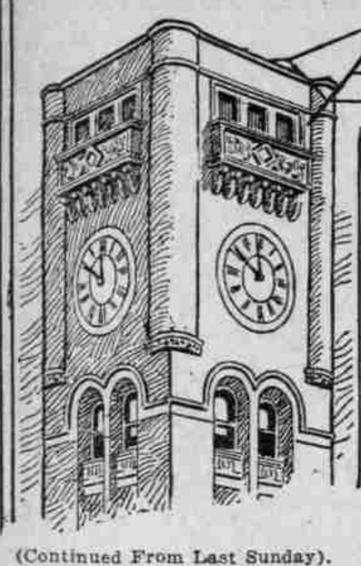
RADIO WAVES AND RIPPLES



(Continued From Last Sunday).

AFTER having explained the erection of an outside aerial with due regard to the fire and life hazards as might occur from lightning or from accidental contact with light and power lines, L. W. Going, chief electrical inspector of the city of Portland, emphasizes the necessity of protective devices in a radio installation as follows:

"Lead-in wires should be of copper or other approved metal which will not corrode excessively and in no case should they be smaller than No. 14 B & S gauge, except that approved copper-clad steel wire not less than No. 17 B & S gauge may be used. Lead-in wires on the outside of buildings should not come nearer than four inches to electric light and power wires unless effectively insulated therefrom by continuous and firmly fixed non-conductor that will maintain permanent separation. The non-conductor must be in addition to any insulation on the wire.

"Lead-in wires should enter building through a non-combustible, non-absorptive insulating bushing. This provision is chiefly to protect the wiring against the possibility of short circuiting with electric light or power wires which may run in the wall and whose location is unknown to the persons installing the radio equipment. This requirement serves also to protect the antenna lead-in wire against contact with metal lath or other metal parts of the building. Furthermore, from a signaling standpoint, it is desirable to insulate effectively all parts of receiving antennas in order that wet weather may not cause the antenna to become partly short circuited or grounded, which would result in weakening the received signals.

"In order that lightning discharges or less violent discharges caused by induction or by atmospheric electricity may be carried safely to the ground with a minimum of damage to the receiving apparatus, building or operator, it is desirable that lead-in wires be protected with an approved protective device properly connected and located, preferably outside the building as near as practicable to the point where the wire enters the building. The protective device should be suitably protected from the weather when installed in exposed locations. The antenna terminal of a receiving set should be connected to the point of junction of the lead-in wire with the arrester.

"The protective device must be an approved lightning arrester which will operate at a potential of 500 volts or less. Protective devices of reliable manufacture are approved by the underwriter's laboratories and can be depended upon to operate at the required voltage. Cheaply constructed home-made arresters should not be used, since they may easily get out of order and fail to operate at the low voltage which is desirable.

"While an arrester connected between the antenna and ground will probably afford sufficient protection, it is somewhat safer to install a switch which will, in its closed position, form a shunt around the protector device. This ground switch can be used to ground directly the aerial when the apparatus is not in use and especially during thunder storms.

"The ground wire for the protective device should in no way be confused with the ground wire attached to the receiving instrument. This ground wire may be bare or insulated and should be of copper but less than No. 14 B & S gauge. The ground wire should be carried outside the building in as straight a line as possible to a good and permanent ground. In running this ground wire it is well to bear in mind that it is more important to provide a satisfactory contact at the ground itself than to avoid a few bends in the ground wire, although, of course, the number of bends should be reduced to a minimum.

"In case a satisfactory ground cannot be obtained outside the building, the protective ground wire may be brought into the basement or cellar and connected in an approved manner (by use of an approved ground clamp) to the nearest available water pipe. Gas piping must not be used for grounding protective devices. Other permissible grounds are grounded steel frames of buildings or the grounded metal work in the building and artificial grounds, such as driven pipes, plates, cones, etc. Where the ground wire is brought into the building, it should be protected by an approved bushing, for the same reasons as the antenna lead-in wire before mentioned.

"The ground wire should be protected against mechanical injury. If exposed at all to mechanical injury, it should be not smaller than No. 10 B & S gauge. Ground wire should not be run through iron pipe or conduit because of the choking effect at radio and lightning frequencies.

"The ground wire attached to a receiving set may be bare or insulated except that where it is necessary to pass through a wall, the ground wire should be insulated from possible contact with light or power wires by an approved bushing. The size and kind of ground wire used should be the same as before mentioned for the lead-in wire. The receiving equipment ground wire may be run inside or outside the building. When it is run in full compliance with the rules for protecting ground wire it may be used as the ground wire for the protective device.

"An ordinance embodying regulations similar to the foregoing is now in the course of preparation and will become effective upon passage by the city council. The ordinance will require that a permit be secured for all receiving stations except those using an indoor antenna. A permit also is required for sending stations. The rules in connection with sending stations are much more stringent. Further information in connection with wiring installations may be obtained from the electrical division, room 412, city hall."

Radio Notes.

RADIO has been the means of greatly improving the service of the United States lighthouse service. Many of the seagoing tenders have been equipped with radio installations which enable the crews to keep in touch with the shore as well as receive valuable instructions in their calling and also much-needed entertainment. Isolated lighthouses in Alaskan waters have also been equipped with radio telephone sets through the co-operation of the navy. Many of the lighthouses along both coasts have been made into radio or signal stations and aid ships at sea in determining their positions, which is a service of inestimable value to the skippers during heavy weather.

* * *

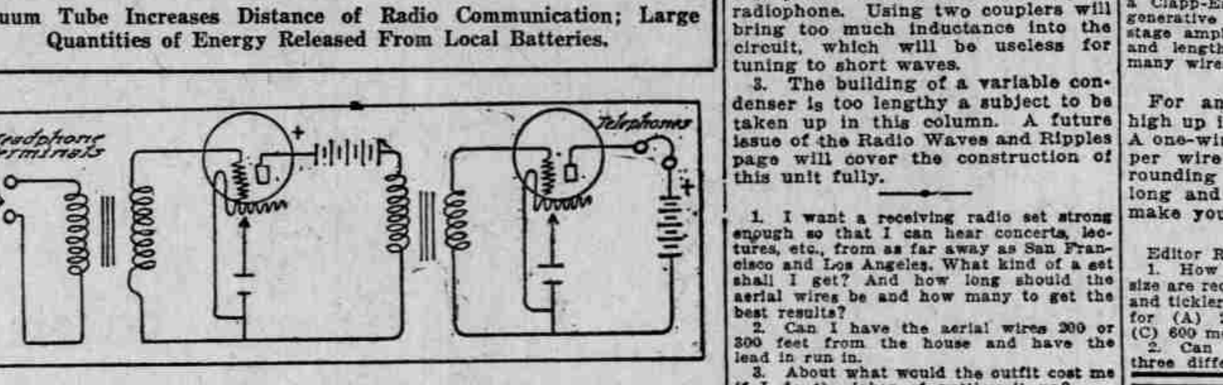
The use of a condenser instead of an antenna for the transmission and reception of radio signals is being investigated by the United States bureau of standards at Washington, D. C. Taking advantage of the fact that the ordinary aerial corresponds to one plate of a condenser and the ground to the other, a pair of large metal plates were substituted in an experiment and signals received very well from many miles away. The use of this condenser instead of the usual aerial and ground proved that it was freer from static disturbances. This should prove of value to those wishing to make portable sets to be carried around when traveling.

* * *

Radio receiving apparatus is being installed at the Polson railroad camp northeast of Hoquiam, Wash., with a view of ascertaining whether the concert programmes broadcast from the coast cities can be heard there with any degree of success, according to Robert Polson, manager of the lumber company. The suggestion was made by E. B. Fish, director of the loggers' and lumbermen's welfare bureau, at a recent meeting at the camp. If it proves feasible other camps of the company will install sets. Harbor radio fans to date have been unable to receive from distant stations. Experts have visited the half dozen receiving sets at Hoquiam but have been unable to make the apparatus. The code messages from ships at sea come in quite strong, but music has been heard infrequently and then indistinctly.

GREATEST VALUE OF AUDION IS ABILITY FOR AMPLIFYING

Vacuum Tube Increases Distance of Radio Communication; Large Quantities of Energy Released From Local Batteries.



HOOK-UP FOR TWO-STAGE AUDIO-FREQUENCY AMPLIFIER TO BE ADDED TO REGENERATIVE RECEIVER.

WHILE the vacuum tube, or "audion," as it is commonly called, has proved to be the most sensitive detector or rectifier of radio oscillation known today, its greatest value in radio communication is its amplifying abilities. Before the audion lamp was developed the distances over which radio communication could be maintained were quite small. In fact, it was necessary to shoot tremendous volumes of electrical power into the ether in order to carry the oscillations a few hundreds of miles. Today, with the use of audions, the initial energy can be very small as it merely acts as a "trigger" of the audion, or as a relay which releases large quantities of energy from local batteries.

The audion amplifies the initial energy in this manner: The small currents which it is desired to amplify are led to the grid and filament or "input" connections of the audion. These currents produce changes of potential on the grid with respect to the filament. These variations in turn produce variations in the plate current or output current of the audion. Under the proper conditions very small currents in the grid filament circuit thus are made to cause large currents to flow in the output circuit.

If the amplification by one audion is not sufficient to bring in distant broadcasts loud enough, the output of the audion amplifier may be connected to the input of a second audion and the same action be repeated as in the first, with even larger amounts of current released from the output of the second audion. Thus the initial current has been amplified twice, or stepped up twice. This same action can be repeated any number of times, using more audion lamps, although it is not advisable to use any more than three steps of amplification.

Using an ordinary audion with a good coupling transformer, the energy amplification may be as great as 400 times the tube, with the audibility amplification about 20 times. Therefore, with a three-stage amplifier the sound will be 8000 times louder than the original intensity.

With an amplification as high as that, undesirable noises, such as arise in the audions themselves, and outside noises also are amplified in the same proportion as the desired signals. Radio phone music amplified to an intensity over 8000 times will become harsh and distorted and no amount of tuning with the other units of the apparatus will tone it down.

There is a distinction between radio and audio amplification. Although the audion tube is used in both forms of amplification, the circuits of their connections are different. In radio amplifiers the high frequency currents are amplified before they enter the detector tube to be converted into sound. In audio amplifiers the low frequency or sound frequency current is amplified. For radiophone reception the radio frequency type is the more desirable because they give the least amount of distortion and therefore bring in the clearest reproduction of the sounds from the transmitter. Another thing, the radio frequency amplifiers permit a receiving set to respond to signals from a much greater distance away than is possible with the audio frequency.

Audio frequency amplification is obtained by means of iron core transformers, while radio frequency is obtained by means of tuned circuits. Roughly speaking, the radio frequency amplifier boosts the feeble incoming impulses to a higher value, while the audio frequency amplifier increases many times the current released in the plate circuit in the audion detector. The audio-frequency amplifier may be used in amplifying the rectified current in a crystal detector circuit. In these cases the leads where the telephones are usually connected are taken to the posts marked "input" on the amplifier or to the transformer coil.

This transformer coil, or amplifying transformer, as it is usually called, has an iron core and primary and secondary windings wound to different ratios, depending on the type of amplifying tube used. As a rule a two-step amplifier used in conjunction with a short-wave regenerative receiver is sufficient to amplify local broadcast signals to a great enough volume to be heard a great distance away from the phones. The addition of another step will bring in distant signals much better, but should not be used for local work, as it will distort the music or speech.

The same battery can be used to light the filaments in the detector and amplifying tubes. Also the same B battery can be used, though it will usually be found that the amplifying tubes will need a much higher voltage than the detector. As high as 90 volts is sometimes necessary, and if power tubes are used as amplifiers 150 or 200 volts will be needed to get the best results.

Radio Questions and Answers.

Editor Radio News:
Kindly mail complete instructions how to construct a radio set, recently described in your paper. Will you also please give me the following information:
1. Can a loose coupler be used in place of the variometer or vario-coupler?
2. Can I use two loose couplers if two variometers or coupler are called for?
3. Can you give me information how to build a good capacity variable condenser?
AN OREGONIAN READER, Astoria, Or.

1. If you mean the construction of a short-wave receiver taken up in three installments in the April 19, 26 and March 2 issues, write to our circulation department for copies of those issues. Yes, the loose coupler is a very efficient tuner if correctly made.

2. Two loose couplers are unnecessary for short-wave receiving of radiophone. Using two couplers will bring too much inductance into the circuit, which will be useless for tuning to short waves.

3. The building of a variable condenser is too lengthy a subject to be taken up in this column. A future issue of the Radio Waves and Ripples page will cover the construction of this unit fully.

1. I want a receiving radio set strong enough so that I can hear concerts, lectures, etc., from as far away as San Francisco and Los Angeles. What kind of a set shall I get? And how long should the aerial wires be and how many to get the best results?
2. Can I have the aerial wires 200 or 300 feet from the house and have the lead in run in.
3. About what would the outfit cost me if I do the labor of putting it up?
B. THOMASON, Sheridan, Or.

1. For long distance reception a regenerative and two-step amplifier with either a pair of 2000-ohm telephone receivers or a loud speaker. One wire 200 or 250 feet long running to your instruments will make a very excellent aerial arrangement if well insulated from nearby objects.

2. That will make your antenna too long for short wave length reception. Don't make the entire length, lead included, over 300 feet.

3. Such sects as described will cost from $150 to $250.

Editor Radio News:
Will you kindly answer a few questions on radio. They are questions on the set that was shown in The Oregonian about a month ago?
1. How many pounds of No. 22 double cotton covered wire will it take for the main inductance and what is the cost?
2. How much wire will it take of number single cotton covered magnet wire on the tickler coil and what is the cost?
HARRY VOGES, Portland.

1. One-eighth of a pound will be sufficient for the winding of the main inductance. Write to the dealers advertising in the radio section for the prices.

2. About 50 feet will be necessary for the tickler coil.

Editor Radio News:
1. Can a magnavox be used with a crystal set?
2. What makes the loud rattling noise when one of the local stations are broadcasting?
Who are the following: 7NA, 7AEA, 7YG, 7EO, 7XG and 7XI?
W. B. P., Portland.

1. No.

2. What you hear is other noises which the transmitter is picking up such as moving about of entertainers or people in the transmitting room.

3. These stations are amateur and experimental located in Portland. You can get a call book with the names of all stations listed from any of the dealers advertising in this section.

Editor Radio News:
Will you please answer the following questions in your radio column? In using a Clapp-Eastham company type HR regenerative receiver and a type HZ two-stage amplifier what should the heighth and length of the antenna be and how many wires are necessary?
D. M. K., Florence, Or.

For any set put your aerial as high up in the air as you can get it. A one-wire aerial of No. 12 bare copper wire well insulated from surrounding objects and about 200 feet long and at least 40 feet high will make you an excellent arrangement.

Editor Radio News:
1. How many turns of wire and what size are required on the primary, secondary and tickler of a three-coil spider web tuner for (A) 200 meters? (B) 360 meters? (C) 600 meters?
2. Can these coils be tapped for the three different wave lengths and get as good results as if you used a separate coil for every wave length?
HAROLD RANKIN, Salem, Or.

1. For wave lengths from 145 to 350 meters with primary condenser of .0005 mcf capacity and .001 in secondary the primary should have 35 turns, secondary 25 and tickler coil 35, wound with No. 22 wire. For waves from 305 to 750 with same condensers primary should have 75 turns, secondary 50 and tickler coil 35 using No. 22 wire.

2. The results will not be as good as there will be no way to vary the relations of the three coils with respect to each other as is done with three coils of different wave lengths.

Editor Radio News:
1. What is the receiving radius of a short wave regenerative receiver? Will a set of this kind receive messages from Honolulu? Is there any other equipment that could be added to this set which would increase its receiving radius?
2. What are the functions of a variometer?
3. Could a variometer be used instead of a tuning coil on a crystal set and would this give me better results?
A READER, Portland.

1. With favorable conditions, the short wave regenerative receiver will pick up messages from several thousand miles. However, if one or two stages of amplification are added the set can be depended upon for long distance reception more constantly.

2. Variometers are used either for sharp tuning or in a regenerative set for making the tube feed back on itself or oscillate thereby creating local amplification.

3. Yes, a variometer is used in a crystal set with very good results.

Editor Radio News:
I note my receivers are marked 1000 on each magnet. They are the Manhattan Mescos. Would not this prevent me from receiving your broadcasts?
E. PRICE, Castle Rock.

This means that each receiver is wound to 1000 ohms each, making 2000 for the pair. They will not prevent your receiving the broadcasts if everything else is O. K.

RADIO

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Westinghouse Aeriola Grand and other long-distance sets and equipment.
We are receiving regular shipments.
Keep in touch with radio headquarters.
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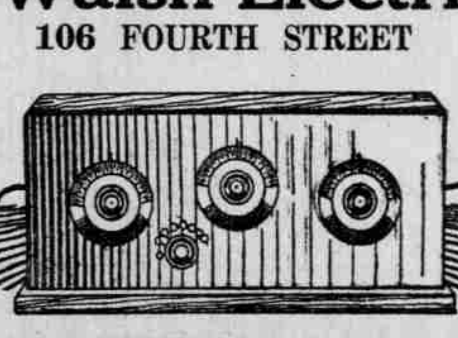

Radio Receiver
High-class Panel Set, with two-step amplifier, tubes, phones, batteries, etc. Complete $140.00
Small Broadcast Receiver, without tube, batteries or phones—a bargain $25.00
(I Will Install)
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RADIO PHONOGRAPH
PORTLAND INVENTION
The Sincoe radio phonograph is now being used with wonderful success by The Oregonian broadcasting station.

Portland, Ore. March 31, 1922.

Mr. W. O. Erbes,
4813 72nd Street S E.,
Portland, Oregon.

Dear Sir:-

We, the undersigned, who are connected with the Radio Wireless here in Portland and elsewhere, have had opportunity to give your new Syncoe Assimilating Phonographic Radio Tone Regulating Modulator and Modifying Amplifier a severe test, and have found it up to every expectation of ours. The entire elimination of the scratch and surface noise is especially commendable. The rich full, natural tone that this instrument possesses, together with its ability to withstand any and all forced tonal emergencies, free from distortion and blast makes it an instrument highly desirable in the sending and receiving of messages, oral, vocal or musical.

The extreme sensitiveness makes its use especially adaptable for the radio wireless, and we highly recommend your invention as the instrument that will fill a much needed want. The entire absence of megaphone effects and the surface noises that are to be found in all different makes of phonographs makes the use of your specially constructive instrument imperative, and compulsory if good results are to be had for human ear consumption.

Wishing you success, and hoping that you can make them fast enough to fill the orders that are coming in, I am,

Yours respectfully,
Radio Insp. [illegible]
Willard [illegible]
[illegible] Radio Operator
[illegible] Chief Engineer [illegible]
J B [illegible] Branch Mgr [illegible]
[illegible] Operator
Tested April 3rd 1922
I made careful tests in my station of the Sincoe and feel satisfied it produced [illegible] and gave better modulation than any device I have yet tested. Willard [illegible]
Hallock & Watson Radio Service by C.H. Watson

These machines may be procured for the next 30 days from the inventor, W. O. Erbes, 4813 Seventy-second street S. E. Phone 620-86. After this time the phonograph will be sold by a corporation on a royalty basis.
This machine can be used as an auxiliary to the magnavox in broadcasting or for transmitting.

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Spanish cedar cabinets, beautifully finished, with 6x8¼ special process insulate raised panel, all ready for your crystal or tube set. 8¼x5¼x5¼ inside dimensions.
$6.00 Each
4-inch coils wound to U. S. Bureau of Standard Specifications, with tapps.
Woven tapps, $1.50. Soldered tapps, $1.00
Tuning Coils, single slide, $3.50. Double slide, $4.00.
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Complete stock of radio equipment.
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Will the Other Radio Dealers Do This for You?
Returnable, face value, on tube set at later date.

Associated Radio Engineers 103
COMPLETE SETS INSTALLED
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The total sum on installation of $52.50
Received $10.00 on above contract $42.50 to be paid on completion of installation.
[illegible]
Edw. S. Munn
245 W. Kilpatrick
J. H. Holden

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Detector panel, with jack	$ 9.50
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Variometer panel, mounted	8.50
Variometer, unmounted	5.25
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