | 833                | 360                      | 10             |
| WEAP | Mobile Radio Co., Inc., Mobile,<br>Alabama .....                                 | 833                | 360                      | 10             | WMAT | Paramount Radio Corp., Duluth,<br>Minn. ....                        | 833                | 360                      | 50             |
| KIN  | Monterey Elect. Co., Monterey,<br>California .....                               | 833                | 360                      | 100            | WNAB | Park City Daily News, Bowling<br>Green, Ky. ....                    | 833                | 360                      | 100            |
| KFCF | Moore, F. A., Walla Walla, Wash.   | 833                | 360                      | 50             | WABD | Parker High School, Dayton, Ohio.                                   | 1,060              | 283                      | 10             |
| WQAE | Moore Radio News Station, Spring-<br>field, Vt. ....                             | 833                | 360                      | 150            | WGAQ | Patterson, W. G., Shreveport, La...                                 | 833                | 360                      | 150            |
| KFCQ | Motor Service Station, Casper, Wyo.  | 833                | 360                      | 50             | KFHL | Penn College, Oskaloosa, Ia. ....                                   | 1,320              | 227                      | 10             |
| WABF | Mt. Vernon Register News Co., Mt.<br>Vernon, Ill. ....                           | 1,280              | 234                      | 250            | WOAV | Pennsylvania National Guard,<br>Erie, Pa. ....                      | 1,240              | 242                      | 100            |
| KGB  | Mullins Elect. Co., Wm. A., Tacoma,<br>Washington .....                          | 833                | 360                      | 100            | WPAB | Pennsylvania State College, State<br>College, Pa. ....              | 833                | 360                      | 1,000          |
| KGU  | Mulrony, Marion A., Honolulu,<br>Hawaii .....                                    | 833                | 360                      | 100            | WBAK | Pennsylvania State Police, Depart-<br>ment of, Harrisburg, Pa. .... | 833                | 360                      | 500            |
| KFGJ | National Guards Missouri, St.<br>Louis, Mo. ....                                 | 1,130              | 266                      | 100            | WTAC | Penn Traffic Co., Johnstown, Pa...                                  | 833                | 360                      | 150            |
| KFDU | Nebraska Radio Elect. Co., Lincoln,<br>Nebraska .....                            | 833                | 360                      | 20             | WNAV | Peoples Tel. & Tel Co., Knox-<br>ville, Tenn. ....                  | 833                | 360                      | 500            |
| WCAJ | Nebraska Wesleyan University<br>(Lincoln, Neb.), University<br>Place, Neb. ....  | 833                | 360                      | 20             | WJAN | Peoria Star Co., Peoria, Ill. ....                                  | 1,070              | 280                      | 100            |
| WAAM | Nelson Co., I. R., Newark, N. J....  | 1,140              | 263                      | 250            | WJAM | Perham, D. M., Cedar Rapids, Ia..                                   | 833                | 360                      | 20             |
| WAAM | Nelson Co., I. R., Newark, N. J....  | 833                | 360                      | 250            | WPAF | Peterson's Radio Co., Council<br>Bluffs, Ia. ....                   | 833                | 360                      | 10             |
| KDZK | Nevada Machinery & Elect. Co.,<br>Reno, Nevada.....                              | 833                | 360                      | 25             | WOAZ | Penick Hughes Co., Stamford,<br>Texas .....                         | 833                | 360                      | 100            |
| WBBA | Newark Radio Lab., Newark, O....   | 1,250              | 240                      | 20             | WPAP | Phillips, Theodore D., Winchester,<br>Ky. ....                      | 833                | 360                      | 10             |
| WCAB | Newburgh News Printing & Pub.<br>Co., Newburgh, N. Y. ....                       | 833                | 360                      | 75             | WHAW | Pierce Elect. Co., Tampa, Fla. ....                                 | 833                | 360                      | 10             |
| WAAQ | New England Motor Sales Co.,<br>Greenwich, Conn. ....                            | 833                | 360                      | 100            | KFFY | Pincus & Murphey, Inc., Alex-<br>andria, La. ....                   | 1,100              | 275                      | 100            |
| KOB  | New Mexico College of Agri. &<br>Mech. Arts, State College, N.M.                 | 833                | 360                      | 500            | WCK  | Pine Bluff Company, The, Pine<br>Bluff, Ark. ....                   | 833                | 360                      | 500            |
| WLAW | New York Police Dept., New<br>York, N. Y. ....                                   | 833                | 360                      | 500            | WJAS | Pittsburgh Radio Supply House,<br>Pittsburgh, Pa. ....              | 833                | 360                      | 250            |
| WIAV | New York Radio Laboratories, Bing-<br>hamton, N. Y. ....                         | 833                | 360                      | 50             | WSAT | Plainview Electric Co., The, Plain-<br>view, Texas .....            | 833                | 360                      | 20             |
| WEAG | Nichols Hiline Bassett Lab.<br>Edgewood, R. I. ....                              | 1,200              | 231                      | 10             | WKAH | Planet Radio Co., West Palm<br>Beach, Fla. ....                     | 833                | 360                      | 50             |
| KFCB | Nielsen Radio Supply Co., Phoenix,<br>Arizona .....                              | 833                | 360                      | 50             | KWG  | Portable Wireless Telephone Co.,<br>Stockton, Cal. ....             | 833                | 360                      | 100            |
| WIAT | Noel, Leon T., Tarkio, Mo. ....  | 833                | 360                      | 15             | KGW  | Portland Oregonian, Portland, Ore.                                  | 610                | 492                      | 500            |
| WLAC | North Carolina State College,<br>Raleigh, N. C. ....                             | 833                | 360                      | 750            | WQAQ | Portsmouth Kiwanis Club, Ports-<br>mouth, Va. ....                  | 833                | 360                      | 15             |
| WPAK | North Dakota Agricultural College,<br>Agricultural College, N. D. ....           | 833                | 360                      | 250            | WMH  | Precision Equipment Co., Cin-<br>cinnati, Ohio .....                | 1,210              | 248                      | 10             |
| WEAM | North Plainfield, Borough of North<br>Plainfield, N. J. ....                     | 1,190              | 252                      | 50             | WQAR | Press Publishing Co., Muncie, Ind.                                  | 833                | 360                      | 10             |
| WLAY | Northern Commercial Co. of Alaska  | 833                | 360                      | 50             | KSS  | Prest & Dean Radio Research<br>Laboratory, Long Beach, Cal..        | 833                | 360                      | 10             |
| WRAL | Northern States Power Co., St.<br>Croix Falls, Wis. ....                         | 1,210              | 248                      | 100            | WQAS | Prince Walter Co., Lowell, Mass..                                   | 1,130              | 266                      | 100            |
| KJR  | Northwest Radio Service Co.,<br>Seattle, Wash. ....                              | 1,110              | 270                      | 100            | KSD  | Pulitzer Publishing Co., St. Louis,<br>Mo. ....                     | 550                | 546                      | 500            |

(To be continued next week)



(C. Underwood and Underwood)  
"Uncle Joe" Cannon listening in on the world at his home in Danville, Ill. Just to show how interested he is in radio we want to call attention to the fact that "Uncle" has forgotten his cigar without which he has never before posed. The set was presented to him as a birthday gift by the Westinghouse Electric & Mfg. Co.



(C. Western Electric)  
An interested audience of the broadcast of the Willard-Johnson bout was a group of ex-service men at the Manhattan State Hospital on Ward's Island. A complete radio set consisting of a tuner, amplifier and loud speaker was presented to the hospital by the Bill Brown Post 507, of Brooklyn. The listeners are all ex-service men under treatment for shell-shock or other illnesses.



(C. Fotograms, N. Y.)  
Another Parisian fad for American girls. Miss Isobelle Bennett, who is an ardent fan, had a small set put in her parasol and by means of a loop which was woven between the ribs of the umbrella was enabled to receive the local broadcast while out for a ride in her cabriolet along the Champs Elysees. Go to it girls, try ticklin' American ribs!

# Radio Pictures From Near and

CAPTIONS BY ROBERT

## Radio Instruction



(C. Keystone View)  
Experimental laboratory at the Royal Military College, Sandhurst, England. Apparatus obtainable under the competency certificate.

**T**HE fact that radio is important in army work has long been accepted in America, and competent instruction has always been available to any who wanted to study this important branch of army work. It is only lately that instruction has been given in England, however. The Royal Military College of Sandhurst, England, which is the West Point of the United Kingdom, was one of the first to recognize the advantages gained by including radio

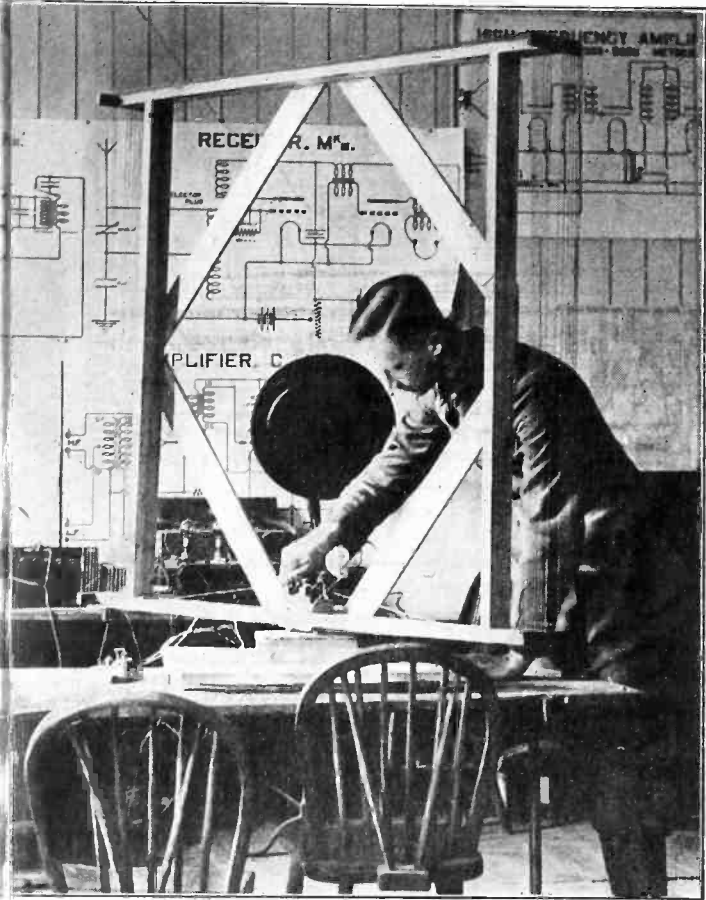


(C. Fotograms, N. Y.)  
Miss Mary T. Loomis, of Washington, D. C., the only woman who personally conducts a radio school. Her father, Dr. Mahlon Loomis, was one of the earliest scientists to experiment with radio, and Miss Loomis is a graduate radio engineer. She is shown instructing a class in the elementary theory of radio.

# War Depict Interesting Episodes

BY T. L. DOUGHERTY

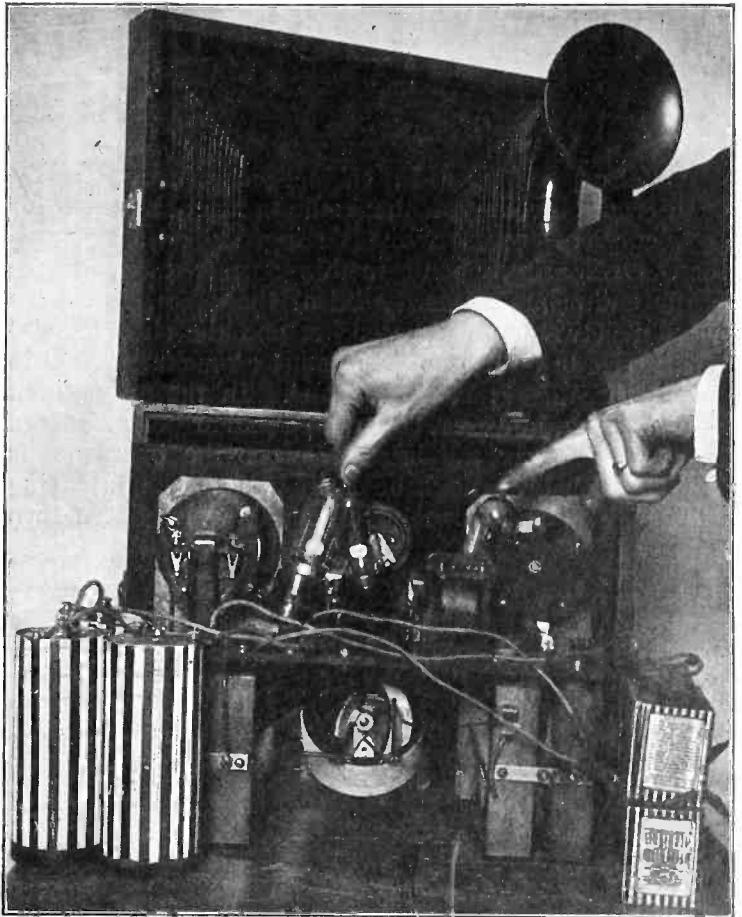
## for the British Army



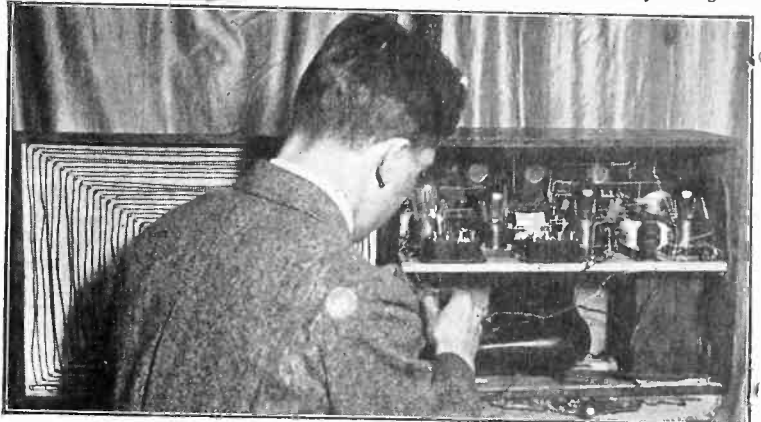
The students are allowed to work their problems out on the best instruction of Army Communication Chiefs.

As a part of the course. Accordingly a powerful transmitter was installed and a radio course given.

It was found that a great many of the students had a working knowledge of the science, but, of course, that had only been gained from their own experiments and from the following of the science through the various books and papers. A complete laboratory was installed, as well as a broadcasting station which the students operate.



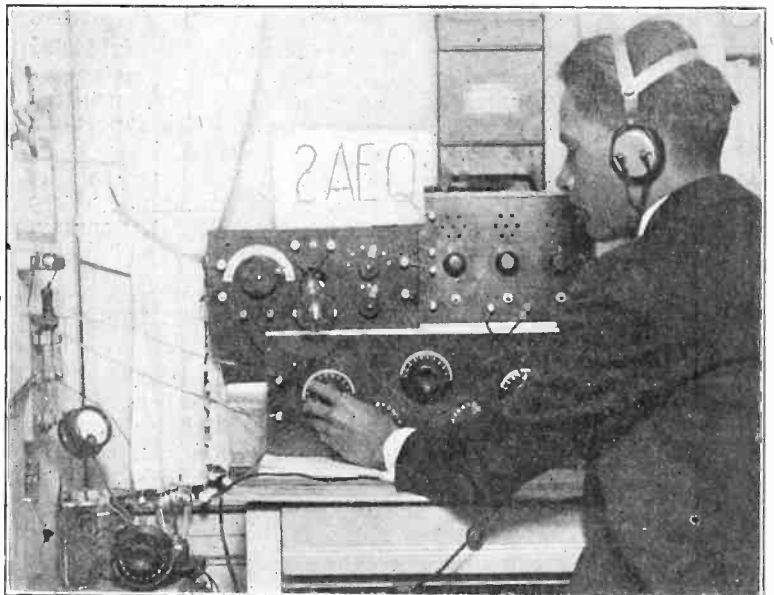
(C. Kadel and Herbert)  
One of the sets that is going to bring happiness to its owner this summer. Sterling C. Sears, a Brooklyn amateur, built it, and, with a view to making it absolutely safe, mounted the tubes on rubber pads to keep them from breaking. The tubes can be jarred without any danger.



(C. Kadel and Herbert)  
Self-contained four-tube reflex set built by William Henderson, who is going to make sure of getting his full share of concerts and music this summer. The set is all contained in the box, even to a loud speaker.



(C. International Newsreel)  
Getting christened by radio is not the commonest thing in the world, so Master Alfred Jerome Schroth can readily say that he is one of the few radio babies. The ceremonies took place at WHN, Ridgwood, L. I., and were heard by thousands of listeners.

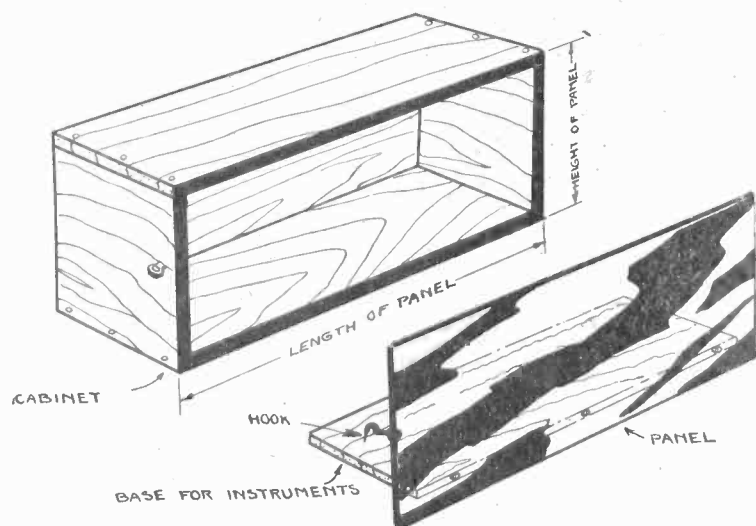


(C. Photonews)  
Allen Fitch and his radio station 2AEQ. This station, which is one of the A. R. R. L. Eastern branch, handles on an average of 1,700 messages per month. A single tube five watt transmitter is used and a distance of 1,200 miles has been covered with it.

# A New Idea in Cabinet Construction

By Arthur S. Gordon

**T**HIS original idea in cabinet construction is the logical outcome of the radio amateur's need for plenty of room while testing or adjusting his receiver. Ordinarily, when something goes wrong with the outfit, the enthusiast raises the lid of the cabinet, puts his hand down between the tube socket and the rheostat and forthwith tries to tighten a nut or start a machine screw in its lawful thread. It can't be done. In the subsequent process of trying, however, the radio amateur becomes very much peeved, to say the least. Before the operation is over he has probably pulled the entire cabinet apart, leaving only the base and the panel front. He would have torn



An idea in cabinet construction that will tend to improve the appearance of your set.

them away also if there were no instruments attached to them.

This mad wrecking of material in order to reach parts in need of repair is not necessary if the cabinet is built

along the lines suggested herewith. All that is necessary is to release two hooks, take a firm hold upon the panel, pull it forward, and the entire receiver, from the vario-coupler down to the last microfarad of condenser capacity, will leave the dark recesses of the cabinet and come forth into view.

Looking at the sketch which accompanies this description the reader will note at once that the base of the cabinet is entirely separate from the base on which the instruments are mounted. This separate base is the secret of the idea's successful application. To it is fastened the panel and upon it are mounted all the instruments that formerly found a place on the bottom board of the box. The double base is of such a size that it will readily slip inside the completed cabinet. It should be made of wood, about  $\frac{1}{2}$ -inch thick, and, when the radio receiver is completely assembled, should rest upon the base of the cabinet.

The panel is fastened to the instrument base by three screws. It is not necessary to further reinforce the base by either a brace or a brass standard, for when the instruments are all in place the unit will be found to be firm and solid. The panel is secured to the cabinet by means of either hooks or screws. Hooks are shown in the sketch, and are recommended because of the greater ease with which the panel may be released from the cabinet. There is no real objection to using screws, however, aside from the extra holes needed in the face of the panel.

The cabinet is a solidly constructed box, built so that its outside dimensions are the same as those of the panel. It is made of wood. There are no hinges necessary. The depth may vary according to the needs of the builder, but six inches is the average dimension. One feature of this slip-in-and-out arrangement that will not pass unappreciated is that the cabinet can be screwed down to the radio table. When firmly fastened in this way it provides a safe receptacle for the radio receiver, mounted on the panel and separate base, as here described.

## RADIOGRAMS

WORLD NEWS HAPPENINGS BRIEFLY  
PHRASED FOR OUR BUSY READERS

The Public Health Service will broadcast this week messages on hay fever and weeds from NAA on 435 meters.

\* \* \*

The American Radio Relay League reports a total of 184,085 radio messages handled during April by amateur wireless operators in North America. Continuous wave sets transmitted 172,763 of the messages and 11,322 were sent by spark apparatus.

\* \* \*

Five junior officers of the Navy have been designated to take post graduate courses in radio engineering at Annapolis. These potential radio engineers of the Navy are Lieuts. J. R. Redman, Arthur W. Peterson, E. E. Stone, L. M. Harvey and J. M. Smith.

\* \* \*

The British Government has appointed a special committee of distinguished scientists to aid in wireless telephony experiments. Sir Joseph Thomson, one of England's foremost electrical experts, said he believed wireless telephony soon would be a commercial possibility because of the perfection of instruments which would be able to conquer atmospheric conditions.

\* \* \*

President Harding on his forthcoming western trip will use a special Pullman car now being outfitted for his service. One feature will be a radio broadcasting set, which will be located at the observation end and be so arranged that while the President speaks from the platform the speech will be broadcast to all parts of the country. The radio will be one of the most powerful sets ever placed on a car.

Wireless Review is the name of a new British radio weekly just launched. Its scientific adviser in chief is Sir Oliver Lodge. In the initial issue a prize of £500 is offered to the first British subject who best demonstrates the practical possibility of wireless television, or seeing by wireless objects invisible to normal sight.

\* \* \*

Station WOC, owned and operated by the Palmer School of Chiropractic, Davenport, Iowa, has issued an interesting and profusely illustrated booklet describing the station. Those who have enjoyed the splendid organ recitals and other attractive program features sent out from WOC doubtless will be interested in seeing this booklet.

\* \* \*

Summer sessions covering specialized engineering subjects in concentrated form have been established at the Massachusetts Institute of Technology, Cambridge, Mass. A number of electrical courses of interest to advanced radio students are scheduled. A bulletin and full particulars may be obtained from T. H. Dillon, Director of the Summer Session.

\* \* \*

Bert Jarvis, a boat liveryman of Theresa, N. Y., will receive \$2,000 reward for recovering 6-year-old Verner Alexanderson, kidnapped son of E. F. Alexanderson, radio engineer. Jarvis found the boy in a woodland cottage on the banks of the Indian River, near Theresa, where the abductors, believed to be Harry Fairbanks and Stanley Crandall, had hidden him in charge of an elderly woman. Fairbanks and Crandall now are sought in Canada.

# Latest Radio Patents

## Method of Secret Signaling

No. 1,454,532: Patented May 8, 1923. Patentee: William E. Beatty, Bayside, N. Y.

THIS invention relates to carrier wave signaling in which messages are transmitted as modulations of a carrier wave.

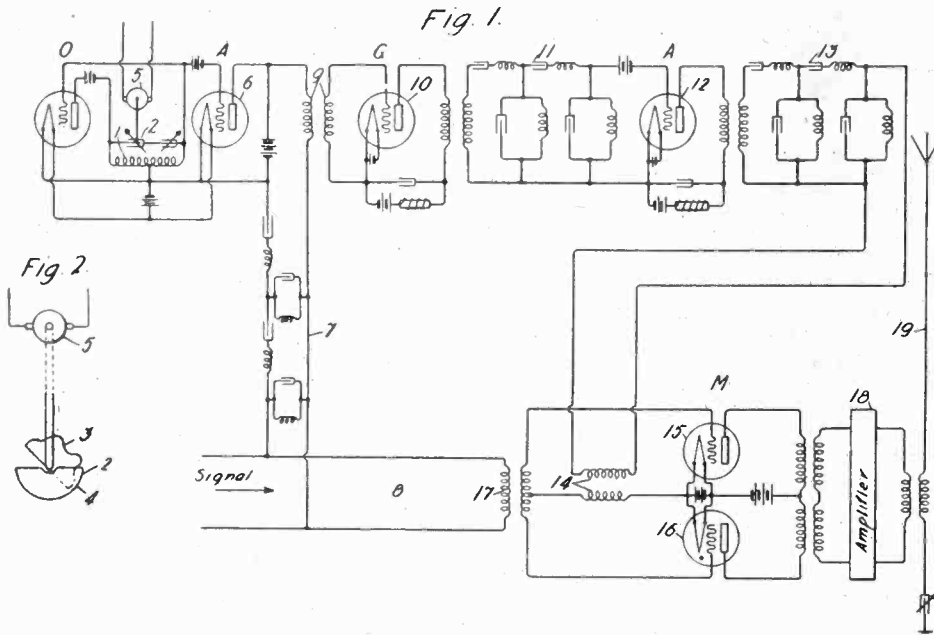
An object of the invention is to transmit the modulated carrier wave in such a form that it will be unintelligible unless received by specially designed apparatus, such as disclosed herein.

When a message in the form of a carrier wave is sent out from a radiating antenna system, this message is liable to be intercepted by any one who has a radio receiving system at his disposal. It was early recognized as being desirable to send a radio message in such a form that it would be unintelligible, or would not be received at all, unless specially designed receiving apparatus were used. Former carrier wave secrecy systems, for the most part, are open to the objection that the specially designed receiving sys-

tem includes a motor which must be kept in synchronism with a similar motor at the sending station. This objection is not applicable to the present invention, according to which a method of and means for secret signaling are provided, in which a proper phase relation between the currents at the sending and receiving stations is maintained without the use of synchronously driven moving parts.

In order to get the modulated wave into a form that cannot be handled by ordinary receiving apparatus, advantage is taken of a previously proposed scheme, according to which the unmodulated components having carrier frequency  $p$  may be suppressed, so that a pure modulated component having only the side frequencies  $p+a$  and  $p-a$  may be transmitted. In this case  $a$  is the instantaneous frequency of the modulating currents. If only the side frequencies  $p+a$  and  $p-a$  are transmitted, this gives an element of secrecy, as this message is unintelligible unless combined at the receiving station with locally generated oscillations of fre-

quency  $p$ . In a manner analogous to the production of beats in sound waves, the combination of currents of frequency  $p$  with currents of frequency  $p+a$  for instance, gives the difference frequency  $a$  corresponding to the signal which was sent. According to the present invention the unmodulated currents are likewise suppressed, so that only the side frequency  $p+a$  or  $p-a$  or both are transmitted. Instead of keeping the carrier frequency  $p$  constant, however, as previously proposed, the present invention provides for continually changing the value of the carrier frequency  $p$  while signals are being sent. If in this case an interceptor attempts to get the message by combining the received waves with the locally generated oscillations of a constant frequency, he will hear in the receiver a noise produced by currents having a varying frequency equal to the difference between the frequency of the locally generated oscilla-



William E. Beatty's method of producing modulated signals which cannot be received except on specially designed receivers. He accomplishes it by the use of a pure modulated wave component having side frequency previously determined. A mechanical means is also used which consists of the rotation of a specially designed condenser at certain speeds.

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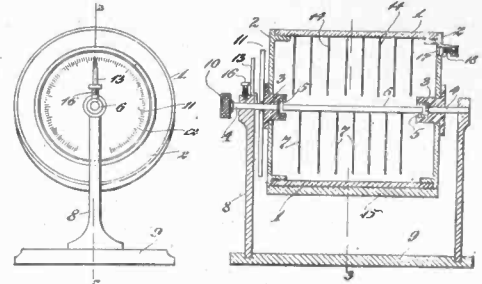
tions and the frequency of the side band  $p+a$  or  $p-a$ , where  $p$  is continually changing. Currents of this character give rise to a siren effect in the receiver and the signal is not intelligible. The value of the carrier frequency  $p$  transmitted is varied rapidly and in an irregular manner, so that an interceptor would be confronted with the problem of similarly varying the frequency of the locally generated oscillations before the received message wave could be rendered intelligible. The manner in which the present invention provides for varying the locally generated oscillations at the receiving station in the same manner as the frequency of the carrier oscillations at the sending station, without the use of synchronous motors, will be described in connection with the drawings in which:

Fig. 1 illustrates a radio signaling station; Fig. 2 discloses the motor-driven condenser blade, having an irregular shape, that may be used in connection with an oscillator to provide a carrier frequency which varies in an irregular manner.

## Electrical Condenser

No. 1,452,610: Patented April 24, 1923. Patentee: Morris Klosner, New York, N. Y.

THIS invention relates to electrical condensers, and has for an object the provision of an apparatus of this character which is of continuously variable capacity whereby the tension may be varied to meet numerous requirements; a further object being to provide an apparatus which is of such air-tight construction as to be capable of containing either compressed air or any adaptable gas capable of being used in electrical condensers.



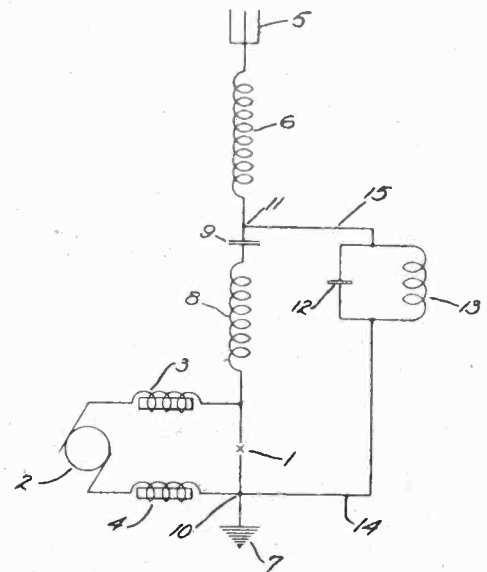
Method of constructing condenser to allow continuous variation and also to allow the use of gas or compressed air as a dielectric.

The above named and other objects are attained by employing improvements which comprise a set of stationary metal leaves or plates, and a set of adjacent turnably adjustable plates adapted to either partly or completely interleave therewith, casing means for enclosing said sets, means for mounting the parts, means for rotating the adjustable plates, and various other novel features, all as hereinafter fully described and specifically set forth in the annexed claims.

## Radio Frequency Transmission System

No. 1,454,652: Patented May 8, 1923. Patentee: Haraden Pratt, San Francisco, Calif.

MY invention relates to a radio frequency transmission system, and more particularly to a system embodying a source of high frequency oscillations, such as a Poulsen arc, which may under certain conditions produce objectionable higher harmonic oscillations. These higher harmonics not only produce an energy loss, but they also present a problem of interference with stations tuned near the



Method of suppressing harmonics in arc or long wave transmission.

frequencies of the higher harmonics. As the number of stations increase, this interference becomes more and more objectionable, and it becomes not only advantageous to suppress the higher harmonics, but almost imperative to do so. One of the objects of my invention is to make it possible to suppress substantially all of the higher harmonics by means of a simple and inexpensive arrangement.

# Answers to Readers of Radio World

*Is there any difference in the hooking up of the U. V. 201A tubes and the regular 200 or 201? Are these tubes any louder? Will I have to use any special type of transformer? I am using the Acme Audio and General now. Will they work with these tubes?—H. Smith, Oswego, N. Y.*

No. You can use the same hook-up for these tubes as for any other three element tubes. They are improved tubes which have certain advantages over the regular U. V. They are slightly better amplifiers than detectors but can be used as both. You can use any type of transformer that you are at present using with the other tubes. The transformers you are now using will function with these new tubes.

*Where can I obtain the circuit diagram of the Mawhinney circuit, described in RADIO WORLD?—A. L. Feldman, Red Bay, Alabama.*

Write to A. S. Mawhinney, 801 Riverside Drive, New York City, and he will advise you as to the cost of the blueprints.

*Advise me if the coil for the Reinartz circuit described in RADIO WORLD for Jan. 13 will allow me to hear the new stations operating on waves up to 500 meters?—Walter W. Ott, 45 Elmwood Ave., Irvington, N. J.*

With proper manipulation of the controls of this set you should be enabled to take all waves up to 550 meters.

*What is the receiving range of the combined transmitting and receiving set described in RADIO WORLD for May 19 by Carl Masson? My antenna is 150 feet long and 50 feet high. Would this aerial be satisfactory for transmitting? Would a shorter aerial be better? Where would a key be inserted to enable me to send code? What would be my range with code? Will using a five watt transmitting tube increase the range of the set?—Jack Fry, 1080 Pearl Street, Denver, Colo.*

As we have stated many times before, it is impossible to even estimate the receiving range of any receiver. The only way in which you can determine that is to build the receiver and try it out. Your antenna is too long for transmitting—100 ft. is about the proper length. Insert your key in the grid circuit. You will have to do two things to accommodate this set to code work. Obtain a key which can be closed (an ordinary line telegraph key with closed circuit switch will do), and also provide some means of shortening the microphone. See answer to your first question. The use of a five watt power tube will increase the range of your transmitter and will allow you to use more B battery, which will make your set more powerful.

*Please tell me where I can get something that will prevent interference between stations.—L. Fitch, Springville, Tenn.*

The easiest and best manner to cut out interference between stations is known as a filter circuit. Numerous filters have been explained from time to time in RADIO WORLD. We refer you to RADIO WORLD for January 20, or April 21. A filter consists of a set inductance in parallel with a capacitance connected in the antenna circuit. This circuit is tuned to the interfering wave, and the receiver is tuned to the wave desired. A wave trap, or filter, will not allow you to eliminate interference if both stations are on the same wave. Only stations on other

waves which interfere, due to being powerful, can be filtered.

*I have built a reflex circuit and want to know if it is possible to add another step of audio-frequency to it. Is it good policy to wind the primary and secondary of a coupler with the same size wire?—Jos. L. Reisler, 7736 Phelps Ave., Detroit, Mich.*

It is possible to do as you suggest but if you are going to use another tube why not make it additional radio and audio, and gain the advantage of two steps instead of one? This will only necessitate the use of an additional radio frequency transformer in connection with the audio transformer that you will have to use. Yes, it is good policy to wind both stator and rotor with the same size wire.

*What is the wave length of the Stockelberg "Pup" set?—H. H. Courtwright, 4119½ Bryan Street, Dallas, Texas.*

Because of the fact that honeycomb coils are used in this circuit the wave length of this set is anything from 200 to 20,000 meters, depending upon the honeycomb coil you use.

*What is the address of R. W. E. Decker, who recently had an article in RADIO WORLD on a C. W. Transmitter?—Rev. Fr. Romuald Fox, O.S.B., Immaculate Conception Church, Valley Falls, Kansas.*

Mr. Decker's address is 834 Riverside Drive, New York City.

*I have constructed the Turnbull set described on page 5 of RADIO WORLD for May 26 and followed your instructions as closely as possible but it does not work right. I can get local stations but no distance. I am using the best apparatus and all my connections are soldered, but the tube will not oscillate.—Dr. E. S. Mayhew, 8524 Quincy Street, Detroit, Mich.*

Examine your antenna and ground leads and wires. Then, if there is no bad connection, make sure of your connections on your variometer. If the ground-filament wire is not connected at the joining of the two windings of the variometer the circuit will not function properly, and this is probably your trouble. Go over your connections very carefully, as too much care cannot be taken in making right connections and the slightest mistake will cause you trouble.

*In RADIO WORLD for March 17 you describe a one-tube super loop receiver by W. S. Thompson. Can this set be used with a WD-11 tube? If not, what tube would you suggest?—H. L. Thomson, 1130 Fifteenth Street, Moline, Ill.*

It is not advisable to use this tube in the set you mention. The circuit calls for a hard tube and also needs a tube with a greater plate and grid surface than the WD-11 tube possesses. The U. V. 201A tube could be used for this purpose if you want one which does not necessitate a storage battery.

*How should I count the turns for the tapping of the honeycomb coil for the Pup set, described by R. L. Dougherty in the May 5 issue of RADIO WORLD?—R. K. Hiner, RFD 5, Box 75, Rogers, Ark.*

The tap should be taken off from the inside turns, counting in the direction in which the wire is run. As every turn in a honeycomb coil comes out as a loop, it is only necessary to begin at the end of the

wire and count the loops around the inside circle as the wire is wound.

*Will the set described by Arthur S. Gordon in RADIO WORLD for April 14 work on a loop? If it will not, what is the next best thing to use it with? I cannot erect an outside antenna because of the landlord's objections. Will it work on a ground alone? Will it work on an antenna alone? How is the set operated?—T. F. Miller, 47 Hikes Street, Brooklyn, N. Y.*

You can accommodate this apparatus to a loop. By the use of the apparatus shown in the circuit you mention an outside antenna is rendered unnecessary, although with the circuit you will have to use a ground. The circuit referred to will be found on page 5 of RADIO WORLD for March 17, 1923. The article in question was written by Arthur G. Shirt and shows a method by which you can very easily accommodate your present set to a loop. A wire strung around a picture moulding will also serve as an antenna, although there is a chance that the metallic structure of the building will lessen your distance due to absorption. Any circuit can be used for local work up to a distance of five or 10 miles by simply using a ground, and this is especially true with single circuit receivers. The set should be operated in the following manner: The tubes should be lighted, after making sure of all your connections, and the taps on the primary of the variocoupler should be varied, at the same time loosening and tightening the coupling of the tickler. A high scream will be heard, which will vary from a very high pitch to low, and then as the tickler is moved, it will again rise from low to high. It is at the dead center of these two carriers that you will hear the voice or music. You will have to determine the point on the primary and the setting of the condenser for each wave length for yourself, as no set point can be given for any wave length. If, when the station is tuned in the voice is muffled and comes in thickly, that is an indication of too much A battery and the filament should be turned down slightly until the voice comes in clearly, and then the vernier of the rheostat brought in until the set is just beyond the point at which the tube will "spill." It is at this point that the set is working the best and the best reception will be had.

## How It Sometimes Happens

THE young radio wizard of the family arrives home from business, parks his hat on the first convenient hook, dashes into the "radio room," puts on the phones and turns up the bulbs—but no juice! He fiddles around a few seconds, and then—a sudden inspiration—with rapidly beating heart and shaking hands he takes out a tube. Wow! Every one of them gone—done gone galley west—burnt out!

Silence! Then with trembling lips and rising temperature he yells: "Say, who was fooling around this set of mine? Who burnt out my tubes? Hey, ma! One of those kids was foolin' around in here after I told them to keep out and now my tubes are all gone. Gee, a fella can't keep anything around this old house with those doggone kids foolin' around."

"Now, son, I told Junior that he could listen in and he just played around in there a little while. Maybe they just went out of their own accord. Don't you dare touch him, or I'll tell pa to throw that noisy thing out!"

## Seamen's Rights to Medical Radio Service

THE probability that some masters of sea-going vessels may not, as yet, have been fully informed in regard to the right of members of their crews to medical service by radio while at sea and to treatment in U. S. Public Health Service hospitals on reaching port has caused Surgeon General H. S. Cumming to direct the preparation and sending of posters giving full information to all vessels of the American Merchant Marine.

Curiously enough, this medical service is really a sort of subsidy to merchant ships and sailors. A century and a quarter ago, when Congress established the Public Health Service, under the title of the Marine Hospital Service, it directed it to render medical aid to every American seaman who applied for it; and that for this each seaman should pay 20 cents a month. This was in 1798. In 1870 the tax was doubled; but in 1888 it was abolished, and since then all such aid has been rendered free. Even the expense of calling the Service by radio from away out at sea is borne by the radio companies without expense to ship or sailor. The forthcoming poster announcement reads:

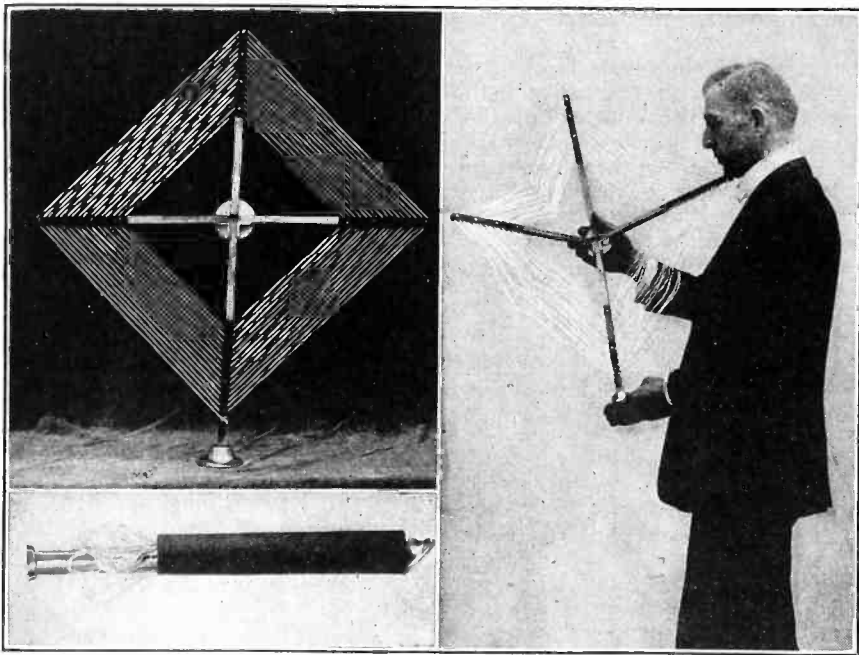
"The U. S. Public Health Service provides hospital care and outpatient treatment for sick and disabled seamen. Hospitals, specialists, dentists and other facilities are open to all persons employed on documented American vessels, and to the Coast Guard, lighthouse keepers, and certain others who help to keep the flag on the seas. An ambulance will go to the dock at any time upon telephonic call from a ship's officer.

"As you are proud of a good ship, take pride also in keeping your own body healthy. Most injuries are due to carelessness. Most diseases can be prevented. Prompt care of small injuries may save a limb. Early treatment for disease may save a life or prevent months of illness. Learn to keep well. Pamphlets on tuberculosis, venereal disease, and other common diseases are sent on request by the Surgeon-General, U. S. Public Health Service, Washington, D. C. A book, 'The Ship's Medicine Chest and First Aid at Sea,' will be sent on request to the master of the vessel. Any Marine Hospital will prescribe emergency treatment through radio shore stations."

## A New Collapsible Loop Antenna

A MOST practical, compact and easily portable loop antenna has been invented and patented by Mr. J. Nazeley, Palisade, N. J.

The "Portena" when extended has a measurement of 27 inches; but, by its ingenious folding design, it is inserted in a rigid tube 16½ inches long, the two ends of



The "Portena" Collapsible Loop Antenna

The inventor of this portable loop, which he has named "Portena," for many years has done research work in the electrical and radio field. He is demonstrating that his loop, although it is only 15 turns of wire on four folding arms 13½ inches long, has successfully operated on receiving sets having two or more stages of radio-frequency for DX work or one stage of radio-frequency for local work.

In the illustration herewith the three positions of this new loop antenna can clearly be seen extended, folded and inserted in its carrying container.

Although this portable loop weighs less than 2½ pounds it is very rigid, being constructed to withstand abuses of the trail when carried to camps, automobiling, etc.

which are sealed by the center flange, and the case is ready to be shipped conveniently anywhere. The construction of the "Portena" is somewhat different from the loops now on the market. The four folding arms, are made of maple, mahogany finish, ½ inch square, and hinged by rivets to channeled flanges on a central non-magnetic disc. Each arm carries two XX Bakelite strips, between which the turns of wire are held securely in slots. There are in all 16 turns of wire comprising the winding. The wire used is special and double insulated, and composed of 60 No. 38 copper and five No. 36 strands of phosphor bronze to obtain the maximum flexibility and to insure against stretching when often manipulated.

## Why Magnavox is the Reproducer Supreme

OFFICIAL tests with the oscillograph prove that the Magnavox electro-dynamic receiver reproduces incoming wave forms with maximum accuracy.

The Magnavox can be used with any receiving set—the better the set, the more Magnavox can do for you.

When you purchase a Magnavox you possess an instrument of the very highest quality and efficiency.



R2 Magnavox Reproducer with 18-inch horn (as illustrated)

This instrument is intended for those who wish the utmost in amplifying power. It requires only .6 of an ampere for the field.

Price, \$60.00

### R3 Magnavox Reproducer with 14-inch horn

The ideal instrument for use in homes, offices, amateur stations, etc. Same in principle and construction as Type R2. Price, \$35.00

### Model C Magnavox Power Amplifier

For use with the Magnavox Reproducer and insures getting the largest possible power input.

2-stage, \$55.00  
3-stage, \$75.00

Magnavox products can be had of good dealers everywhere.

THE MAGNAVOX CO.

Oakland, California

N. Y. Office: 370 Seventh Ave.

"Character, industry and thrift are of primary importance, integrity is a fundamental element in wholesome growth, sham is waste, and there is no real success without sincere service."—Strawbridge & Clothier, Philadelphia.

# Radio Merchandising

Advertising Rates: Display, \$5.00 an inch, \$150.00 a page. Classified Quick-Action Advertising, 5 cents a word.

Telephone Bryan 4796

## Radio Literature Wanted

Manufacturers of and dealers in radio apparatus and accessories are notified that literature and catalogues describing their products have been requested, through the Service Editor of RADIO WORLD, by the following:

Radio Lyre Co., 413-14 New Nelson Building, Kansas City, Mo. (Distributor, particularly to foreign-born population.)

Heilman's Electrical Shop, East Lake Station, Birmingham, Ala.

Marion Brown, 1107 West Sycamore Street, Independence, Kans.

O. A. Kenyon, 111 Broadway, New York City.

R. Nairn, General Delivery, Kamloofis, B. C., Canada.

Lester Hayne, Milverton, Ont., Canada.

Alphy Blais, 25 D'Aiguillon Street, Quebec City, Canada. (Will soon open radio store.)

O. V. Rzehak, 1146 San Julian Street, Los Angeles, Calif.

Edward V. Archer, 1402 Olivia Street, Key West, Fla.

A. E. Baldwin, Switchboard Supervisor, Chenango & Unadilla Telephone Corporation, Norwich, N. Y.

Whitman Radio Service, 176 Monroe Street, Brooklyn, N. Y. (Build receiving sets with standard parts.)

Walter Mohr, Witherton, Ontario, Canada.

Wm. Wachsmann, 120 West 117th Street, New York City.

John N. Schmitz, Box 272, Albion, Nebr.

Richard M. Melcher, 185 Main Street, Brunswick, Me.

Jack Gordon, Belmont Supply Co., 468 Springfield Avenue, Newark, N. J.

W. B. Speirs, 4102 Buchanan Street, Detroit, Mich.

H. B. Lynch, Windsor, Mo. (Dealer.)

Leo V. Brains, Carlisle, Ark. (Retailer.)

E. L. Kemp, Brandon, Vt.

The Parker Roll & Record Co., Lexington, Ky.

V. G. Bidwell, Healdton Electric Supply Co., Healdton, Okla.

C. F. Clark, Wall, South Dakota.

Robert Fisher, 116 Park Street, Burlington, Vt.

Anthony Sini, P. O. Box 123, Shoreham, Long Island, N. Y.

Calvin E. Church, 1202 Castle Hill Avenue, New York City.

L. W. Hunt, 324 West Second Street, Ottumwa, Iowa.

Frank J. Morrison, Box 223, State College, New Mexico.

Lewis R. Twitchell, 302 Northwest 22nd St., Miami, Fla. (Wants information on a long-distance broadcasting station.)

A. J. Bryant, 506 North Lake St., Urbana, Ill.

O. C. Miller, Atchison, Kans.

Blas Rocaforat, Lealtad and Malecon Sts., Havana, Cuba. (Consumer.)

F. D. Rohrback, P. O. Box 45, El Reno, Okla. (Dealer and repairs.)

John Nelson, Lincoln Park, N. J.

A. V. Jacobson, Box 496, Venango, Neb.

Emery S. Dennis, 1703 Crilly Court, Apt. 4, Chicago, Ill.

John J. Kenna, Woodbridge Ave., Port Reading, N. J. (Interested in dry cell receivers.)

W. I. Bartlett, Atlanta, Mo. (Interested in experimental equipment.)

Walter V. Frabell, 3602 Wood St., Wheeling, W. Va.

Chas. Ebert, 48 Wycoff Ave., Brooklyn, N. Y.

Frank Ebert, 794 Flushing Ave., Brooklyn, N. Y.

A. E. Searing, 1213 Gray Ave., Utica, N. Y. (Wants to buy set.)

V. A. Charles, 107 Massachusetts Ave., Boston, Mass. (Will open retail business in September.)

A. B. Miles, Library, Walter Reed General Hospital, Washington, D. C.

B. F. Bianchi, Sabael, Staten Island, N. Y.

C. B. Millar, Reward, Calif.

Jack Brothers, R. F. D. 3, Kosse, Tex.

A. F. Williams, 1001 Franklin St., San Francisco, Calif.

General Radio Company, 122 Fifth Ave., New York City.

The first of these names were printed in Radio World dated April 21, and have continued in each issue since. Any copy 15c. Any 7 copies for \$1.00. Radio World, 1493 Broadway, N. Y.

## The New Grebe CR-12 Receiver

IN the new Grebe receiver, the CR-12, is employed radio frequency and regeneration, the two factors most important in long distance reception. One of the distinctive features claimed by the manufacturers of this Grebe product, is the simple manner in which it may be used with any tubes now on the market. A 201A may be used in the radio frequency circuit and a WD-11 as a detector, a UV-199 in the first stage of audio-frequency amplification and a UV-200 in the second stage audio-frequency amplification. Such combinations may be used with either dry cells or a six volt storage battery. With no combination of tubes is more than one A battery necessary.

This receiver has but two tuning controls, one of which is calibrated to wave lengths, thus reducing to a minimum the elements of chance in tuning for a given station. With a wave length of 200 to 600 meters, the set will receive all wave lengths which have come into effect since May 15th. No outdoor antenna is used, in fact the antenna is supplied with the set, and consists of a silk covered wire 20 feet in length. This wire, although not unsightly, may be hidden back of a picture moulding or run along the base board.

Telephone jack and plug have been provided for those who wish to receive with telephone headset, and the insertion of the plug in the jack automatically disconnects the loud speaker and transfers the signals to the telephones. This new receiver is readily transportable, as it is, with the exception of the loud speaker, self-contained.

## Compact Variable Grid Leak

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# New DX Night Owl Records That Count

## Fair to Middlin', Eh?

From Burdette M. Smith, R. I., Box 48, Le Mars, Ia.

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| California .....  | 6  | N. Dakota .....   | 1  |
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I wish also to submit the following list of stations received on Wednesday, April 18, from 8:15 P. M. to 11:45 P. M. All received on det. and 1 step:

|      |                      |
|------|----------------------|
| WOC  | —Davenport, Ia.      |
| WAAW | —Omaha, Nebr.        |
| WOI  | —Ames, Ia.           |
| WIAH | —Newton, Ia.         |
| KYW  | —Chicago, Ill.       |
| WDAF | —Kansas City, Mo.    |
| WHAS | —Louisville, Ky.     |
| WEAB | —Ft. Dodge, Ia.      |
| WOS  | —Jefferson City, Mo. |
| WHAD | —Milwaukee, Wisc.    |
| KFDY | —Brookings, S. D.    |
| WGV  | —New Orleans, La.    |
| KDKA | —E. Pittsburgh, Pa.  |
| WLAG | —Minneapolis, Minn.  |
| WEAH | —Wichita, Kansas.    |

THE editor of RADIO WORLD will be pleased to receive sketches of hook-ups drawn carefully in black ink or heavy pencil from the "DX Nite Owls" who send in records with a view to publishing them.

Send hook-ups of your sets, provided they contain something unusual. Send, also, the names of the various makes of apparatus you are using.

Make your letters brief and informative. Write on one side of the paper only.

The letters and hook-ups will be published in the earliest possible numbers of RADIO WORLD.

|      |                          |
|------|--------------------------|
| WLW  | —Cincinnati, Ohio.       |
| KFDU | —Lincoln, Nebr.          |
| WJZ  | —Newark, N. J.           |
| KDYS | —Great Falls, Mont.      |
| WCAE | —Pittsburgh, Pa.         |
| KSD  | —St. Louis, Mo.          |
| WBAP | —Ft. Worth, Texas.       |
| CFCN | —Calgary, Canada.        |
| 5KW  | —Tuninucu, Cuba.         |
| KPO  | —San Francisco, Cal.     |
| CFCA | —Toronto, Canada.        |
| WMC  | —Memphis, Tenn.          |
| CHBC | —Calgary, Canada.        |
| KFAE | —Pullman, Wash.          |
| WMAQ | —Chicago, Ill.           |
| KHJ  | —Los Angeles, Cal.       |
| WSB  | —Atlanta, Ga.            |
| KFDB | —San Francisco, Cal.     |
| KFFQ | —Colorado Springs, Colo. |
| KWH  | —Los Angeles, Cal.       |
| WRAL | —St. Croix Falls, Wisc.  |
| WDAJ | —College Park, Ga.       |

I have a Grebe CR 9 and for concert work for the neighbors and the family, use a Magnavox 2 stage power amplifier and Magnavox loudspeaker. I obtain enough volume to entertain neighbors over a mile away on still evenings, using UV 201 A tubes in set and power amplifier with 113 volts on plates of tubes in power amplifier. I have a .005 mfd. condenser across the input terminals of my Magnavox which helps greatly to clear up reception when using extreme amplification.

I am going to sign off here and if anyone cares to write me concerning further information regarding my set and my equipment, I will be glad to answer their inquiry. I am building a three stage R. F. amp. and det. and expect to make some better records than these.

## A Little More from N. S.

From A. D. Turnbull, 57 Union St., Sydney, Nova Scotia

With single circuit regenerative using one R215A dry cell tube I can hear whenever they are going CFCF, CKAC, WGI, WBZ, WNAC, WMAF, WGY, WHAZ,

WOR, NAA, WEA, WAAF, KYW, 10AA, 1AA (Canadian), KDKA, WIP, WFI, WAO.

On several occasions, using one stage peanut tube, I've heard CJCI, WOC, WFAA, PWX, WSB, WHB, WLW, WBAP, WPA, WDT, WVP, KDOW, WDY and QXJ.

Not bad for away up here. With one stage on fair evenings WGY is heard 25 feet from phones. Home-made set. This R215A is a Canadian tube, Northern Electric, and takes 22½ on plate, 1½ on filament. Excellent for detector or radio frequency work and gives great audibility on low-frequency.

## Nothing Like Trying—to Beat This

From Wilbur Craig, McLean, Illinois.

I GET the RADIO WORLD every week and I am interested in the DX Nite Owls' records. Some of the records are good, some aren't quite so good.

I have had a one tube three circuit set since September. I have heard 217 stations, the list only shows 210, but as there were seven that I wasn't sure of I did not send them in. The most stations I ever heard in one night was 39.

March 10th I received WJZ, PWX, CFCN, KHJ, KFI and KGW. Five stations, all over 1,000 miles distant. I have heard both coasts, Cuba and Canada all in one night quite often. I am not saying that there are not better one tube records but I am fully satisfied. I have a three wire aerial 45 feet long, 25 feet high and in among trees.

WHB, KFAE, WAAC, 9XZ, WPAD, WWJ, 2XI, WIAO, WGAX, WBT, WGM, KDKA, WNAL, WEAK, KNJ\*, WCX, WAAK, WJAN, WEA, WJAX, WCK, WBAE, WCAT, WAAA, WCAS, WSB, WBAP, WCAB, WAAP, KHJ\*, WOC, WCAP, WGAF, WQAO, WIAQ, WKY, WCAZ, WLAL, WCM, 9AMI, WLK, WDAF, WIAR, WCD, WEAO, WPA, WDAJ, WFAC, WWI, 5XJ, WRM, WEAB, WNAD, WOAN, WGR, WLW, WFAA, WKAK, WMH, WMC, WBL, WAAF, CJCG, WJAP, WIP, WGY, WFAP, CFCA, WGAZ, WFI, WOR, WHAS, WCAF, 5YU, CKCK\*, WJZ, WMAQ, WBZ, WOAZ, WOI, WGF, WDAF, WKAL, 5YO\*, KOP, WOS, WDAC, WCAF, WEAH, 9ZV, WSY, WMAC, WHAM, PWX\*, WGV, WHK, WFAB, WQAA, WKAA, WDAO, WMH, WFAV, XIAZ, WLAJ, WHAP, KSD, WNAV, 9CPM, WCAJ, WSA, WAZ, CFC\*, CHBC\*, WFAT, WLAK, WCAL, 9YF, 9DIL, WIAZ, WLAZ, WOO, WHAB, WAAL, 8XJ, WSAT, 9DWG, WJAL, WJD, WMC, WPAL, WPCAL, WCAV, KFFO, WRK, WOAL, WNAR, WGAZ, WFAZ, 6KW\*, 9CLS, WNAT, KGW\*, WEAY, WJAF, KXY, WHA, 9XM, WJAD, WBAA, WJAJ, WRR, CFCN\*, WHAD, WSAH, WPAH, WCAM, 9DXD, 4XJ, WAAX, 9AWK, WOAX, WGI, WWAY, WBAH, WJYT, WDS, WHAX, WOAW, WEB, 9AWA, WJAS, KFDV, 9CCV, WHAS, WMAV, WSAJ, WIAS, KFDL, KFCL\*, WIAE, 9UH, 9AWJ, WOAL, WWAD, CKCZ, KWH\*, CFCF, WTAW, WMAK, WOA, WEV, KFEL, WLAC, WWB, WDAL, WMAV, WTAS, KFEP, WDAE, WPAL, CAY, WDAV, WQAV.

\*Indicates those over 1,000 miles.

# Pittsburgh Church Unveils Tablet Given by Radio Congregation

Episcopal Churches all over the country on June 3 made the announcement that a bronze tablet, probably the most unique in the world, contributed by and dedicated to the unseen radio congregation of Calvary Church, Pittsburgh, Pa., was unveiled during the church services that night.

The Rev. Edwin J. Van Etten, pastor of the church, who was the first minister in the world to have his services broadcast; Bishop Alexander Mann, of the Pittsburgh Episcopal diocese; H. P. Davis, "father of radio broadcasting," representing Station KDKA, of the Westinghouse Electric & Manufacturing Company, which station first broadcast the church services; and

other prominent Pittsburghers took part in the ceremony.

More than 4,700 people representing 40 states of the Union, five provinces of Canada, Cuba and Bermuda, London, England, even sailors from ships sailing the Atlantic Ocean contributed to the purchase of the tablet. The contributions came in every form of legal tender—silver dimes, stamps, nickles, pennies and checks. There were a surprising number of Canadian dimes. A worker in the Southern cotton mill sent Dr. Van Etten two cotton socks with a nickles, pennies and checks. There were on the Atlantic sent the minister 120 pennies he had won playing penny ante.

These contributions came as a result of Rev. Van Etten's idea that his radio congregation to which he had been preaching since January 2, 1921, might like to contribute to some sort of memorial. Accordingly, during the reading of his regular church announcements Dr. Van Etten addressed, directly, his unseen hearers and told them of a plan to have small contributions from such of them as might like to participate. The sum obtained from the contributions was to be used for a memorial dedicated to them.

Responses to this idea were almost instantaneous. An hour after the announcement was broadcast contributions were received.

"Character, industry and thrift are of primary importance, integrity is a fundamental element in wholesome growth, sham is waste, and there is no real success without sincere service."—Strawbridge & Clothier, Philadelphia.

# Radio Merchandising

Advertising Rates: Display, \$5.00 an inch, \$150.00 a page. Classified Quick-Action Advertising, 5 cents a word.

Telephone Bryant 4796

## Radio Literature Wanted

Manufacturers of and dealers in radio apparatus and accessories are notified that literature and catalogues describing their products have been requested, through the Service Editor of RADIO WORLD, by the following:

Radio Lyre Co., 413-14 New Nelson Building, Kansas City, Mo. (Distributor, particularly to foreign-born population.)

Heilman's Electrical Shop, East Lake Station, Birmingham, Ala.

Marion Brown, 1107 West Sycamore Street, Independence, Kans.

O. A. Kenyon, 111 Broadway, New York City.

R. Nairn, General Delivery, Kamloofis, B. C., Canada.

Lester Hayne, Milverton, Ont., Canada.

Alphy Blais, 25 D'Aiguillon Street, Quebec City, Canada. (Will soon open radio store.)

O. V. Rzehak, 1146 San Julian Street, Los Angeles, Calif.

Edward V. Archer, 1402 Olivia Street, Key West, Fla.

A. E. Baldwin, Switchboard Supervisor, Chenango & Unadilla Telephone Corporation, Norwich, N. Y.

Whitman Radio Service, 176 Monroe Street, Brooklyn, N. Y. (Build receiving sets with standard parts.)

Walter Mohr, Witherton, Ontario, Canada.

Wm. Wachsmann, 120 West 117th Street, New York City.

John N. Schmitz, Box 272, Albion, Neb.

Richard M. Melcher, 185 Main Street, Brunswick, Me.

Jack Gordon, Belmont Supply Co., 468 Springfield Avenue, Newark, N. J.

W. B. Speirs, 4102 Buchanan Street, Detroit, Mich.

H. B. Lynch, Windsor, Mo. (Dealer.)

Leo V. Brains, Carlisle, Ark. (Retailer.)

E. L. Kemp, Brandon, Vt.

The Parker Roll & Record Co., Lexington, Ky.

V. G. Bidwell, Healdton Electric Supply Co., Healdton, Okla.

C. F. Clark, Wall, South Dakota.

Robert Fisher, 116 Park Street, Burlington, Vt.

Anthony Sini, P. O. Box 123, Shoreham, Long Island, N. Y.

Calvin E. Church, 1202 Castle Hill Avenue, New York City.

L. W. Hunt, 324 West Second Street, Ottumwa, Iowa.

Frank J. Morrison, Box 223, State College, New Mexico.

Lewis R. Twitchell, 302 Northwest 22nd St., Miami, Fla. (Wants information on a long-distance broadcasting station.)

A. J. Bryant, 506 North Lake St., Urbana, Ill.

O. C. Miller, Atchison, Kans.

Blas Rocafofort, Lealtad and Malecon Sts., Havana, Cuba. (Consumer.)

F. D. Rohrback, P. O. Box 45, El Reno, Okla. (Dealer and repairs.)

John Nelson, Lincoln Park, N. J.

A. V. Jacobson, Box 496, Venango, Neb.

Emery S. Dennis, 1703 Crilly Court, Apt. 4, Chicago, Ill.

John J. Kenna, Woodbridge Ave., Port Reading, N. J. (Interested in dry cell receivers.)

W. I. Bartlett, Atlanta, Mo. (Interested in experimental equipment.)

Walter V. Frabell, 3602 Wood St., Wheeling, W. Va.

Chas. Ebert, 48 Wycoff Ave., Brooklyn, N. Y.

Frank Ebert, 794 Flushing Ave., Brooklyn, N. Y.

A. E. Searing, 1213 Gray Ave., Utica, N. Y. (Wants to buy set.)

V. A. Charles, 107 Massachusetts Ave., Boston, Mass. (Will open retail business in September.)

A. B. Miles, Library, Walter Reed General Hospital, Washington, D. C.

B. F. Bianchi, Sabael, Staten Island, N. Y.

C. B. Millar, Reward, Calif.

Jack Brothers, R. F. D. 3, Kosse, Tex.

A. F. Williams, 1001 Franklin St., San Francisco, Calif.

General Radio Company, 122 Fifth Ave., New York City.

The first of these names were printed in Radio World dated April 21, and have continued in each issue since. Any copy 15c. Any 7 copies for \$1.00. Radio World, 1493 Broadway, N. Y.

## The New Grebe CR-12 Receiver

IN the new Grebe receiver, the CR-12, is employed radio frequency and regeneration, the two factors most important in long distance reception. One of the distinctive features claimed by the manufacturers of this Grebe product, is the simple manner in which it may be used with any tubes now on the market. A 201A may be used in the radio frequency circuit and a WD-11 as a detector, a UV-199 in the first stage of audio-frequency amplification and a UV-200 in the second stage audio-frequency amplification. Such combinations may be used with either dry cells or a six volt storage battery. With no combination of tubes is more than one A battery necessary.

This receiver has but two tuning controls, one of which is calibrated to wave lengths, thus reducing to a minimum the elements of chance in tuning for a given station. With a wave length of 200 to 600 meters, the set will receive all wave lengths which have come into effect since May 15th. No outdoor antenna is used, in fact the antenna is supplied with the set, and consists of a silk covered wire 20 feet in length. This wire, although not unsightly, may be hidden back of a picture moulding or run along the base board.

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I have had a one tube three circuit set since September. I have heard 217 stations, the list only shows 210, but as there were seven that I wasn't sure of I did not send them in. The most stations I ever heard in one night was 39.

March 10th I received WJZ, PWX, CFCN, KHJ, KFI and KGW. Five stations, all over 1,000 miles distant. I have heard both coasts, Cuba and Canada all in one night quite often. I am not saying that there are not better one tube records but I am fully satisfied. I have a three wire aerial 45 feet long, 25 feet high and in among trees.

WHB, KFAE, WAAC, 9XZ, WPAD, WWJ, 2XI, WIAO, WGAX, WBT, WGM, KDKA, WNAL, WEAK, KNJ\*, WCX, WAAK, WJAN, WEA, WJAX, WCK, WBAE, WCAT, WAAA, WCAS, WSB, WBAP, WCAB, WAAP, KHJ\*, WOC, WCAP, WGAF, WQAO, WIAQ, WKY, WCAZ, WLAL, WCM, 9AMI, WLK, WDAF, WIAR, WCD, WEAO, WPA, WDAJ, WFAC, WWI, 5XJ, WRM, WEAB, WNAD, WOAN, WGR, WLW, WFAA, WKAK, WMH, WMC, WBL, WAAF, CJCG, WJAP, WIP, WGY, WFAP, CFCN, WGAZ, WFI, WOR, WHAS, WCAF, 5YU, CKCK\*, WJZ, WMAO, WBZ, WOAZ, WOI, WGF, WDAF, WKAL, 5YO\*, KOP, WOS, WDAC, WCAF, WEAH, 9ZV, WSY, WMAC, WHAM, PWX\*, WGV, WHK, WFAB, WQAA, WKAA, WDAO, WMH, WFAV, XIAZ, WLAI, WHAP, KSD, WNAV, 9CPM, WCAJ, WSA, WAZ, CFCN\*, CHBC\*, WFAT, WLAK, WCAL, 9YF, 9DIL, WJAZ, WLAZ, WOO, WHAB, WAAL, 8XJ, WSAT, 9DWG, WJAL, WJD, WMC, WPAL, WPAC, WCAV, KFFO, WRK, WQAL, WNAK, WGAZ, WFAZ, 6KW\*, 9CLS, WNAT, KGW\*, WEAY, WJAF, KXY, WHA, 9XM, WJAD, WBAA, WJAJ, WRR, CFCN\*, WHAD, WSAH, WPAH, WCAM, 9DXD, 4XJ, WAAX, 9AWK, WOAX, WGI, WWAY, WBAH, WJYT, WDS, WHAX, WOAW, WEB, 9AWA, WJAS, KFDV, 9CCV, WHAS, WMAV, WSAJ, WIAS, KFEL, KFCL\*, WIAE, 9UH, 9AWJ, WOAL, WWAD, CKCZ, KWH\*, CFCF, WTAW, WMAK, WQAI, WEV, KFEL, WLAC, WWB, WDAL, WMAV, WTAS, KFEP, WDAE, WPAL, CAY, WDAV, WQAV.

\*Indicates those over 1,000 miles.

I have a Grebe CR 9 and for concert work for the neighbors and the family, use a Magnavox 2 stage power amplifier and Magnavox loudspeaker. I obtain enough volume to entertain neighbors over a mile away on still evenings, using UV 201 A tubes in set and power amplifier with 113 volts on plates of tubes in power amplifier. I have a .005 mfd. condenser across the input terminals of my Magnavox which helps greatly to clear up reception when using extreme amplification.

I am going to sign off here and if anyone cares to write me concerning further information regarding my set and my equipment, I will be glad to answer their inquiry. I am building a three stage R. F. amp. and det. and expect to make some better records than these.

## A Little More from N. S.

From A. D. Turnbull, 57 Union St., Sydney, Nova Scotia

With single circuit regenerative using one R215A dry cell tube I can hear whenever they are going CFCF, CKAC, WGI, WBZ, WNAC, WMAF, WGY, WHAZ,

# Pittsburgh Church Unveils Tablet Given by Radio Congregation

Episcopal Churches all over the country on June 3 made the announcement that a bronze tablet, probably the most unique in the world, contributed by and dedicated to the unseen radio congregation of Calvary Church, Pittsburgh, Pa., was unveiled during the church services that night.

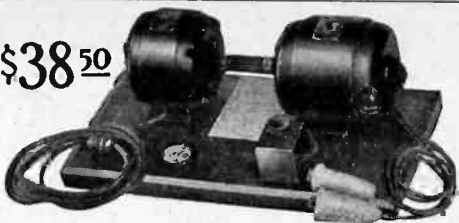
The Rev. Edwin J. Van Etten, pastor of the church, who was the first minister in the world to have his services broadcast; Bishop Alexander Mann, of the Pittsburgh Episcopal diocese; H. P. Davis, "father of radio broadcasting," representing Station KDKA, of the Westinghouse Electric & Manufacturing Company, which station first broadcast the church services; and

other prominent Pittsburghers took part in the ceremony.

More than 4,700 people representing 40 states of the Union, five provinces of Canada, Cuba and Bermuda, London, England, even sailors from ships sailing the Atlantic Ocean contributed to the purchase of the tablet. The contributions came in every form of legal tender—silver dimes, stamps, nickles, pennies and checks. There were a surprising number of Canadian dimes. A worker in the Southern cotton mill sent Dr. Van Etten two cotton socks with a nickles, pennies and checks. There were on the Atlantic sent the minister 120 pennies he had won playing penny ante.

These contributions came as a result of Rev. Van Etten's idea that his radio congregation to which he had been preaching since January 2, 1921, might like to contribute to some sort of memorial. Accordingly, during the reading of his regular church announcements Dr. Van Etten addressed, directly, his unseen hearers and told them of a plan to have small contributions from such of them as might like to participate. The sum obtained from the contributions was to be used for a memorial dedicated to them.

Responses to this idea were almost instantaneous. An hour after the announcement was broadcast contributions were received.

\$38<sup>50</sup>

## RECHARGE YOUR OWN BATTERIES

WHY pay out good money constantly for recharging batteries when the Ohio Motor Generator will do it quickly at a slight expense. This inexpensive home charging outfit keeps your Radio in service all the time and pays for itself—by charging your neighbors' batteries. It is noiseless, gives no trouble, and will even recharge totally exhausted batteries quickly. The set is made up of the celebrated Ohio A C motor and D C generator wound for 6-10 volts. The motor and generator have ball bearings and are of the highest grade construction. It has none of the troubles common to cheap charging sets and will last a lifetime. It will charge quickly any three cell automobile or Radio "A" battery. Furnished complete on a substantial base with ammeter and field rheostat to adjust the charging rate from one to twenty amperes. The motor is for 60 cycle, 110 volt service and is complete with ten foot cord and attachment plug ready for instant connection and operation. Full instructions provided.

Motor and generator can be specially wound to charge six cell batteries or other unusual conditions.

Price \$38.50 f. o. b. Cleveland. Ship by Express C. O. D., weight sixty pounds. Send your order today and stop paying good money for recharging. Your money back quick if not satisfactory.

NOTE:—If your service is other than 60 cycle, 110 volt, ask for special price.  
THE OHIO ELEC. & CONTROLLER CO.  
CLEVELAND OHIO

## Treat Your Radio Phones As You Do Your Watch

ONE of the essential parts of a radio-telephone receiving outfit is a good pair of telephone receivers, or a 'double head-set,' as they are sometimes called," said an official of Station WOC, owned and operated by The Palmer School of Chiropractic, at Davenport, Iowa, when asked about the operation and care of the telephone receiver. He continued: "On account of their connection with the receiving outfit, receivers are naturally subject to more mechanical abuse than any other part of the set. They are passed, as a rule, from person to person during a concert and thrown carelessly on the table afterwards where the cord is usually a convenient length for them to be bumped off onto the floor.

"A telephone receiver, simple in construction as it may seem, is the result of a great deal of experimenting by manufacturers and designers of radio equipment. Each of the two receivers consists of a coil of very fine wire, a permanent magnet and a diaphragm, these parts being housed in the hard rubber case with remarkable care. The size of wire and number of turns in the coil, the thickness of the diaphragm and the magnet and the amount of residual magnetism in the pole pieces are all very delicate factors in the successful operation of a telephone receiver. These factors are carefully tested in the manufacture of these instruments and any tampering with their adjustments usually decreases their efficiency or renders them entirely useless.

"The action that takes place within a receiver is as follows: Feeble electric currents set up in the receiving instrument by incoming signals are passed through the coil of a telephone receiver. This current is rapidly changing in value or fluctuating, which change causes a corresponding change in the degree of magnetism within the pole pieces. The diaphragm being suspended within this rapidly changing magnetic field, records these fluctuations in the form of mechanical vibration, which in turn is reflected to the ear in the form of sound waves. When this delicate function is kept in mind it is easy to understand why more than the average care should be taken in handling these instruments.

"It is well to observe the following rules regarding their use:

"Don't drop the receivers or subject them to a heavy jar in any way. A jar is a very effective means of demagnetizing a permanent magnet.

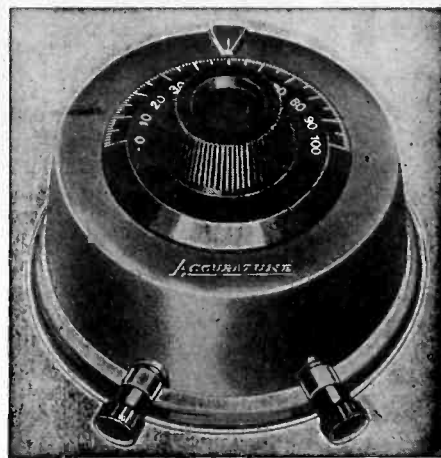
"Don't try to use an ordinary receiver, such as used on your office phone, to receive radio signals. While the principle of operation is the same in both, the receivers designed for radio are many times more delicate and time spent with the former is usually time wasted.

"Never remove the cap from the receivers or look for suspected trouble inside; such cases are very rare, and should they exist, it is not at all likely that you could locate or repair such trouble satisfactorily.

"Do not press upon the metal which you see through the hole in the cap. This diaphragm is made of very thin metal and must be in a perfect plane to vibrate as intended. The slightest dent or bend will ruin a diaphragm.

"It is well to have a convenient hook on which to hang the receivers by the head band when they are not in use. In short, apply the same rules to handling your phones as you do to your watch and they will serve you with equal faithfulness."

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Not a mere wave-trap, but a high-grade tuner which when connected in series with antenna will materially improve the selectivity of the average receiver.

One piece molded Condensite Case.  
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Or send 25c for Neutrodyne Constructor which shows "How to Make the Neutrodyne"

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Na-ald Special Socket No. 499



Na-ald De Luxe No. 400

### It's the contact that counts

The Na-ald Special Socket No. 499 is a sturdy little socket with a dependable contact for the G. E. No. 199 dry-cell tube. It has special slot construction, and is moulded of genuine Bakelite. The heat from soldering connections will not affect Na-ald sockets.

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The dual-wipe contact strips of the Na-ald De Luxe socket avoid the trouble experienced with the socket of conventional design. Because of thorough cure and high dielectric properties Na-ald sockets keep plate to grid losses at a minimum (of particular importance in Flewelling Circuit or in Radio Frequency).

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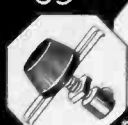
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This is the latest in the popular handbook series published by the International Correspondence Schools. It was compiled by Harry F. Dart and technically edited by Francis H. Doane, principal of the School of Electrical Engineering. The subject matter is comprehensive, well arranged and efficiently condensed. The book should be of value to all radio amateurs as well as to those professionally engaged in the art.

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RADIO will have an important place in the International Aero Exhibition at Gothenburg, Sweden, during July and August, according to dispatches from Consul Sholes to the Department of Commerce. A special radio section is under preparation, and several foreign and American firms are expected to exhibit apparatus, especially radio sets suitable for interplane and plane to ground communication.  
A feature of unusual interest will be the daily receipt of news by radio from the United States for the American visitors at the exposition. Through the co-operation of a Swedish-American News Association and the Naval Communication Service, NAA will broadcast daily five hundred words of "home news."

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| Fluorizing Super Circuit   | Feb. 24  |
| Multi-tube Reflex Circuits   | March 3  |
| One tube Superregenerative   | March 3  |
| Lewis Three Tube Circuit   | March 10 |
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| Compact Universal Receiver   | April 28 |
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The rate for this RADIO WORLD QUICK-ACTION CLASSIFIED AD. DEPT. is 5c. per word (minimum of 10 words, including address), 10% discount for 4 consecutive insertions, 15% for 13 consecutive insertions (3 months). Changes will be made in standing classified ads. if copy is received at this office ten days before publication. RADIO WORLD CO., 1493 Broadway, N. Y. C. (Phone, Bryant 4796).

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**PATENTS—SEND DRAWING OR MODEL FOR EXAMINATION AND OPINION.** Booklet free. Watson E. Coleman, Patent Lawyer, 624 F Street, Washington, D. C.

**EXCHANGE JOLLY, INTERESTING LETTERS** through our club. Stamp appreciated. Betty Lee, Inc., 4254 Broadway, New York City

**RECHARGE** dry cell batteries. Cost, 5c. Instructions, 15c. J. Brent, 3 Stueben St., Bridgeport, Conn.

**WANTED**—Omnigraph in good working condition. Box 435, Hardin, Montana.

**DO YOU WANT TO SAVE MONEY** in making your set? Send for the Jan. 27 issue of RADIO WORLD, containing a full-page drawing of how to make filament control rheostats, as well as an easily understandable text, which makes the construction easy. 15c a copy, or start your subscription with this issue. RADIO WORLD, 1493 Broadway, New York.

**SAXOPHONE**, brass Alto, made by Buffet, Paris, with leather case cost hundred dollars new, both in good condition, WILL TRADE for complete WD-11 or WD12 three-tube receiving set or parts for same. Give names and value of parts. C. Dillman, No. 246, Webb City, Okla.

**THREE NEW 50 WATT TUBES.** Never used. \$20 each. W. N. A. B., Bowling Green, Ky.

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## RADIO DEALERS !!!

Have you seen the list of Camps and Camp Directors which started in the MAY 12 issue of RADIO WORLD? Here is a list of all the Camps and Directors of camps in the United States, and is of essential value to any Radio Merchant who is anxious to enlarge his summer business. Get these people interested in installing radio sets in their camps for the benefit of the campers. Any single copy, 15c; or the four issues for 60c. RADIO WORLD, 1493 Broadway, New York City.

**VENTRILOQUISM** taught almost anyone at home. Small cost. Send 2c. stamp today for particulars and proof. Geo. W. Smith, Room M-643, 125 N. Jefferson Ave., Peoria, Ill.

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**ELEMENTS OF RADIO TELEPHONY**, by Wm. C. Ballard, Jr. A standard book on radio telephony, the work of a recognized authority. Accurate, simple, clear, reliable and strictly up-to-date. For the technical man who wants to post himself on radio and for the radio enthusiast who wants the fundamental principles of radio and their application tersely and entertainingly presented. Price, postpaid, \$1.50. The Columbia Print, 1493 Broadway, New York.

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### Technical Radio Service Wants Latest News

Editor Radio World: The writer has established a service department in conjunction with one of the well established retailers in this vicinity. The purpose of this department is to be purely technical and to render service and information to the new fan and those floundering around in the dark wishing to obtain a good reliable set for themselves. Also for those who now have sets that sound wishy-washy or like a boiler factory in full bloom.

We have great difficulty here on the Coast to get the new improvements and the necessary information regarding new developments. From four to six weeks elapse between the time some authority in radio publishes his findings before we get a glimpse of it.

This is a deplorable condition and lies in the fact that no one has ever taken advantage of a service back in the East to hand out these findings hot off the griddle.

It is with the hope in mind that you can place me in touch with such a service and also place me on everybody's mailing list.

Yours very truly,  
WESTERN RADIO ENGINEERS.  
Frank D. Andrews.  
5937 Sunset Blvd., Hollywood, Calif.

### Opera Festival Cancelled By Royalty Demands

The Information Bureau of Broadcast Central, Aeolian Hall, New York City, sends the following interesting communication to RADIO WORLD:

We regret exceedingly that plans to broadcast the Spring Festival of Italian Grand Opera which were recently announced through this bureau failed to materialize owing to restrictions placed on the use of the music which is copyrighted by the American Society of Authors, Composers and Publishers. Attempts to substitute other music free from such restrictions as well as efforts to persuade the society to grant temporary permission to use the copyrighted music were of no avail.

"Every precaution is taken at WJY and WJZ to eliminate last-minute cancellations on our programs but circumstances peculiar only to the case of the Italian Grand Opera feature which developed but a few hours before the performance prevented our recalling the press announcements."

### All Dressed Up and a Real Place to Go!

Editor, Radio World:—I have just received back from the binder two copies of RADIO WORLD, volume 1, April 1921 to September 1922, handsomely bound in half morocco, light red English buckram, handsomely gold stencilled on the back, with gilt tops.

And this is a valuable addition to my already large wireless and radio library.

I will continue to subscribe to two copies in the future.

I write you this letter to respectfully request that just as soon as you publish an index, or for any future volumes, to kindly send me two copies of the same.

Yours very truly,  
New York City. P. C. KULLMAN.

### "Leviathan's" Call Is WSN

WHEN the Shipping Board's giant Leviathan sails on her trial trip from Boston on June 19, she will keep in touch with the land radio stations by radio and will answer the call WSN. Radio Operators Jack Irwin and E. N. Pickerill will be in charge of the big ship's wireless.

### Marconi Acquires Radio Station at Vienna

THE Marconi Company has taken over the Austrian Government radio station at Laaerburg, just outside of Vienna. This has necessitated negotiations between that company and representatives of the Naval Communication Service regarding charges for traffic handled in the future for the Naval Communication Service. This station has formed since the War, a link in the Naval Communication Service in Europe from Paris to Constantinople. Messages are sent from Paris by telegraph via Coblenz to Vienna. Navy enlisted personnel in the telegraph office at Vienna receive these messages and transmit them by telegraph a short distance to the radio station at Laaerburg where Navy operators, utilizing the Vienna radio transmitter during certain hours of the day, transmit the messages to American vessels in the Mediterranean and at Constantinople. Service will continue as heretofore via the Austrian radio station, but a certain rate per word will be paid to the Marconi Company for despatches transmitted through the Vienna station.

### Naval Airships to Have Radio Compasses

PLANS for equipping the two new Naval rigid airships with radio compasses so that they can navigate in darkness or in fog are under consideration. These are the great ZR ships now building. It is believed that the radio compass installations can be made satisfactorily, and that this feature will prove a valuable asset for the efficiency and safety of both personnel and material through assisting the accuracy of navigation. The location selected is adjacent to the observation platform located on top of the ship, well forward. A coil has been designed which will enable observations to be made on frequencies extending over a band of from, approximately, 600 to 16 kilocycles. If this installation is made satisfactorily, it will be the first time a radio compass has been successfully utilized upon a lighter-than-air craft.

### American Radio Exports Increase

DURING the first three months of 1923, the value of exports of American-made radio and wireless apparatus exceeded a half million dollars. An increase of over \$30,000 a month since the first of the year is shown by figures just issued by the Department of Commerce.

In January, these exports were valued at \$141,577; in February the value increased to \$173,909, and in March the figure was \$213,094.

Of the March exports, \$70,273 worth went to Quebec and Ontario, \$37,030 was purchased in Cuba, and \$25,068 worth was shipped to Mexico. The weight of the shipments was approximately 58 tons.

### Will Hold Examination for Radio Gunner

IT is expected that the Bureau of Navigation of the Navy will hold an examination for Gunner (Radio) about the middle of August, 1923. The bureau will notify the service at large as soon as it is definitely settled. In all probability, requirements for this examination will be the same as those incorporated in the Bureau's Manual. This is a step in advance for radio in the Navy as the gunner is a warrant officer and stands next to the commissioned personnel.

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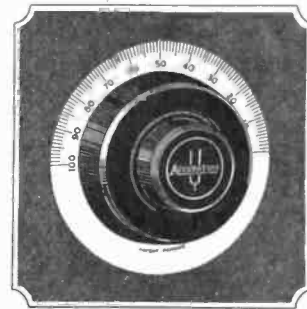
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## Keep Your Tail Up— Advertise!

IN season and out of season advertise; I tell your merchandising story. Especially advertise out of season. People earn and spend just about the same amount of money for their pleasure and amusement winter and summer, and they spend it for the things that are advertised.

Overhead is continuous. No manufacturer of a standard brand of radio goods can afford to stop advertising during the summer and let his brand be forgotten. Does Victor Phonograph or Wrigley's Gum or any of the others that have made millions in advertising ever stop?

Here is what happened to a success when they stopped advertising. Cook's Flaked Rice was one of the first and best known breakfast foods—their factory was running in three eight-hour shifts to supply the demand. They stopped advertising and went entirely off the market.

Pearline was advertised for years in season and out of season and made millions for the manufacturers. Their advertising ceased. What has become of Pearline?

The Magnavox manufacturers are increasing their advertising this summer. Watch the results in comparison with the other loud speakers who curtail or stop their advertising during the dull season.

What does a radio dealer think of a manufacturer who loads him up with goods in the late spring and then stops advertising until Fall? Can a radio manufacturer afford to treat his trade this way? Is not continuous, year-round advertising absolutely necessary?

Good merchandising means continuous sales. Continuous sales are only obtained through continuous advertising plus customer sales effort.

To advertise a brand or trade name for six months, and then stop advertising and let the buying public forget you for the next six months is, to say the least, bad management.

*Advertise now.* The great creative sales power of advertising will overcome a dull period. That is what advertising is for, to stimulate and create business when business is sluggish or dull.

We have evidence to prove that RADIO WORLD, the national illustrated weekly, brings quicker, larger and more satisfactory sales results from both the consumer and dealer than can be obtained for the same amount of cost in any other radio publication. Let us show you the evidence. RADIO WORLD, 1493 Broadway, New York.

### Radio License Required in Czechoslovakia

THE manufacture, sale, storage and importation of radio telephone and telegraph equipment in Czechoslovakia is only permitted under license from the state, says Trade Commissioner H. L. Groves in a report to the Department of Commerce. The Ministry of Commerce in cooperation with the ministry of Posts and Telegraphs are authorized to grant licenses for this purpose. The Ministry of Posts and Telegraphs also supervises and controls the manufacture, sale and storage of radio equipment and cooperates with the Ministry of Commerce in the granting of licenses.

Up to the present time only one company, "Radioslavia," has obtained a license for the manufacture of radio equipment in Czechoslovakia. It has not yet started production. This company is understood to be affiliated or closely connected with the French Company "Societe Francaise Radio-electrique." A German company, "Gesellschaft fur Drahtlose Telegraphie, System Telefunken," is said to be promoting a company with Czechoslovak capital for the purpose of exploiting German wireless patents,

but it has not yet been granted the necessary license.

The attitude of the Ministry of Posts and Telegraphs toward the granting of licenses to transmit as well as to receive radio messages is said to be favorable in the following instances:

(1) Technical High Schools, for scientific purposes.

(2) Industrial establishments which have obtained special licenses from the Ministry of Commerce to manufacture radio equipment.

(3) Ships and aircraft.

(4) Electric power stations, waterworks, and other establishments of public utility, under special conditions.

(5) Companies which have been authorized by the State to broadcast matter of general interest, such as news-statements, exchange reports, agricultural reports, concerts, lectures, etc.

Licenses for the operation of receiving sets only will be granted to institutions, companies and those regularly taking the report transmitted either by the State Telegraph Office or by companies authorized by the state to transmit such messages.

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"GRANOLITE" Universal Radio Horns are positively superior to all others because we have embodied in their construction perfect acoustic qualities, careful workmanship, high grade, carefully selected materials, strength and beauty of design. The base construction and equipment is universal, permitting the installation and use of any of the standard and well known loudspeakers and receivers.

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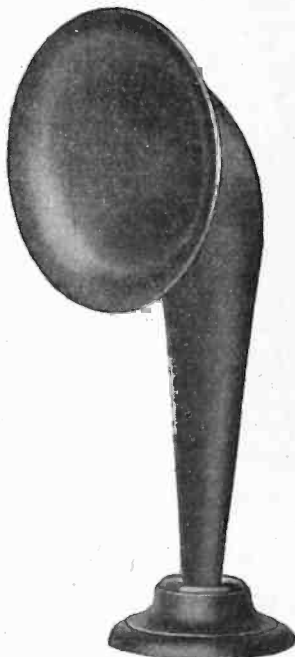
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No. 3 with .14 inch bell; height, 25 inches.

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Episode XV

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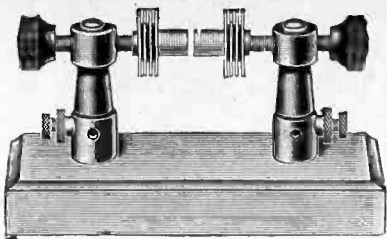
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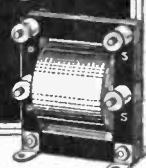
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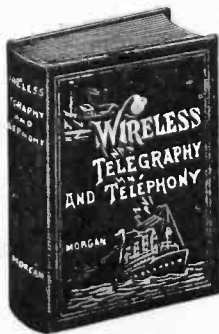
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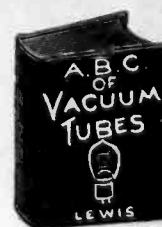
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