

RADIO AGE

The Magazine of the Hour

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SEPTEMBER, 1923

IN THIS NUMBER

How the New Wave Allocations Affect the Receiver

By Frank D. Pearne

How to Make a Simple Radio Frequency Receiver

By Felix Anderson

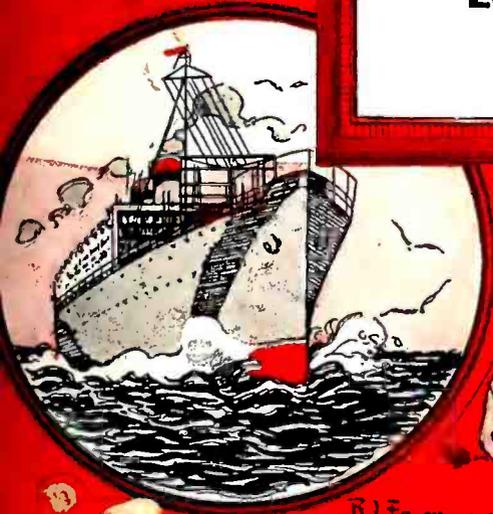
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By E. F. McDonald, Jr.

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Volume 2

SEPTEMBER, 1923

Number 8

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Looking Ahead

IN THE August number we promised to publish a feature in the present issue that would interest every radio fan. We refer to the article written by Mr. Pearne on the effect of the new wave lengths allocated to stations in the United States and how fans may adjust their receivers to meet difficulties caused by the change. This illustrated article will answer large numbers of letters from fans who desired information on this new situation in radio.

Illustrated information on several important circuits is in preparation for the October number. We have no doubt that readers have noticed that technical articles in Radio Age are written by our own experts. Radio Age does not "borrow" its text or its illustrations from any other publication. We are publishing a magazine for the readers and we want readers to ask for what they want.

Questions are answered in our "Trouble Shooter" department and the greatest of care is devoted to the writing and illustration of the answers. For non-subscribers who wish immediate assistance through the mail, with hook-up sketch, a nominal service charge of 50 cents is made. For answers published in the magazine no charge is made. It is your department. Use it.

Send in your letters about radio experiences. They will interest other fans. Write and tell us what you like most in a radio publication. We are building for the future as well as enjoying the present.

To the thousands of new readers whom we greet in this issue we want to say that they are welcome additions to our big swarm of bugs.

Give us a buzz.

—The Editor.



Here is a picture of Dr. Donald B. MacMillan, the Arctic explorer, as he looks in the radio room of his doughty little vessel, the "Bowdoin." The ship is equipped with powerful radio apparatus and for the first time is carrying into the land of vast silences a means of constant communication with the home country. Radio has thus eliminated one of the greatest difficulties attending explorations in the polar regions—loneliness and maddening silence. Read the article by E. F. McDonald, Jr., on page 9.

RADIO AGE

"The Magazine of the Hour"

M. B. SMITH
PUBLISHER

PUBLISHED MONTHLY

FREDERICK SMITH
EDITOR

How the New Wave Allocations Affect the Receiver

By FRANK D. PEARNE

ON THE fifteenth of May, a change was made in the allocation of wave lengths to be used by the various broadcasting stations in the United States. This change was recommended by the National Radio Conference and approved by Secretary Hoover. This has resulted in a rather peculiar condition, so far as the broadcast listener is concerned. Many of us were astonished to hear stations which formerly came in just fairly well, suddenly become quite strong and on the other hand, some of the old reliable stations which could always be depended upon to give plenty of volume, dropped so far below standard that reception of any kind was quite difficult. Why all this confusion?

Formerly all broadcasting was done on a wave length of from 360 to 485 meters. Under the new arrangement this band was changed to from 222 to 545 meters. It will be noted that the increase in length only amounted to sixty meters, but the change in the downward direction amounted to 138 meters. In other words, the wave band has been broadened to a considerable extent and most of the receiving sets in use today are not equipped with the proper apparatus to cover this wide range.

The question now arises, "Why were they not made so that they would cover a wide range?" The answer is quite simple. Unless special apparatus is used, the wider the range of a set, the less the efficiency will be on any one particular wave length. The average set in use today will cover a wave band of from 200 to 450 meters. It is possible, of course, to hear a station slightly outside of this range,

but the reception is poor, due to the fact that the set can not be tuned in perfect resonance, or harmony, with the incoming wave.

Apparently there will be no difficulty in getting down to the 222 meter end of the scale, but the thing which most concerns us is how to raise the wave length far enough to get the stations working on the high end of the scale. This will call for an additional raise of sixty meters, which is not a great change, but very necessary if we wish to get all the good things going on the air. This slight change may be accomplished without any great loss in efficiency, by loading the different circuits of the set.

First of all, however, some attention must be paid to the aerial. Every aerial has a certain fundamental wave length, which is de-

termined by its inductance and capacity. For example, let us refer to a single wire aerial of not more than 100 feet in length, or rather 100 feet from the extreme end to the point where it is connected to the ground, after passing through the set. The most simple method of calculation is to multiply the length in feet by the constant 1.44, which will give the approximate wave length in meters. This, of course, is not absolutely accurate and does not take into consideration the inductance used in the primary circuit of the receiver, but it is sufficiently accurate to give some definite idea as to whether or not results should be expected. Such an aerial as mentioned would have approximately a fundamental wave length of 145 meters.

Now, when it is connected through

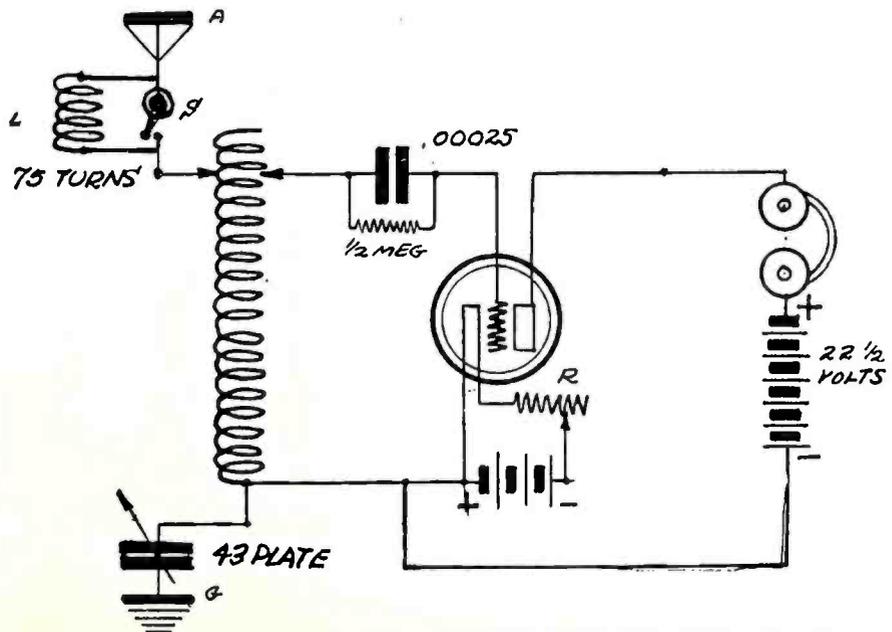


Figure 1. The single circuit receiver is loaded by inserting a seventy-five turn coil in the antenna circuit and placing a 43-plate condenser in the ground lead.

the set, considerable inductance is added to its natural inductance, which would greatly increase its wave length. If the primary inductance of the set is the stationary winding of a variocoupler, then the switch contacts provide a means of changing the inductance of the aerial circuit. If only a few turns are cut in by the switch, then very little inductance will be added to the fundamental inductance of the aerial and the wave length will be a little more than the fundamental wave length of the aerial, but if all the turns are cut in, then the inductance is greatly increased and the wave length is also greatly increased. Any way we know that we can cut the wave length down to just a little more than the natural wave length of the aerial and we can raise it to any point depending upon the inductance which we cut into its circuit.

Before the change of wave length went into effect, most of the variocoupler primary, or aerial coils, were wound with from forty to sixty turns, which when used in connection with a large aerial, would be sufficient inductance to receive the new wave lengths; but if the aerial is small, having a short fundamental wave length, then this winding is not enough and more turns will be necessary to increase the wave length to the desired point. These extra turns need not be on the primary of the coupler and if placed anywhere in the aerial circuit, the result will be to add inductance and any changes in this may be accomplished by regulating the turns on the coupler by means of the switch.

An arrangement of this kind will take care of increasing the wave length of the receiver. But what happens to the fellow who has such

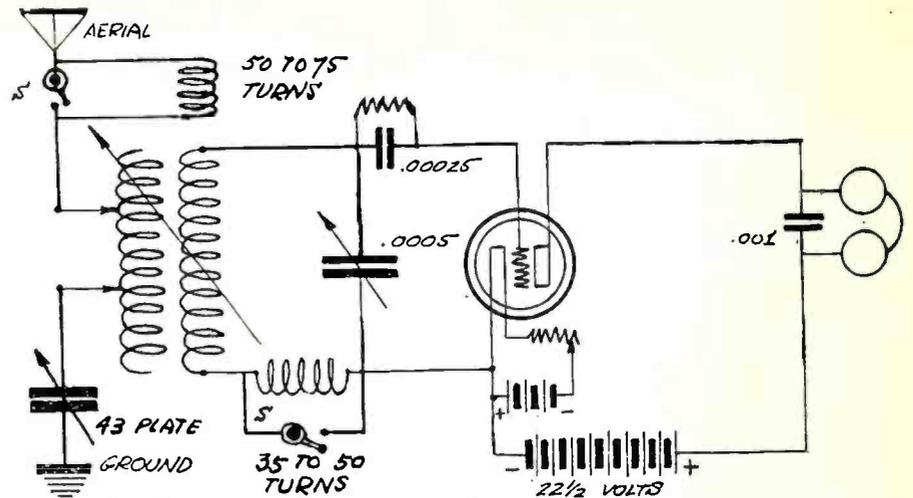


Figure 2. The two-circuit tube set is loaded by the addition of two coils placed in the antenna and grid return circuits. Switches are provided to cut out the coils if desired

a large aerial that the long waves come in but on account of its size, he cannot cut it down below 300 meters? In this case, the fundamental wave length of his aerial is so high, that it is some where near 300 meters and adding inductance will only increase it. This can be taken care of very nicely by adding a condenser to the aerial circuit. This should be cut into the circuit, somewhere between the aerial and ground.

A variable vernier condenser should be used for this purpose, its capacity depending upon how much the wave length is to be lowered. Generally, a 43-plate condenser, which varies from nearly zero to .001 M. F. is used for this purpose and the best point to place it is between the set and the ground. The reason for this location is that when so placed the movable plates may be connected to the ground, which will cut down the body capacity effect when trying to tune very close. Thus we see that by using either inductance, or capacity

in the aerial circuit, we can conform the fundamental wave length of any aerial to meet our requirements.

So far as a single circuit receiving set is concerned, this is all that is necessary; but for those who are using the double circuit type, or three circuit arrangement, we shall have to go farther into details. In sets using more than one circuit, as shown in Figures 2 to 6, these other circuits will also have to be loaded so that they will oscillate in resonance with the aerial circuit. In the double circuit tuner shown in Figure 2, the secondary or rotor of the coupler is connected to the grid circuit. To load a circuit of this kind, the aerial inductance added should be approximately fifty to seventy-five turns. This is shown as "L" in the drawing. The inductance "L1" should be thirty-five to fifty turns. Ordinary honey-comb coils may be used for this purpose, or the coils may be made at home by winding the proper number of turns on a four-inch cardboard tube. The coil used in the

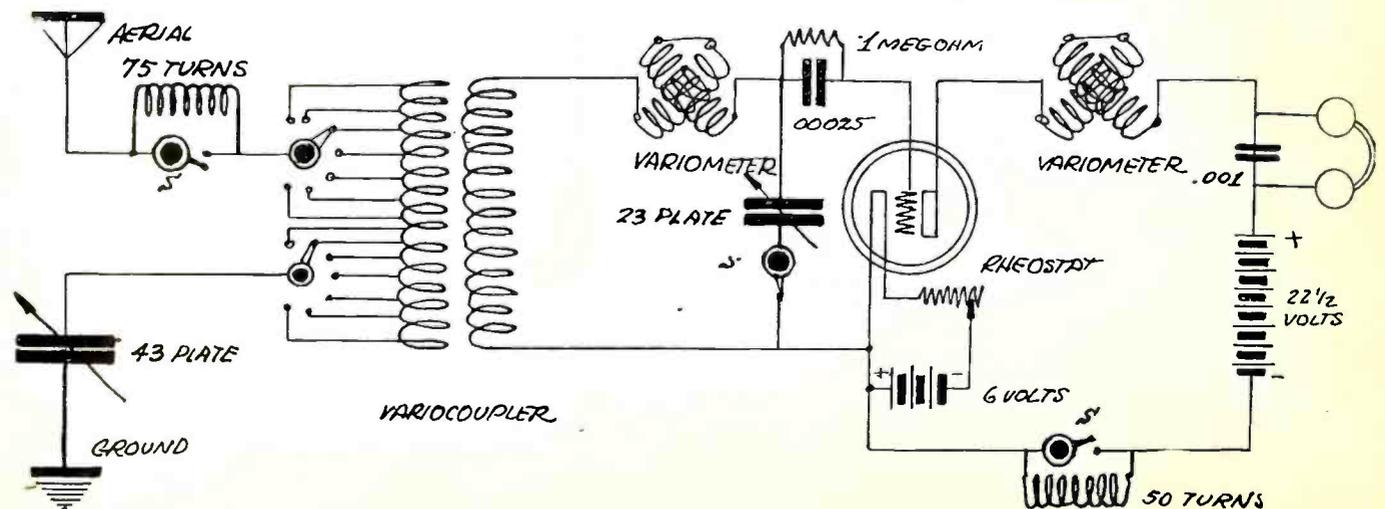


Figure 3. The Armstrong circuit illustrates the use of both coils and condensers to load a circuit.

aerial circuit of Figure 1 (the single circuit set) should have seventy-five turns and may be constructed in the same way. Condensers may, or may not be used in these aerial circuits as shown, but as they serve so well in obtaining a close adjustment, it is well to use them if it can be done without requiring too much added inductance. In the standard Armstrong regenerative circuit shown in Figure 4, the variometers give a change in wave length which usually amounts to a change of 240 to 250 meters, which is generally enough to take care of the secondary and plate circuits, however, in some cases it has been found necessary to add a 75-turn inductance in the aerial circuit, and a 50-turn coil in the plate circuit.

A 23-plate condenser shunted across the grid variometer and the filament circuit as shown, will raise the wave length of the grid circuit. This application of the condenser should not be confused with that of the aerial condenser as in the case of the aerial it is in series, and in this case it is in parallel.

The Reinartz tuner is the most difficult of all to load for longer waves. In his original specification, Mr. Reinartz used a coil of 70-turns for this purpose. An extra contact was added to the aerial and grid switches. These contacts were located on the left-hand end of the aerial switch and the right-hand end of the grid switch. The ends of the coil were connected to these two contacts and at a point twenty turns from the grid contact connection the coil was grounded, as shown in Figure 4. As this required considerable changing in the panel

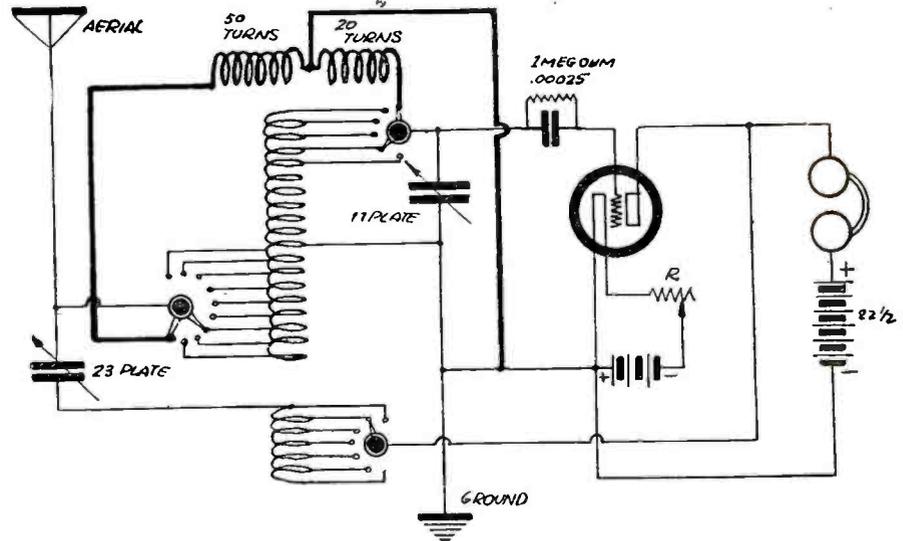


Figure 4. Showing the loading arrangement of the Reinartz circuit.

arrangement, some of our readers have had excellent results by simply adding a 75-turn coil in the aerial circuit and a 50-turn coil between the grid switch and the rest of the grid circuit. This is a matter of experiment, as most Reinartz sets were built by the user and in a number of known cases, the switches advance in the opposite direction to that given in the original specifications, which would make a difference in the location of the extra switch contacts.

Figure 5 shows the ultra audion circuit. To raise the wave length of this circuit it is only necessary to add a 75-turn coil between the variometer and grid connections as shown. In the case of the three-coil honeycomb set, shown in Figure 6 the standard windings consist of coils having 35, 50 and 75 turns

and to change this over to the new wave lengths it is only necessary to procure an additional honeycomb coil having 100 turns. Use the 50-

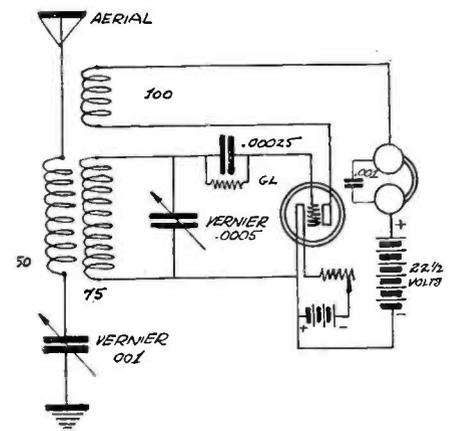


Figure 6. The use of larger honeycomb coils in the honeycomb circuit will increase the wave length of this set.

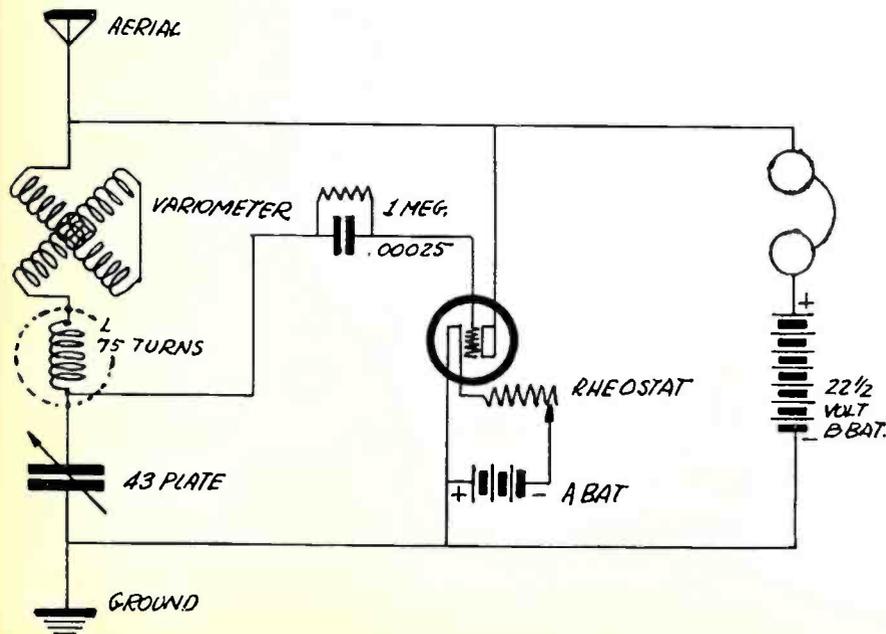


Figure 5. The only additional apparatus used to increase the wave length range of the Ultra Audion circuit is a 75-turn coil placed in the antenna circuit.

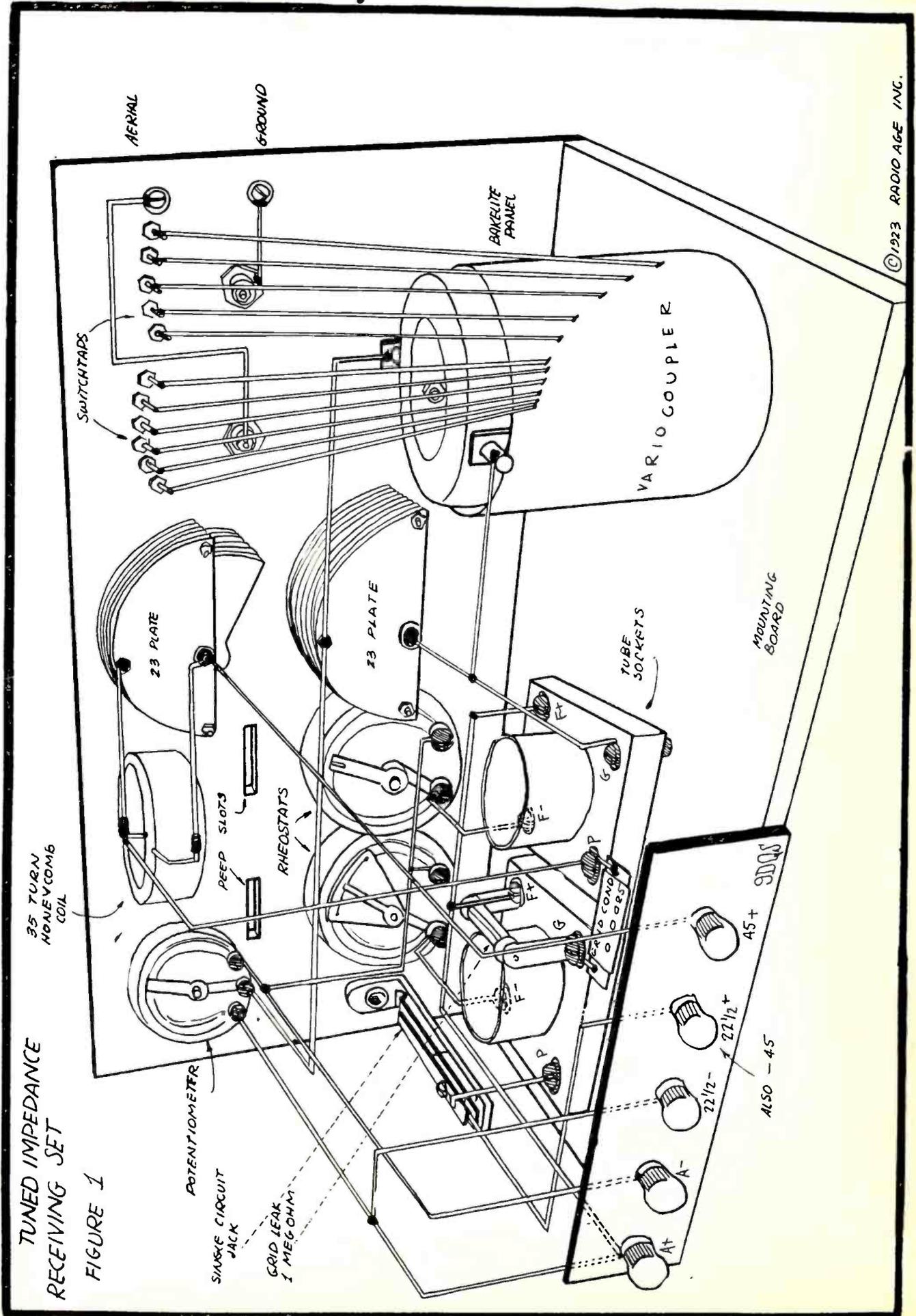
and to change this over to the new turn coil in place of the 35; the 75 in place of the 50; and use the 100 where the 75 was formerly used. In adding these coils to circuits 1 to 5, it is a good plan to arrange them with a short circuiting switch, by means of which they may be cut in or out of the circuit at will. If desired these coils may be made with taps, which can be connected to switches on the panel, allowing changes to be made in the value of these added inductances, thus securing just the right balance of the different circuits. This is a great help in procuring both tone and volume.

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TUNED IMPEDANCE RECEIVING SET

FIGURE 1



How to Make a Simple Radio Frequency Receiver

By Felix Anderson

Radio 9 DQS

THIS magazine has incorporated in the course of its policy of radio instruction, and presented to its readers a series of tube circuits dealing largely with new and unique arrangements of the various components of circuits, and as yet has not given detailed instruction relative to the building and design of a radio frequency amplifier. Many of our readers are probably interested in a receiver of this kind.

Radio frequency amplification is a delicate radio problem, and as a rule requires the use of delicate transformers, accurate condensers, and carefully computed inductances. Due to this obstruction, the technical department of RADIO AGE has taken a conservative point of view on the subject. Until recently this type of amplification was the subject of experimentation by leading radio engineers and the rank beginner must not be misled into believing that a radio frequency amplifier is a simple thing to construct.

Radio frequency amplification is the amplification of a radio frequency oscillation prior to its being detected and recorded. This may sound a bit technical to the average reader, but is easily explained.

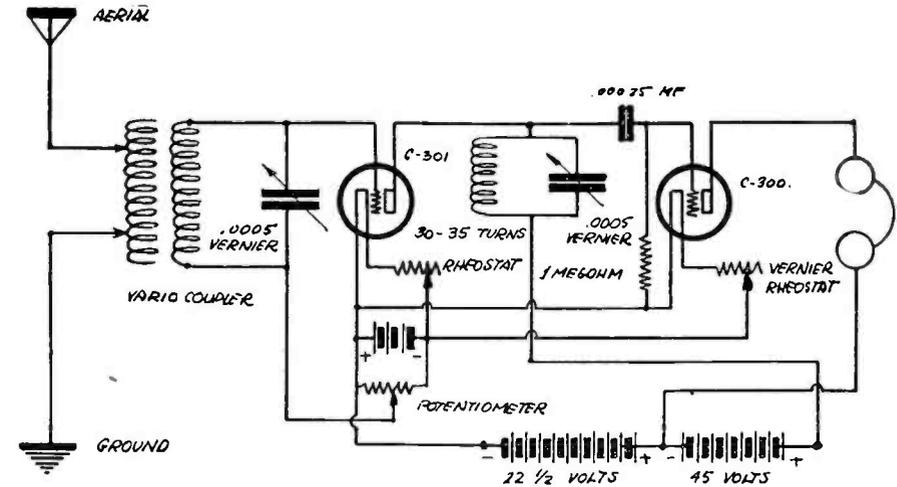
It is generally conceded that the average human ear cannot register sounds above frequencies of 10,000 cycles per second. This is called audio frequency. There are some rare exceptions to this rule but it is arranged by experts as a convenient dividing point, classifying it from radio frequency which applies to frequencies of 10,000 and up. Radio signals being of radio frequency nature, therefore are inaudible to the human ear. This explains the use of crystals, tubes and other rectifiers used to change them to frequencies audible to our sluggish ears.

In radio we generate these oscillations at a transmitting station and transfer them at various frequencies to the transmitting antenna where, according to the general belief, they produce pulsations of corresponding length in the ether.

We erect aerial systems to intercept and retransfer these oscillations or ripples into our receiving sets which, providing they are properly designed and adjusted, will rectify and record them.

These feeble currents, collected by our antenna systems (still of radio frequency nature) travel along the aerial and lead-in wires until they reach the receiving instruments.

Here is where the change takes place. The popular method is to transfer these oscillations or signals directly to the rectifying component of the set. Usually we find them very feeble pulsa-



tions, especially if they are generated by some distant transmitter, and even though they may be intercepted, are lost, due to the fact that they are not of sufficient strength to make a tangible change in our rectifiers, which would permit us to hear them.

Suppose we had an arrangement with which we could amplify these feeble pulsations to a value where they would be impressed upon our detectors at a greater strength than when they were originally intercepted.

This is exactly what is carried out when we use radio frequency amplification.

A circuit diagram of a set which will efficiently carry out this phase of radio is shown in Figure 2. This circuit, called a tuned impedance receiver, does not use a transformer of the usual type, and its function is widely different, as illustrated in Figure 3.

An alternating current generated at A passes out to the point on the wires at the dotted lines across B. A current measurement is taken at B at a given frequency. Supposing a circuit consisting of an inductance E and a condenser F which is tuned to the same frequency (as when the measurement was taken) is shunted across the circuit at G, at the points C and D. A current reading taken at G will, when compared with the measurement obtained at B, show a greater flow of current.

We apply this principle in the circuit shown at Figure 2. The signal traveling

through the aerial and variocoupler primary sets up a current in the secondary. The secondary in connection with the 23-plate variable condenser forms an oscillatory circuit similar to that shown in Figure 3. The condenser is adjusted until the circuit is in resonance with the incoming oscillation.

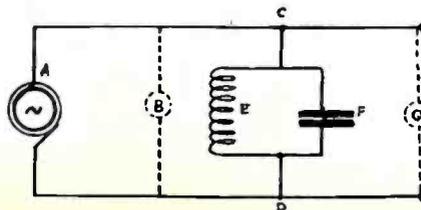
True to the foregoing principle it is amplified by this first circuit. The amplified oscillations are carried on to the first vacuum tube where they are further amplified by the action of the tube and are again amplified when they are carried to the second tuned circuit, consisting of a 23-plate condenser and a 35-turn honeycomb coil, connected to the plate of the first valve and the positive B battery.

The signal is then impressed upon the grid of the detector valve with much greater force than if it were introduced using the customary arrangement.

A set of this kind is simple to construct and requires the following apparatus:

- Two sets of switchtaps and levers.
- One variocoupler.
- Two 23-plate vernier variable condensers.
- Two rheostats, one with and one without vernier.
- One potentiometer, 200 to 400 ohms.
- Two tube sockets.
- One single circuit jack.
- One grid condenser, .00025 Mf.
- One grid leak, one Megohm.
- One U V or C 300 tube.
- One U V or C 301 tube.
- One 30 to 35-turn honeycomb coil.
- One 22 1-2-volt B battery.
- One 45-volt B battery.
- Headset, phone plug and storage battery.
- Connecting wire, preferably copper bus bar tinned.

(Continued on page 32.)



Arctic Radio

Every explorer who returns from a trip to the Arctic regions says that the morale of such an expedition is not broken by the intense cold which prevails in these latitudes, nor the privations, but the awful solitude which is imposed upon the members of such an adventure.

When a party departs on a mission of this kind, it means the cessation of news from the civilized world, and the anxiety for knowledge from home becomes so great as to even break the morale of the most carefully organized expedition.

But this is no longer necessary, as demonstrated by the radio polar expedition, which is led by Dr. Donald B. MacMillan.

The radio phase of this exploration is being carried out by the receiving and transmitting station, better known as WNP—Wireless North Pole, which is to endeavor, through the efforts of its operator Donald H. Mix, to keep in constant touch with the United States.

The qualities of Mr. Mix's radio experience, coupled with the 100-watt transmitter of a very efficient circuit

and the Zenith receiver adapted to both long and short waves should certainly insure, if such a thing is possible, reliable communication.

The transmission is to be carried on schedule, but any one hearing this station should report its reception to the American Radio Relay League at Hartford, Connecticut, and the North American Newspaper Alliance, at 63 Park Row, New York City with the detail concerning any such reception.

The schedule of WNP is as follows:—
10 p. m. to midnight WNP will stand by for press reports.

Midnight: WNP will stand by for reports from the government station NSS on a wave length of 17,000 meters.

1 a. m. to 2: 59 a. m., WNP will communicate with amateurs.

3 a. m. to 4: 59 a. m., special communication with designated stations.

5 a. m. to 7 a. m., communication will be carried on with amateur stations.

If any of our readers are so fortunate to hear WNP, this magazine should be glad to acknowledge receipt of such

news. Station WNP will transmit on wave length of about 185, 220 and 300 meters according to the demand of the receiving operator with whom communication is being carried on. However 220 will probably be the one most used.

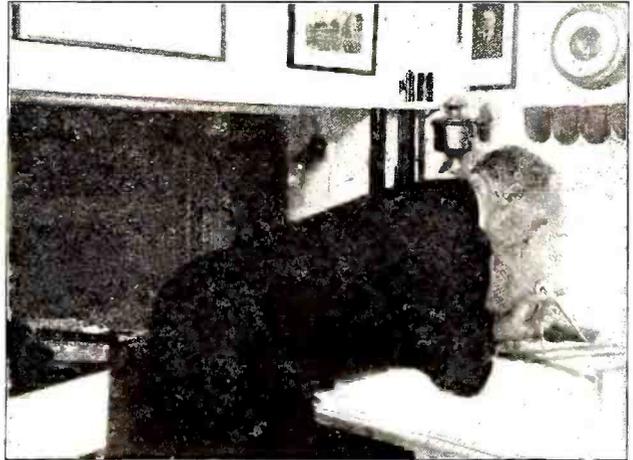
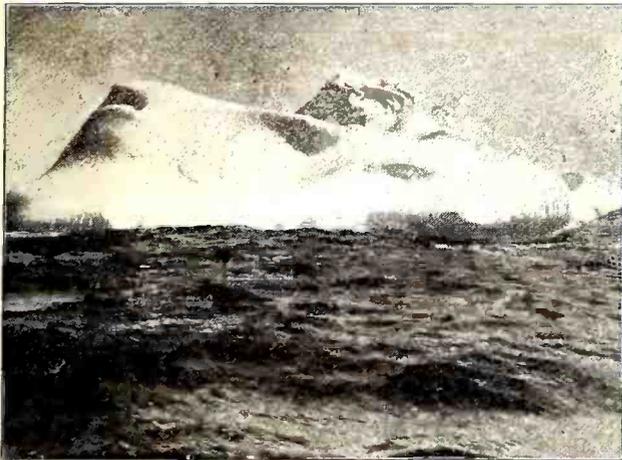
As we go to press, we learn from a letter from Mr. E. F. McDonald, Jr., of the Zenith-Edgewater Beach Hotel Broadcasting station that the expedition has not been heard from since July 28th. Mr. McDonald says however, that there is no cause for anxiety, as the ship Bowdoin is inside the auroral band, and will be in continuous daylight until September. Reception is exceedingly difficult because of low power transmission necessitated by limited daytime shift.

Station WJAZ is presenting gratis to the first Canadian or American amateur to deliver to the Zenith-Edgewater Beach Hotel Station the next message from MacMillan, a complete standard Zenith receiver and amplifier, a duplicate of the instrument supplied to the expedition.

Who will be the first amateur to QSO the Bowdoin?



William Scheney, the one-man orchestra with the instruments of his trade as gathered about the microphone in the radio studio of WGY, the Schenectady broadcasting station of the General Electric Company.



Photograph on the right shows Dr. Donald B. MacMillan in the chart room of the "Bowdoin," the tiny ship now in the Arctic. On the left is a picture of an iceberg as seen from the deck of the Bowdoin. Photographs by courtesy of E. F. McDonald, Jr., of the Chicago Radio Laboratory, who was a member of the adventurous party for some distance into the frozen north. Radio communication with the boat was sustained daily, until July 28.

A Fragment of MacMillan's 1923 Trip to the Arctic

By E. F. McDonald, Jr.

THE elaborate preparation for the MacMillan trip back to the Arctic reached its culmination June 23, when the Bowdoin, trim and smartly arrayed with international code flags, shoved off from Wiscasset, Maine. On board were Dr. Donald B. MacMillan, his crew of six men, a handful of guests, including the two ex-Arctic explorers, General A. W. Greeley and Langdon Gibson, the former the oldest living Arctic explorer and the latter a participant of the early memorable Peary expeditions.

Every man, woman, and child of the town and county were at the dock to wish Godspeed and wave a kerchief of *au revoir*. This group was considerably swelled by many visitors from Maine and notables from different parts of the United States. Long after the seething crowd at the dock became a blur against the dark land background as the Bowdoin sped down the river, we could still hear the shrill voice of a locomotive and the boom of a cannon calling farewells.

The wireless operator on board the Bowdoin kept up constant communication even after we were out of sight with Mr. Maxim, Mr. Warner and Mr. Schnell of the American Radio Relay

League, who had erected a temporary Zenith radio receiving apparatus on the pier, and used that not only for receiving but for sending messages over the short distance to the Bowdoin. This sending of messages with a receiving set was accomplished by making the receiving set oscillate and when the antenna switch was touched with the moistened finger, it produced signals so that messages in continental code were readable aboard the ship.

The first stop was at Boothbay, where all visitors, including General Greeley and his daughter, took leave of us. Then we put to sea in earnest and had as our

next objective, Monhegan Island. Within the very next hour we ran into a school of enormous black fish, which are a species of whale, some of them ranging forty feet in length. So close did we approach one of these that Tom McCue disturbed it in its peaceful slumber by tossing a can of pemican, which reached its mark.

At Monhegan Island we were cordially received and dined by the inhabitants. Our moving picture photographer bade us good-by here. We saw him tearing off a reel of film as we left him standing on the shore, but the day was misty and not conducive to good pictures.

Clouds of fog enveloped us practically, all the way from Monhegan to Sydney, Nova Scotia. But notwithstanding the impenetrable mist, we crossed the Bay of Fundy, passed Cape Sable and the graveyard of the Atlantic without mishap. During one of the night watches we encountered a mysterious ship which was in our course about one point off our port bow when its lights were sighted, and as we approached extinguished all lights. It had all the earmarks of a warship, but it might have been a rum runner or a Canadian government rum runner chaser.



Here is the crew of the "Bowdoin," sturdy little ice-pusher, that is carrying Dr. Donald B. MacMillan into the far north waters.

Fullfledged sea discipline was in operation on the Bowdoin from the moment the last visitor stepped off the gang plank at Boothbay. The day and night was divided into four watches: six hours on, and six hours off. I had the good fortune to be in the watch in charge of Captain MacMillan and the Chief Assistant, Ralph Robinson. The other watch was in charge of the mate, Thomas McCue. Breakfast at six, dinner at noon, supper at six, with a "mug up" at midnight.

Since my return I have been frequently asked for a description of the layout of the Bowdoin. I might as well sandwich that in at this point. Although frequently stated before, the length of the ship bears repeating, for the ship's size should be borne in mind, to appreciate the extraordinary economy of space and the wonder of cramming the restricted cubic area with provisions and equipment to last for years. Not only is every available inch of space below decks used, but the main deck is crowded with barrels and barrels of fuel and lubricating oil, and miscellaneous provisions of an imperishable nature. The ship is not more than eighty-nine feet over all. The forecabin, galley, and radio room make up the forward end of the ship.

It is the smallest ship that ever ventured an Arctic expedition. The hold or storage space is amidships; back of this, the engine room; the captain's quarters, aft. The largest compartment is the forecabin, comprising the radio room, living and sleeping quarters of the crew, and the galley. The radio room is in the peak of the forecabin, the berths for six men along the sides, the mess table in the center, and the galley in the after end of the forecabin. When the radio starts sending, as it usually does between midnight and 3:00 it makes as much noise as a locomotive would, running up and down the passage-way of the forecabin.

The first night, the cook arose in great consternation believing bedlam had broken loose. He rubbed his eyes furiously and finally discovering the source of the disturbance, drawled in his quaint way, "Well, I have been shipmates with a lot of things, snorers, etc., but never with anything as noisy as that animal." Strange to relate, the crew no longer hears the noise of radio sending. After a few days' companionship we were used to the noisy stranger and slept undisturbed.

The hold is loaded so full of provisions, it was with difficulty that the hatch was battened down. Filled not only with food and provisions but with dolls, clothing, knick-knacks, and Brunswick phonographs to be presented to the Eskimos of the most northerly tribes. The engine room is a solid mass of machinery, every inch of space being utilized. Its four walls are enormous fuel tanks of kerosene which give this ship the greatest cruising range of any small ship in the world. The enormous fuel supply is needed when one considers that for days and days with the engine running full speed the ship, which normally makes nine knots per hour, makes



Donald Mix, famous radio operator, who is in charge of the radio equipment on the little ship "Bowdoin." U & U foto.

less than nine knots per day, trying to forge ahead while pushing against the ice.

In the forward end of the engine room are two 3-4 kilowatt Delco generators and two complete sets of thirty-two volt storage batteries. At present one generator and set of batteries is being used to light the ship and the other generator and batteries for the radio. Tremendous power is consumed by the radio in hurling forth its wireless messages back to civilization.

The captain's quarters, of which I have an excellent picture, are very small and compact. Two berths, one Dr. MacMillan's and the other that of his chief assistant, doctor, photographer, general handyman, etc., Ralph Robinson. In the middle of the cabin stands the captain's chart table with its chart rack and navigating instruments. Lining the upper walls is a very complete library of scientific books. The forward wall presents the scene of an arsenal with at least twenty rifles, running in calibre from the small 22, equipped with Maxim silencer, to the large 401 calibre, bear and walrus rifles.

Small side arms have no place on this expedition. As a matter of fact, there is only one revolver on the ship, which is owned by Richard Goddard, the representative of the Carnegie Institute of Washington, who explained to me that he carried it only for protection while away from the ship, making his observations in terrestrial magnetism. On the back wall of the captain's quarters are fastened two delicate chronometers, which are checked by Arlington wireless time each day. For this purpose there has been an extension wire run from the Zenith receiving set in the forward end of the ship to a position directly alongside the chronometer, which incidentally is also directly alongside the head of the captain's berth. While the extension was primarily for setting the chronometers, it is used many nights by the captain, lying in his berth between watches, to listen to the radio concerts going on in the forecabin.

The captain's quarters are heated only by a small oil stove, which does nothing in the extreme cold but raise the temperature slightly. The forward end of the ship is heated by the galley shipmate range, which is now burning coal, but as soon as the supply is exhausted (not very

long), will be equipped with oil-burners, to utilize the kerosene fuel intended for the engine. This year the fuel of the ship has two drains which it did not have on expeditions heretofore: heating and cooking, and the radio.

So much for the ship equipment.

Sydney was the next stopping place. Anchor was dropped at North Sydney the first night because of the heavy fog. Next day found the Bowdoin gracefully gliding into Sydney harbor amid the roar of salutes from the French gunboat *Regulus*, anchored in the harbor. At first the cannonading worried us, because we had heard the night before of a strike waging in the coal mines and steel mills; of Canadian troops moving in; and of increasing threatening trouble. But our doubts soon gave place to delight over the warm reception and extreme courtesy of which the cannonading was the first evidence. The guns were not turned towards us. This was July 1. I shall never forget it. What a thrill it gave as I saw the American, Canadian, and French flags flying from the Royal Sydney Yacht club, and public buildings and from private residences. Such was the interest shown in the MacMillan exploration trip on the national holiday of the Canadians. As everywhere else we were showered with attention here. Worth mentioning is the fact that Sydney is the outpost of civilization and was the last place on the trip showing signs of modern day progress. It was here that Dr. MacMillan had his last ice cream cone. I caught him in the act with my camera, as a very good picture gives abundant proof.

Leaving Sydney we headed northeast through a dense fog and caught only a glimpse of Newfoundland as we passed by. This was Port-Aux-Basques. Fog whistles blew at other points along the Newfoundland shore, but only at the one point did the fog lift its veil long enough to permit a view. Likewise most of the Coast of Labrador remained a mystery to us. Often we thought land directly ahead, but as we approached the dim outline of the supposed land there was gradually revealed the form of an iceberg. So many icebergs strewed the way traveling was exceedingly dangerous.

Our first stop in Labrador was in back of Greeneley Island, at night and under cover of fog. Next morning when the sun rose, about 3:00, a. m. we found ourselves within a hundred yards of shore. Were it not for the wonderful navigating of Dr. MacMillan, we would many times have been piled on the rocks along that formidable Labrador shore. Dr. MacMillan made this stop to visit and examine Parquet Island, which is a rookery of the puffin. These puffins are known as the "parrots of the Arctic," are wonderfully colored, have the characteristic parrot bill, but feed on fish. Millions of them swarm the island which is no more than one mile square.

A walk on the Island disclosed the tundra formation, undercut and tunneled by puffins' nests in countless numbers. The puffins are so tame that they posed in front of our camera, but invariably

(Continued on page 22.)

W R C Goes On the Air

Washington, D. C.—At three minutes past eight on August 1, announcer Cross of WRC told the waiting fans that a new voice, the voice of the Capital, was about to speak. Presently the new 500-watt station of the Radio Corporation began its initial program on 469 meters. It was a comprehensive evening's entertainment from the appropriate prayer of Chaplain Scott of the Navy to the final number by the U. S. Marine Band at 11:00 p. m.

Officials of the Corporation and the

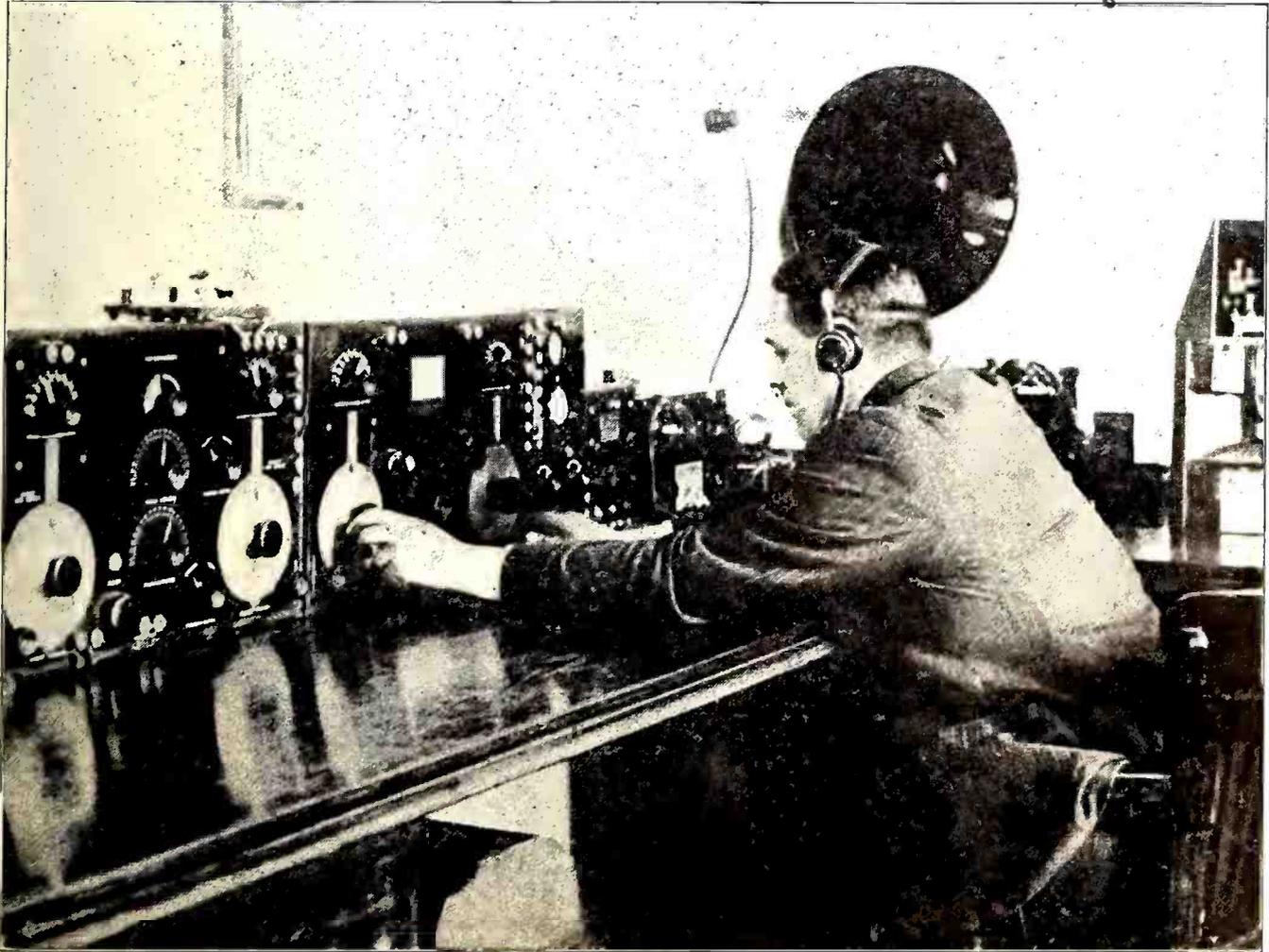
type, to flourish but a moment and then perish. We who listen nightly to the messages that entertain and instruct us accept them more or less as a matter of course, without much thought of either their mystery or their novelty; but no prior discovery has ever seized the public mind and sprung so rapidly into general popular use as has radio.

"The first license authorizing a station to broadcast was issued in September 1921, less than two years ago. Tonight, with the entry of this latest station into

and education within the reach of all.

"Since the day when the savage sent his messages by signal fires and beating drums man has been striving to conquer distance. He has dotted the earth with his railroads and automobiles and the sea with his ships in his effort towards the more speedy transportation of person and property, and at last for the same purpose he traverses the skies.

"Radio now supplements the telegraph and telephone; it has become the voice of ships; it bridges uncharted seas, and



Long range receiving apparatus installed in the new wireless station of the United States Shipping Board in London. The station picks up messages from Annapolis and Panama with ease. U & U foto.

Government spoke of the station's future and the development of radio as a public utility available in peace and war.

Rarely has a more graphic recital of the romance of radio been offered than the following address by Assistant Secretary S. B. Davis of Commerce Department and Chairman of the Interdepartmental Radio advisory committee.

"We meet tonight to welcome the youngest member of the radio family, which is to devote its life to what we now call "broadcasting," an activity so new that the word itself, in its present significance, was unknown only a few years ago. The family has been of rapid growth, but it is not of the mushroom

the field, there are five hundred sixty-seven stations in this country authorized to broadcast. Born in the United States, broadcasting has largely retained its Americanism. Foreign countries have adopted its English name into their language. In all the rest of the world there are only sixty-three such stations, and of these, thirty are in Canada, our nearest neighbor. How many people receive their messages no one knows, but in our country alone they are numbered by the million. Never since the first letter was printed from moveable type has such a huge stride been taken to make information freely available and to put knowledge

spans unsurveyed distances on land. It brings the church, the market, public speech music and instruction into our homes. This most scientific of modern discoveries has become a household factor of common use. The human voice carries with it the elements of personality, force and earnestness, vital to any plea, far more effectively than does the printed word. Broadcasting conveys the expressed thought of one to the minds of many. It is a unique means to that end, and it is unique again in that, in most instances, whatever future development may be, it now has small direct commercial value.

"Measured in dollars and cents of

profit to the transmitter its worth in most cases is small: measured in terms of service its value cannot be calculated. I doubt if there is in the world another activity involving so great an effort in science and invention and such an immense actual expenditure of money in installation and maintenance, not founded on the expectation of immediate financial profit.

"Under existing laws, enacted, by the way, some years before broadcasting had been heard of, our government regulates the transmission of radio messages of all kinds. At first devoted largely to the protection of life at sea, that regulation of late has been particularly directed to broadcasting, and has been made necessary by the crowding of the hitherto free and unoccupied air, which we call interference. By the allocation of wave lengths, the inspection of transmitting instruments and the attempt to induce better methods both mechanical and personal, it is trying to minimize troubles so far as possible in the present state of the art. Avoiding actual control and management, it has left the radio field free to individual research and personal initiative, adopting in this respect a policy unknown to most foreign countries where we frequently find direct management, close control, many restrictions and a strict system of taxes or fees imposed upon all stations and instruments whether for transmitting or receiving. We have chosen rather the minimum of intervention consistent with due regulation, coupled with full assistance in the working out of scientific problems.

"The government has enjoyed invaluable assistance from the persons directly interested, those who transmit and those who receive, and it appreciates the aid given it through the public conferences held under the auspices of the Secretary of Commerce, and the spirit with which all have joined in trying to solve common difficulties.

"Rather than attempt to prophesy tonight, let us welcome this new station, a sturdy youngster, as it needs to be to hold its own with its broadcasting brethren; let us congratulate the men behind it upon the courage, enterprise and genius which have made it possible, and dedicate this latest example of modern magic to the dissemination of knowledge, to the increase of culture, to spiritual development, and to the spread of entertainment and happiness among the countless thousands who will hear its voice."

1126 More Stations

By CARL H. BUTMAN

(Copyright 1923)

Washington, D. C.—The end of the fiscal year shows a gain of 1,126 radio stations of all kinds in the United States, according to the Department of Commerce figures just compiled. On June 30, there were 21,967 ship and land radio stations, whereas a year ago there was a total of 20,841. The increase represents added interest among amateurs and broadcasters who have taken out station licenses during the past twelve months.

\$500 for Prize Radio Drama

RADIO broadcasting Station WGY of the General Electric Company of Schenectady, N. Y., is offering a prize of \$500 for the best radio drama submitted in competition during the three months' period beginning September 1.

The prize-winning play will be presented by the WGY Players during the winter months when transmission conditions are at their best and when, it can be reasonably stated, a million people will be listening in. An audience of this size will be the equivalent of the attendance at 500 performances of a stage pro-

duction by the WGY Players has convinced Martin P. Rice, director of broadcasting for the General Electric Company, that there is a public demand for this type of entertainment and that the peculiar requirements of the radio drama as compared with the stage and the screen production will in time result in a new form of dramatic art. The screen has evolved a distinct type of drama which depends solely on the eye for its appreciation; tomorrow the radio drama will be so written that the listening ear and the imagination, unaided by the eye, will be satisfied. It is for the purpose of stimulating and encouraging the development of the radio drama that the General Electric Company inaugurates this prize competition.

The author of the radio drama must place himself in the position of writing for a blind man. The lines of the characters must convey a picture of the scene in which the action takes place. This apparent limitation or handicap becomes an aid to action, however, as the writer need not restrict his play to three, four or five scenes. For example, he can depict an automobile race and carry his audience through its exciting phases by means of the lines.

He may take his listener from room to room or floor to floor in a dwelling, if farce or melodrama call for such action. The chase, long a popular feature in the early motion pictures, may be brought into the radio play by means of speech. The radio drama requires no scenery. No careful search need be made for locations. The spoken word builds the scenery.

Dramatic situations may be built up by the speaking voice and through the medium of sound-making devices. The writer is encouraged to make use of sound devices and the engineer will provide a means of producing through the air a counterpart of the prescribed sound. Rain, thunder, surf, the roar of a moving train, an airplane, telegraph key or automobile motor may all be reproduced in sound to impart atmosphere and realism.

Those who have written short stories, books of fiction, scenarios or plays, successfully or unsuccessfully, may have the germ of a prize-winning radio drama. Those interested may obtain a folder which sets forth the rules of the competition, with an outline of the special requirements of the radio play, by addressing Prize Composition, WGY Broadcasting Station, General Electric Company, Schenectady, N. Y.

A REAL DRAMA IN WJAZ STUDIO

BRIG. GEN. CHARLES G. ("Hell-and-Maria") Dawes, broke down and wept last night while broadcasting a final tribute to President Warren G. Harding from Station WJAZ at Edgewater Beach Hotel.

The sound of his sobs sped out on the air, borne on the wings of radio, and found their answers in the hearts of thousands of listeners within a radius of a thousand miles.

It all came very suddenly.

Gen. Dawes had been speaking quietly into a microphone, a tiny contrivance of metal, wires and a sensitized disk. He spoke slowly and with emotion. The President had been a very dear friend. He knew that he was speaking to a vast audience, even though only the microphone was before him.

Then came a tenseness, and those who stood by knew that the general was fighting for control.

His voice faltered, broke—and he wept.

The head that was so proudly carried before a senatorial investigating committee when the general, cornered, "cussed" his way out of a tight place and into the hearts of all Americans was bowed.

The general wept, his head in his arms on the table before him, his shoulders shaking with sobs.

"This is station WJAZ signing off," said the announcer. "Gen. Dawes is unable to finish his talk."

Then came the telephone calls—from all parts of the city from those who had heard that last address, and telegrams from out of town.

So was ended the most dramatic program ever broadcast by any radio station.

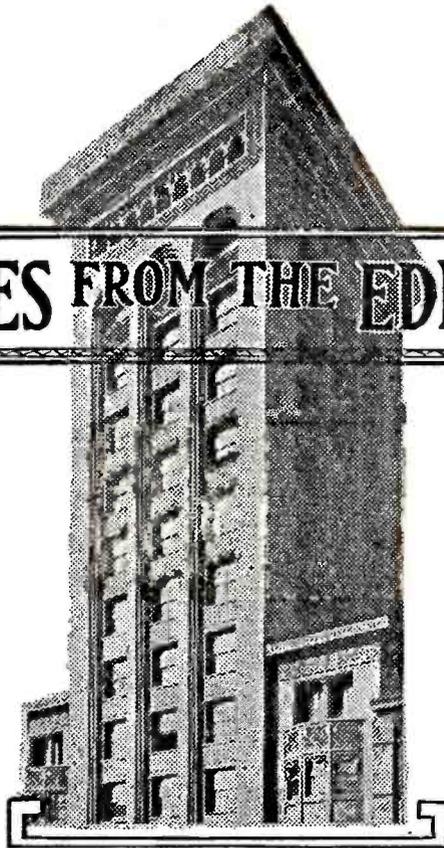
—From the Chicago Herald and Examiner of August 4.

duction in a theatre seating 2,000 people. In addition to the \$500 prize the successful writer will receive an introduction to a public as large as the reader-circulation of a national magazine and he will have the personal satisfaction of taking a leading part in the development of a new phase of dramatic art. Other plays offered in competition will be produced via the air, if found suitable, and the author will be remunerated in every case.

Amateur Radio Stations

Dis- tricts	Headquarters	June, 1921	June, 1922	June, 1923
1	Boston.....	2,040	2,489	2,139
2	New York.....	1,880	2,348	2,055
3	Baltimore.....	1,325	1,857	2,005
4	Atlanta.....	208	341	449
5	New Orleans.....	418	758	948
6	San Francisco.....	1,136	1,756	1,957
7	Seattle.....	504	753	864
8	Detroit.....	1,615	2,354	2,013
9	Chicago.....	1,683	2,838	3,340
Totals.....		10,809	15,504	16,57

THOUGHT WAVES FROM THE EDITORIAL TOWER



THE important part played in our daily life by radio was forcibly impressed upon the public when, following the death of President Harding, a majority of the broadcasting stations throughout the country closed down for varying periods as a mark of respect.

The almost complete cessation of broadcasting brought home as could nothing else the important niche which radio has carved for itself in our daily routine in the last two years. People in all walks of life commented upon the gap in their evenings, which they found hard to fill, and while practically all agreed that it was but fitting that the broadcasting of entertainment should temporarily halt while the country sorrowed, probably nothing else connected with the final honoring of our dead President made as deep an impression.

In the death of President Harding, radio lost a good friend. He was one of the first officials of the government to turn radio fan when, following the first radio conference in 1922, the attention of the country was turned toward the new method of entertainment. The set built for his use in the White House was the last word in reception, but while he liked to "play" with it, he had but little time to devote to amusement and found himself for a long time unable to cope with the interference which prevailed when there was but one wave length for broadcasting.

In many ways the President evinced his interest in radio. He gladly accepted the invitation extended to him by the National Press Club of Washington to attend the exercises incident to the "christening" of its receiving set, and while the music and speeches which were to have been broadcast from a nearby government station especially for the occasion failed to "come through," the President stuck around like the good fellow he always was, chatted with the members of the club—which is composed of news-

subject of consideration at the White House, Mr. Harding frequently expressed his interest in the matter and the hope that legislation could be enacted to eliminate interference, give the amateurs the privileges they desired and which he thought they were entitled to, and put radio on a concrete foundation.

President Harding was radio's friend, and the silencing of the broadcasting stations of the country was but a fitting mark of respect to a man who laid down his life for his country as surely as if he had died on the field of battle. No finer tribute could have been paid than the silencing of more than five hundred stations, quiet while the country ceased its activities and a hundred million people mourned.

RADIO once more played an important part in the dissemination of news of a national character, when President Harding died in San Francisco on August 2. The President's death occurred at 7:30 p. m., Pacific time, and the Associated Press had the story out within five or ten minutes, the report being received at the Washington office of that organization at 10:55 p. m., Eastern standard time, or twenty-five minutes after Mr. Harding died.

The news, by air, that the President had died, resulted in a great number of telephone calls to the newspapers and various offices of the Associated Press throughout the country. As a result of the broadcast announcement, the news of the President's death was generally known from thirty minutes to two hours before the newspapers in the larger cities were on the street with an extra.

When wires were down and a storm was raging on election day last November, radio carried the news of important results to the Pacific coast. Radio has taken its place as a disseminator of news.

HE KNEW

A PARTY of city dwellers, returning from an automobile trip into the Adirondacks the evening of July 4 began to discuss the Shelby financial fiasco. It was after 8 o'clock and they were naturally curious about the outcome of the fight. Passing a farm house one of the men in the party saw a radio antenna running from dwelling to barn and he suggested that they ask the farmer for the latest news on the fight.

The farmer was caught as he came in from the barn. He calmly heard their question as though it was the most natural thing in the world that he should be asked the outcome of a fight in Shelby, Montana.

"Dempsey won on points," the farmer laconically answered.

The radio story of the fight, broadcast by WGY, at Schenectady, N. Y. had given the farmer the news as quickly as it arrived in the offices of great metropolitan newspapers.

paper men—and gave them a little talk on the difficulties of being President, which gave them much inside dope on the great task which confronts the Nation's Executive from day to day.

While the failure of Congress to pass the White Radio Bill kept radio from becoming an official

Radio the World Over

The restrictions against the use of any radio equipment except that licensed by the British Broadcasting Company are making it impossible for English merchants to sell American radio products, according to a report just submitted to Washington by Consul Ross E. Holaday, from Manchester, England.

Consul Holaday, making an investigation of the radio situation, found that the restrictions upon the use of equipment and the regulations governing the use of wireless sets give the British Postmaster General, through his arrangement with the British Broadcasting Company, an ironclad control over radio. There is no prohibition against the importation of foreign radio products, or against their sale after importation, but this freedom is nullified by the difficulty of securing a license to use any equipment other than that endorsed by the "B. B. C." which collects a royalty on every set manufactured in England.

There is now under consideration by the British authorities the issuance of a new form of license to be known as the "constructor's license," under which people with no technical knowledge will be permitted to assemble wireless sets and use them to receive broadcast and other matter. Even those who purchase the sets manufactured under B. B. C. restrictions are required to secure a license before they can make use of their outfits. This is known as a

"broadcasting license" and costs approximately \$2.50. Only those persons having "experimental licenses" are permitted to assemble their own apparatus, and to secure such a license the applicant must have a knowledge of the technical side of radio which the majority of would-be listeners do not possess.

German Restrictions

Efforts to secure a relaxation of the government restrictions under which private radio installations are prohibited in Germany are being made by a radio club established in Berlin early this year, according to a report from Consul E. Verne Richardson to the Department of Commerce.

It is commented that Germany lags far behind many other countries in private radio enterprise, a great contrast to pre-war times, when Germany was well in front in radio matters.

Aid for Canadian Radio

Government aid to the extent of \$55,000 has been extended in Canada for the purpose of establishing radio stations at McMurray, at the end of the railroad in Northern Alberta, Fort Simpson, on the MacKenzie River, and Dawson, in the Yukon, according to reports just received at the Department of Commerce. The new stations will displace the land lines at present in use from McMurray, northward,

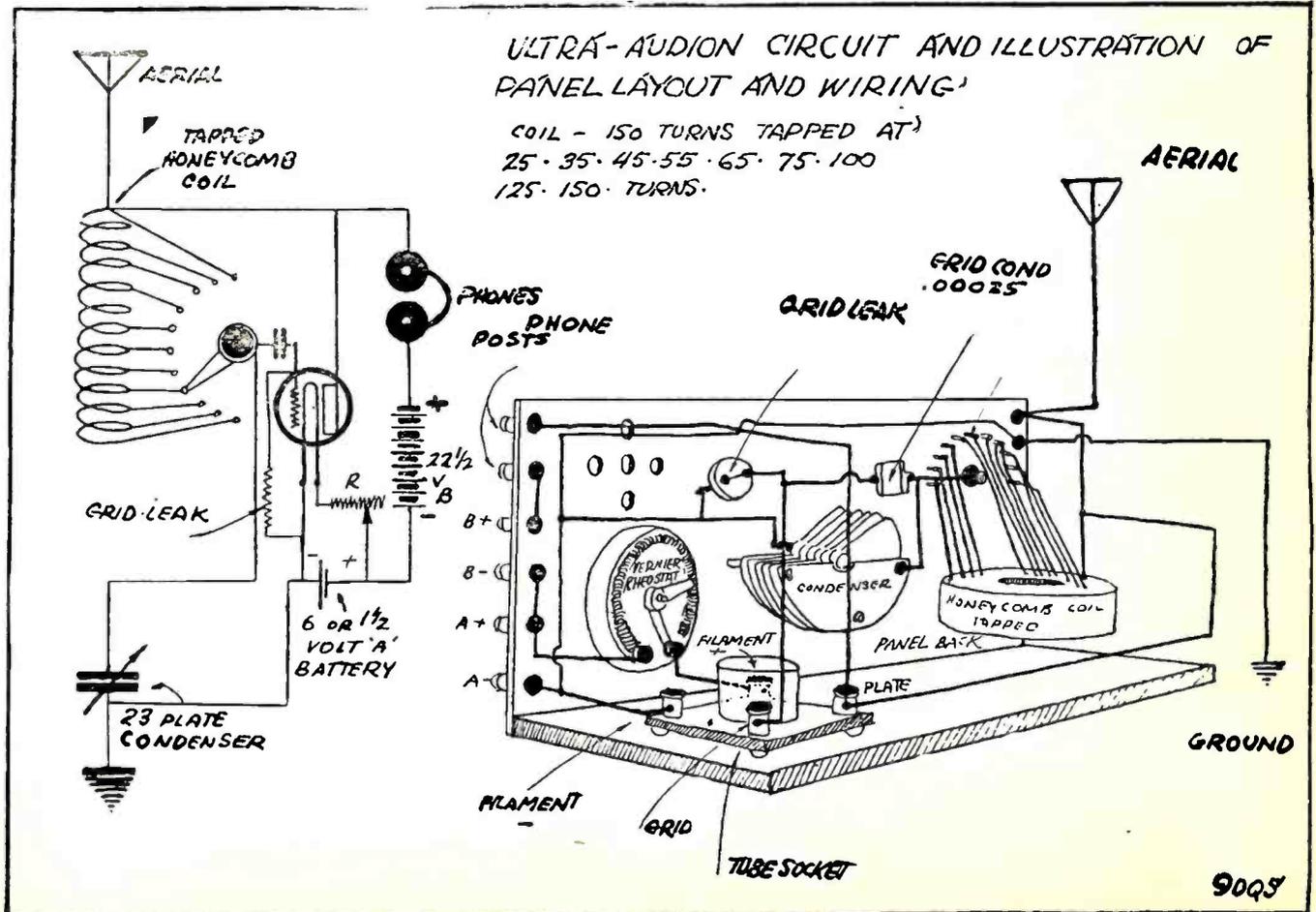
for which the Canadian government has appropriated from \$275,000 to \$300,000 annually for the last twenty-three years.

Germans Supply Norway

Apparatus for the radio station which is to be built at Bergen, Norway, has been received in that country, according to advices to Washington from Consul George N. Ifft, and preliminary tests have assured the government of its efficiency. Because of the failure of an appropriation for duplex apparatus which would enable the transmission of messages both ways simultaneously, and the failure of the plan to establish a telephone line between Bergen and the Rundemanden radio station, the chief use of the new station will be for the transmission of wireless communications to ships at sea. The apparatus to be used was made in Germany.

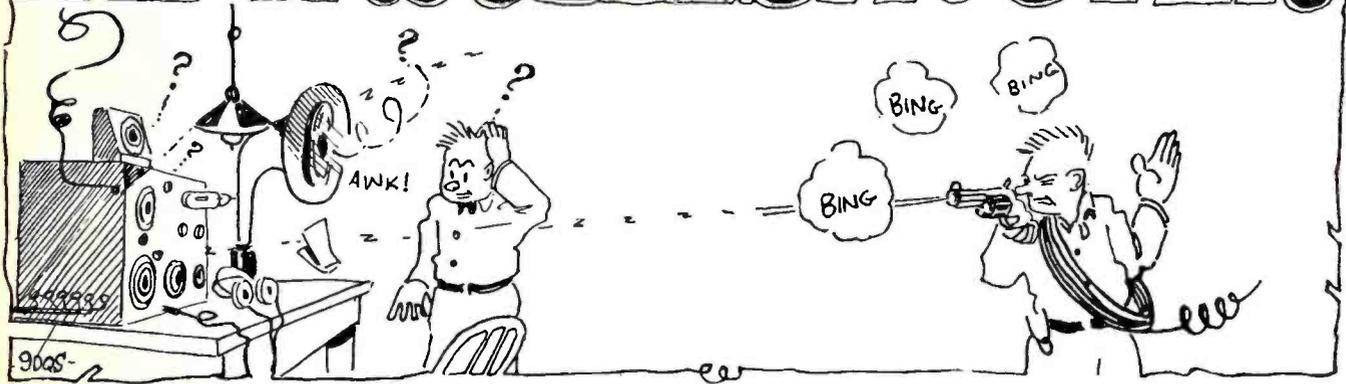
Rio de Janeiro

A radio organization, known as the Radio Sociedade do Rio de Janeiro, has been formed in Rio de Janeiro, and already has more than one hundred members, it is reported by Commercial Attache, W. L. Schurz. Several very influential men of the city are among the officers and directors. It is also announced that a daily broadcasting service will be inaugurated by the Praia Vermelha station.



Try hooking up this circuit using the apparatus you have lying around inactive. Further instructions will be printed in the October issue. It has a substantial range and the ease of tuning which it affords makes it well worth the consideration of the absolute beginner.

THE TROUBLESHOOTER



The technical department sends out many replies to questions in each day's mail. In order to assure prompt service to our subscribers the direct reply method hereafter must be restricted to those fans who are on our subscription list.

Fans who are not subscribers may obtain this service by enclosing 50 cents with their question and the reply will be mailed at once, accompanied by circuit diagram where illustration is needed.

All inquiries should be accompanied by self-addressed and stamped envelope.

W. G. L., Chicago, Ill.

Question: I figure on building a Cockaday four-circuit tuner. Would you advise using No. 18 bell or annunciator wire instead of D C C on the coils? If you have any diagrams of the above circuit in connection with two stages of audio frequency, I would appreciate a copy very much.

Answer: I see no reason why you could not use the wire you mention, excepting that its use will make your coils slightly larger. If you use the annunciator wire do not shellac the coils. I am printing in Figure 1, the four-circuit tuner in connection with a two stage amplifier. The amplifier may

be constructed according to the instructions given in the August issue of RADIO AGE on pages five and six.

T. F. W., Chicago, Ill.

Question: I have had greater success with the original Reinartz as described in your book in this circuit, than with any other and I have hooked up quite a few. I am inclosing a drawing I copied and added one stage of audio and I would thank you to advise if you think it will operate well if hooked up as shown. Another stage of audio would of course increase the volume, but I don't care for loud speakers; also advise if an extra inductance is advisable at the point marked X. The variometer I have is or

was made by the Diamond Radio Products Company, and consists of two honeycomb wound coils in a square, wooden frame. Please advise if this is OK or name a better one. Do the Crossley people make a book type condenser suitable for the Reinartz? Is a vernier adjustment on these condensers possible? If not, could a three-plate vernier be used instead? My battery is an Edison five-cell auto which I hardly ever have to charge, although I have a Homecharger type R for use with three-cell rating. When I use this charger it starts out charging at a five-ampere rate. The hydrometer always registers 1,200 after charging. Would a voltmeter tell me anything?

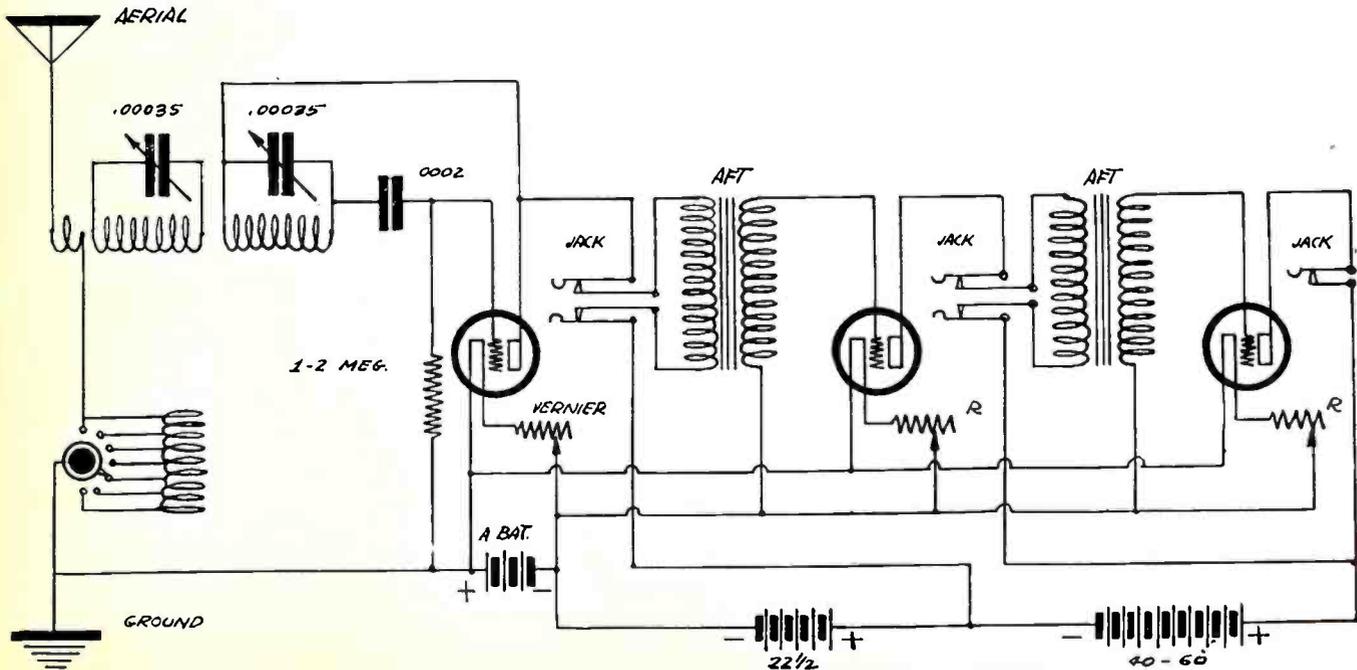


Figure 1. A diagram of the Cockaday circuit, in connection with a two-stage audio frequency amplifier. AFT are the transformers.

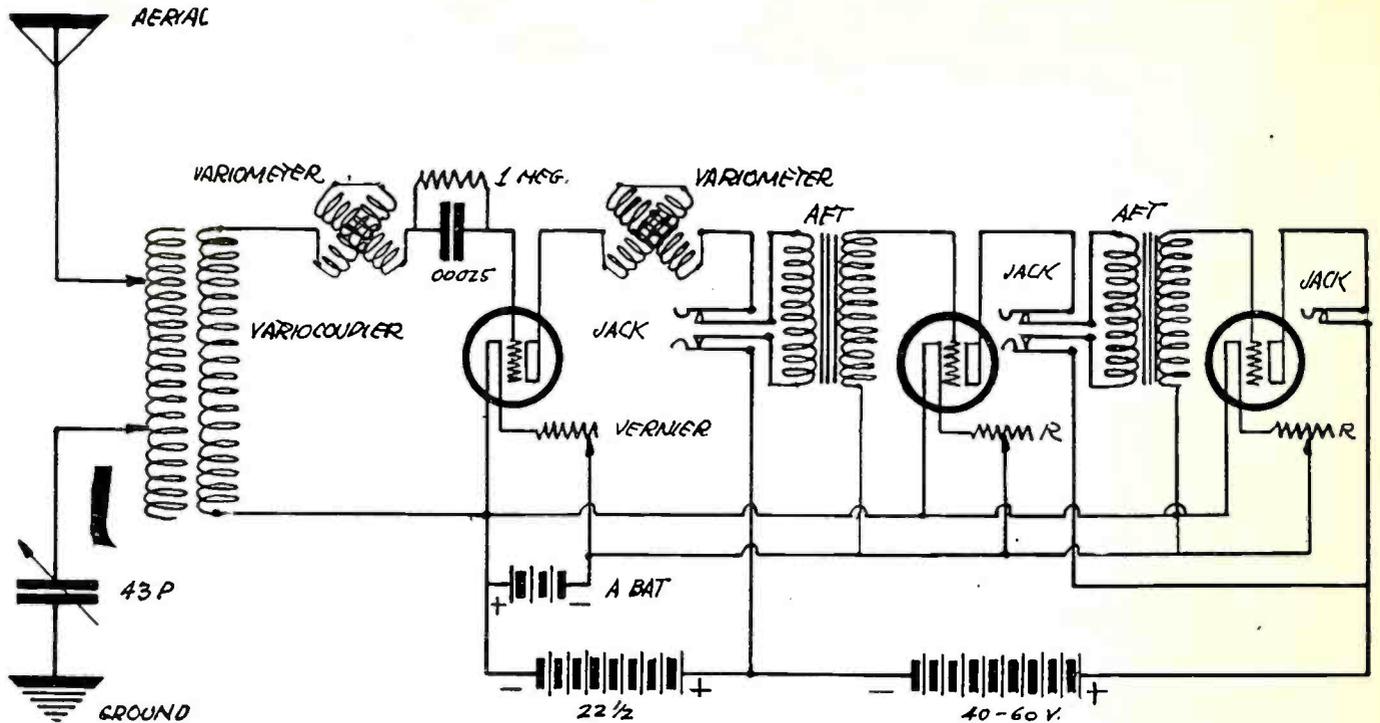


Figure 2. The standard Armstrong three-circuit set, with two stages of audio frequency, is an ideal close tuning broadcast receiver for the use of a BCL who is advanced in the arts of tuning.

Answer: The circuit you submitted is correct. The extra inductance mentioned is unnecessary. I have never seen the variometer which you describe. Probably OK if made by the company named but have never had any experience with it. The book type condenser is supposed to have the same capacity as an ordinary 23-plate variable plate condenser, and owing to its peculiar construction it should be equal to a vernier although I have never had much success using them in a Reinartz circuit. The addition of the three-plate variable would simplify tuning. The battery which you are using is very good. The voltage of these cells is somewhat lower than that of the lead battery which accounts for the use of five cells instead of three, and

as the action of your charging apparatus is perfectly normal this should give you no trouble. The addition of a voltmeter would enable you to keep a closer observation of its condition.

H. G. Pittsburgh, Pa.

Question: I own a set but am not getting satisfactory results from it. There are sets advertised by the Experimenter Information Service of New York as Model L and C and I would like to know whether it would be advisable to build one or buy one of the above. I want a set with which I can exclude the amateurs and get distance.

Answer: As I have had no personal experience with the above set, I could not fairly pass judgment on it; however

if you wish a good selective set, I would advise that you construct one such as I am printing in Figure 2. This set is giving very good results over long distances, and is about the most selective I know of.

H. S. J. Sioux City, Ia.

Question: In the Erla one-tube reflex set, can you use honeycomb coils instead of the variocoupler and have a twenty-three plate condenser instead of the switches? If this is possible where should the condenser be connected? Can one stage of A F amplification be added in the usual manner? Can a magnovox loud speaker be operated by six volt alternating current? If possible, how is this done?

Answer: The values of the Erla circuit have been carefully worked out, and any change in the construction would bring about doubtful results. This applies to any reflex circuit. Would advise that you adhere to the original plan of using a variocoupler. A one-stage audio

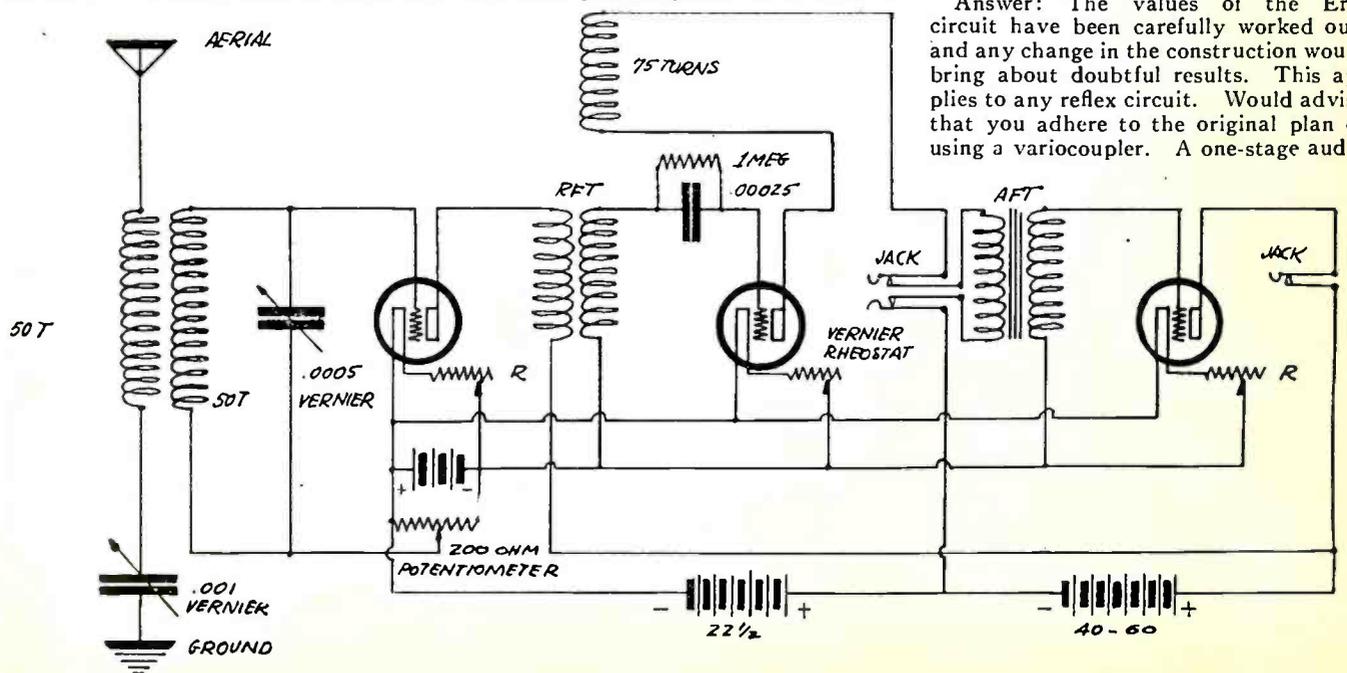


Figure 3. This is the standard honeycomb circuit with the addition of one-stage of radio frequency and one step of audio amplification. RFT is the radio frequency transformer.

frequency amplifier is added by connecting the phone posts of the Erla set to the primary terminals of the audio frequency transformer marked P and B. The tube may be lighted by the same A battery as that of the reflex tube but separate B batteries must be used in the amplifier circuit. The expense involved in properly rectifying the alternating would greatly exceed the cost of a regular six-volt storage battery so I would advise that you do not attempt it.

A. C. McE., Chicago, Ill.

Question: I am a constant subscriber and reader of the RADIO AGE and have benefited by your instructions. Will you please print a circuit showing the method of adding radio frequency to the Standard honeycomb circuit?

Answer: I am printing in Figure 3 a circuit showing how one stage of R F is added to the circuit you inclosed.

O. B. G., Paris, Ill.

Question: I understand that a six-volt battery charger can be made using aluminum and lead plates with an electrolyte as a rectifier. If this is possible will you please send me the instructions?

Answer: I am sending under separate cover the issue of RADIO AGE which contained the constructional data on the making of the charger you have in mind. This charger was designed for homes having a 110 volts alternating current source of electricity.

A. E. H., Munfordsville, Ky.

Question: I have completed a circuit that I got from RADIO AGE and corrected the wiring of the secondary that by oversight was not connected to anything. I am enclosing a diagram of a circuit that I am trying to use, but I am not getting satisfactory results. Anything that I will have to change please write me.

Answer: I have looked over your hookup, and although I can find no apparent faults will say that the trouble is probably caused by either the honeycomb coil being placed in the wrong position so that the windings oppose each other or that your coil is not large

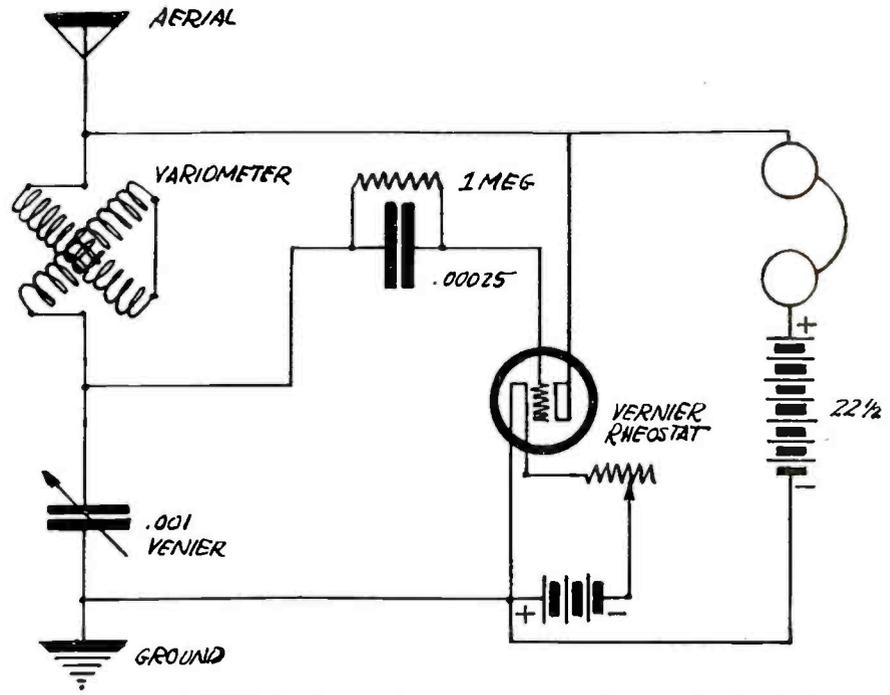


Figure 4. The WD 11 circuit. This circuit is especially adaptable to the beginner who does not wish to construct or operate a set which would require painstaking construction and difficult tuning. Many of our readers are having remarkable results with this circuit.

enough. A condenser as indicated should help. Your inductance coil should be placed directly over the secondary coil of the variocoupler. Make sure that your antenna system is not at fault, and that no poor connections exist.

D. W. I., Youngstown, O.

Question: I am a reader of the RADIO AGE and think it is a good magazine for hookups. I have an antenna sixty-five feet high at one end and thirty-five at the other. Which end would be the proper one to take the lead in from? Please print a circuit of a set using a variocoupler, a variable condenser, grid leak and condenser B battery, etc., in connection with two stages of audio frequency. What should be the dimensions of a loop antenna to be used with the above circuit? What ohmage of phones would be the best for this circuit?

Answer: The lead end would be

taken from the end nearest the set you are going to use. If you will refer to the August issue of RADIO AGE, on page sixteen, you will find the diagram you are looking for. A loop satisfactory for this circuit can be made by winding about ten turns of No. 24 D C C wire on a frame three feet square. A headset of good sturdy construction, having a resistance of from 2,000 to 3,000 ohms is satisfactory for this set.

P. R., Omaha, Nebr.

Question: Please inform me if any dealer in my city stocks .00005 fixed condensers as specified in the Kaufmann circuit. If not, please state firm and price at which I may obtain them.

Answer: The condenser which you mention is very hard to obtain as it is not a standard size. The best arrangement is to procure two ordinary grid condensers of .00025 Mf capacity and connect them all in series. This will give the proper value for the Kaufmann circuit. Do not make a mistake and

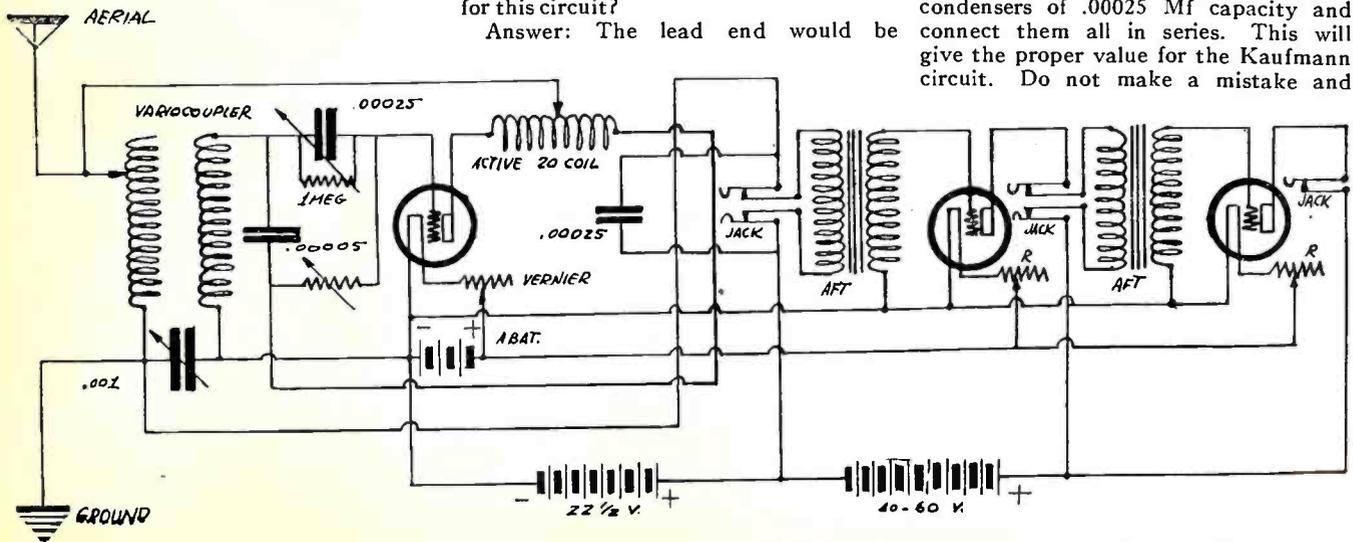


Figure 5. Many of our readers have been asking for a circuit of the Kaufmann set with a two-step amplifier. This shows how the connections are made.

connect them in parallel or the circuit will not work.

R. G. W., Kansas City, Kans.

Question: Please print a hookup of a simple long distance tube set. I am a beginner, and something of efficient and simple nature would be appreciated.

Answer: I am printing in Figure 4, a circuit which is especially adaptable to your purpose. Many of our readers are using this circuit with remarkable results. The simplicity of its construction and operation will doubtless be of interest to many of our beginners.

H. M. C., Coal City, Ill.

Question: I have just finished the Kaufmann circuit, and would like very much to add two stages of audio frequency amplification. Would a standard amplifier circuit function with this circuit? If you have any information relative to this on hand would be pleased to receive a copy. I have assembled two of the Reinartz circuits and have heard nearly every station in the United States and Canada. I am especially anxious, therefore, that the Kaufmann circuit I have constructed be a success.

Answer: I am printing in Figure 5, the Kaufmann circuit in connection with a two-stage amplifier. This amplifier may be constructed according to instructions given in the August number of RADIO AGE. The queer arrangement of the components in the Kaufmann circuit requires the use of a separate plate battery for the amplifier as shown.

H. D. M., Omaha, Nebr.

Question: I would like to know if you can give me the size of tube for coil and size of wire used in winding the inductance in Mr. Smith's adaption of the Bureau of Standards crystal set of which he had a pencil drawing in your July issue.

Answer: The size of the tube used in the Bureau of Standards crystal set is three and one-half or four inches in diameter, and long enough to accommodate the required number of turns. I would not advise the use of a tube of less than three and one-half inches in diameter, as this would reduce the inductive effect of the coil.

E. A. N., Hopwell Junction, N. Y.

Question: I would like to know if the coil C (bank wound) in the four-circuit tuner of the August issue is anchored where it starts and also where it ends. How is it held down to the mounting board? Is the coil tube holding A and B fastened down to the board by blocks of wood with common screws? Can the binding posts for the antenna, ground and amplifier be mounted on the back of the set instead of the front as shown?

Answer: Figure 6 shows how the bank wound coil used in this circuit is constructed. A hole is punched in the tubing and the wire is drawn through. The winding is started in the usual manner for a single layer coil, until the second turn is completed. The third turn, instead of being placed next to the second, is wound on top of the first two as shown. The bank-wound coil is held in place by the rigid copper bus bar wire used to make connection to the

taps. If the connections here are soldered firmly, no other support will be necessary. The coil, holding A and B is raised on two small bakelite strips to allow the single turn of copper bus bar wire to pass around the coil. The binding posts for antenna, ground and amplifier may be placed as you suggest. If an amplifier is to be added immediately, it is not necessary to use these two posts. Connect the two central springs directly to the first A F transformer, the top center going to the post marked B and the lower center spring going to the post marked P.

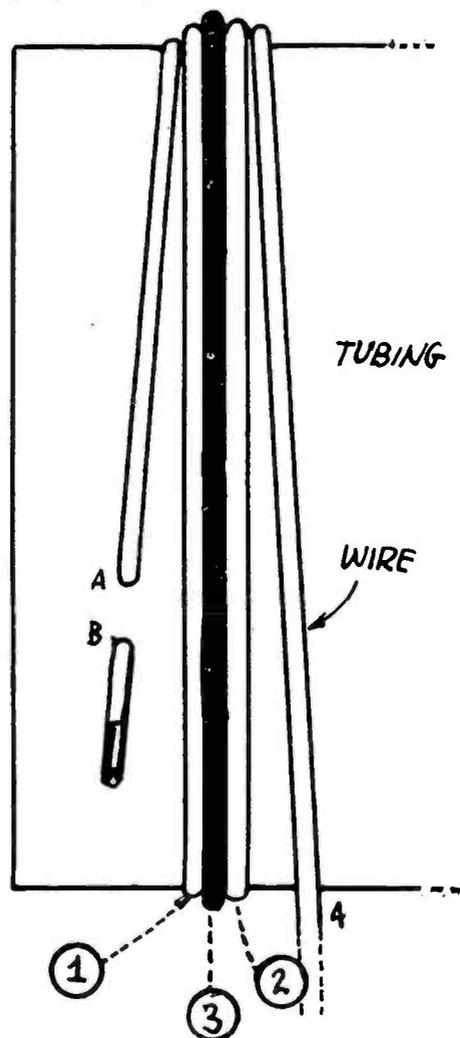


Figure 6. This illustrates the construction of the bank-wound coil, used in the Four-Circuit tuner. Two holes are punched at A and B and the first turn is put on as shown at 1. The second is wound immediately alongside of 1, and the third shown at 3 is wound on top of these two in the groove formed by the wires 1 and 2. The fourth turn is wound alongside the second, and fifth is wound in the groove made by 2 and 4.

Japanese radio enthusiasts are firmly convinced that in the very near future the present laws against aerial communication in Japan will be lifted, the Western Electric visitor announced. Although the government has refused to license any broadcasting or receiving stations to date, Japanese dealers in close touch with the situation are reflecting their optimism in the future by stocking up with radio receiving sets to be sold once the ban is removed.

Oh, Boy!

When a small boy is confronted by the problem of choosing between a radio concert and studying for examinations, the radio generally wins, that is if mother and father are not near to influence the choice.

A ten-year-old Philadelphia youngster writing WGY at "Skednety," N. Y.—Schenectady was a little bit too much for him—took advantage of his mother's absence and scribbled a note to WGY as follows:

"I was one of your many radio fans of Tuesday night, June 18, 1923. I wish you to accept a thousand compliments from me. I am only a boy ten years old and a radio fan. I have built a set with a peanut tube. My mother says I pay more attention to it than to my studies and this letter looks it. I was listening Tuesday night to WFI in my own city and all of a sudden I heard in a stern loud voice 'this is station WGY, the next number is —?' It blotted out WFI intirly. You had some power. Oh, boy."

Very cincerly Yours.

(Name withheld for reasons shown in postscript.)

"P. S. My mother is out I guess it looks it. Please excuse this as I haf to get it out to you before she sees it. She will tare it up and say 'Get to your studies young man,' as my examanations are going on."

Evidently mother came in before the young Philadelphian could get a stamp for his letter. In the upper right hand corner, generally decorated by a postage stamp, he had written "Colect on the other end please."

Radio Plot!

A postal card received by Forecaster Charles L. Mitchell, of the Chicago Weather Bureau, August 8, two days before the violent wind and rain storms, stated that a gang of men were manufacturing bad weather by means of wireless. The writer again on August 13, after the storms, informed Mr. Mitchell that the gang were plotting to continue to terrorize the people through the same method. The first postal card follows:

"August 8—Weather Man:

"I tell you there are a gang of men who work and make wireless weather, through electricity and these fellows are doing this for spite. They make lightning and thunder, and wind storms and they are southwest in Clearing or Argo, and are heard plane in Auburn Park plotting weather and other plots. You can here them through radia."

The postal was unsigned.

The second card was as follows:

"Mr. Mitchell:

"I wrote you this week about these men out here. They say they are going to keep the heat up and lightning and thunder. They use these means to terrorize the people they tell over the radia that they will strike and kill with lightning and electricity. They have told me again they are going to make electricty storms and heat waves and they have the heat rays on all the house besides."

Little Things That Help

.00005 MF Capacity for Kaufmann Circuit

Inasmuch as this circuit calls for a condenser of so small a capacity, the reader constructing this set will find it hard to secure a condenser of this capacity, as they are not standard, and very few dealers stock them. A simple way to substitute for this is to purchase two condensers of .00025 MF capacity and connect them in series, as shown in Figure 1. This will give the proper capacity necessary for this circuit.

Another way to do this is to take two pieces of thin copper five-eighths of an inch square and separate them with a mica dielectric, such as used in heating-stove doors. This is, of course, not absolutely accurate as the thickness of the mica will have much to do with the capacity, but others have used it successfully. This is a special size and for this reason very few supply stores can supply a condenser of this capacity. The best and most accurate arrangement is the two condensers in series.

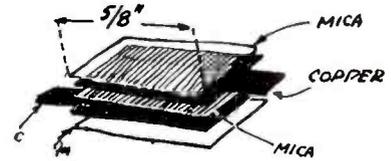


Figure 1. By this arrangement, the correct capacity for the .00005 MF condenser used in the Kaufmann circuit can be obtained.

Unmounted Audio Frequency Transformers

Due to the fact that unmounted audio frequency transformers are not shielded, it is a good plan to ground the cores of these transformers, as a precaution against stray inductance which might cause trouble in producing distortion, noises and other limitations in an amplifier.

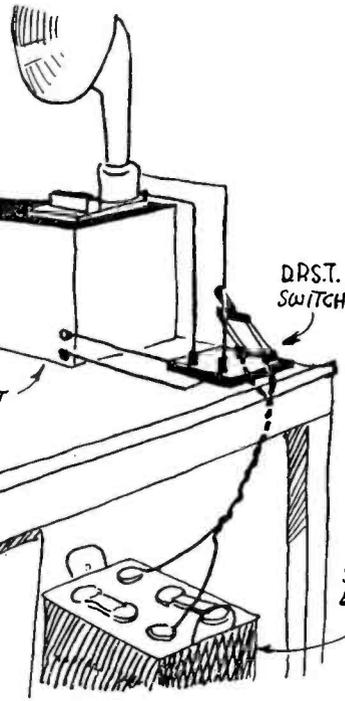


Figure 3. This illustrates the use of a double pole, single throw switch used to protect the storage battery from unintentional discharge.

Don't Unwittingly Discharge Your Storage Battery

Many BCL's are probably unaware of the fact that if they allow their power loud speakers to be connected to the filament battery, they are unknowingly discharging their storage batteries. These power speakers draw a heavy current, and to leave them connected while the set is not in use is an unnecessary waste of valuable current.

This also applies to the potentiometers on sets, where they are connected directly across the filament battery as a grid bias or plate battery control. If the po-

tentiometer you are using does not include an off position, it will dissipate a small amount of current. The best way to avoid this is to disconnect one of the A battery leads or provide a double pole, single throw switch in the leads, as shown in Figure 3.

If this method is used, there is no danger of letting your tubes burn all night or the power speaker or potentiometer to dissipate current.

FOR 30 DAYS

Don't miss the great subscription offer described on the back cover of this issue. The rate positively will be withdrawn on October 1, 1923. Write now.

A Good Ground Connection

A good ground connection is very essential in the course of long distance reception. Many of our readers are probably using water pipes for this purpose and do not want to create an unsightly lump of solder on the pipe and at the same time are experiencing trouble, due to the fact that the wire or ground clamp will not stay in place on the scraped surface of the pipe.

About the most simple method to assure that a connection is established at all times is to use an arrangement shown in Figure 2. A piece of common lead or tin foil is wrapped firmly around the pipe, and around this the wire or ground clamp is placed. The connection should be as firm as possible, and if wire is used it should be wrapped firmly around the tin-foil. The tin-foil being very easily crumpled will make positive contact where the wire could not reach and also affords greater surface against the scraped piping.

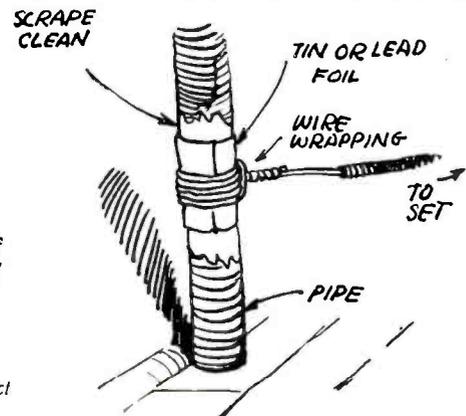


Figure 2. This arrangement shows how to make an efficient ground connection, when water pipes are used.

Mrs. Coolidge a Fan

Mrs. Calvin Coolidge, new "First Lady of the Land," is an ardent radio fan, and derives much pleasure from her set, which is a large one of improved type. Mrs. Coolidge for some time has had a set installed in her room at the New Willard Hotel, used temporarily as a "White House" following the death of Mr. Harding and the elevation of Calvin Coolidge to the presidency, and will probably take it with her when Mr. Coolidge takes official possession of the White House.

Pick-up Records by Our Readers

George W. Jeffers, of Pennsgrove, N. J., an ardent BCL and experimenter, writes us to the effect that he has made some tests with the Kaufmann circuit, the results of which he describes as follows:

"I constructed a Reinartz set according to your specifications and blue prints, with no changes, and have to this date since the change of wave lengths received forty-three stations, the farthest being over one thousand miles, using a detector and two stages of audio frequency. When using head phones attached to the horn, I can bring in New York, Massachusetts, Chicago and Philadelphia stations with ease and great volume. I constructed a Kaufmann circuit of your design, and had a little trouble in making it operate satisfactorily. After experimenting a little, I struck upon the idea of adding an aerial condenser of 23 plates and then, you should have heard it coming in the horn on twenty-two volts. Boy, you are there! I am,

Very truly yours,
GEORGE W. JEFFERS.

Mr. Jeffers' find will probably interest other readers, and we are printing in Figure 1, the Kaufmann circuit in connection with the addition from which he gets such good results.

The method by which he found this out is interesting as shown by his second letter to the technical department:

"I am enclosing herewith a pencil sketch of my addition to the Kaufmann circuit. I hope it will be of service to others if they find the same conditions as I have.

"With the antenna and ground direct to the instrument, I could not get the proper results, but I found that by disconnecting the ground wire and holding it between my thumb and finger very loosely it would bring in the signals clear and loud. Tightening the fingers resulted in decreased signal strength. This adjustment brought to mind the fact that probably my fingers were acting as a condenser, and I immediately placed one as shown. With the condenser in the aerial

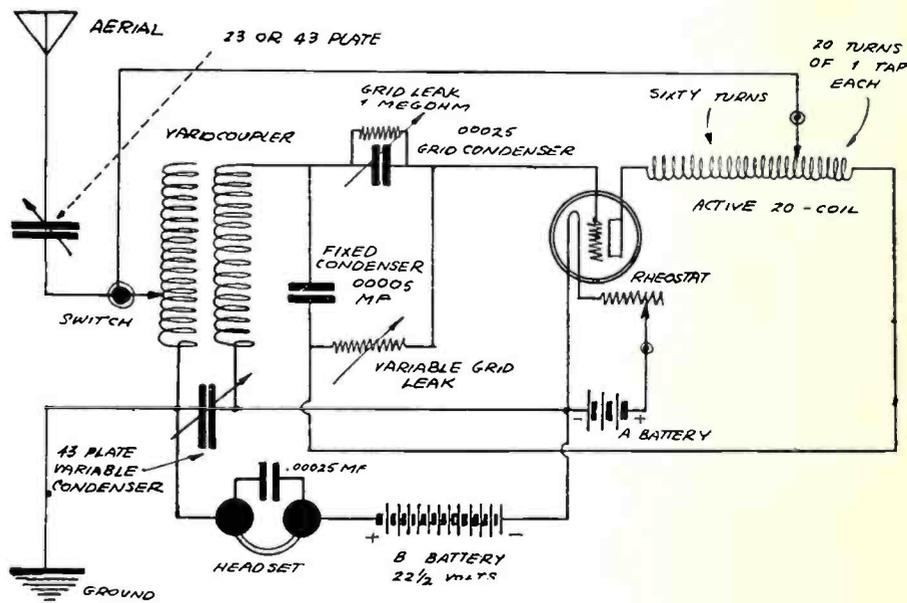


Figure 1. The Kaufmann circuit, showing where Mr. Jeffers placed the condenser in the antenna lead. This improves the circuit greatly, he claims.

it will work fine and dandy. Everything in the set is according to your specifications, excepting that I have added a phone jack. I have no trouble in getting WDAP, of Chicago. I am using a single wire antenna about seventy-five feet long, thirty feet high with a thirty foot lead-in.

R. G. Wittle of Chicago reports that with a set, constructed according to the instructions given in RADIO AGE, using the Koprassch circuit, he has, during the summer months since May, received the following stations: Minneapolis, Minn.; Jefferson City, Mo.; Memphis, Tenn.; New York City; Troy, N. Y.; Davenport, Iowa; Kansas City, Mo., and all local stations.

Mr. Wittle contends that the secret of this set is in the connections of the variometers, which must be correct to get results. He is awaiting the radio frequency addition to this circuit, in order that he may increase his range.

J. H. Jones, of Crestwood, Ky., writes: "I am using a Reinartz circuit, constructed according to your specifications and a two-stage AF amplifier in connection with an art mache loud speaker, and the signals have been heard over a radius of two blocks. He evidently knows how to hook a set up.

W. G. Lehr, of Chicago, Ill., who recently featured the Reinartz circuit with many long distance stations to his credit, wants to know if we want the dope on his circuit. We certainly do, Mr. Lehr, let us hear from you soon.

He further writes: "In my opinion RADIO AGE is far ahead of any radio magazine published when it comes to real radio information. The only fault I can find with it is that you do not publish it often enough. A month seems too long to wait for it."

Many of our readers are writing in and asking for the correct connections on the terminals on the transformers in the Erla circuit of the May issue.

N. A. Bleischer, of 3126 Cambridge Avenue, Chicago, Ill., informs us that he is getting the best results when the transformers are connected, as shown in Figure 2. He says that he uses the phonograph in his home in connection with the phone unit of his head set, and hears local stations all over the house. He has only had the set for a short while, and claims no spectacular reception, but we sincerely hope that as the cold weather sets in he may be able to do the same with the DX stations this fall.

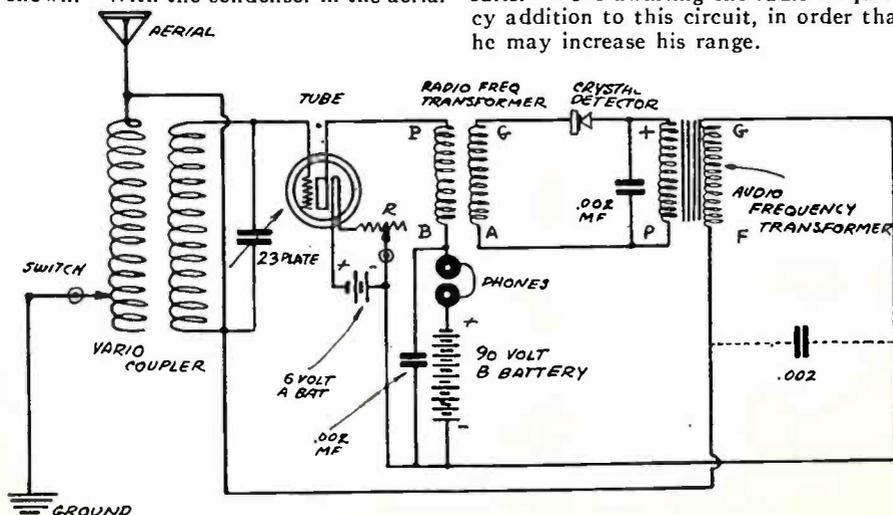


Figure 2. With this arrangement of the transformers, one of our readers, who is using the Erla hookup, says he is getting remarkable results. The .002 fixed condenser across the secondary of the audio transformer is material in bringing this about, he contends. This condenser is indicated by the dotted lines.

FOR 30 DAYS

Don't miss the great subscription offer described on the back cover of this issue. The rate positively will be withdrawn on October 1, 1923. Write now.

Is World Flat?

Radio Age, Inc.,
Boyce Building,
500 N. Dearborn St.,
Chicago, Ill.
Gentlemen:

I note in your July issue, page 32, an article entitled "Now it is Zion," and wish to make some corrections on same.

Station WCBD is located at Zion, Ill. (not Zion City), and was installed at a cost of \$40,000 (not \$30,000), broadcasting on 345 meters (not 245 meters), and have no angel choir, but a choir of good, faithful men and women singers.

Overseer, Wilbur Glenn Voliva, believes the world flat, being far ahead of Christ, Columbus and modern astronomy, being a graduated astronomer himself. His ideas and ideals as to the shape of this world are backed by the Bible, surveyors and navigators. He also offers a big reward for any proof that the world is the shape of a sphere, so, why ridicule him?

I would like to see this station listed in your list of broadcasting stations, and enclose a schedule of same.

Yours respectfully,
RAYMOND C. BAURLE
Chicago, Ill.

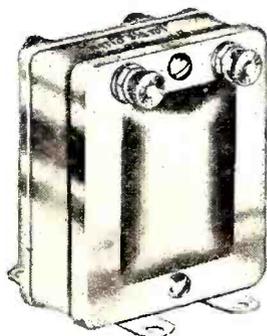
Future of Radio Compass

Position-finding by wireless is destined to be one of the most important navigational aids of the future, whether employed alone or in conjunction with sound to obtain synchronous signals, according to D. W. Hood, M. Inst., C. E., engineer in chief to the Corporation of Trinity House, London, who was among those present at the International Congress of Navigation, held in London last month. George R. Putnam, Commissioner of Lighthouses, was among the American delegates to the convention, which was declared to be the most important meeting of the kind ever held.

In his report, Mr. Hood referred to the fact that various countries have different direction-finding systems of their own, and recommended that an investigation be made to find the most effective method, not by individual countries but by one agency under an international agreement.

The establishment of radio fog signals was the most important advance in lighthouse work in the United States during the last ten years, according to a paper read at the conference by Commissioner Putnam. The first of these signals were placed in service on May 1, 1921, when three were put into commission in the vicinity of New York Harbor. The number of such stations has been increased during the last year and others are in course of preparation.

Each of the radio fog stations in United States waters sends automatically during fog or low visibility radio signals on a wave length of 1,000 meters, with a distinctive characteristic, which are used by vessels equipped with radio compasses. Very reliable results are being obtained, Mr. Putnam declared.



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There are many reasons why National Transformers are demanded and used by the majority of experts and amateurs—greater volume—absolutely no distortion—no interaction between fields—perfect results on any stage of amplification and with any type of tube—scientifically perfect—sturdy construction—beautiful design—highly nickel finished.

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Genuine Telefunken Tubes

Amplification without distortion. Maybe used as amplifier and detector.



We have just received a limited number of Telefunken tubes direct from Europe. These tubes are the most perfect that can be secured today. Tube is made of finest glass known and the filament is of the highest type.

Every Telefunken tube we sell is guaranteed to work as per instructions. If purchasers are not satisfied will exchange for new Tube.

Price \$5.95 with socket delivered.

SEND COUPON BELOW

Use coupon below. Do not send any money but pay postman on delivery of tube.

VOLTAGE.....1½ to 6
AMPERAGE.....1.0

Test made by F. D. Pearne, of Radio Age:
6-Volt filament potential.

Uses 6-ohm rheostat in connection with a 6-ohm constant resistance.

Plate voltage:
As detector 50 volts
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**PRICE
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With SOCKET

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Room 814-8 S. Dearborn St.
CHICAGO, ILL.

Franklin Radio Co.,
Room 814-8 So. Dearborn St.
Chicago, Ill.

Please send me.....Telefunken tubes as per advertisement. I agree to pay postman \$5.95 on delivery. You guarantee this tube to operate as represented or will exchange for new tubes.

Name.....
Address.....
City.....State.....

A Fragment of MacMillan's 1923 Trip to the Arctic

(Continued from page 10.)

too close to get a picture. To bring them out of their hiding places, it was only necessary for us to lie on the ground for about five minutes. Then the heads began to bob up all around. We took some species of these birds and also some species of the eggs. These are as large as hens' eggs and are one source of food to the natives. Captain MacMillan has been supplied with permits from the Canadian, New Foundland, and Danish governments allowing him to take whatever specimens he desires.

While the Captain, Fairbanks, and I were on this Island, three of the crew decided to visit their first iceberg. Directly after they left it, the iceberg decided to turn over. It was very fortunate that this did not occur while they were on it, for they would have been lost. It was interesting to hear the captain tell these men, upon their return, the lurking dangers of the iceberg. At the same time he figured out for them the enormous tonnage in this particular iceberg. It looked so small. Only one-tenth of it showed above water.

Paraquet Island is located in the Canadian Labrador section. On the mainland, one-half mile away, a tent was perched in open view. This, we were later informed, belonged to the government game warden, but the Canadian government, although equipping him most excellently in every other way, failed to furnish him with a boat.

As we passed north along the Coast of Labrador, it was seldom that the fog permitted us to see land. The curtain very accommodatingly raised as we passed Point Amour, where we were given an opportunity to take pictures of the wreck of the battleship, Raleigh, once the pride of the British navy, but now piled up high and dry on the rocks. Even her guns are still mounted. While passing through some of the thickest of the thick fog, the rocky shore of Labrador only a short distance from us on our port side, but yet completely shut off from view, the cook, who was on his first trip to the Arctic, came on deck and the captain, pointing towards where he knew the land was, said, "Well, Cooky, how do you like your view of Labrador?"

The cook gazed intently and seeing nothing but fog, sighed, "Is it always like this?"

The Captain answered, "No, not always." But Robinson at that point confided the surprising information that the captain had seen the whole Coast of Labrador without fog only once in his fifteen years of Arctic exploration.

The coast, when visible, is an enormous pile of unfriendly rocks. I shall take occasion to quote verbatim from Captain Cartwright's "Journal of Labrador," written in 1780. In describing Labrador on page 341 of his book, written 143 years ago, Captain Cartwright said: "Although in sailing along this coast, the astonished mariner is insensibly drawn into a conclusion that this country was the last which God made and that he had no other view than to throw together there the refuse of

his materials of no use to mankind (I shall interrupt Captain Cartwright to say that the Coast of Labrador has not changed, since he so adroitly described it in 1780. I shall continue with Captain Cartwright). Yet the mariner no sooner penetrates a few miles into a bay than the great change, both of the climate and prospects, alter his opinion. The air then becomes soft and warm; bare rocks no longer appear; the land is thick-clothed with timber, which reaches down almost to highwater mark, and is generally edged with grass. Few stout trees are to be met with, until you have advanced a considerable distance and have shut out the sea." This description of Captain Cartwright's may be true of some sections of Labrador, but we failed to find that section in our trip. What we saw was dimly cold, barren, rocky, and uninviting.

The natives of the villages who make their living by fishing the cod and the salmon have in their back yards piles of wood, sometimes fifteen to twenty feet in height, the largest piece not exceeding two inches in diameter. It is all of scrub growth. The missionaries told us that in the winter the poor inhabitants must travel miles and miles with their dog sleds, quite content to find even this scrub growth. It is true that the air becomes warmer as you travel inland, but it is also true that the moment it does become warmer you see flies as you have never seen before. The air was literally thick with flies. A picture taken by Dr. MacMillan on a previous expedition shows the back of Labrador Cabot's shirt a seething mass of flies and the shirt visible at no spot.

Snow everywhere on the mountain tops and enormous balls of ice on the shore. At one point we had eighty-nine icebergs visible from our crew's nest. One of these icebergs was in the form of an arch, so high that had we been sure the water was clear below we could have sailed our ship through. The very names of the bays, capes, and islands indicate the hardship that has been experienced on this God-forsaken country. Here are some that are strongly descriptive:

Devils Bay, Mistaken Cove, Blow Me Down, Cut Throat Tickle, Icey Cove, Lower Savage Islands, Hopewell Narrows, God Haven, Misery Bay, Cape Fair Well, Cape Hold With Hope, Death River Frozen Strait, Escape Reef, Refuge Cove, Cold Foot River, Deadman's Cove, Savage Cove, Isle of God and Mercy, Battle Harbor, Fairness, Windy Tickle, Ragged Island, Cape Comfort, Punch Bowl, Lost Hope, Dead Man Lake, Repulsed Bay, Bay of Mercy, Anxiety Point, False River and Fly Away Cape.

As we entered each of these Labrador ports a group of small dories would invariably put out from the shore, and a race start among the fishermen to see which could reach us first. After the usual preliminaries of getting acquainted, would follow the question, "Is there a doctor on board?" Next, they asked clothing of any description. We found many of the hardy fishermen, bronzed, weather-worn, and thin, clothed in a

pair of old looking castoff oilskin trousers, a threadbare sweater, a battered pair of boots, and nothing more. The fishing had been bad for the last two years. There is an abundance of fish this year, but the inhabitants are faring poorly because of the enormous quantities of ice which tear their nets into pieces and oftentimes carry them away completely. These people are mostly of French, Irish and Scotch descent.

In one port a native offered us lobsters for sale. He had a dozen and apologetically explained that the price of lobster was very high this year. Having left the states but recently the argument of short supply and over-demand was not new to us, and we were quite prepared for a South Water Street price. So he asked the exorbitant figure of ten cents a piece for the lobsters. Wherever we went, people were all agog with excitement over the radio carried on board. They were glad of visitors; glad of the chance to exchange courtesies, but glad especially to view, as many as could, the equipment of the Bowdoin. Their wonderment struck its height when they heard the receiving set, heard voices and music from far away places in the United States, the land they know but little and none had seen. It was gratifying to notice their frank and open reaction, so childlike, so sincere. No electric lights in the homes of these, no telephones, little of the conveniences that we Americans enjoy.

On his last trip, Dr. MacMillan showed the natives moving pictures. Strange to say they do not consider the radio a mechanical or electrical device. When they saw the moving pictures they believed it was Dr. MacMillan's ability to make the spirits move on the screen. As for radio, they believe that in the year Dr. MacMillan has been back, he has learned how to make the spirits talk.

On July 4 the icebergs completely surrounding us, we received the returns of the Dempsey fight, and the pool which was started on board for him who guessed the number of rounds the fight would last was won by Jaynes, the engineer, and paid to him when the twelfth round was reached, that being the number he selected. But the money was promptly taken away from him when the fight went fifteen rounds.

In Battle Harbor where I left the expedition we were met at the dock by the doctors and nurses of one of those wonderful institutions, the Grenfell Mission, where self-sacrificing men and women give of their time and energy without remuneration, caring for the sick and injured that are brought to them from miles around. Contact with them was especially delightful. They made an indelible impression for their devotion to a noble cause, their unselfishness, their genuineness and ease of manner, and their lively interest in us as visitors. They visibly enjoyed everything just as the natives, but had the added advantage of education and refinement. They, too, were completely absorbed with the radio, although they were not by any means ignorant as the

natives of radio. They not only enjoyed listening to the radio concerts but took every opportunity to dance to the strains of faraway stations, even the Edgewater Beach hotel station in Chicago.

Being an old yachtsman, I may have taken too many things for granted in omitting much which to me is commonplace, but perhaps interesting to others. In describing the trip sketchily, I tried to be brief without neglecting the more important phases.

One thing remains to be said, however, and that has to do with Dr. MacMillan, himself. What I enjoyed as much if not more than anything of all the trip, was the opportunity to study and know in close quarters that wonderful optimist—Dr. Donald B. MacMillan. It might not savor of good taste to speak of him as a friend, as a man, as a captain, because it would probably offend his sensitive nature to have me praise him thus openly, but I may without danger of indelicacy to him refer to his optimism, which to me is unparalleled. If it rains, it rains. If it is cold, it is cold. If there is a mishap of any kind it is accepted by Dr. MacMillan in contented spirit, and in full confidence that no matter what occurs, it is for the best. He never looks backward, always forward. He sees a bright side to every situation, every occurrence. He is a real optimist.

Dr. MacMillan and his crew were well and happy when I took my leave. One comforting thought over the separation was realizing that communication would not be cut off with them, as before, until their return to civilization, but would be kept intact by means of the first thing of its kind to be introduced to the land of the Eskimo—the land of solitude, that which really is responsible for my introduction to Dr. MacMillan, that which made possible my trip with him as far north as Labrador, that which will help us get MacMillan's interpretation of what he sees and hears on his expedition to the North Pole—radio.

Radio Goes Exploring

By Carl H. Butman

Equipped with a special radio receiving set, a party of ten explorers from the Geological Survey left Lee's Ferry in northern Arizona on August 1, for a three hundred mile trip down the Colorado to the mouth of the Virgin River, at Rionville, Nev.

Unfortunately these modern surveyors, who are following the route first explored by Major Powell fifty-four years ago, were unable to carry a radio transmitting set due to weight and space. But they are carrying a modern receiving set and will be able to hear what is going on in the world during the three months, although they will be unable to return daily their adventures in mapping this stretch of the Colorado. Arrangements have been made however with the radio stations of the Deseret News of Salt Lake City and the Los Angeles Times to broadcast bulletins sent from trail crossings. The dispatches will be relayed by runners and telephone or telegraph when the party gets far enough down

the Colorado to reach the regular lines of communication. In this manner the world will be advised of the progress of the exploration in the Canyon and passage of the four boats through some of the wildest rapids in the country.

The special radio set was reconstructed by Mr. R. L. Atkinson of the Survey, from a standard Westinghouse regenerative set, adapted to two stages of amplification with new tubes. The whole outfit, including the batteries, is packed in a water-proof, wooden box with sponge rubber to keep it from jarring during the long boat trip. An especially constructed antenna on a reel, capable of being erected at camp sites on the banks of the river, can be strung from short poles or from projecting rocks to a length of 150 feet.

A preliminary radio set at Lee's Ferry has already been made, and it is reported that the explorers received broadcasts from Los Angeles, 430 miles away without difficulty at night. The real reception test Col. C. H. Birdseye, who is in charge of the party, believes will come when they are in the lowest part of the Canyon, estimated as a mile deep, near El Tovar, where dead spots and static may be encountered.

Besides the geological and topographical results achieved, the trip will also prove of material interest in the development of radio communication, along with experiments undertaken by the Bureau of Mines, and other governmental bureaus, to see how far radio will carry into the "bowels of the earth."

Frequency Indicator

At the Second National Radio Conference held in Washington, it was resolved:

"That every broadcasting station should be equipped with apparatus such as a tuned circuit coupled to the antenna and containing an indicating instrument or the equivalent for the purpose of maintaining the operating wave frequency within two kilocycles of the assigned wave frequency."

The Bureau of Standards has designed a preliminary model of a radio frequency indicator to meet the above need and has prepared specifications covering its construction. These specifications may be had by any broadcasting station upon request.

The instrument consists essentially of a 72-turn space-wound coil on a 3 3/4" tube, an air condenser, and a sensitive thermo-galvanometer. These three elements are connected in series. The condenser, which is of the variable type, is provided with a locking device so that it may be locked and soldered into position after the instrument has been adjusted to indicate the required frequency. This instrument may be set to indicate any radio frequency in the range from 1,350 kilocycles (222 meters) to 550 kilocycles (545 meters).

If any instrument is constructed according to the specifications and sent to the Bureau of Standards, Radio Laboratory, by a licensed broadcasting station, it will be adjusted for a nominal fee to operate at the frequency of the station.

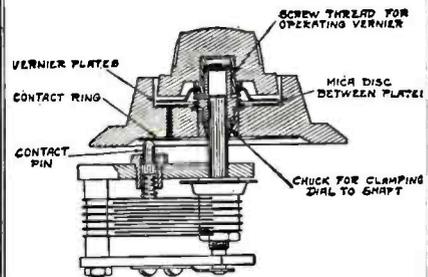
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improve the range, clearness and tone quality of both nearby and distant broadcasting. Voluntary testimony from appreciative users all over the world leaves no doubt about this. The reasons are in the instruments themselves—their electrical correctness, and their precision workmanship, from better-than-need-be materials.



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"Hootch" Tubes Defraud Radio Public

THE BOOTLEGGING of vacuum tubes used in radio receiving sets has grown to be one of the most widely-practiced and highly profitable by-products of prohibition. Its importance is second only to the business of rum smuggling itself. With a potential market of nearly a million dollars worth of tubes per month, the radio bootlegger is playing a big game. His net profit is generally as large, if not larger, than that of the whiskey runner and his danger of apprehension and punishment seems much less.

Beginning about a year ago on a small scale with the manufacturer of various crude types of tubes which were easily spotted, the radio bootlegger has developed his business to the point of so skillfully and accurately counterfeiting the products of several prominent manufacturers that only an expert is able to detect the difference. In the course of examining the receiving sets of about forty amateurs a day for the past year and a half, the Sunday Call has been afforded an unusual opportunity of examining a large variety of vacuum tubes, and whereas it was formerly a very simple matter to detect a bootleg product because of its faulty construction, the job has now become one requiring the closest examination.

The manufacture of the so-called "standard" vacuum tubes is in the hands of a closely knit group, comprising the General Electric Company and the Westinghouse Electric and Manufacturing Company, from whose factories come the U. V. 200, U. V. 201, U. V. 201-A, U. V. 199, W. D. 11, W. D. 12 and, in addition, a series of tubes used largely in transmitting circuits. These tubes are sold through the Radio Corporation of America to the jobbers and dealers of the country. From the General Electric factories also come a series of tubes identically the same as listed above, but bearing the trade designation C. 300, C. 301, C. 301-A., C. 299, C. 11 and C. 12 and the signature of E. T. Cunningham. These tubes are widely used on the Pacific coast and have recently been introduced into New Jersey through the State distributor, E. M. Wilson and Son, 11 Lafayette Street, this city.

Copies of "Peanut" Tubes

Another important manufacturer of standard tubes is the Western Electric Company, makers of the V. T. 1 and V. T. 2, used extensively by the Signal Corps of the United States Army, the 216-A used as a power amplifier and the "N" (peanut) tube employed as a detector, as well as a radio and audio amplifier. The latter tube, although not sold for amateur and experimental use in this country has attracted considerable attention here. The interest thus aroused has been capitalized by the bootleggers, who have placed copies of this tube on the market,

Steal Fruits of Research

The development of "standard" vacuum tubes to their present high point of efficiency has been achieved only after the expenditure of hundreds of thousands of dollars by the companies mentioned above. The patents resulting from this costly experimentation represent a form of protection for the manufacturer against the pirates of industry who seek to profit by the fruits of another's labor and brains.

Patents mean nothing to the radio bootlegger, however. Not only does he steal the fundamental principle which has taken a legitimate firm years to develop, but he completes the job to the last detail by counterfeiting the tube in size, shape and even in the design of the trademark.

Newark is reported to be the biggest source of bootleg vacuum tubes in the country, but strangely enough, fewer bootleg tubes are sold in this city than in any radio center of its size and importance in the United States. The local public is afforded a large measure of protection through the integrity of the dealers and through the medium of the personal service feature of the Sunday Call's Radio Department, which is available for testing tubes and apparatus every day except Monday from 2 to 5 p. m. A constant watch over the radio market is maintained by the Call's staff for the protection and information of its readers. Because of this fact radio bootleggers find it more profitable to seek other dumping grounds for their products.

Seven Newark Bootleggers

From a source believed to be very reliable the Sunday Call learns that there are approximately seven "factories" engaged in the manufacture of bootleg tubes in this city. The combined capacity of these plants is figured at 3,500 tubes a day. There are five additional factories in New York and Brooklyn, this latter group being capable of producing about 2,000 tubes a day.

The reason Newark is such a big manufacturing center for bootleg tubes is because this city and vicinity affords the greatest market for skilled labor and materials, vital necessities to the bootlegger. In Harrison, just across the Passaic River from Newark, is the General Electric plant, employing thousands of workers—mostly girls—on the various processes of vacuum tube construction. In Bloomfield, another suburban town, is the Westinghouse Lamp works, also employing thousands of trained workers on radio tubes. In these factories inexperienced labor is taken and thoroughly trained in the delicate work of tube making. Once thoroughly trained and experienced, this labor is recruited by agents of the bootlegger who are known to have approached workers leaving the factories. Higher wages is the usual bait, but bonuses are offered to the girls skilled in the more

delicate branches of the work.

With this labor at his command the bootlegger is better able to carry out the details of counterfeiting standard tubes. There has come to the attention of the Sunday Call some excellent copies of the U. V. 199. It is difficult to tell the copy from the original. Its weakness is in its extremely short filament life, the average bootleg lasting only a few hours as against 1,000 hours, the normal service of a standard tube. The bootleg 199's examined have a higher rate of current consumption than the genuine and a low percentage of electron emission, which means poorer service. This is largely because the bootlegger is unable to obtain the proper filament material and is obliged to substitute a flattened platinum wire, which, incidentally, is also obtainable locally.

Earmarks of Fakes

The counterfeit U. V. 199 is distinguished by the fact that the R. C. A. G. E. and W. trademarks impressed in white on the glass may be erased by rubbing a moistened finger over them. On the genuine these trademarks are etched on the glass and cannot be removed. The printing on the base of the tube is frequently badly smudged on the bootleg, whereas on the genuine it is quite clear and readable.

In addition to counterfeit U. V. 199, the Sunday Call has discovered fake Western Electric "N" tubes U. V. 200 and U. V. 201, De Forest D. V. 6, W. D. 12 and U. V. 201-A. Another article to be published shortly, showing how counterfeit tubes may be distinguished from the genuine, will be given.

Boon to Light-Keepers

Radiophone communication between light stations in isolated territory has been found very successful by the Light-house Service, according to reports to the Department of Commerce. Complete stations were installed at Cape Sarichef and Scotch Cap Light stations, Alaska, in 1921, and after overcoming some difficulties of operation during the first year, due to burnouts of the motor generator and wrecking of one of the steel antenna masts by a storm, communication between the stations has continued uninterruptedly for the past year.

The two stations are about seventeen miles apart. Keepers at both stations have mastered the code, so as to be able to exchange messages with mail steamers, and have been able to communicate for a distance of sixty-five miles by voice and 165 miles in code. The telephone installation at these stations consists of a type C. W. 936 short-range radio telephone set, two three-fourths K. W. 32-volt Delco engine-driven generators, two seventy foot steel poles and the antenna and ground system.

How Radio Visualized Harding Funeral

THIS is a story of the first attempt of a broadcasting station to visualize by means of music and spoken word a current event of large significance—in this case the final tribute paid President Harding in the city of Washington.

The listeners of WJAZ—the Zenith-Edgewater Beach Hotel Broadcasting Station were carried in imagination to the starting point of the funeral cortege and accompanied the sorrowful procession step by step up Pennsylvania Avenue, now to the tune of "Abide With Me," again to children's voices singing "Nearer My God to Thee," again to the inspiring strains of "Onward Christian Soldiers," the impressive "Chopin's Funeral March," Harding's favorite "Lead Kindly Light," and so on up the wide stairs of the Capitol Building. Then as strong male voices sang "Lead Kingly Light," the coffin mantled in the Red, White, and Blue was placed on the catafalque in the rotunda. The brief and impressive funeral services followed which were concluded by the sounding of taps.

When the procession got under way the bells of St. John's Episcopal Church began to toll "Nearer My God to Thee," and continued until Reverend J. Freeman Anderson's voice was lifted in prayer. "Nearer My God to Thee" played by the church chimes fell on the ears of the mourners loud and clear at first, fainter and fainter as the procession neared the Capitol, the key-note as it were of the pathetic spectacle.

All this passed before the mental vision of the listeners with the aid of the word pictures painted by N. A. Fegen. The introductory words of the program spoken by E. F. McDonald, Jr., the narrative of N. A. Fegen, and the text of the invocation follow.

WJAZ was the recipient of enthusiastic comments on the effectiveness of this program. To some people it was so realistic as to bring tears.

INTRODUCTION

By E. F. McDonald, Jr.

This evening's newspapers give the account of the Washington ovation to the earthly remains of President Harding. The Zenith-Edgewater Beach Hotel Broadcasting Station will repeat the strains of music which echoed the feelings of the throng of sorrowers and fondly enveloped the body of him who had won to an extraordinary degree the love, esteem, and respect of his fellowmen. Most of the musical selections were the favorites of the man about whom and for whom the solemn demonstration.

Recital of the episode will be made by Mr. N. A. Fegen and the music will be played and sung by the Oriole Orchestra and the Crystal Studio Quartet.

Directly after this Presidential program taps will be sounded and there will be a pause of ten minutes. Then the Zenith-Edgewater Beach Hotel Broadcasting Station will go on the air with classical music from the Crystal Studio.

So that our listeners will be able to tune in satisfactorily, we shall start the

program by playing one of Mr. Harding's favorites, "Abide With Me."

By N. A. Fegen.

The evening's program of the Zenith-Edgewater Beach Hotel Broadcasting Station having been curtailed out of respect for the dead President, the occasion will be taken to play and sing the music that filled the air of Washington today while countless souls felt poignant sympathy as they viewed the remains of President Harding borne along. The body of President Harding was today carried from the White House to lie in state in the Capitol Building of silent Washington draped in black. Let us visualize that solemn journey, the last of the President on Pennsylvania Avenue, so different from the festive pageant of his inaugural a little over two years ago; let us view that journey with our mind's eye by repeating music which gripped the heart of the hushed multitude. The funeral services were simple, but to those who attended will ever be memorable for their impressiveness. There were short prayers, a brief Scripture reading, the singing of a few hymns, hymns favored by the dead President, and then was ended the official tribute of the United States to Warren G. Harding. At 10:00 a. m. the funeral procession started from the White House. The escort was made up of President Coolidge, the Cabinet and Diplomatic Corps, leaders of Congress, two former Presidents—Wm. Howard Taft and Woodrow Wilson—civic organizations and many prominent citizens. Hardly had the first of the procession started under way when the bells of St. John's Episcopal Church across LaFayette Square—the Church of Presidents—began tolling.

Bells by Smith.

As the funeral cortege passed the District Building, 3,000 wide-eyed school children, their little hearts oppressed by the national calamity, tenderly and with deep devotion for him so suddenly taken away from his people, strewed flowers in the path of the procession and sang "Nearer, My God to Thee."

Quartet.

Pennsylvania Avenue, rich with the memories of historic scenes, presented two long aisles of grief. As the great procession of sorrow swung out and beyond the District Building, the Marine Band with its crepe muffled drum played "Onward Christian Soldiers." Listen to the majestic strains and know why those who stood in Pennsylvania Avenue felt a catch at their throat and their hearts jump a few beats.

Orchestra.

The procession continuing, strains of "Chopin's Funeral March" were wafted up and down Pennsylvania Avenue.

Orchestra.

Arrived at the Capitol, the Army Band, as the coffin was carried up the steps, played "Lead, Kindly Light." Immediately preceding the services the Male Quartette of the Calvary Baptist Church sang "Lead, Kindly Light."

Quartet.

Then followed the Invocation of the Rev. J. Freeman Anderson, Pastor of Calvary Baptist Church. It expresses a beautiful sentiment, and being brief, will be repeated for the edification of the Zenith-Edgewater Beach Hotel Broadcasting Station and audience.

Invocation Read by N. A. Fegen.

The funeral services came to a close after a short reading of Scripture. It just so happened that the verse read from Micah, the eighth from the sixth chapter, is the one upon which President Harding's hand rested when he took the oath of office, the same Bible which George Washington kissed at his inaugural services.

In the rotunda of the Capitol rested the remains of President Harding. The people of Washington had their last look at their beloved President.

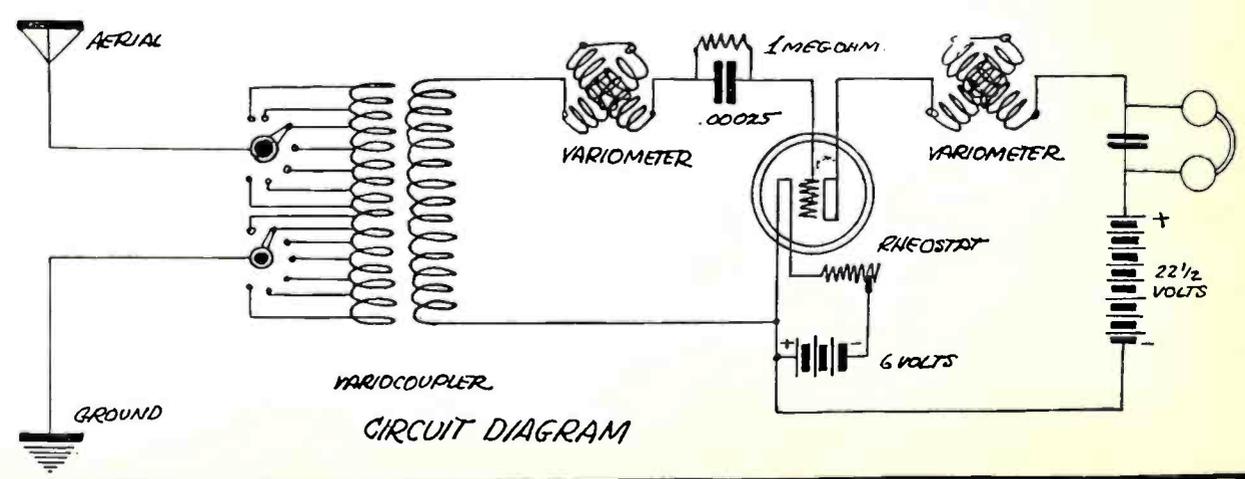
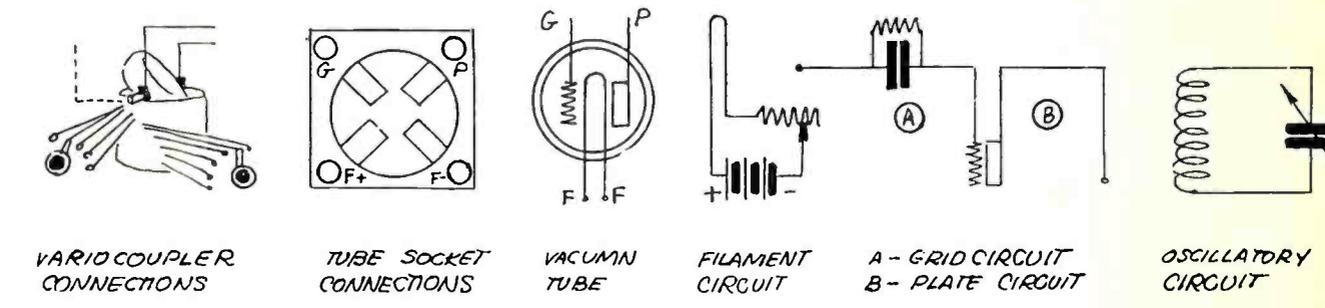
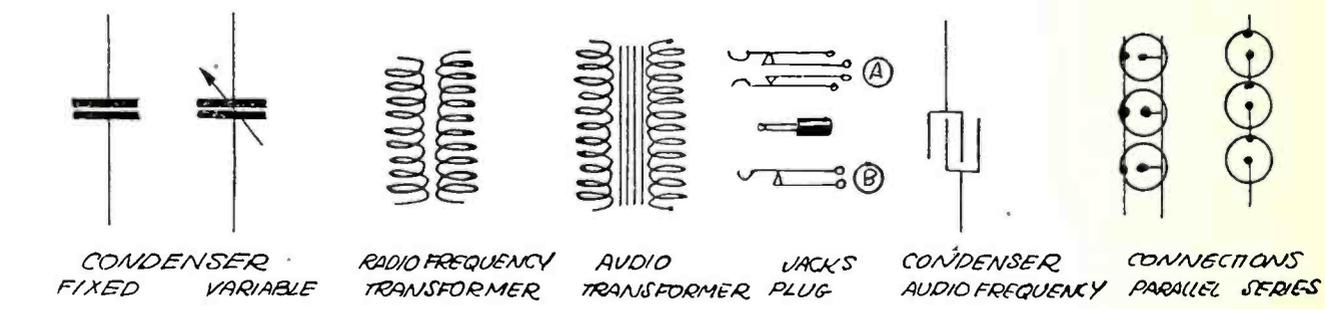
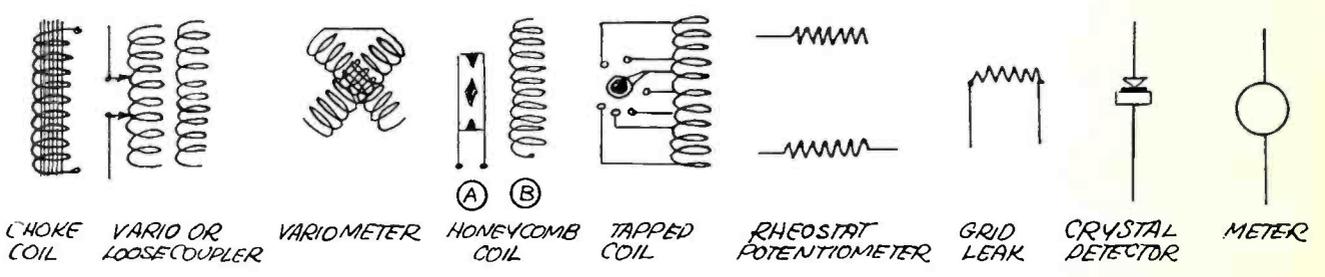
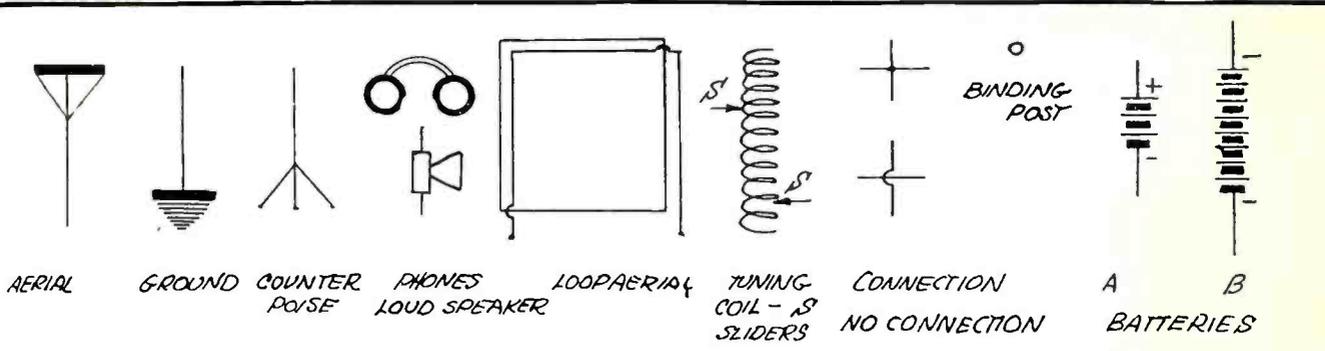
(TAPS.)

Dr. Anderson's Invocation Delivered at 11:40 a. m., August 8, 1923.

"Our gracious God, close to whose great Father heart alone our weary hearts find rest, breathe, we beseech Thee, Thy sorely needed benediction of peace upon the mourning millions today, and especially upon those who shared most intimately the good life of our lamented leader. Behold, we are submerged under a great sorrow! With a startling suddenness, distress of uncommon depth and darkness has broken upon us and our stricken Nation echoes the psalmist cry, 'Thy waves and Thy billows are gone over me.'

"Out of the midst of the storm is there come to us, each and all, the voice of our Divine Helper, Who walks in triumph upon the waves, saying, 'Peace, be still, when Thou passest through the waters, I will be with thee, and through the rivers, they shall not overflow thee.' Beyond all the depressing shadows that conceal our sky, this hour gives us, with uplifted eye of faith, to see clearly Him Who is the Light of the world, Whose radiance is cloudless and fadeless, despite our earth born tempest—God, Who standeth amid the shadows, keeping watch above His own; beyond all unfulfilled dreams and broken plans and bitter disappointments, to know that all things work together for good to them that love God.

"Give us befitting resignation amid the mystery of Thy wise providence that, like little children bending slowly and humbly at the feet of a father whose mind is far beyond their comprehension, we may say with a new submissiveness, 'Thy will be done.' Driven by the blow of this great grief to merge our hearts in common sympathy and prayer, teach us to hold ourselves on the high level of fraternal spirit and of consecration to humanity's largest good. And 'Lord God of Hosts, be with us yet, lest we forget, lest we forget.' We ask all needed grace in the Name that is above every name and at which every knee shall bow. Amen."



BROADCASTER LOSES

Judge Lynch, sitting in the United States Court, Trenton, N. J., granted an injunction on August 11, restraining L. Bamberger & Company, operators of a large department store in Newark, from broadcasting music copyrighted by a member of the American Society of Composers, Authors and Publishers.

The court nullified his own order for the time being, however, by stating that he would not sign the restraining order until it had been passed on by the higher courts. It was the opinion of the court that L. Bamberger & Company was making an indirect profit from its radio station.

The suit was brought by attorneys for M. Witmark & Son, and has been regarded as the first important legal action promising a definite and final adjustment of the question as to whether broadcasters can be forced to pay royalties for the use of copyrighted music in their broadcasting stations. The particular song, which it was complained the department store had broadcast illegally was "Mother Machree." Chauncey Olcott and Ernest K. Ball wrote the music for the song but they are not parties to the suit. Rita Johnson Young wrote the lyric, but she is not a party to the suit. The action is brought solely by the publishers.

Witmark asked for a temporary injunction. The defense of the department store station was that it was not operating for profit. The music publishers had demanded \$1,000 a year from the station in payment for the use of copyrighted music. The store refused to pay and the suit resulted. The radio world will await the action of the higher courts with some interest.

Radio for the Blind

Letters which come to the radio broadcasting station emphasize the enjoyment which the stay-at-homes get from broadcast music. One such letter is that received recently by the General Electric Company station at Schenectady, N. Y., from a young blind woman who lives in Seneca Falls, N. Y. Writing to WGY she says:

"If you could know how much we enjoy the voice of the Schenectady station, you would be glad that God gave you such a gift. My father, who is very hard of hearing, can hear you distinctly and knows your voice already although we are only two weeks old in the radio world. Father could get nearly all the service and sang the hymns with the choir.

"My work is so very exhausting that even when there is an invitation to get some recreation, physical weariness makes it impossible to enjoy anything. The constant association with sick people, the worry of expense and the strain of trying to do things without sight, the care of a father who has been feeble a long time, and the anxiety of a mother, seventy-four years old, who has had to work so hard to serve a deaf husband and blind daughter, all these

things brought me to a dreadful state of mind, distrusting everybody and sorry for myself. No honors conferred on a celebrity could have given greater pleasure than the church service gave two people, one deaf and the other blind and hungry for something good and helpful. The talk which I heard about Christ and Christianity was a greater banquet than any that was ever spread before the greatest man.

"I do wish that some philanthropist who would like to do something for the blind would furnish radio sets to those who are less fortunate than I."

Movies by Wireless

Washington, D. C.—The near future will see the perfection of radio movies; essentially, they are here today. Every "listener-in," with the aid of a special apparatus, contained in a box about a foot square, and a small curtain, will be able to see as well as hear over the versatile radio, according to C. Francis Jenkins of this city.

Professor Jenkins, who has previously demonstrated the transmission of still pictures by radio, recently showed on a screen in his laboratory the movements of his hand and other objects held in front of his radio transmitting apparatus in another room. The apparatus used in transmitting still pictures was employed in the last experiment, but a new "lens-faced prismatic ring" was introduced to show a rapid succession of pictures depicting movement.

Perfection of the moving picture radio transmitting set now awaits only the manufacture of a new and more powerful electric lamp of the "corona-glow" type. In the recent demonstration a temporary lamp was made by the inventor but it is not strong enough to transmit large pictures. The question of rapidity is solved, Mr. Jenkins says, as he has already sent pictures at twice the standard movie speed. What he needs is a better and stronger lamp which will stand up when the signal strength is increased about 3,000 times, as is necessary in sending pictures in motion.

Not only actual pictures of moving bodies can be transmitted, by pointing the machine at them, but films can be broadcast, Mr. Jenkins claims and shown on screens in theatres or homes where proper receiving and reproducing apparatus and a screen are available. When the power of the light is raised the size of the picture can be increased, it was explained.

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Complete Each Issue

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1XAH, Pawtucket, R. I. 1000 miles; Special license experimental; Standard Radio & Electric Co.
KDKA, E. Pittsburgh, Pa.; Class B station Westinghouse Elec. & Mfg. Co.
KDOW, Steamship America, New York.
KDPM, Cleveland, Ohio; Westinghouse Elec. & Mfg. Co.
KDPT, San Diego, Calif.; 344 meters; 50 watts; Southern Electrical Co.
KDYL, Salt Lake City, Utah; news music, entertainment, Telegram Publishing Co.
KDYM, San Diego, Cal.; Savoy Theatre; 252 meters 100 watts
KDYQ, Portland, Ore.; Oregon Inst. Technology.
KDYS, Great Falls, Mont.; Class B, Great Falls Tribune.
KDYW, Phoenix, Arizona; Smith Hughes & Co.
KDYX, Honolulu, T. H.; 12:15 to 1:15 p. m., stock reports and weather; 6:30 to 7:30 p. m., music; lectures; Sunday, 11 a. m. to 12:30 p. m., sermons; Honolulu Star-Bulletin, Ltd.
KDZB, Bakerfield, Calif.; Frank H. Seiffert.
KDZE, Seattle, Wash.; 455 meters; 500 watts; The Rhodes Co.
KDZF, Los Angeles, Calif.; Automobile Club of Southern California.
KDZI, Wenatchee, Wash.; Electric Supply Co.
KDZK, Reno, Nev. Wednesday 8 to 9 p m; Friday 8 to 9 p m. Musical and news features; Nevada State Journal, Nevada Machinery & Electric Co.
KDZD, Denver, Colo. Pyle & Nichols, 1247 Broadway.
KDZR, Bellingham, Wash; 261 meters, 50 watts; Bellingham Pub. Co.
KDZD, Phoenix, Ariz.; Class B, McArthur Bros. Mercantile Co.
KFAE, Pullman, Wash.; State College of Washington.
KFAF, Denver, Colorado; George S. Walker, Western Radio Corporation; musical programs, news items, etc., daily except Tuesday and Sunday, 8 to 9 p m; mountain standard time.
KFAI, Boulder, Colo.; University of Colorado.
KFAN, Moscow, Idaho; Electric Shop.
KFAP, Butte, Mont.; Standard Pub. Co.
KFAQ, San Jose, Calif.; City of San Jose.
KFAR, Studio Lighting Service Co., Hollywood, California 280 meters, 200 watts.
KFAU, Boise, Idaho; Class B, Boise High School.
KFAV, Venice, Calif.; Able-Kiefer Co.
KFAW, Santa Ana, Cal.; 280 meters; 10 watts; Radio Den.
KFAY, Central Point, Ore.; W. J. Virgin Milling Co.
KFBB, Havre, Mont.; F. A. Buttrey & Co.
KFBC, Phoenix, Ariz.; Nielson Radio Supply Co.; 238 meters; 10 watts.
KFBE, San Louis Obispo, Calif.; R. H. Horn.
KFBG, Tacoma, Wash.; First Presbyterian Church.
KFBM, Sacramento, Calif.; 263 meters; 100 watts; Kimball Upson Co.
KFBL, Everett, Wash.; Lesco Bros.
KFBU, Thomas, Bishop, N. S., Laramie, Wyo.; 263 meters, 50 watts.
KFCB, San Diego, Calif.; 278 meters; 20 watts; W. K. Azbill.
KFCD, Salem, Ore.; F. S. Barrin.
KFCF, Walla Walla, Wash.; Frank A. Moore.
KFCG, Billings, Mont.; Elec. Service Station.
KFCM, Colorado Springs, Colo.; 122 meters; 10 watts; Colo. Springs Radio Co.
KFCN, Los Angeles, Calif.; Los Angeles Union Stock Yards.
KFCO, Richmond, Calif.; Richmond Radio Shop.
KFCQ, Casper, Wyo.; Motor Service Station.
KFCP, Ogden, Utah, Ralph W. Flygare.
KFCV, Houston, Tex.; Fred Mahaffey, Jr.
KFCY, La Mars, Ia.; Western Union College.
KFCZ, Omaha, Neb.; 258 meters; 100 watts; Omaha Central High School.
KFD, Baker, Ore.; Adler's Music Store.
KFDB, San Francisco, Calif.; Mercantile Trust Co.
KFDD, St. Michael Cathedral, Boise, Idaho, 252 meters, 10 watts.
KFDH, Tucson, Ariz.; Univ. of Arizona.
KFDJ, Corvallis, Ore.; Oregon Agr. College.
KFDL, Denver, Colo.; Knight Campbell Music Co.
KFDO, Bozeman, Mont.; Everett H. Cutting.
KFDP, Des Moines, Iowa; Radio Radio & Supply Co.
KFDR, York, Nebraska; Bullock's Hardware & Sporting Goods.
KFDS, San Francisco, Calif.; John D. McKee.
KFDU, Lincoln, Nebr.; Nebraska Radio & Elect. Co.; 240 meters; 20 watts.
KFDV, Fayetteville, Ark.; Gilbrech & Stinson.
KFDX, Shreveport, La.; First Baptist Church.
KFDY, Brookings, S. D.; South Dakota State College of Agriculture and Mechanical Arts.
KFDZ, Minneapolis, Minn.; Harry O. Iverson.
KFEC, Portland, Ore.; Meier & Frank Co.
KFEJ, Tacoma, Wash.; Guy Greason.
KFEL, Denver, Colo.; Winnet Radio Corp.
KFEP, Denver, Colo.; Radio Equipment Co.
KFEQ, Oak Nebraska, N. L. Bergala.
KFER, Ft. Dodge, Iowa; 231 meters; 10 watts; Auto Electric Service Co.
KFEV, Douglas, Wyo; Radio Elect. Shop; 263 meters; 100 watts.
KFEX, Minneapolis, Minn; 261 meters, 100 watts Augsburg Seminary.
KFEY, Kellogg, Idaho; Bunker Hill & Sullivan Mining & Construction Co.
KFEZ, St. Louis, Mo.; American Society of Mechanical Engineers.
KFFA, San Diego, Calif.; Dr. E. C. Shelton.
KFFB, Fenelon, Ore.; Larson Oregon Radio Co.
KFFC, Ellaboga, Oregon; Dr. E. H. Smith.
KFFD, Moberly, Missouri; First Baptist Church.
KFFG, Colorado Springs, Colo.; Marksheffel Motor Co.
KFFR, Kirk, Jim, Sparks, Nev.; 226 meters, 10 watts.
KFFV, Lamoni, Iowa; Grassland College.
KFFX, Omaha, Neb.; 276 meters, 250 watts; The McGraw Co.
KFFY, Alexandria, La.; 275 meters; 100 watts; Pincus & Murphy Inc.
KFFZ, Dallas, Texas; 226 meters, 20 watts; A. G. Barnes Amusement Co.
KFGC, Baton Rouge, La.; 254 meters, 160 watts; Louisiana State University.
KFGD, Chickasha, Okla.; 248 meters, 20 watts; Chickasha Radio & Elect. Co.
KFGF, Mt. Vernon, Wash.; Buchanan, Stevens & Co.
KFGH, Stanford Univ., Calif.
KFGI, St. Louis, Mo.; 266 meters, 100 watts; Nat'l Guards Missouri 188 Infantry.
KFGJ, Arlington, Oregon; Arlington Garage.
KFGK, Cheyenne, Kansas; 229 meters, 10 watts; Cheney Radio Company.
KFGQ, Boone, Iowa; 228 meters, 20 watts; Cray Hardware Co.
KFGV, Utica, Nebraska; 224 meters, 10 watts; Haldredner Radio Supply Co.
KFGX, Orange, Texas; 250 meters; 500 watts; First Presbyterian Church.
KFGY, Baudette, Minn; 224 meters, 15 watts; Gishberg's Radio Shop.
KFGZ, Berrien Springs, Mich; 268 meters, 10 watts; Emmanuel Missionary College.
KFHA, Gunnison, Colo.; Colorado State Normal School.
KFHB, Hoonah, Oregon; F. L. Boardwell.
KFHD, St. Joseph, Mo.; 228 meters, 10 watts; Utz Electric Co.
KFHF, Shreveport, La 266 meters, 150 watts; Central Christian Church.
KFHR, Seattle, Wash; Star Elect & Radio Co; 270 meters; 100 watts.
KFHH, Neah Bay, Wash.; Ambrose McCue.
KFHI, Wichita, Kansas; 224 meters, 20 watts; Charles V. Dixon.
KFHJ, Santa Barbara, Calif.; Fallon.
KFHL, Okaloosa, Ia.; 226 meters, 10 watts; Penn College.
KFHP, Kearney, Nebr; Radio Bug Products Co; 246 meters; 10 watts.

KFHQ, Curtis Bros. Hardware Store, Los Gatos, Calif.; 242 meters, 5 watts.
KFHS, Dow, Clifford J. Lhuue, Hawaii, 275 meters, 30 watts.
KFHT, Nelson, Robert Washington, Hutchinson, Kansas; 229 meters, 50 watts.
KFHU, Sateren, M. G., Mayville, N. D.; 261 meters, 50 watts.
KFHV, McEwan, R. S., Trinidad, Col.; 212 meters, 50 watts.
KFIB, St. Louis, Mo.; 214 meters, 10 watts; Franklin W. Jenkins.
KFID, Iola, Kansas, 246 meters, 20 watts; Ross Arbuckle's Garage.
KFIF, Portland, Ore.; Benson Tech. Student Body.
KFIJ, Platte, S. D.; Sidney I. Thoreau; 236 meters; 5 watts.
KFIK, Gladbrook, Ia.; Gladbrook Electric Co; 234 meters; 20 watts.
KFIO, Spokane, Wash.; North Central High School; 252 meters; 50 watts.
KFIQ, Yakima, Wash.; 224 meters, 50 watts; Yakima Valley Radio Broadcasting Association.
KFIU, Alaska Elect. Light & Power Co., Juneau, Alaska, 226 meters, 10 watts.
KFIV, Broyles, V. H., Pittsburg, Kansas; 240 meters, 20 watts.
KFIX, Reorganized Church of Jesus Christ of Later Day Saints, Independence, Kans.; 240 meters, 500 watts.
KFJ, Seattle, Wash; 236 meters 15 watts; Brott Laboratories.
KFJC, Seattle, Wash.; 233 meters; 100 watts; Post Intelligencer.
KFJD, Greeley, Colo.; Weld County Printing & Publishing Co; 236 meters; 100 watts.
KFJE, Oklahoma City, Okla; 252 meters; 20 watts; Nat'l Radio Co.
KFJH, Selma, Calif.; 273 meters; 10 watts; The Sugar Bowl.
KFJI, Astoria, Ore.; 252 meters; 10 watts; Liberty Theatre.
KFJJ, Carrollton, Mo.; Carrollton Radio Shop; 230 meters; 50 watts.
KFJK, Bristow, Okla.; 233 meters; 100 watts; Delano Radio Elect. Co.
KFJL, Los Angeles, Calif.; radio covers entire U. S. and Canada; Daily, 8:45 to 11 p. m., Sunday, 10 to 11 a. m., 4 to 4:30 and 8 to 11 p. m.; entertainment and educational features; station operates three remote control stations; Earle C. Anthony, Inc.
KFKH, Denver Park Amusement Co; Lakeide, Colo; 226 meters, 10 watts.
KFU, Gridley, Calif.; The Precision Shop.
KFZ, Spokane, Wash.; Doerr-Mitchell Elec. Co.
KGB, Tacoma, Wash.; Mon. Wed. and Fri. 7 to 9 p m, News sport bulletins, lectures, entertainment, weather, tide tables, and time. Tacoma Daily Ledger, Tacoma, Wash.
KGG, Portland, Ore.; Hallock & Watson Radio Service.
KGN, Portland, Ore.; Northwestern Radio Mfg. Co.
KGO, Altadena, Cal. 2500 miles; every Saturday 8 to 9:30 p m Musical program;
KGU, Honolulu, Hawaii, Walkiki Beach, Marlon A. Mulrooney; Honolulu Advertiser;
KGW, Portland, Ore.; Oregonian Pub. Co.
KGY, Leacy, Wash.; St. Martin's College, (Rev. S. Ruth).
KHJ, Los Angeles, Calif.; Daily except Sunday, 12:30 p. m. to 1:15 p. m. news and concerts; 7 to 7:30 p. m. Children's Half Hour; 8 to 9:30 p. m. De Luxe program of music, news and educational features; Sunday; 10 to 11 a. m. Scripture reading, sermon, prayer and sacred musical program; Pacific time; Times-Mirror company.
KHQ, Seattle, Wash.; Louis Wasmer.
KHJ, Stockton, Calif.; C. O. Gould.
KIS, Los Angeles, Calif.; Bible Inst. of Los Angeles.
KLB, Pasadena, Calif.; J. J. Dunn & Co.
KFDC, Spokane, Wash.; Radio Supply Co.
KLN, Monterey Electric Shop, Monterey, Calif.; 261 meters, 10 watts.
KLS, Oakland, Calif.; Warner Bros.
KLK, Oakland, Calif.; Tribune Pub. Co.
KLI, Denver, Colo.; Class B, 485 Reynolds Radio Co.
KMAZ, Macon, Ga. Mercer University.
KMC, Reddy, Calif.; Lindsay-Wetherill Co.
KMJ, Fresno, Calif. Max. 257 1/2 Miles; Musical program, San Joaquin Light & Power Corp.
KMO, Tacoma, Wash., Lovo Electric Co.; Tacoma Times.
KNJ, Roswell, New Mexico; 250 meters; 150 watts; every evening at 8; news, sports, concerts, stock market, sermons; Roswell Public Service Co.
KNT, Aberdeen, Wash.; North Coast Products Co.
KNV, Los Angeles, Calif.; 256 meters; 20 watts; Radio Supply Co. of Cal.
KNX, Los Angeles, Calif.; Electric Lighting Supply Co.
KOB, State College, N. Mex.; time signals and weather reports 12 noon and 10 p m, mountain time; music and lectures Monday, Wednesday and Friday, 7:30 to 8:30 p m; New Mexico College of Agriculture and Mechanical Arts.
KOP, Spokane, Wash.; Spokane Chronicle.
KOP, Detroit, Mich.; Detroit Police Dept.
KOQ, Modesto, Calif.; Modesto Evening News.
KPO, San Francisco, Calif., Hale Bros.
KQI, Berkeley, Calif., Univ. of California.
KQP, Hood River, Oregon; Apple City Radio Club.
KQV, Pittsburg, Pa.; Peoples-Hill Elec. Co.
KQW, San Jose, Calif., G. S. D. Herrold.
KRE, Berkeley Daily Gazette, Berkeley, Cal.; 278 meters, 50 watts.
KSC, San Jose, Calif., O. A. Hale & Co.
KSD, St. Louis, Mo.; 1700 miles; grain, livestock, cotton, New York stocks, poultry and butter market, metal market, official weather and news at 2:40, 10:40, 11:40, 12:40, 1:40, 2:40 and 4 p m; 8 p m 400 meters, musical and other features; Fulmer Publishing Co., St. Louis Post Dispatch.
KSB, Long Beach, Calif. Frost & Dean Radio Research Lab.
KSU, Wenatchee, Wash.
KTW, Seattle, Wash., First Presbyterian Church.
KUS, Los Angeles, Cal. 500 miles; setting up exercises daily, 7 to 7:30 a m and 12:00 noon to 12:30 p m; concert, 65 voices, 6 to 8:45 p m, Wednesdays and Fridays; City Dye Works.
KUY, Del Monte Calif., Coast Radio Co.
KVJ, Francisco, Calif. Examiner Printing Co., San Fran. Examiner.
KWG, Stockton, Cal. Daily Market reports, music and news 4 to 5 p m; Music, 2 to 3 p m, Sunday; Tuesdays and Fridays, music, 8 to 9 p m. Portable Wireless Telephone Co.
KWH, Los Angeles, Calif., Los Angeles Examiner.
KXD, Modesto, Calif., Herald Publishing Co.
KYD, Honolulu, T. H., The Electric Shop.
KYW, Chicago, Ill.; Westinghouse Elec. & Mfg. Co., 345 meters.
KZN, Oakland, Calif., Western Radio Inst.; Preston D. Allen.
KZN, Salt Lake City, Utah, The Desert News.
KZV, Wenatchee, Wash., Wenatchee Battery & Motor Co.
NOR, Anacostia, D. C., U. S. Navy Dept.
PWX, Havana, Cuba, Cuban Telephone Co.
WABD, Dayton, Ohio; 284 meters, 18 watts; Parker Hlsh School.
WAB, Dayton, Ohio, McCook Field, U. S. Army.
WAB, New Orleans, La., Valdemar Jensen.
WAAC, New Orleans, La., Tulane Univ.
WAAD, Cincinnati, Ohio, Ohio Mechanics Inst.
WAEE, St. Louis, Mo., St. Louis Chamber of Commerce.
WAAP, Chicago, Ill., Chicago Daily Drivers Journal.

(Continued on next page.)

Complete Corrected List of U. S. and Canadian Broadcasting Stations

- WAAH, St. Paul, Minn.: Commonwealth Electric Co.
 WAAK, Milwaukee, Wis., Gimbel Bros.
 WAAI, Minneapolis, Minn., Minnesota Tribune Co. & Anderson-Beamish Co.
 WAAM, Newark, N. J., 300 miles; musical and code, every week day 11 to 11:55 a. m., 3 to 4 p. m.; Wednesday evenings 8 to 9; I. E. Nelson Company.
 WAAN, Columbia, Mo., Univ. of Missouri.
 WAAP, Wichita, Kans., United Elec. Co.; Orte W. Taylor.
 WAAS, Decatur, Ga., Georgia Radio Co.
 WAAT, Jersey City, N. J., Jersey Review.
 WAAW, Omaha, Neb., Omaha Grain Exchange.
 WAAZ, Emporia, Kans.; Daylite 100 miles; nite 500-1000 miles; each Tuesday and Thursday from 7 to 8 p. m. Acknowledge all communications at 7:15 p. m. The Hollister Miller Motor Co.
 WABB, Harrisburg, Pa.; 266 meters, 10 watts; Dr. John B. Lawrence.
 WABC, Anderson, Ind.; 299 meters, 10 watts. Fulwider-Grimes Battery Co.
 WABD, Dayton, Ohio; 286 meters, 10 watts; Parker High School.
 WABE, Washington, D. C.; 283 meters, 50 watts; Y. M. C. A.
 WABF, Mt. Vernon, Ill.; 234 meters, 250 watts; Mt. Vernon Register-News Co.
 WABG, Jacksonville, Fla.; Arnold Edwards Plano Co. 248 meters; 10 watts.
 WABI, Bangor, Me.; Bangor Railway and Elect. Co.; 240 meters; 50 watts.
 WABJ, South Bend, Ind.; The Radio Laboratories; 240 meters; 50 watts.
 WABM, Doherty, F. E. Saginaw, Mich.; 254 meters, 100 watts.
 WABD, Lake Avenue Baptist Church, Rochester, N. Y.; 252 meters, 30 watts.
 WAJT, Marshall, Me., Kelly-Vawter Jewelry Co.
 WAJU, Yankton, S. D., Yankton College.
 WABH, Sandusky, Ohio; 234 meters, 100 watts; Lake Shore Tire Co.
 WBAW, W. Lafayette, Ind., Purdue University.
 WBAD, Minneapolis, Minn., Sterling Elec. Co. & Journal Printing Co.
 WBAE, Peoria, Ill., Bradley Elec. Co. & Inst.
 WBAF, Moccasin, N. J., Fred M. Middleton.
 WBAG, Bridgeport, Pa., Diamond State Fibre Co.
 WBAK, Harrisburg, Pa.; 360 meters; Pennsylvania State Police.
 WBAM, New Orleans, La., I. B. Benjony.
 WBSN, Paterson, N. J., Wireless Phone Corp.
 WBAD, Decatur, Ill.; 166 miles; occasional music; sermons; James Millikin Univ.
 WBAF, Fort Worth, Tex.; 4000 miles; Markets and News; Feature concert Monday to Friday inclusive; 9:30 p. m. to 10:45 p. m. Central Time; Quiet nights Saturday and Sunday. The Star-Telegram.
 WBAQ, South Bend, Ind., Myron L. Harmon.
 WBAU, Hamilton, Ohio, Republican Publishing Co.
 WBAV, Columbus, Ohio, Ermer & Hopkins Co.
 WBAW, Marietta, Ohio; Marietta College; 246 meters; 100 watts.
 WBAZ, Wilkes-Barre, Pa., John H. Stenger, Jr.
 WBB, Newark, N. J.; 240 meters; 20 watts; Newark Radio Lab.
 WBBG, Sterling, Ill.; 229 meter, 50 watts; Sterling Radio Equipment Co.
 WBBD, Reading, Pa.; Barby Battery Service; 224 meters; 50 watts.
 WBL, Anthony, Kans.; T & H Radio Co.; 261 meters; 100 watts.
 WBS, Newark, N. J.; Radius 500 mi.; Musical and Educational, week days: 10:30 to 11 a. m.; 1:00 to 1:15 p. m.; 2:15 to 2:30 p. m.; 7:30 to 8:30 p. m.; Sundays: 9 to 10:30 a. m.; to 9 p. m.; D. W. May, Inc.
 WBT, Charlotte, N. C.; 1200 miles; 11:15 weather report 485; 4:30 p. m. mechanical music; 8 p. m. Market Report; 8:30 Tuesday and Friday regular concert; 7:30 p. m. Sunday, Church Southern Radio Corp.
 WBU, Chicago, Ill., City of Chicago.
 WBZ, Springfield, Mass., Westinghouse Elec. & Mfg. Co.
 WCAD, St. Lawrence University, Canton, N. Y.; 280 meters, 50 watts.
 WCAF, Pittsburh, Pa.; 3:30 news and reports; 3:30 weather reports; 4:15 Closing Market reports; 7:30 Late news and lecture; 8:30 musical programs; Kaufmann Beer Co.
 WCAG, New Orleans, La., Daily States Pub. Co.
 WCAH, Columbus, O., Daily program 11:30 to 12:30; Every Tuesday evening at 7, musical program; C. A. Entrekis Electric Co.
 WCAI, San Antonio, Texas, Southern Equipment Co.
 WCAJ, Univ. of Nebr., Nebr., Nebraska Wesleyan University.
 WCAK, Houston, Texas, Alfred P. Daniel.
 WCAL, Northfield, Minn., St. Olaf College.
 WCAM, Villanova, Pa., Villanova College.
 WCAD, Baltimore, Md., Sanders & Stayman Co.
 WCAP, Chesapeake & Potomac Tel. Co., Washington, D. C.; 469 meters, 500 watts.
 WCAQ, San Antonio, Texas, Alamo Radio Elec. Co.
 WCAW, Minneapolis, Minn., Minnesota Durody Industrial Inst.
 WCAT, Rapid City, S. Dak., South Dakota School of Mines.
 WCAU, Philadelphia, Pa.; 1000 miles; Daily 10:30 a. m.; 2:30 p. m.; 6:30 p. m.; regular concert 10 to 12 noon; Tuesdays, Fridays, Saturdays; Durham & Co., Inc.
 WCAV, Little Rock, Ark., J. C. Dice Elec. Co.
 WCAW, Omaha, Neb., Woodmen of the World.
 WCAZ, Burlington, Vermont, University of Vermont.
 WCAY, Milwaukee, Wis., Kesselman O'Driscoll Co.
 WCBA, Allentown, Pa.; Chas. W. Halmbach; 280 meters; 5 watts.
 WCBG, Greenville, O.; 240 meters, 100 watts; K. & K. Radio Supply Co.
 WCBH, Voliva, Wilbur Glenn, Zion, Ill.; 345 meters, 500 watts.
 WCE, Minneapolis, Minn., Findley Elec. Co.
 WCG, St. Louis, Mo., Six Bar & Fuller.
 WCM, Austin, Texas, Univ. of Texas.
 WCX, Detroit, Mich., Detroit Free Press.
 WDAD, Lindshurg, Kas.; Central Kansas Radio Supply.
 WDAE, Tampa, Fla., Tampa Daily News.
 WDAF, Kansas City, Mo.; Kansas City Star; 411 meters; 500 watts. Regular concerts on Mon, Wed, and Fri. nights from 8 to 9:30. Concerts from 3:30 to 4:30 p. m. each afternoon except Sun. Baseball scores 3:25, 4:00, 4:30, 5:00 and 5:50 p. m. Marketgram and weather forecast 5:55 nightly, except Sun. Educational features and musical program 6 to 7 o'clock each night except Sunday. "Nighthawk" Frolic, Coon Sanders orchestra at the Hotel Muehlebach nightly except Sun. 11:45 p. m. to 1 a. m.
 WDAG, Amarillo, Texas, K. Laurence Martin.
 WDAH, Brownsville, Pa., Hartman-Riker Elec. & Mech. Co.
 WDAH, El Paso, Tex.; Trinity Methodist Church.
 WDAI, Erlins, El. Co., Parsons, Kan., 258 meters, 15 watts.
 WDAI, Syracuse, N. Y., Hughes Electrical Corp.
 WDAK, Hartford, Conn., Hartford Courant.
 WDAL, Jacksonville, Fla., Florida Times Union.
 WDAP, Dallas, Texas, Automotive Elec. Co.
 WDAP, Chicago, Ill., markets, and concerts 360; Daily on all business days: 9:30 a. m. receipts and shipments; estimated car lots; local weather report; opening futures market in wheat, corn, oats, barley, pork, lard and ribs. 10 a. m. Future quotations, live stock receipts and prices; 10:30 a. m. futures quotations; 11 and 11:30 a. m. same; 12 noon, futures and cash grain prices; 12:30 and 1 p. m. futures quotations; 1:20 p. m. closing futures quotations and high and low for day. Cash grain prices. Gross bids for cash grain to arrive. 6 p. m. closing quotations; news items. On Saturdays closing prices at 12:05 p. m. Instead of 1:20 p. m. Visible supply changes sent when posted. Regular concert schedule 10 p. m. Tuesdays, Thursdays and Saturdays. Sunday evenings 9 p. m. and 10 p. m. Chicago Board of Trade official station.
 WDAR, Philadelphia, Pa.; Lit Brothers.
 WDAS, Worcester, Mass., Samuel A. Walte.
 WDAU, New Bedford, Mass., Bloem & Kilburn.
 WDAZ, Centerville, Iowa; First National Bank 268 meters, 100 watts.
 WDAY, Fargo, N. D.; 244 meters, 50 watts; Fargo Radio Service Co.
 WDBF, Phillips, Robert G. Youngstown, Ohio; 261 meters, 50 watts.
 WDM, Washington, D. C., Church of the Covenant.
 WDT, New York, N. Y., Ship Owners Radio Service.
 WDT, Tuscola, Ill., James L. Rush.
 WEAA, Fallain & Lathrop, Flint, Mich.; 280 meters; 150 watts.
 WEAB, Fort Dodge, Iowa, Standard Radio Equip. Co.
 WEAC, New York, N. D., Northwest Arkansas Radio Supply Co.
 WEAE, Blackburg, Va., Virginia Polytechnic Inst.
 WEAF, New York City, N. Y., Western Electric Co.
 WEAG, Edgewood, B. I. Nichols-Hineline-Bassett Lab.
 WEAH, Wichita, Kans.; 214 meters; 100 watts; Wichita Bd of Trade.
 WEAT, Ithaca, N. Y., Cornell University.
 WEAY, Vermillion, S. Dak., University of South Dakota.
 WEAK, St. Joseph, Mo., Julius B. Abercrombie.
 WEAM, North Plainfield, N. J., Borough of N. Plainfield.
 WEAN, Shepard Co., The, Providence, R. I.; 273 meters, 100 watts.
 WEAO, Columbus, Ohio, Ohio State University.
 WEAP, Mobile, Ala., Mobile Radio Co.
 WEAQ, Berlin, N. H., Y. M. C. A.
 WEAR, Baltimore, Md., Balt. American & News Pub. Co.
 WEAS, Washington, D. C., The Hecht Co.
 WEAU, Sioux City, Iowa, Davidson Bros. Co.
 WEAY, Houston, Texas, Will Horwitz, Jr.
 WEAZ, Waterloo, Iowa, Donald Redmond.
 WEB, St. Louis, Mo., The Benwood Co., Inc.
 WEV, Houston, Texas, Hurlburt-Still Elec. Co.
 WEW, St. Louis, Mo., Market and weather reports at 9 a. m., 10 a. m., and 2 p. m.; no other regular program; St. Louis University.
 WEY, Wichita, Kansas, Coaradio Co.
 WFAA, Dallas, Texas, A. H. Belo & Co.
 WFAB, Syracuse, N. Y., C. F. Weese.
 WFAC, Superior, Wis., Superior Radio Co.
 WFAF, Poughkeepsie, N. Y., H. C. Spratley Radio Co.
 WFAH, Port Arthur, Texas, Elec. Supply Co.
 WFAJ, Asheville, N. C., Hi-Grade Wireless Instrument Co.
 WFAK, Brentwood, Mo., Domestic Electric Co.
 WFAW, St. Cloud, Minn., Granite City Elec. Co. and Times Pub. Co.
 WFAN, Hutchinson, Minn., Hutchinson Electric Service Co.
 WFAQ, Cameron, Mo., Cameron Radio Co. and Mo. Wesleyan College.
 WFAT, Sioux Falls, S. Dak.; also Argus-Leader.
 WFAV, Lincoln, Nebr., Univ. of Nebr. Dept. of Elec. Engineering.
 WFI, Philadelphia, Penn., also Strawbridge & Clothier.
 WGAC, Brooklyn, N. Y., Orpheum Radio Stores Co.
 WGAD, Ensenada, Porto Rico, Spanish-American School of Radio-telegraphy.
 WGF, Des Moines, Iowa 300 miles; Musical and entertainment Tuesday and Friday 7:30 p. m.; Church Services Sunday at 5 p. m. or 7:45 p. m. as announced; Special programs as announced Register and Tribune.
 WGI, Shenandoah, Iowa, W. H. Gass.
 WGAN, Lancaster, Pa.; Lancaster Elect. Supply Co. 248 meters; 100 watts.
 WGAP, Pensacola, Fla., Cecil E. Lloyd.
 WGAS, Shreveport, La., Glenwood Radio Corp.
 WGAR, Fort Smith, Ark., Southwest American.
 WGAU, Wooster, Ohio; 226 meters, 20 watts; Marcus G. Limb.
 WGAU, Savannah, Ga., B-H Radio Co.
 WGAU, Altoona, Pa., Ernest C. Alright.
 WGAU, Madison, Wis., North Western Radio Co.
 WGAZ, South Bend, Ind., South Bend Tribune.
 WGI, Medford Hillside, Mass., Am. Radio & Research Corp.
 WGL, Philadelphia, Pa., Thos. F. J. Horwitz.
 WGM, Atlanta, Ga., Atlanta Constitution.
 WGR, Buffalo, N. Y., Federal Tel. & Teleg. Co.
 WGV, New Orleans, La., Interstate Elec. Co.
 WGY, Schenectady, N. Y., General Elec. Co.
 WHA, Madison, Wis., Univ. of Wis.
 WHAA, Iowa City, Ia.; 500 miles; 8:30 p. m. Monday, instruction; Tuesday, concert; Wednesday, popular lecture; Friday, University News; public lectures and concerts irregularly; State University of Iowa.
 WHAB, Galveston, Texas, Clark W. Thompson (Fellman's Dry Goods Co.)
 WHAC, Waterloo, Iowa, Cole Bros. Elec. Co.
 WHAD, Marquette Univ., Milwaukee, Wis.; 280 meters, 100 watts.
 WHAG, Cincinnati, Ohio, Univ. of Cincinnati.
 WHAM, Joplin, Mo.; radius, 1384 ml.; Concerts, markets, weather, etc. Tuesday and Thursday evenings: 8 to 10; Daily except Sunday: 10 a. m. to 2 p. m.; Saturday night special: 11 to 12:30; Hafer Supply Co.
 WHAI, Davenport, Iowa, Radio Equip. & Mfg. Co.
 WHAJ, Bluefield, W. Va., Bluefield Daily Telegraph and E. K. Kitts.
 WHAK, Clarkshurg, W. Va., Roberts Hdwe. Co.
 WHAL, Lansing, Mich., Lansing Capitol News.
 WHAM, Rochester, N. Y., Daily-Weather reports 2:40 p. m.; Organ 2:45, 5:00, 6:45; Orchestra 8:00, 7:00; Bed-time stories, Sport results, Business reports and market reports, the latter on 485 meters, 7:15 p. m.; Sunday-Radio Chapel Service, 3:15 p. m.; University of Rochester.
 WHAD, Savannah, Ga., Frederlek A. Hill; every evening 8 to 9; Saturday nights, 12:30 to 1:30 a. m.
 WHAP, Decatur, Ill., Dewey L. Otta.
 WHAQ, Washington, D. C., Semmes Motor Co.
 WHAR, Paramont Radio & Elect. Co., Atlantic City, N. J.; 231 meters, 15 watts.
 WHAS, Louisville, Ky., Courier Journal and Louisville Times Co.
 WHAV, Wilmington, Del., Wilmington Elec. Spec. Co.
 10 p. m. Wednesday evenings; Central Standard time; Iowa Radio Corp.
 WHAY, Huntington, Ind., Huntington Press.
 WHAZ, Troy, N. Y., Rensselaer Polytechnic Inst.
 WHB, Kansas City, Mo., Sweeney Auto & Tractor School.
 WHD, Morgantown, W. Va., W. Va. University.
 WHK, Cleveland, Ohio, Warren R. Cox.
 WHN, Ridgewood, N. Y., Times Printing & Pub. Co.
 WHU, Toledo, Ohio, Wm. B. Ducek Co.
 WHX, Des Moines, Iowa; 300 miles; 5:45 p. m. to 6:15 p. m. Daily; 8:00 p. m. to 10 p. m. Wednesday evenings; Central Standard time; Iowa Radio Corp.
 WIAB, Jostyn Automobile Co., Rockford, Ill.; 252 meters, 50 watts.
 WIAC, Galveston, Texas, Galveston Tribune.
 WIAD, Ocean City, N. J., Ocean City Yacht Club.
 WIAF, New Orleans, La.; G. A. DeCortin, 10 Marlborough Gate; 234 meters, 10 watts.
 WIAG, Norfolk, Nebr.; 200 miles News and Markets 12:15, 3:30 and 5:30 p. m. The Huse Publishing Co., The Norfolk Daily News.
 WIAH, Newton, Iowa, Continental Radio & Mfg. Co.
 WIAI, Springfield, Mo., Heer Stores Co.
 WIAJ, Menah, Wis., Fox River Valley Radio Supply Co.
 WIAK, Omaha, Nebr.; 7:45 a. m. Livestock receipts; 9:10 a. m. Livestock receipts and opening on hogs; 10:15 a. m. rainfall and temperature report and weather forecast for Nebraska and Iowa, Livestock market; 12 m. cattle, hog and sheep market; 1:50 p. m. rainfall and temperature report and weather forecast for Nebraska and Iowa; market detail; 3:50 p. m. complete market reports and estimated receipts for next day; Daily Journal-Stockman.
 WIAD, Milwaukee, Wis., School of Engineering.
 WIAP, Springfield, Mass., Radio Development Corp.
 WIAQ, Marion, Ind.; 226 meters; 10 watts; Chronicle Publishing Co.
 WIAR, Paducah, Ky., Musical 3:30 to 4 p. m. and 7 to 8 p. m. except Sundays Paducah Evening Sun; Albert Bennett, operator.
 WIAS, Burlington, Iowa, Hawk-Eye Home Elec. Co.
 WIAT, Tarkio, Mo., Leon T. Noel.
 WIAU, Le Mars, Iowa, Am. Trust & Savings Bank
 WIAY, Neenah, Wis.; 224 meter, 100 watts; Fox River Valley Radio Supply Co.
 WIK, McKeesport, Pa., K. & L. Flea Shop.
 WIL, Washington, D. C., Continental Elec. Supply Co.
 WIP, Philadelphia, Pa., Gimbel Bros.
 WIAB, Lincoln, Nebr., American Radio Co.
 WIAD, Waco, Texas, Jackson's Radio Engrng. Lab.
 WIAF, Muncie, Ind.; 1800 miles; 7:30 to 8 Monday, Wednesday, Friday evenings music; 6:30 to 7 p. m. Saturday, music; 8:30 to 4 every afternoon, News; 10:30 to 12 M. Sundays, Church service. Smith Electric-Muncie Press.

(Continued on next page.)

Complete Corrected List of U. S. and Canadian Broadcasting Stations

WJAK, Stockdale, Ohio, White Radio Lab.
WJAM, Cedar Rapids, Ia.; D. C. Perham, 268 meters, 20 watts.
WJAN, Peoria, Ill.; 280 meters, 100 watts; Daily except Sunday: 9 a. m. Peoria Livestock; 9:15 a. m. Special Weather Information; 11:30 a. m. weather, opening livestock and market quotations; 1:30 p. m. Closing livestock and markets, official weather information; talk to women by Phyllis Ann; Monday and Thursday, government agrigrams; 5:30 p. m. baseball reports during season; Tuesday, Thursday and Saturday, special concerts as announced at 9:15 p. m.; One musical number precedes each broadcasting. Peoria Evening Star.
WJAP, Duluth, Minn., 1500 miles; Sunday 11 a. m. 12:30 p. m. Church Service and organ recital; First Methodist Church, Rev. Chas. N. Pace, Pastor, Monday 8 p. m. to 9 p. m. musical; Thursday 8 p. m. to 9 p. m. musical; Kelley Duluth Co.
WJAG, Topeka, Kans., Copper Publications.
WJAR, Providence, R. I., The Outlet Co., J. Samuels & Bros.
WJAS, Pittsburgh, Pa., Pittsburgh Radio Supply House.
WJAT, Marshall, Mo., Kelley-Yanver Jewelry Co.
WJAX, Cleveland, Ohio, Union Trust Co.
WJAZ, Chicago, Ill., Chicago Radio Lab.
WJD, Granville, Ohio; 229 meters, 50 watts; Richard Harris Howe.
WJH, Washington, D. C., White & Boyer Co.
WJK, New York, N. Y., De Forest Radio Telephone & Teleg. Co.
WJZ, New York, Radio Corp. of America; Asolin Hall, 465 meters.
WKAA, Cedar Rapids, Ia.; Daily, weather reports, crop reports, government reports; Mondays, Thursdays and Saturdays, music; H. F. Paar.
WKAC, Lincoln, Neb.; Star Publishing Co.; 275 meters; 100 watts.
WKAD, Looft, Charles, East Providence, R.I.; 240 meters, 10 watts.
WKAF, Wichita Falls, Texas, W. S. Radio Supply Co.
WKAN, Montgomery, Ala., Alabama Radio Mfg. Co.
WKAP, Cranston, R. I., Dutcey W. Flint.
WKAQ, Sao Juan, Porto Rico, Radio Corp. of Porto Rico.
WKAR, Michigan Agri. College, East Lansing, Mich.; H. F. Paar.
WKAS, Springfield, Mo., L. E. Lines Music Co.
WKAV, Laconia, N. H., Laconia Radio Club.
WKAW, Beloit, Wis.; 242 meters, 10 watts; Turner Cycle Co.
WKAX, Bridgeport, Pa.; W. A. McFarlane; 231 meters; 15 watts.
WKAY, Gainesville, Ga., Brenau College.
WKC, Baltimore, Md., Joe M. Zamolski Co.
WKY, Oklahoma City, Okla., Oklahoma Radio Shop.
WLAC, Raleigh, N. C., N. C. State College.
WLAD, Minneapolis, Minn., Cutting & Walsh Radio Corp.
WLAI, Syracuse, N. Y., Samuel Woodworth.
WLAL, Waco, Texas, Waco Elec. Supply Co.
WLAK, Bellows Falls, Vt., Vermont Farm Machine Co.
WLAL, Tulsa, Okla., Tulsa Radio Co.
WLAN, Houlton, Me.; 283 meters; 250 watts; Putnam Hardware Co.
WLAP, Louisville, Ky., W. V. Jordan.
WLAR, Kalamazoo, Mich., A. E. Schilling.
WLAT, Burlington, Iowa, Radio Specialty Co.
WLAV, Pensacola, Fla.; daily musical program, 8 to 9 p. m.; The Electric Shop.
WLAW, New York, N. Y., New York Police Dept.
WLAX, Greencastle, Ind., Greencastle Community Broadcasting Station.
WLAY, Fairbanks, Alaska, Northern Commercial Co.
WLAZ, Warren, Ohio, Hutton & Jones Elec. Co.
WLB, Minneapolis, Minn., Univ. of Minn.
WLW, Cincinnati, Ohio, Crosley Mfg. Co.
WLZ, Fairfield, Ohio, U. S. Army.
WMA, Anderson, Ind., Arrow Radio Lab.
WMAB, Oklahoma City, Okla., Radio Supply Co.
WMAC, Cazenovia, N. Y.; J. Edw. Page; 261 meters; 50 watts.
WMAE, Dartmouth, Mass., Bound Hills Radio Corp.
WMAH, Lincoln, Neb., General Supply Co.
WMAI, Kansas City, Mo., Drovers Telegram.
WMAK, Lockport, N. Y., Norton Labs.
WMAL, Trenton, N. J., 100 miles; 7:30 to 9 p. m. Mondays and Thursdays, musical programs, lectures etc.; Trenton Hardware Co.
WMAN, First Baptist Church, Columbus, Ohio; 286 meters; 20 watts.
WMAN, Columbus, Ohio, First Baptist Church.
WMAP, Easton, Pa., Utility Battery Service.
WMAQ, Fair Store Building, Chicago; 25 to 5 p. m. daily; 7 to 7:30 p. m. Monday, Wednesday, Friday; 7:30 to 8 p. m. Tuesday and Thursday; 9:15 to 10 p. m. daily; Chicago Daily News and Fair Department Store.
WMAT, Paramount Radio Corp., Duluth Minn.; 260 meters, 25 watts.
WMAV, Auburn, Ala., Polytechnic Inst.
WMAZ, Macon, Ga., Mercer University.
WMAZ, St. Louis, Mo.; 280 meters, 10 watts; religious services, Sunday 11 a. m. and 8 p. m. Tuesday at 7 p. m. Kingshighway Presbyterian Church.
WMC, Memphis Commercial Appeal; Memphis, Tenn.
WMH, Cincinnati, Ohio, Precision Equipment Co.
WMI, Washington, D. C., Doubleday-Hill Electric Co.
WMAN, Boston, Mass.; Monday 4 to 5 p. m. (silent at night) Tuesday 4 to 5 p. m. and 7 to 8:30 p. m. Wednesday 4 to 5 p. m. 9:30 to 11 p. m. Thursday 4 to 5 p. m. and 7 to 8:30 p. m. Friday 4 to 5 and 8 to 9:30 p. m. Saturday 4 to 5 and 9:30 to 11 p. m. The Silver Shop; J. J. Fanning, announcer Samuel Curtis, operator, 278 meter, 100 watts.
WMAD, Norman, Okla., Okla. Radio Engineering Co.
WMAL, Omaha, Neb., R. J. Rockwell.
WMAN, Syracuse, N. Y., Syracuse Radio Telephone Co.
WMAP, Springfield, Ohio, Wittenberg College.
WMAQ, Charleston, S. C., Charleston Radio Elec. Co.
WMAK, Austin, Texas, Radio Corp.
WMAI, Philadelphia, Pa., 100 miles; Talka, Radio information, music, Chapel Service, Wednesday 7:30 p. m.; Saturday 7:30 p. m.; Sunday 3:30 and 4:30. Every day 12:15, 1 p. m. Lennig Bros. Co.
WMAV, Knoxville, Tenn., People's Tel. and Tel. Co.
WMAW, Fortreas Monroe, Va., Henry Kunzman.
WMAX, Yankton, S. Dakota; 244 meters, 100 watts; Dakota Radio Apparatus Company.
WMAZ, Baltimore, Md., Shipowners' Radio Service.
WNJ, Albany, N. Y., Shotton Radio Mfg. Co., Inc.
WOOA, Ardmore, Okla.; radius 1,500 miles; Tuesdays and Fridays: musical and educational programs; Dr. Walter Hardy; station operated by G. H. Reitz.
WOAB, Grand Forks, N. D.; 280 meters; 10 watts; Valley Radio Co.
WOAC, Lima, Ohio, Maus Radio Co.
WOAE, Fremont, Neb., Midland College.
WOAF, Tyler, Texas, Tyler Commercial College.
WOAH, Charleston, S. C., Palmetto Radio Corp.
WOAI, San Antonio, Tex.; 385 meters; Southern Equipment Company; Programs Daily; 10:30 a. m. opening markets, U. S. weather forecast, crop reports, road reports, cotton reports, money market, livestock quotations and news bulletins, daily except Sun. 12:15 p. m. Livestock quotations, produce markets, and news bulletins. 3 p. m. closing markets, cotton reports, grain and market futures and news bulletins. 7 to 7:15 p. m. baseball scores from American National and Texas leagues, final reports on markets, and news bulletins. Daily except Sun. 9:30 to 10:30 p. m. Concerts. Thurs. 7:30 to 8:30 p. m. Musical and Community Programs. Sunday 11:00 a. m. Church Services, 5:00 to 8:00 p. m. Concerts.
WOAJ, Parsons, Kans., Irving's Electrical Co.
WOAK, Frankfort, Ky., Collins Hardware Co.
WOAL, Webster Groves, Mo., Wm. E. Woods.
WOAN, Lawrenceburg, Tenn., James D. Tausan.
WOAO, Omaha, Neb., 100 miles; Woodmen of the World.
WOAQ, Portsmouth, Virginia; Portsmouth Elwanis Club.
WOAR, Kenosha, Wis., Henry P. Lundskow.
WOAT, Wilmington, Del., Boyd Martell Hemp.
WOS, Jefferson City, Mo., Missouri State Marketing Bureau; 411 meters, 500 watts; first fifteen minutes of every hour from 8 a. m. to 2 p. m.; markets and music at 5 p. m. Monday, Wednesday and Friday nights, 8 to 9:30 concerts. No Sunday program.

WOAV, Erie, Pa., Pa. Nat'l Guard.
WOAW, Omaha, Neb., 100 miles, Woodmen of the World.
WOAX, Trenton, N. J., Franklin J. Wolf.
WOAZ, Stanford, Texas, Fenick Hughes Co.
WOC, Davenport, Ia. Time signals, 10:55 a. m.; weather 11 a. m.; 360 meters, 11:05 opening market quotations, agrigrams; 12:00 noon, chimes concert; 2:00 p. m. closing stocks and markets; 3:40 p. m. educational talk; 5:45 p. m. chimes concert; 6:35, sandman's visit; 7:00 musical program; 8 p. m. lecture; Sunday, religious and musical and religious features, 9 a. m. to 10 p. m.; Palmer's School of Chiropractic.
WOI, Ames, Ia., Iowa State College.
WOK, Pilo Bluff, Ark., concerts Tuesday and Friday evenings beginning at 9; Sunday, song services and sermons from churches at 11 a. m. and 7:30 p. m., Arkansas Light & Power Co.
WOO, Philadelphia, Pa., John Wanamaker.
WOQ, Kansas City, Mo., Western Radio Co.
WOR, Newark, N. J., L. Bamberger & Co.
WOV, Omaha, Neb., E. B. Howell.
WPA, Fort Worth, Texas, Fort Worth Record.
WPAB, State College, Pa.
WPAC, Okmulgee, Okla., Donaldson Radio Co.
WPAD, Chicago, Ill., Wieboldt & Co.
WPAF, Council Bluffs, Iowa, Peterson's Radio Co.
WPAG, Independence, Mo., Central Radio Co.
WPAH, Waupaca, Wis., Wisconsin Dept. of Markets.
WPAJ, New Haven, Conn., Doolittle Radio Corp.
WPAN, Fargo, N. D., North Dakota Agricultural College.
WPAK, Columbus, Ohio, Superior Radio & Tel. Equip. Co.
WPAM, Topeka, Kans., Awerbach & Guttel.
WPAP, Winchester, Ky., Theo. D. Phillips.
WPAO, Frothingham, Md., General Sales & Eng. Co.
WPAQ, Wilmington, Del., Radio Installation Co., Inc.
WPAR, Beloit, Kans., R. A. Ward.
WPAT, El Paso, Texas, St. Patrick's Cathedral.
WPAU, Moorhead, Minn., Concordia College.
WFAZ, Charleston, W. Va., Dr. John H. Koch.
WFG, New Lebanon, O., Nushawk Poultry farm; 234 meters, 50 watts.
WQAA, Parkersburg, Pa., 1500 miles; 10:30 p. m. every evening, Horace A. Beals, Jr.
WQAB, Springfield, Mo., Southwest Missouri State Teachers' College.
WQAC, Amarillo, Texas, E. B. Gish.
WQAD, Waterbury, Conn., Whittall Electric Co.
WQAE, Moore Radio News Station, Springfield, Vermont; 275 meters, 50 watts.
WQAF, Sandusky, Ohio, Sandusky Register.
WQAH, Lexington, Ky., Brock-Anderson Elect. Eng. Co.
WQAL, Cook County Tel. & Tel. Co., Mattoon, Ill.; 258 meter, 10 watts.
WQAM, Miami, Fla., Electric Equipment Co.
WQAN, "The Voice of Anthracite," 280 meters, 150 watts; Scranton Times, Scranton, Pa., musical and informative programs three daily; 12:30, 4:30 and 7:30 p. m. except Sunday. Music, news, weather forecasts and reports baseball scores, market quotations, evening bedtime stories. Special musical programs by vaudeville and other artists on Tuesday and Friday evenings at 8 p. m.
WQAO, New York, N. Y., Calvary Baptist Church.
WQAP, Lincoln, Neb., Am. Radio Co.
WQAQ, Abilene, Texas, West Texas Radio Co.
WQAR, Muncie, Ind., Press Publishing Co.
WQAS, Lowell, Mass.; Prince-Walter Company.
WQAV, Huntington & Guerry, Inc., Greenville, S. C.; 258 meters, 15 watts.
WQAW, Washington, D. C.; Catholic University of America; 236 meters; 50 watts.
WQAX, Peoria, Ill.; Radio Equipment Co.
WQAY, Hastings, Neb., Gaston Music & Furniture Co.
WQAZ, Greensboro, North Carolina; Greensboro Daily News.
WRAA, Houston, Texas, Rice Institute.
WRAB, Savannah, Ga.; Savannah Board of Public Education.
WRAC, Laporte, Ind.; 224 meters, 10 watts; Radio Club, Inc.
WRAD, Marion, Kas.; 248 meters; 10 watts; Taylor Radio Shop.
WRAH, Providence, R. I.; Stanley N. Read.
WRAL, St. Croix Falls, Wis.; Northern States Power Co.
WRAM, Carthage, Ill., Robert E. Compton & Carthage College.
WRAN, Grover, Waukeo Co., Ia. Crosse, Wis.; 234 meters, 100 watts.
WRAO, St. Louis, Mo., Radio Service Co.
WRAP, Winter Park, Fla.; Winter Park Electric Construction Co.
WRAR, David City, Neb.; J. C. Thomas; 226 meters; 20 watts.
WRAS, McLeansboro, Ill.; Radio Supply Co.
WRAU, Amarillo, Texas, Daily News.
WRAW, Yellow Springs, O., Antioch College.
WRAW, Good, Horace O., Reading, Pa.; 258 meters, 10 watts.
WRAZ, Carthage, Mo., Gloucesterville, N. J.; 268 meters, 50 watts.
WRAY, Scranton, Pa.; radius 400 mi.; Sunday Chapel service; Wednesday: Selective Musical program, 8:15 to 10; Saturday: 8:15 to 11; Radio Sales Corp., 280 meters, 100 watts.
WRAZ, Radio Shop of Newark, Newark, N. J. 233 meters, 50 watts.
WRB, Washington, D. C.; Radio Corporation of America, 469 meters, 500 watts.
WRK, Hamilton, Ohio, Doron Bros. Elec. Co.
WRL, Schenectady, N. Y., Union College.
WRM, Urbana, Ill., Univ. of Ill.
WRP, Camden, N. J., Federal Inst. of Radio Telg.
WRP, Dallas, Texas, City of Dallas, Police and Fire Signal Dept.
WRW, Tarrytown, N. Y.; Tarrytown Radio Research Lab; 275 Meters; 50 watts.
WSAB, Cape Girardeau, Mo., Southeast Mo. State College.
WSAC, Clemson College, S. C.; Clemson Agricultural College.
WSAG, Davis, Loren V., St. Petersburg, Fla.; 244 meters, 10 watts.
WSAH, Chicago, Ill.; A. G. Leonard, Jr.; 248 meters, 500 watts.
WSAJ, Grove City, Pa., Grove City College.
WSAK, Daily News, The, Middletown, Ohio; 258 meters, 20 watts.
WSAL, Brookville, Ind.; Franklin Electric Co.
WSAP, Allentown, Radio Club, Allentown, Pa.; 229 meters, 10 watts.
WSAP, New York City; Seventh Day Adventist Church.
WSAQ, Round Hills Radio Corp., Dartmouth, Mass.; 280 meters, 100 watts.
WSAR, Doughty & Welch Elect. Co., Fall River, Mass.; 254 meters, 10 watts.
WSAT, Plainview Elect. Co., Plainview, Texas; 268 meters; 20 watts.
WSAU, Chesam, N. H.; 229 Meters; 10 watts; Camp Marfield.
WSAW, Canandaigua, N. Y.; 275 Meters; 100 watts; Curlee & McElwee.
WSB, Atlanta, Ga., Atlanta Journal.
WSL, Utica, N. Y., J. & M. Elec. Co.
WSV, Birmingham, Ala., Alabama Power Co.
WTAB, Fall River Daily Herald, Fall River, Mass.; 248 meters, 10 watts.
WTAC, Johnstown, Pa., Penn. Traffic Co.
WTAD, Carthage, Ill.; 229 meters; 50 watts; Robert E. Compton.
WTAF, New Orleans, La.; 242 meters; 20 watts; Louis J. Gallo.
WTAS, Elgin, Ill.; 275 meters, 500 watts; Chas. E. Erbstein.
WTAU, Tucumseh, Neb., Ruckey Battery & Elec. Co.
WTAW, College Station, Texas; Ag'ltile & Mech. College; 254 meters; 50 watts.
WTG, Manhattan, Texas, Kans. State Agri. College.
WVP, New York, N. Y., Signal Corps, U. S. Army.
WWAC, Waco, Tex.; 3000 miles; Weather forecast 11 a. m. daily; musical concerts, daily, 1:30 p. m. and on Wednesday and Saturday evenings at 8; Sanger Bros.
WWAD, Philadelphia, Pa., Wright & Wright, Inc.
WWAX, Laredo, Texas, Workman Bros.
WWB, Daily News Print Co., Canton, Ohio; 268 meters, 200 watts.
WWI, Dearborn, Mich., Ford Motor Co.
WWJ, Detroit, Mich., Evening News.
WWL, New Orleans, La.; Loyola University; 280 meters, 100 watts.

Complete Corrected List of U. S. and Canadian Broadcasting Stations

Canadian Stations

CFAC, Calgary, Alta., Can. Western Radio Co., Ltd.
 CFCA, Toronto, Ont., Can. Toronto Star.
 CFGB, Vancouver, B. C., Can. Marconi Co.
 CFCE, Halifax, N. S., Can. Marconi Co.
 CFCH, Trois Rivières, Ont., Can. Marconi Co.
 CFCL, Walkerville, Ont., Can. Abitibi Power & Paper Co., Ltd.
 CFEN, Calgary, Alta., Can. W. W. Grant Radio, Ltd.
 CFEX, London, Ont., Can. The London Advertiser.
 CFPC, Fort Frances, Ont., Can. International Radio Develop. Co.
 CFTC, Toronto, Ont., Can. The Bell Telephone Co.
 CFYC, Vancouver, B. C., Can. Victor Westworth Odium.
 CFZC, Montreal, Que., Can. Can. Westinghouse Co., Ltd.
 CHBC, Calgary, Canada, W. W. Grant Radio, Ltd. (Morning Albertan.)
 CHCA, Vancouver, B. C., Can. Radio Corp. of Vancouver, Ltd.
 CHCB, Toronto, Can. Marconi Co.
 CHCC, Edmonton, Alta., Can. Can. Westinghouse Co., Ltd.
 CHCF, Winnipeg, Man., Can. Radio Corp. of Winnipeg, Ltd.
 CHCQ, Calgary, Alta., Can. Western Radio Co., Ltd.
 CHCS, London, Ont., Can. London Radio Shoppe.
 CHCX, Montreal, Que., Can. E. L. Silver.
 CHCZ, Toronto, Ont., Can. Globe Printing Co.
 CHCC, Vancouver, B. C., Can. Can. Westinghouse Co., Ltd.
 CHVC, Toronto, Canada, Metropolitan Motors Co.
 CHXC, Ottawa, Ont., Can. J. R. Booth, Jr.
 CHYC, Montreal, Que., Can. Northern Elec. Co.

CJBC, Montreal, Que., Can. Dupuis-Freres.
 CJCA, Edmonton, Alta., Can. Edmonton Journal, Ltd.
 CJCB, Nelson, B. C., Can. James Gordon Bennett.
 CJCD, Toronto, Can., T. Eaton Co.
 CJCE, Vancouver, B. C., Can. Vancouver Sun.
 CJCF, Kitchener, Ont., Can. News Record, Limited.
 CJGG, Winnipeg, Canada, Manitoba Free Press.
 CJCH, Toronto, Ont., Can. United Farmers of Ontario.
 CJCI, St. John, N. B., Can. McLean, Holt & Co., Ltd.
 CJCN, Toronto, Ont., Can. Simons, Agnew & Co.
 CJCS, Halifax, N. S., Can. Eastern Telephone & Telegraph Co.
 CJCY, Calgary, Alta., Can. Edmund Taylor.
 CJGC, London, Ont., Can. London Free Press.
 CJNC, Winnipeg, Man., Can. Tribune Newspaper Co.
 CJSC, Toronto, Ont., Can. Evening Telegram.
 CKAC, Montreal, Can. La Presse.
 CKCB, Winnipeg, Man., Can. T. Eaton Co., Ltd.
 CKCD, Vancouver, B. C., Can. Vancouver Daily Province.
 CKCE, Toronto, Ont., Can. Can. Ind. Telephone Co.
 CKCK, Regina, Sask., Can. Leader Pub. Co.
 CKCR, St. John, N. B., Can. Jones Elec. Radio Co., Ltd.
 CKCS, Montreal, Que., Can. The Bell Telephone Co.
 CKCZ, Toronto, Ont., Can. Westinghouse Co., Ltd.
 CKKC, Toronto, Ont., Can. Radio Equipment & Supply Co., Ltd.
 CKOC, Hamilton, Ont., Can. Wentworth Radio Supply Co., Ltd.
 CKQC, London, Ont., Can. Radio Supply Co.
 CKZC, Winnipeg, Man., Can. Salton Radio Eng. Co.

Radio Frequency Tuner

(Continued from page 7.)

The mounting and arrangement of the apparatus is clearly shown in Figure 1.

Vernier condensers should be used and should be of a low loss type, in order that they enable the builder to tune closely.

The grid condenser is connected directly across the grid and plate terminals of the tube sockets and the grid leak of the tubular type is mounted as shown.

All connections should be short, and should be soldered with flux and wiped with alcohol after the soldering is completed.

The two tube sockets are mounted directly in front of the peep slots in the panel, permitting the operator to observe the brilliancy of the valve filaments

while they are in use.

The rheostats should be of proper design for the tubes used, the first for the radio frequency amplifier requiring no vernier. The detector rheostat should however include this highly desirable feature.

The 35-turn coil used in the filter arrangement in the plate circuit should be a 30 or 35-turn honeycomb coil or may be homemade, using a cardboard or bakelite tube, three and one-half inches in diameter, wound with the required number of turns, using No. 20 D C C wire. It is mounted by soldering it directly to the connecting leads which are in turn soldered to the proper points on the 23-plate condenser. If tinned copper bus bar is used in connecting up the set, it will furnish ample rigidity to hold the coil in place.

All radio frequency circuits require the use of a potentiometer to correctly control the grid bias. The potentiometer is mounted directly over the phone jack in the upper left-hand corner of the panel as shown.

Battery posts are mounted on a strip of bakelite on the back of the mounting board and the cabinet is slotted to allow this strip to slide into the back. This keeps all unsightly connecting wires away from the view of the operator.

If an amplifier is to be added, it may be constructed according to instructions in the August issue of RADIO AGE. The single circuit jack shown is substituted for by a double circuit jack and the two center springs on the double circuit jack should be connected to the binding posts P and B as shown in Figure 1, page six of the August issue. Otherwise they are connected to the P and B terminals of the first transformer of the audio frequency amplifier.

This circuit gives the best results when a U V 301 or C 301 is used as an amplifier, and a C or U V 300 is used as a detector. The merits of a U V 201 A tube as an audio frequency amplifier are unsurpassed but the results obtained when it is used as a radio frequency amplifier are not particularly gratifying.

If the operator wishes to make the set a regenerative one, a variometer may be placed in the plate circuit between the tube socket connection marked P and the phone jack. Regeneration when used with radio frequency does not always give gratifying results, and the experiment is left entirely to the judgment of the builder.

The tuning of the set requires patience as the set tunes very closely and intelligent operation is the only certain method in which results may be obtained.

Wires Supplant Radio

The Air Mail Service, Post Office Department, has ceased to utilize the radio circuit between Reno and Naval radio station San Francisco, a leased wire service having been inaugurated by the post office department between those points.

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