Vol. 6. No. 1.—Published by A. F. Penton & Co. at 60-62 Adelaide St. E., Toronto, Ont.

RADIO

APRIL - 1923 Price 15c

CONDENSITE CELORON STANDARD RADIO PANEL

The package speeds the sale

CELORON Radio Panels in standard sizes enable you to give the radio set-builder immediately the panel he needs. Each panel makes a separate package wrapped in glassine paper to protect the surface.

Stock Celoron Radio Panels in standard sizes and you carry a packaged article that turns rapidly and brings substantial profit. Furthermore, you give a service that can easily lead to the sale of other parts the set-builder needs for completing his set.

This material is a leader among radio insulations used by leading manufacturers of radio equipment. It is easily worked, machined, drilled, and tapped and will engrave evenly without feathering.

The following panel sizes have been selected only after thorough investigation as to the needs of set-builders and the requirements of many dealers:

1.—6 x 7	5.— 9 x 14
2.—7 x 9	6.— 7 x 21
3.—7 x 12	7.—12 x 14
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Thickness ⅛ or 3/16.

**This strip for cutting special sizes. Not wrapped in glassine.*

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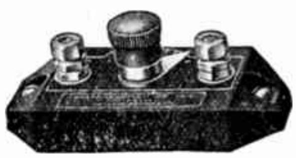

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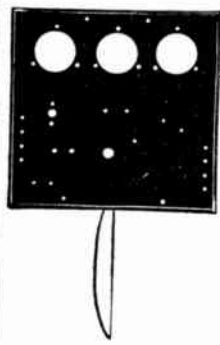

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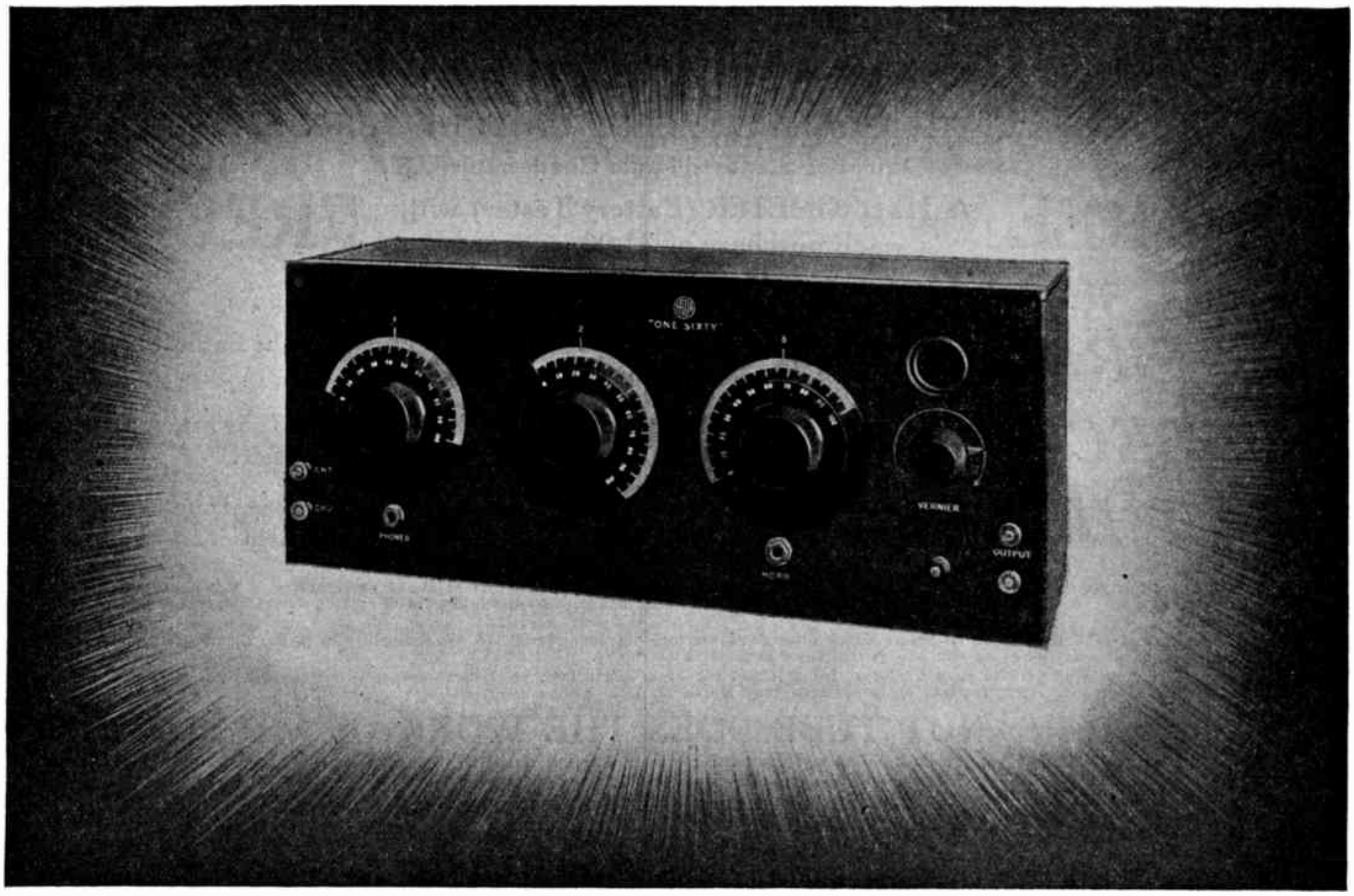

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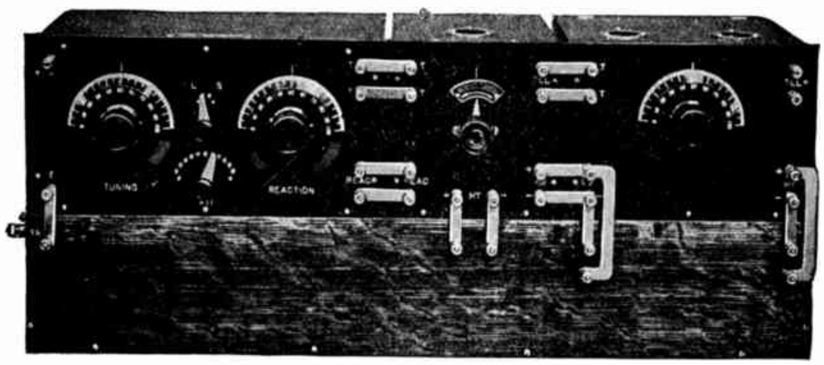

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Receiver complete with the following accessories:—

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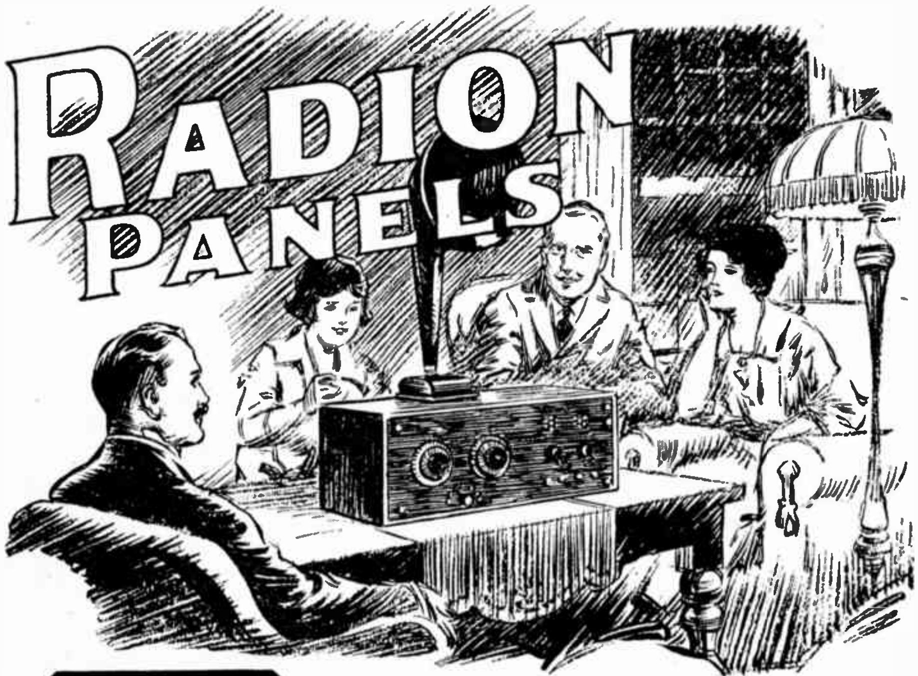

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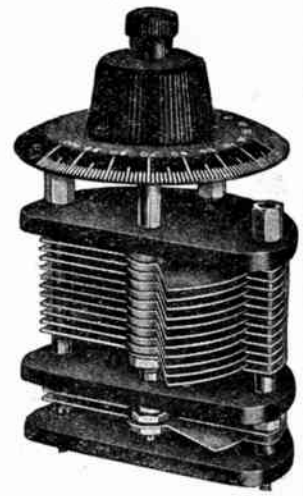

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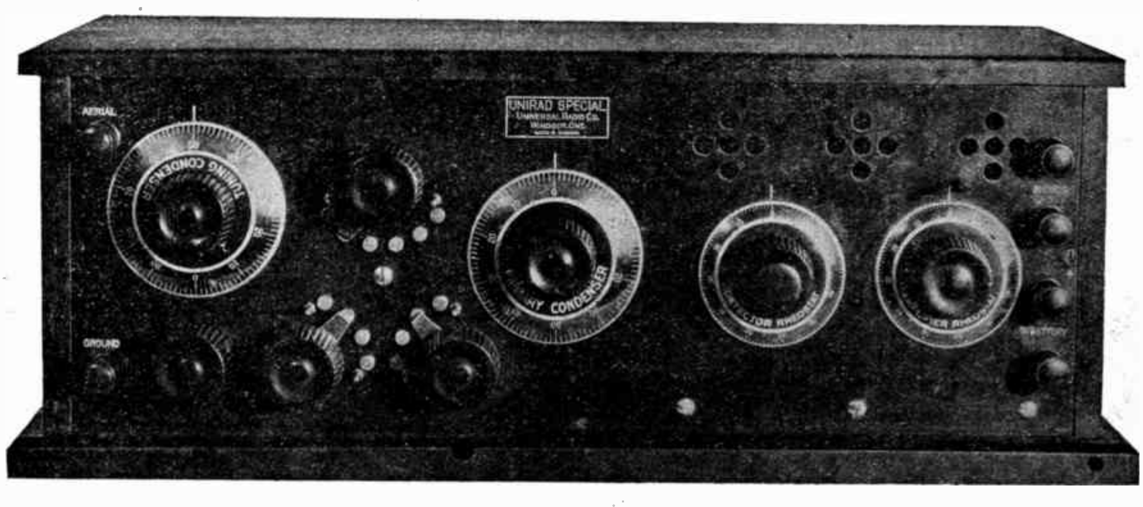

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It Has Dominated Its Field For Over 17 Years

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Because it requires no argument to sell it—because it is so universally recognized as the best radio protecter in the market, dealers find the Brach Arrester an active seller throughout the year and especially during the season when static interference is greatest and lightning storms most frequent.

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SELL SOLDERALL TO YOUR RADIO FANS

IT IS A METAL IN PASTE FORM—great for soldering radio wires and joints, insuring perfect reception.
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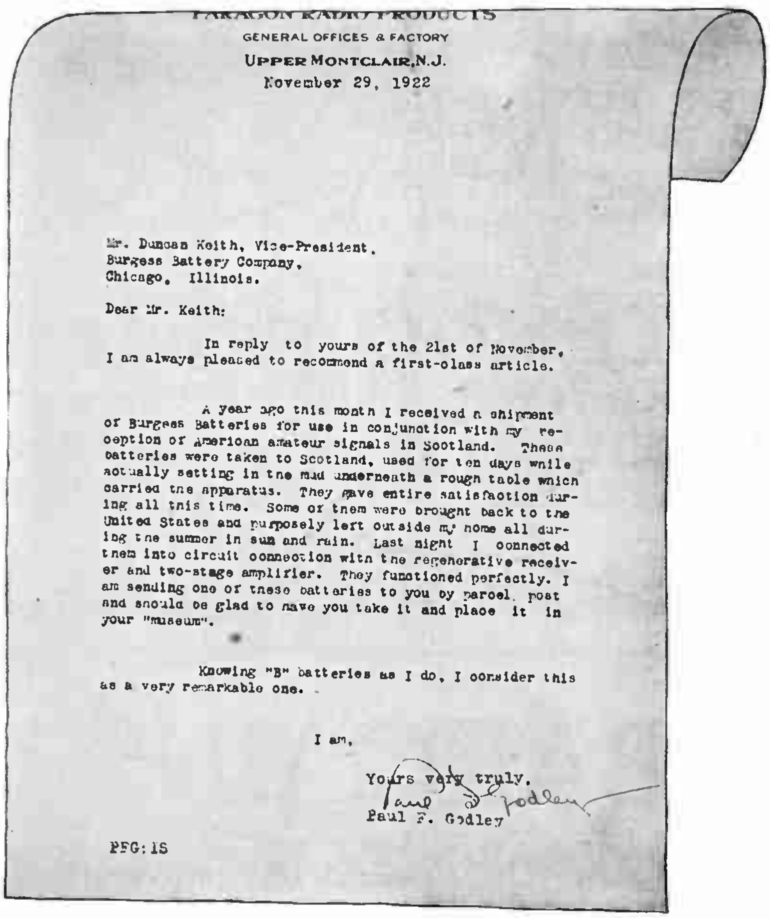

PARAGON RADIO PRODUCTS
GENERAL OFFICES & FACTORY
UPPER MONTCLAIR, N.J.
November 29, 1922

Mr. Duncan Keith, Vice-President,
Burgess Battery Company,
Chicago, Illinois.

Dear Mr. Keith:

In reply to yours of the 21st of November, I am always pleased to recommend a first-class article.

A year ago this month I received a shipment of Burgess Batteries for use in conjunction with my reception of American amateur signals in Scotland. These batteries were taken to Scotland, used for ten days while actually setting in the mud underneath a rough table which carried the apparatus. They gave entire satisfaction during all this time. Some of them were brought back to the United States and purposely left outside my home all during the summer in sun and rain. Last night I connected them into circuit connection with the regenerative receiver and two-stage amplifier. They functioned perfectly. I am sending one of these batteries to you by parcel post and should be glad to have you take it and place it in your "museum".

Knowing "B" batteries as I do, I consider this as a very remarkable one.

I am,

Yours very truly,
Paul F. Godley
Paul F. Godley

PFG:IS

TWICE across the stormy Atlantic, engulfed in oozing mud, and exposed for months to the destructive action of the elements, Paul Godley's set of BURGESS Radio Batteries, wind-swept, rain drenched and sun-scorched though they were, responded instantly and powerfully, with the vital energy necessary to the perfect operation of his delicate receiving set.

While it is seldom that a radio battery is required to function under the stress of conditions a fraction as difficult as these, Paul Godley's experience stands out as a remarkable and heretofore unheard-of example of the long life, high capacity, tenacity of power and indestructible construction of Burgess Batteries—*enduring qualities that are built in.*

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RADIO

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Publishers.
(Member Canadian Business Publications Association)

60-62 ADELAIDE ST. EAST, TORONTO, CANADA.
R. F. BUILDER, Bus. Mgr.

C. LINCOLN-MITCHELL,
Publication Manager.

Volume 6. TORONTO, APRIL, 1923. No. 1

PROPER ANTENNA FOR TUNING

By Frank Conrad, Assistant Chief Engineer, Westinghouse Electric and Manufacturing Co.

The ability to hear a desired station alone, or "selectivity," as it is called, depends in part on the receiving apparatus and in part on the antenna system to which it is connected.

Many believe that the better the antenna, the better the signals. This is true, but it does not necessarily mean that the best antenna is the largest. The function of the antenna is to transfer to the receiving apparatus the electric forces which are set up by the waves being transmitted through space. This receiving apparatus must discriminate between the electric forces due to the radio wave it is desired to receive, and the forces due to the undesired waves, among which are the waves from "Dame Nature" herself, or "static" as they are called.

The selective receiver is one that offers a high resistance to the flow of current which woudl be set up by the electric forces from undesired waves, and offers a low resistance path for the flow of current due to the electric forces from the waves it is desired to receive. In other words, it permits you to hear the stations you wish to hear, and to tune out those you do not wish to hear.

The receptive ability of an antenna is, in general, determined by the height of its horizontal portion above the ground, or, stated differently, the strength of the electric forces induced in an antenna by the radio waves is proportional to the height of this antenna. Therefore, to tune out or discriminate between different waves, the selectivity or resisting power of the receiver to interfering waves would have to be increased as the antenna height is increased, while to receive an equal signal from a desired wave, the resistance in the receiving set to this desired wave, would have to be decreased as the antenna height is decreased.

Experiments have shown that when the antenna height is increased and a receiver, such as a crystal-detector set or a tube set not using regeneration, is used, the signal at first increases but soon reaches a maximum strength, which can not be exceeded by further increase of antenna height. This height is such that the electric forces set up by the incoming wave is sufficient to drive through the receiving apparatus the full current strength which is equivalent to the received signals. To express it in another way, this maximum current is that which would itself set up the same strength of radio wave around the receiving antenna as is induced by the transmitting antenna sending out the signals it is desired to hear.

A vacuum-tube receiving set, in which the principal of regeneration is employed, tends to reduce the resistance to the flow of current from a wave corresponding to that for which it is tuned. Therefore, if a regenerative receiver is used, an antenna in an ideal location, it will be found possible to maintain the maximum strength of signal, even with a reduced antenna height. However, as the same resistance will be maintained by this receiver against undesired waves the reduction of height will therefore give a greater selectivity. Of course, in general practice it usually will not be possible to obtain quite the same strength of signal with the low as with the high antenna, as there is a certain amount of absorption or loss near the ground which tends to reduce the possible signal strength.

Should the location be such that the antenna is perfectly clear and free from surrounding objects, the low one will be found to be practically equal to the high one, when a regenerative receiver is used. But should the antenna be located where it is considerably shielded, as where it is surrounded by high buildings, it is possible that the signal strngth will be greatly influenced by height. In this latter condition, it will probably be necessary to make up for the poor selectivity of the high antenna by using a somewhat elaborate receiving apparatus. Under the conditions surrounding the average residence district, it usually is possible, with care in the location of the antenna, to maintain good signals, even though the height is considerably less than with the scheme generally employed of attaching the horizontal wire to some point near or on the roof of a two-story house.

The actual selectivity required divides itself into two classes or conditions of service; one in which it is desired to discriminate between two relatively nearby stations of approximately equal signal strength but separated by some interval of wave length, the other where it is desired to discriminate against a nearby station and receive from a distant one, the signal from which would, of course, be very much weaker than that from the nearby station. For the first condition, it will be found that with the average regenerative receiver ample strength will be obtained from an antenna which is not over ten or fifteen feet high, or it may even be entirely within an ordinary living room. The second condition, however, is a much more severe one and requires either a location where an antenna of not over fifteen or twenty feet high will not be unduly shielded, or where the lesser selectivity of a high antenna will be counterbalanced by a more elaborate and selective receiving set.

Hints on Antenna Construction

By F. Conrad, Assistant Chief Engineer, Westinghouse Electric and Manufacturing Co.

If your antenna were erected in an open space clear of any obstruction, the problem would be comparatively simple but as it is we usually have to make the best of the conditions as we find them. The element of the antenna which determines its ability to pick up or give off signals is its effective height. The term of effective height does not mean the height from the ground connection to its topmost point, but is more nearly the average height from ground connection to the center of its exposed area. For an antenna consisting only of a straight vertical wire, the effective height is about two-thirds its actual height while for an antenna having a large horizontal top structure the effective height is very nearly the actual height. The only purpose of the horizontal top element of a receiving antenna is to give a greater effective height for a given actual height.

When a regenerative vacuum-tube receiver is used the extent to which the signal can be built up by regeneration is independent of the antenna height if all parts of the antenna were equally exposed to the incoming signal. However, the amount of interference which is picked up will be proportionate to the height, and we must, therefore, endeavor to select a location which will permit of minimum height.

As the lower part of the antenna will usually be more or less shielded it is necessary to make some compromise between signal strength and selectivity and for installation in cities a height of 20 feet with a horizontol top of the same length will usually be found ample for reception of distant signals. For use when interference is slight or in country districts the height may be increased to 30 feet. It is of course assumed that for strictly local reception the antenna will be an indoor one.

It is unnecessary to use more than one wire for any part of the antenna and the size of this wire is unimportant. It should be well insulated at the supporting points and be spaced as far as possible from conducting objects. If the outer end of the top wire is attached to a tree, a break insulater should be placed in the wire well top wire over or near any objects such as a metal roof, outside the branches. We should also avoid running this as the effective height of the antenna will probably be about the height of this top wire above the metal roof. If a supporting structure is available, a straight vertical wire without top horizontal part will be satisfactory or it may extend in a diagonal direction from the side of the building near the receiving set to a point some twenty or thirty feet above on an adjoining building or other support with clear space between.

For the best results the ground connection should be made to some conducting area on about the same level as the receiver. A steam or hot water heaving system gives a good ground. Avoid a long ground wire as this gives height and lack of selectivity without compensating additional signal strength. This is an important point when the receiver is installed in an upper floor of a building such as an apartment. In this latter case the piping system of the building will furnish a good ground. Never run a separate wire down to the ground floor. The wires from antenna and ground where they approach the receiver should be separated as much as possible and the receiver should be placed as near as possible to the point where the antenna wire enters the building. The ground connection should be made to the nearest part of the conducting system which is to form the ground and it is often an advantage to connect to more than one conductor —such as the heating and water or gas pipes.

If your receiving set is not giving the results you think it should, look over your antenna structure to see how it meets the conditions I have just outlined. Thus it is possible that by a change in the height you can obtain the selectivity desired or by a change in its location you can improve the strength of signals from those distant stations.

How to Save Your Tubes

Paul McGinnis.

When it comes to "burning money" there are, perhaps, few methods which can compare in neatness and dispatch to that of connecting a "B" battery across the filament of a vaccum tube. A tiny flash and there the tube stands silent and imperturable, the grim reminder of money which has gone forever.

The sudden demise of tubes must be guardad against in a number of ways and there are other precautions in the matter of minor ailments which must be taken if tubes are to have long and useful lives.

A fundamental mistake which is made sometimes by the experienced operator as well as by the novice is that of connecting parts of the apparatus or changing connections without first disconnecting the batteries. There may seem to be no danger. Perhaps it is merely the connections of the tickler coil which need to be reversed. Such a change, as most anyone knows, could not burn out a tube, but there are other things to be considered.

When a wire is taken from the tickler coil it may, like all wires, have a tendency to spring from your hand, and if it should fly loose, it could easily touch another wire in such a manner that the high voltage of the "B" battery would flow through the filament of the vacuum tube and burn it out.

It is worth while, therefore, to remove your tubes when making connections, to connect your batteries after all other connections have been made, and to make tests of the circuits.

The beginner is not apt to have a voltmeter or other instrument for testing, and he sometimes relies upon the short circuit sparks of his batteries to guide him unless he understands a handy use of his head phones.

Although the wire with which phones are wound is delicate, it will not burn out when the phones are used as a voltmeter for testing purposes because of the great length of wire wound in the little coils and because of its resulting high resistance. The tips of the phone cord can be touched to any part of the set without danger of injury, and the resulting clicks of the diaphragms will positively identify the low and high voltages used and avoid all danger of burning out the tubes.

Most sockets are marked with the letters F. G and P, which stand for filament, grid and plate. Some sockets for "peanut" tubes are not marked, but since one hole into which the prongs of the tube fit is larger than the others, the terminals are easily identified; the large hole is the plate, the one opposite is the grid and the other two are the filament terminals.

A moderately loud click should be heard in the phones when they are connected across the two filament terminals. When connected between the plate and either of the filamnt terminals, a much louder click should be heard. A click of medium intensity may be heard when connection is made to the grid and plate terminals. As the only danger to the tube comes through placing high voltage on the filament, the phones make an efficient testing instrument.

the intensity of the spark which is given off when con-

Voltages on the set may be fairly accurately judged by nections are made and broken, for the spark of the "B" battery is much brighter than that of the "A" battery. Where such testing forms a short circuit, however, it takes considerably energy from the battery and shortens its life.

When the current of the "A" battery is turned off by means of the filament rheostat, the current from the "B" battery also ceases to flow, as there is no connection between the elements inside the tube without the stream of ions given off by the lighted filament. All current can be turned off in this manner. The tubes can be harmed by turning the current on suddenly, and for this reason the rheostat should always be turned slowly. If your phone jacks control your tube current, the rheostats should be turned off when changing from one stage to another, so that the insertion of the phone plug will not light the tubes suddenly.

While the ions flowing from the filament form the only path for the "B" battery current, the tubes can be damaged if this current is too high. It is possible to use as much as 90 volts with some tubes, but when the high voltage causes a blue glow inside the tube, it should be reduced.

The plate vlotage must be determined for each detector tube. It will be something less than 22½ volts, and when it is once found, the tube can be operated on it without appreciable change. The adjustment of the filament voltage is a delicate matter, especially when amplification is used, and vernier rheostats are often useful.

It is possible to buy fuses to protect your tubes, and where temporary hook-ups are used such fuses are often valuable. If your connections are not soldered, they should be made by looping the wire entirely around the binding post, so that it can not come unfastened unless the thumb screw is removed from the post.

Tubes are made to be mounted in an upright position, and if they are mounted horizontally the filaments will sag, so as to shorten their length of service if they do not actually make a short circuit, and the function of the tube will be impaired.

The Neutrodyne Circuit Receiver

By Kimball Houton Stark,
Chief Engineer, F. A. D. Andrea, Inc.

Possibly the newest development in radio is the neutrodyne circuit invented and developed by Professor L. A. Hazeltine, professor of electrical engineering at Stevens Institute of Technology, Hoboken, N.J.

Professor Hazeltine recently disclosed his circuits before a meeting of the Radio Club of America at Columbia University, New York City.

The object of the neutrodyne circuit is the neutralization of the capacity coupling between two or more portions of a given circuit. When used for the improvement of radio receiver circuits it eliminates the capacity coupling existing between plate and grid, thus preventing regeneration. This condition of neutralization is brought about by the adjustment of specially designed condensers placed in the circuit.

The fundamental circuit illustrating the neutrodyne principle is shown in Fig. 1. In the diagram, circuits A and B are coupled through the direct connection at the bottom and through the coupling capacity C1. To neutralize this capacity coupling two closely coupled inductances L1 and L2 and the neutralizing capacity C2, are arranged as shown, L1 being connected between one terminal on C1 and the common connection, and L2 being connected in series with C2, between the other terminal on C1, and the common connection. Terminals of L1 and L2 which are connected together are of unlike polarity. If circuit A has a source of alternating curernt, the alternating potential at its upper terminal (marked disturbing potential) will send a current through C1 to circuit B, which current in flowing through the impedance of circuit B will set up a voltage between the terminals of this circuit, power thus being transferred from A to B.

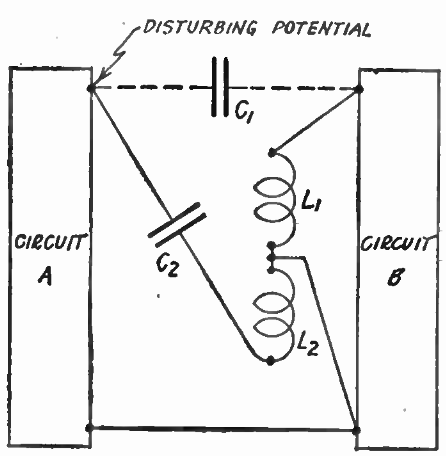
Now if the neutralizing circuit L1, L2 and C2 be introduced and so adjusted that the current through L1 magnetically balances the current through L2, no voltage will exist across either of these coils nor across circuit B, which is the condition desired to eliminate the transfer of energy.

As directly applied to vacuum tube circuits, Fig. 2 illustrates the application. In this figure, the capacity C2, being correctly adjusted, neutralizes the grid-plate capacity, represented by C1.

I actual practice inductance coils L1 and L2 may be respectively the primary and secondary inductances of air core radio frequency transformers. The secondaries of these transformers are prferably tuned by variable air condensers. A distinct advantage of the neutrodyne circuit is the fact that radio frequency transformers may be employed having a step-up ratio of windings of the order of one to four.

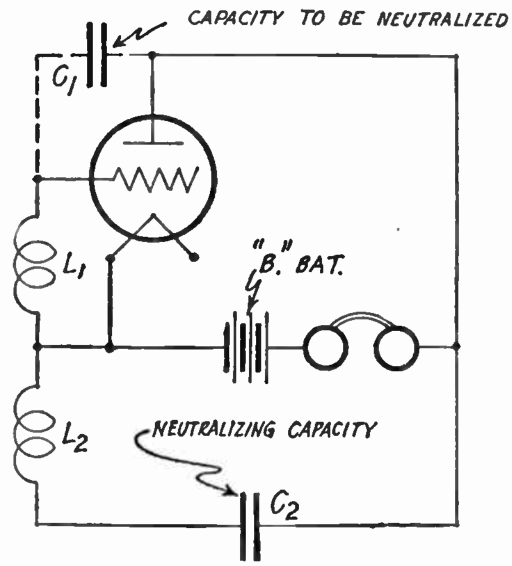
The adjustable neutralizing capacity in both Figs. 1

and 2 is designated as C2. In actual practice this capacity is adjusted in such a manner that the capacity coupling between circuits is reduced to a minimum, if not to zero. The neutralizing capacity may have a capacitance of from 1 to 5 or 6 micro-micro-farads.



FUNDAMENTAL CIRCUIT ARRANGEMENT SHOWING PRINCIPLE OF CAPACITY COUPLING NEUTRALIZATION USED IN FADA "ONE-SIXTY" NEUTRODYNE RECEIVER

Such a very small adjustable condenser is unusual even in radio. A condenser of this kind may be readily constructed as shown by the drawings in Fig. 3. It consists of an insulated sleeve in which are inserted two pieces of wire with about ⅛ inch space between them at the centre. A metal tube is then adjusted lengthwise from the ends of the two wires, the resul-



FUNDAMENTAL TUBE CIRCUIT ARRANGEMENT USED IN FADA "ONE-SIXTY" NEUTRODYNE RECEIVER

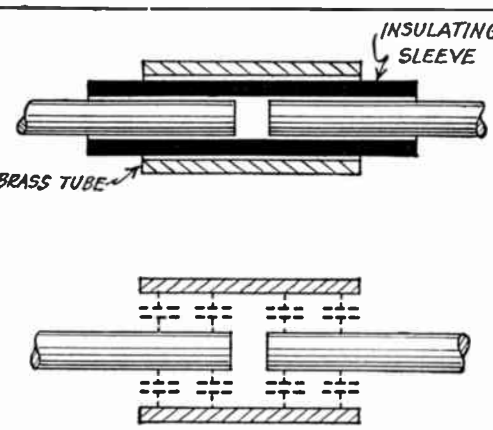
tant capacity being the series capacity of the metal tube and both wires. During tests this neutralizing capacity is adjusted and then sealed.

In making this initial adjustment, the receiver circuits are tuned to a strong buzzer siganl, the filament of the tube whose capacity is to be neutralized is turned out, but the tube left in its socket. When the neutralizing capacity is properly adjusted under these conditions there will be no capacity coupling on either side of the tube and no buzzer signals will be transferred. If the tube, however, is taken out of the socket altogether signals will come in strong, being again neutralized when the tube is placed in contact with the grid and plate contact springs.

Such a method of adjustment illustrates that the neutrodyne circuit operates to eliminate capacity coupling and is not just a method for opposing the effects of regeneration, because the adjustment is made with the filament cold, and, therefore, under conditions when the tube could have no regeneration.

The front of the panel has only four controls. Three of these are large dials for tuning control and the fourth knob is that of a vernier rheostat for the detector tube. A switch is placed at the lower right hand end of the panel for tuning on and off the filament current to all tubes.

In the interior, the radio frequency transformer units are mounted at such an angle to each other that no transfer of electro-magnetic coupling can take



CONSTRUCTION OF NEUTRALIZING CAPACITIES USED IN FADA "ONE-SIXTY" NEUTRODYNE RECEIVER

place. The neutralizing or balancing capacities are above and between the transformer units.

Fig. 4 shows a complete schematic wiring diagram of the receivers. The table of constants beneath the wiring diagram will explain the various parts of the circuit. This circuit using only four tubes actually does the work of five tubes, as the first tube is used as both a radio and audio frequency amplifier.

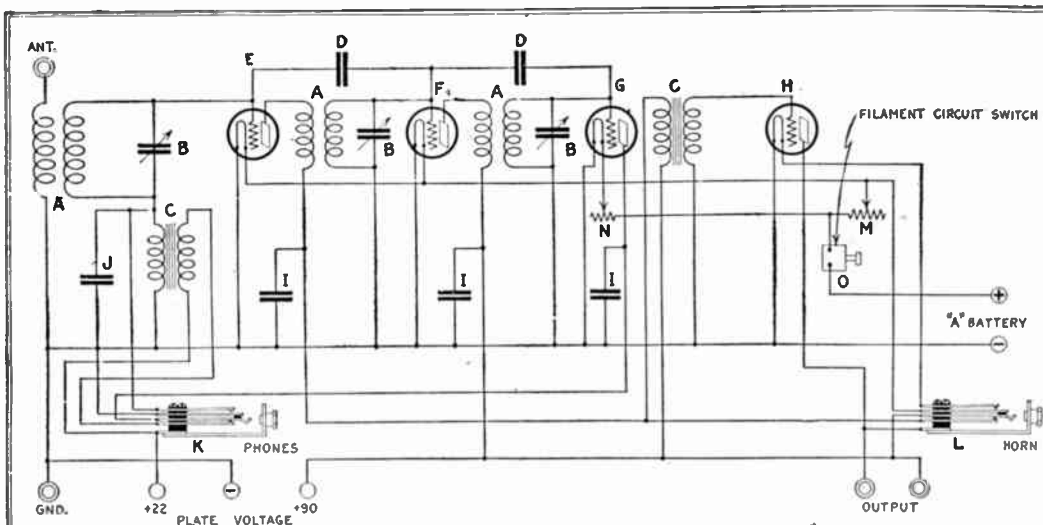
It seems to be human nature for every one who owns any kind of a radio receiver to want to pull in long distance signals. To get stations a thousand miles away isn't enough, and we are continually staying up nights twisting dial after dial in an effort to bring in that station 1,500 or 2,00 miles away.

From this point of view receivers utilizing the neutrodyne circuit are certainly ideal. There being only three simple adjustments, nearly any one can learn to operate the receiver in a few moments and with exceptional results. In such a receiver, there being no regeneration and no re-radiation, obviously there will be no squealing and howling and interference will not be caused in passing over various carrier waves.

It will be found when a station is actually tuned in that Dials 2 and 3 will read nearly the same, Dial 1 varying in setting with various antennae used.

Once a station is logged and notations made of the settings of all three dials the same station can be listened to at any later time by simply readjusting the dials to the given setting.

WGM	Atlanta, Ga.	38.2	65	64	10:56
CFCA	Toronto, Canada	47.2	72.2	71.2	11:00
WLAG	Minneapolis, Minn.	38	58	57	11:15
WAAP	Wichita, Kan.	20	52.2	51	11:30
WHN	New York, N.Y.	19	47	45	11:45
					A.M.
WSB	Atlanta, Ga.	35	62	61	12:02



FOUR TUBE "NEUTRODYNE" CIRCUIT WITH CONSTANTS AS USED IN THE FADA "ONE-SIXTY" NEUTRODYNE RECEIVER

A AIR CORE RADIO FREQUENCY TRANSFORMERS
B VARIABLE AIR CONDENSERS 0.0004 MFD.
C IRON CORE AUDIO FREQUENCY TRANSFORMERS
D ADJUSTABLE NEUTRALIZING CAPACITIES 1-5 MICRO-MFD
E REFLEXED AUDIO & RADIO FREQUENCY AMPLIFIER TUBE
F SECOND RADIO FREQUENCY AMPLIFIER TUBE
G DETECTOR TUBE
H PURE AUDIO FREQUENCY AMPLIFIER TUBE
I RADIO FREQUENCY BY-PASS CONDENSER 0.001 MFD
J BY-PASS CONDENSER 0.0001 MFD.
K SPECIAL TELEPHONE JACK FOR PHONES
L " " " " LOUD SPEAKER
M POWER RHEOSTAT FOR AMPLIFIER TUBES
N VERNIER FILAMENT RHEOSTAT FOR DETECTOR TUBE
O FILAMENT CIRCUIT SWITCH

Some of the broadcasting stations heard from New York using only a 50-foot indoor antenna around the picture moulding of a fourth floor apartment are noted below, together with dial settings. This reception was on the evening of March 8, 1923.

STATIONS HEARD FROM NEW YORK ON RECEIVER USING HAZELTINE'S NEUTRODYNE CIRCUIT

	Stations	Dial 1	Dial 2	Dial 3	Time P.M.
WBZ	Memphis, Tenn.	40	67	66	9:35
WOO	Philadelphia, Pa.	36	63	62	9:35-10
WEAF	New York, N.Y.	30	56	57	9:35-20
WGY	Schenectady, N.Y.	23	49	48	9:35-30
WJZ	Newark, N.J.	10	42	41	9:35-40
WHB	Kansas City, Mo.	31.2	60	59	10:50
WDAP	Chicago, Ill.	17	48	47	12:12
WDAJ	College Pt., Ga.	17	45	44	12:15
WLW	Cincinnati, Ohio	38	41	40	12:17
WDAF	Kansas City, Mo.	32	63	62	12:35
WSD	St. Louis, Mo.	27	57.2	56	12:52
KFI	Los Angeles, Cal.	49	71.3	70	....

WGY, Schenectady, N.Y., was received without aerial or ground and with very good intensity on a simple loud speaker.

Surely any receiver as simple to operate, which does not cause interference by re-radiation, and which has the ability to bring in long distance stations such as are shown above, is an ideal receiver.

Hardly a day goes by that enthusiastic letters are not received from all over the country telling of exceptional results obtained with this circuit—results that did not require an expert to obtain.

WHAT HEINIE HEARS

Nothing But Market Quotations Being Broadcasted in Berlin.

Only one station in Berlin has obtained a broadcasting license. There are several receiving stations, but mainly for business purposes only, and the lone broadcasting station deals solely with market and exchange quotations and fluctuations. Its service is confined to subscribers who pay for a license to erect a receiving apparatus, also a monthly subscription varying from one thousand to seven thousand five hundred marks. Subscribers can either do this, or else hire a receiving set from the post office department, which costs them 2,500 marks every month.

CHANGE NAME TO RADIO

The name of the Wireless Society of London has now been officially altered to the Radio Society of Great Britain.

Washington.—Public houses in England have been forbidden to instal radio sets and regale thefr customers with concerts and beer simultaneously. The information came semi-officially to Washington for use of United States manufacturers of radio apparatus, whose market is to be thus circumscribed.

Radio sets in public houses, the law justices at Manchester ruled, according to the reports, turn them into a different type of entertainment places than the liquor selling license allows the owner to maintain. He must either get a special license, the decision ran, or quit selling intoxicants. Lawyers for the publican at the trial of the test case introduced an ancient precedent, which allows a clarionet player to stick his horn through a public house door and play without the publican having a special entertainment permit, but the court ruled it out.

— Amateur Section —

The Construction of a Long Distance Peanut Valve Receiving Set

By Alex. V. Polson, E.E., Assoc. Member, A.I.E.E.

The details for the construction of the apparatus described in this article are the result of four months experimenting with peanut valve detectors and amplifiers, and apply in practically every detail to a set which is now in operation and delivering the goods.

Before proceeding further, it may be well to mention that the set referred to, with a single wire aerial thirty feet high and a hundred and twenty feet long, including lead-in and ground connection, has received clearly between fifty and sixty broadcasting stations, located from New York to British Columbia and Los Angeles to Havana, Cuba. These results have been consistent, and such stations as KHJ, Los Angeles; WSB, Atlanta; WBAP, Forth Worth, and others twelve hundred to two thousand miles away, can be heard almost every night. Further, several of these stations as far as Fort Worth have been clearly heard without any aerial connection. Local stations can be heard satisfactorily with a six-inch aerial and no ground connection. The methods for operating the set under each of these conditions will be dealt with later.

The parts necessary to construct this set are as follows:

- 1 vario coupler, with dial.
- 1 23 plate vernier condenser, with dial.
- 1 vernier rheostat.
- 2 plain rheostats.
- 3 peanut tubes and sockets.
- 1 variable grid leak and .00025 M.F. condenser.
- 1 .001 M.F. telephone condenser.
- 2 audio amplifying transformers.
- 2 switch levers.
- 12 contact points.
- 2 2-circuit telephone jacks.
- 1 single circuit telephone jack.
- 1 telephone cord tip plug.
- 1 nickel-plated bezel for tube peep-hole.
- 7 binding posts.
- 1 panel, 8½ in. x 20 in.
- 1 woden box to suit, approx. 9 in. x 10 in. x 20 in.
- 1 sq. ft. of tin foil for shielding rear of panel.
- 2 1½ volt cells Eveready flashlight batteries.
- 3 No. 6 dry cells for A battery.
- 1 22½ volt B battery, with tops 16½ to 22½ volts.
- 1 22½ volt B battery, without tops.

The panel that was used in the set was mahogany wood, 8½ in. x 20 in. x 5/16 in., and was laid out as shown in Fig. 1. The exact layout of hole spacing will vary somewhat with the apparatus purchased, but if the general arrangement shown is followed, the connecting wires between the various pieces of apparatus will be about as short as possible. This panel is held to the baseboard by means of small angle pieces of brass, which can be procured at a hardwood store. The three peanut tube sockets are carried on a little shelf, as shown in Fig. 1. By this means the amplifying transformers can be conveniently located on the baseboard, as shown. The "B" batteries are arranged one above the other in order to save floor space, the upper battery being supported on a shelf.

The variocoupler used, when purchased had fifty-six turns on the stator and twenty-eight on the rotor. Previous experiment showed that there were advantages to be gained by having seventy or eighty turns on the stator and about sixty on the rotor, this later being used as a tickler coil. In order to obtain the desired number of turns, two pieces of cardboard tubing—one 3 in. in diameter by 1½ in. long and one 3½ in. in

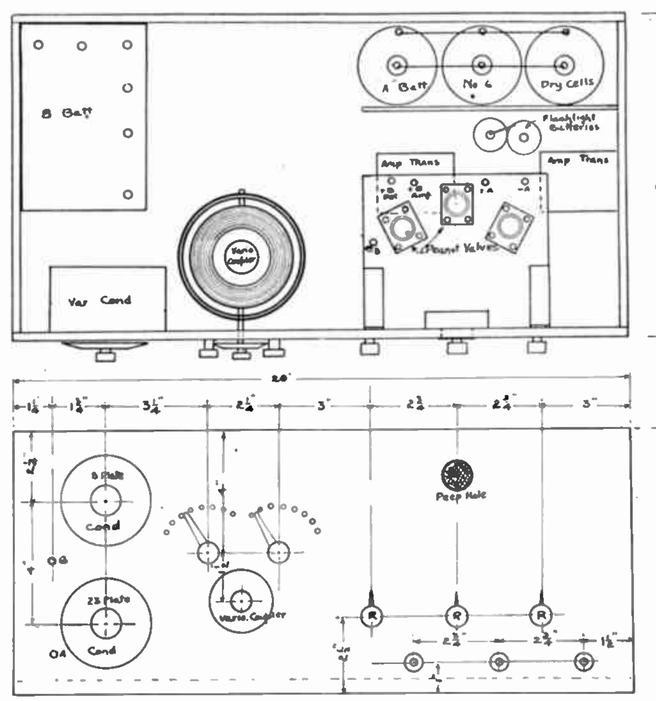


FIG. 1 GENERAL LAYOUT

diameter and 1½ in. long, are each wound with twenty-eight turns of No. 24 S.C.C. copper wire. The larger coil has tops taken out at every seventh turn and the smaller coil has no tops. These two coils are connected so that the larger coil is a continuation of the stator of the variocoupler and the smaller coil is connected in series with the rotor. The direction of the winding should be continuous, i.e., in the same direction as the original stator. The coils are placed concentrically in the lower part of the stator tube and held in place by wooden wedges or spacers. The variocoupler thus altered may be mounted behind the panel and the tops soldered to the contact points, as shown in the diagram of connections. If a variocoupler can be procured with fifty or sixty turns on the rotor and seventy or eighty on the stator no alterations will be necessary.

The variable condenser used should have 23 or 43 plates, with a vernier of 3 or 5 plates for best results. The writer used one 23 plate and one 5 plate condenser, connected in parallel, but the use of a single vernier condenser would have saved space.

The detector rheostat should be of the best vernier type, as the filament adjustment is quite important in tuning. The other two rheostats are plain, and do not require any verniers.

A grid leak condenser of .0005 or .00025 M.F. capacity and an adjustable pĉncil mark leak are used, although the set will operate with a fixed grid leak of about one megohm. It will be found that reception of weak signals will be affected very noticeably by a close adjustment of the grid leak.

The audio amplifying transformers used were Jefferson No. 41, although any good transformer with a ratio of 4½ or 5 to 1 should be satisfactory.

The apparatus described above may be arranged as shown in Fig. 1, and should be connected according to Fig. 2.

The two small 1½ volt cells of flashlight battery are connected in series, and are located as shown in the wiring diagram. Before deciding on the best value for this "C" battery a potentiometer was used, and it was found that about 3 volts was very satisfactory. It may be well to mention here that the centre pole of the flashlight cell is positive and the outer zinc casing negative.

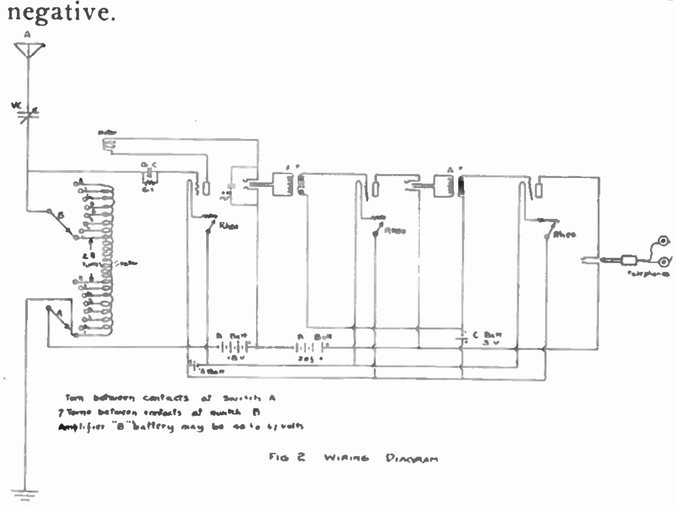


Fig 2 Wiring Diagram

When using peanut valves I have always made a practice of inserting a short piece of resistance wire between each filament and the A battery. This is merely a safety measure to lessen the danger of filament burnout when the batteries are new. It is good practice to use three No. 6 dry cells connected in parallel when using three tubes.

A few notes on tuning this set under the following conditions may be of value: In the first place, with the aerial mentioned in the first paragraph; in the second place, with a lamp plug aerial; in the third place, with no aerial, but with a ground connection; and lastly, with a loop aerial, and no ground connection.

First, switch A is put on the 3rd contact, switch B on the 3rd or 4th contact. The tubes are lighted to a dull red and the variable condenser adjusted until a "whistle" is heard. The detector rheostat should be turned back slowly until the whistle disappears and the music comes through clear. A closer adjustment of the condenser vernier, the tickler and the detector rheostat may then be made to strengthen signals. The amplifier rheostats require very little adjustment.

In using this set with a lamp plug aerial it will be found that switch "A" should be placed on the seventh or eighth contact, and switch "B" will have to be on the seventh or eighth point. This has held true in every case tried out, and signals are almost as good as with an outdoor aerial.

If no aerial is used, the ground wire should be connected to the aerial terminal on the set and the adjustment of switches A and B will be as mentioned in the preceding paragraph. The tuning will be found to be extremely sharp, and careful tuning is necessary for distant stations. Several stations over a thousand miles away have ben heard in this way.

Local stations have been heard with various loop aerials from three inches in diameter to three feet square. The tuning is very sharp when a loop aerial is used, and the condenser must be rotated slowly or the "whistle" will be passed by unnoticed.

AMERICAN AMATEURS HEARD IN NEW ZEALAND

A radio amateur in far-off New Zealand, with a home-made single tube receiving apparatus, has succeeded in hearing dots and dashes from a number of amateur transmitting stations in the United States, it was reported recently in a letter from R. Slade, the New Zealand amateur, to the American Radio Relay League. This came as a surprise, since it was not known generally that New Zealanders were interested in radio.

As far as it is known, this is the first authentic reception of American amateur signals in New Zealand linking that island up with other distant corners of the world, where low power apparatus of U. S. amateurs is reaching out in an ever-widening circle. The letter, signed by three other amateurs who witnessed this feat, stated that a number of amateur radio clubs were being formed in New Zealand.

Tme first station heard was that of Thomas E. Nikirk, of Los Angeles, Cal., and his signals were picked up repeatedly on several nights. Other stations heard at distances ranging up to 8,500 miles were the following:

C. Tipton, 200 Clark Ave., Fort Worth, Texas.
C. Foresan, 1714 Alameda Ave., Alameda, Cal.
Leslie B. Essington, 4412 Farlin Ave., St. Louis, Mo.
Roy W. Weisbach, 6727 Yale Ave., Chicago, Ill.
C. C. Brown, Volta Power House, Manton, Cal.
Albert P. Upton, 2547 Ulyses St., Minneapolis, Minn.
Gray & Gray, Orange, Texas.
L. Mott, Avalon, Cal.
H. A. Duvall & O. Esler, 4963 Wadsworth St., Los Angeles, Cal.
Lloyde V. Berkner, 117 E. Summitt St., Sleepy Eye, Minn.

"In New Zealand we are much restricted by the government," Slade stated. "We have to get special permits to receive, and no sending is allowed at all. Instruments are also very hard to obtain here, and the prices are extremely high." Interest in radio in New Zealand, he said, was stimulated by the American Radio Relay League's trans-Atlantic tests. He expressed the desire that amateurs in his vicinity will have an opportunity to take part in long distance amateur tests.

On Some Experiments with a Hazeltine Circuit

By F. K. Crosbie.

Having been much troubled with the interference caused by the use of the narrow band of wave-lengths in vogue to-day by the general run of broadcasting stations, I happened to think of a circuit, named after its originator, used in England during the latter days of 1918-1919.

I decided that I would build a set, incorporating this particular circuit, and make some experiments with it for the purpose of finding out, if possible, some simple method of eliminating undesirable stations.

It has been recommended by Scott-Taggart as a highly selective circuit, embodying the principle of non-regeneration and absorption of all wave lengths differing in but a few meters on either side of the wave length which it was desired to receive, and regenerating to its maximum degree the desired wave length.

The set was assembled in a quarter-cut oak cabinet, finished in the natural color, the parts being mounted on a Formica panel, 6 in. x 21 in. x 3/16 in.

The usual list of parts required may be compiled from the following diagram:

In this diagram, regeneration is effected by means of the magnetic coupling between the coils L-1 and L-2.

The plate oscillatory circuit L-2, C-2, is connected across the plate and grid, and not across the plate and filament, which is the more usual connection.

Both the grid and plate circuits are tuned to the desired wave and the regenerative amplification will be confined to that wave length.

The valve has a strong tendency to reduce interference, as it absorbs energy from oscillations of other frequencies than the one to which it is tuned.

Using the tube in this way for combined regenerative and absorbing action precludes its use as a detector, because its grid circuit is connected to the aerial circuit L-1 C-I.

In the diagram which shows a detector and one stage amplifier, we have that circuit loosely coupled to the circuit L-2 C-2, by which interference may be still further minimized.

One may of course insert one stage of radio-frequency, or one may use variometers in the grid and plate circuits of the detector valve.

It is necessary to use separate A and B batteries for really satisfactory working, C batteries being used in both amplifier valves.

The ratios between L1-L2-L3 are found by experiment, L1 having a value in turns of half L2, while L3 has approximately from 50 to 80 turns.

The condensers C1-C2-C3 may be of the value .001, .0005, or .0006.

The condenser C1 was a Dubilier Variodon, which is singularly accurate and smooth-working, and takes up no room.

These are highly recommended, as they get away from undesirable inter-capacity effects between condensers.

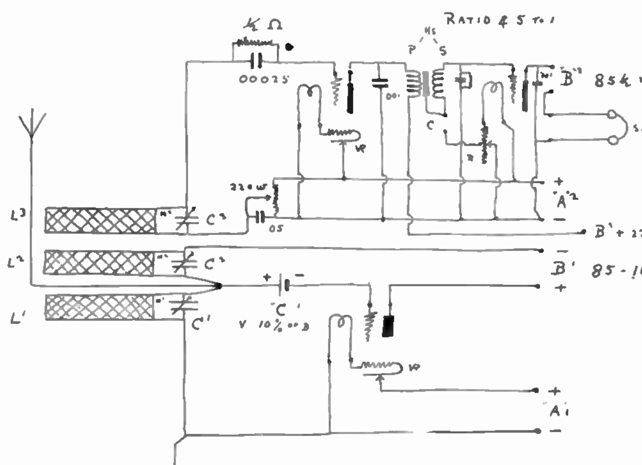
The valves used were two English Marconi R's for the amplifiers, using 85-160 volts with a C battery voltage of approximately 10% of B1 and B2.

The detector was a D1, others being also tried.

A potentiometer of 220 ohms was used as a grid bias on the detector, and made quite a difference to the valve used in different cases.

This circuit is not difficult to tune, and the results to me were quite in accord with Hazeltine's claims.

It was a pleasant surprise to me when I tuned in



HAZELTINE CIRCUIT

WGY, WEAF, and WDAE, among others, in absolute silence produced by the successful elimination of all interference from other sources.

Our friend the Star, roaring in with its usual clarity, and what may be termed the pristine beauty of its carrier wave, could be, if desired, tuned out by a 3 millimetre movement of the dial controlling C3.

This is not by way of cheap sarcasm, for I have a sneaking affection for our local "Music Box," having enjoyed many an excellent programme broadcasted by them, and I may say enjoying it more since working with this circuit.

I am carrying out a further series of experiments with this circuit, which I hope in due course to disclose at some future date through the pages of this magazine.

Lastly, I would mention that for short wave-lengths large diameter Groves coils are the best to use in this circuit.

EVERYONE IS INTERESTED IN RADIO

Are all of the citizens in the United States interested in radio? Nearly all of them are, and the majority actively, according to Hiram Percy Maxim, president of the American Radio Relay League, in an address read before the Second Michigan Convention of the A.R.R.L.

It appears so when you know there are about 600 broadcast stations in America, when you hear radio talked about at every turn, that it is common ignorance not to know about the functioning of a vacuum tube, that any number of listeners in Newark, N.J., go to bed with receivers over their ears, and that thousands upon thousands of amateurs in every part of North America and foreign countries listen to each other's signals by means of short wave transmission on low power.

One can hardly walk a city block nowadays without finding someone who is interested in radio, whether manufacturing, selling, buying, or using radio apparatus. Outside the joy of reassembling a certain low-priced automobile, it is the only game verging on the technical which has widespread popularity. Thousands who had previously never shown the least enthusiasm in eelctricity are not burning midnight oil, but running up their light bills until 3 a.m. figuring out a new hook-up for their receiving sets.

Recently an automobile, loaded with headsets, was mobbed on arriving in a town where radio material was short, and they were carried away before the retail dealers were aware of their loss. Radio is not only in the air, but in the system, and Mr. Maxim, who is the best known amateur in America, divides the U. S. into four classes—the amateur telegrapher, expert broadcast listener, broadcast listener, and the interested citizens. Mr. Maxim says in part:

"Until the present time our conventions all over the country have been for one kind of people—amateur telegraphers. The conventions were organized by and for the amateur. We called each other by our call letters. We discussed our transmitting problems, our traffic organization, importance of co-operation, and questions that surround only dot and dash communication.

"But to-day our conventions must go beyond these things. We must consider others who are in radio, and who must use the same air with us. They are interested in radio, as we are, but from a different angle. The tremendous number of them mean purchasing power and influence. These two things will do more to advance the radio science in our country than all of the others combined.

"The expert broadcast listener is much the same kind of clay as we, but he happened to come into the game via the broadcast instead of the code telegraphy. He studies radio, and he knows what there is in receiving. Now this sort of person, with his technical bent and his appetite whetted, is not going to remain satisfied with concerts and crop reports, and the minute he tastes the sweet of long distance communication he is lost and becomes one of us."

W. A. O. O.

The last meeting of the Wireless Association of Ontario was held in Room 25, Electrical Building, University of Toronto.

The first speaker of the evening was Mr. Thatcher, who spoke of some very interesting experiments with synchronous rectifiers. Mr. A. L. Ainsworth supplemented this paper with some remarks upon the practical operation of this type of rectifier. Considerable discussion followed.

Mr. W. C. C. Duncan, Canadian traffic manager, announced that since the last trans-Canada tests had apparently failed, similar tests would be held on April 13, 14 and 15.

It was suggested by Mr. C. A. Lowry that separate listening stations work in connection with transmitting stations during the tests. The work of organizing these "listening stations" was given to the city manager, Mr. W. Choat.

The last speaker of the evening was Mr. R. A. H. Galbraith, who spoke on the operation of "reflex" receiving circuits. This paper concluded the evening's program.

CHANGE IN SERVICE COMMITTEE

Broadcast listeners are requested to note that Mr. F. A. Burgess has been appointed to the Service Committee of the Wireless Association of Ontario, to fill the position left vacant by the departure of Mr. Ross Young from Toronto. Mr. Burgess' address is 3 Glebe Road, and his telephone number is Hudson 10.

Broadcast listeners unfamiliar with the purpose of the Service Committee are referred to the Wireless Association's announcement in the last issue of this magazine.

CANDIDATES SUCCESSFUL IN EXAMINATIONS FOR RADIO CERTIFICATE

The Department of Marine and Fisheries announce that nineteen (19) candidates were examined during the month of February, 1923, of which the following were successful and obtained "Certificate of Proficiency in Radiotelegraphy":

Name.	Address.
First Class—Commercial.	
Messiter, W. F.	Vancouver, B.C.
Withrow, P. G.	Halifax, N.S.
Watt, G. E.	Vancouver, B.C.
Second Class.	
Mennie, J.	Vancouver, B.C.
Amateur.	
Best, J. G.	Toronto, Ont.
Coleman, G. S.	North Sydney, N.S.
Crowell, G. D.	Sydney, N.S.
Dusky, W. A.	Windsor, Ont.
Hartley, F. W.	Toronto, Ont.
Lanskail, R. B.	Vancouver, B.C.
Miles, F.	Toronto, Ont.
Rigney, W. H.	London, Ont.
Rowland, A. E.	Montreal, P.Q.
Smith, C. H.	Windsor, Ont.
Southam, W. G.	Westmount, P.Q.

RADIO IN THE HOME
INTEREST TO FANS

The Problems of Radio Broadcasting

By H. P. Davis, Vice-President, Westinghouse Electric and Manufacturing Company.

Has it occurred to you what a curious relation there is between the broadcasters and the listeners, and how little there is to let us know what the other think of us? The artist appearing before an audience is almost immediately aware of the success or failure of his effort; the theatre manager has a barometer in his box office; the newspaper or the magazine can tell by its circulation to what extent it is meeting public appreciation. Public utility service companies can readily sense the public's attitude. But in this undertaking of ours—which in a way is also a public service—we have not yet found an effective means to sense the feelings of those who make use of this broadcasting service.

Now, KDKA is anxious to change this situation and wishes in some way to obtain a closer touch with you. Besides, we would like you to have a better understanding of radio matters in general, and the problems that must be solved in an undertaking of this kind.

With a full appreciation of the situation, and realizing the serious nature of the difficutlies now confronting broadcasting, I am giving this talk as a sort of opening chapter of a series of talks, which will follow at short intervals, on the various phases of radio broadcasting transmission and reception, and it is hoped to cover every angle of the subject.

These talks will be given by some of the foremost radio engineers and broadcasting program managers.

The broadcasting problem really divides itself into three major divisions, the first of which is that of regulation.

When KDKA started to broadcast it was the only broadcasting station in existence. It offered a service entirely new and of a most fascinating and mysterious character. It, therefore, had no difficulties with interference, nor did it have to meet any criticism from its comparatively small audience.

During the period of somewhat over two years that we have been operating, however, this situation has materially changed. Receiving stations have been established at an almost inconceivable rate, so that now they number in the millions all over United States and Canada, and radio service has become actually a public necessity.

Unfortunately, however, this growth is not confined to the receiving or listening public, but the number of broadcasting stations also has increased by leaps and bounds, until now there are in the neighborhood of 600 broadcasting stations in the United States, all bunched on two wave lengths.

This huge but miscellaneous bunch of broadcasters and listeners is now confronted with a condition of chaos. There is no existing or proposed plan to correct this chaotic condition or to prevent interference. Action must soon be taken in some way to restrict the number of stations broadcasting if there is to be any hope of enjoying non-interfering reception, so essential to worth-while broadcasting.

Further, there must be supervision and regulation that will require both quality and service of the broadcasting stations.

In the range of wave bands allotted by the Government for broadcasting there are comparatively few available for that purpose, and even if all of them were made use of it would not permit more than 30 or 40 stations throughout the country, and location and wave length would have to be very carefully allotted and adhered to, to permit these to operate at the same time without interference.

The problem of accomplishing this with six hundred or more stations now operating, and possibly as many more starting in the near future, will make it plain for you to see that the situation is out of control.

Pending such time as there is proper organization and proper federal regulation to remedy this situation, there have been many suggestions made to improve existing conditions, and the one which has most frequently appeared, and has been the most urged, is that of a silent night to permit of long distance reception.

Have you realized how difficult this will be? Suppose that in the Pittsburgh territory all the stations closed for one night to allow local listeners to receive distant programs. In the selection of the nights, it would, of course, be out of the question to select nights in advance when reception conditions would be favorable.

Next, if all the rest of the world were operating, even though the local stations were closed, the interference would still be uncontrolled and satisfactory reception would be very uncertain.

It appears that the better suggestion would be to have one night a week in which a few selected stations properly picked throughout the country would operate, and these only. This selection of stations, of course, could be changed from week to week.

These stations should operate on such wave lengths on that night so that they would not interfere with each other, and selection and regulation of the stations and allotment of wave bands would have to be done from Washington.

In addition to the selection of the stations, the hours during which each station would broadcast should also be arranged, so that they could not conflict—thus giving the listeners for that evening opportunity to listen to the broadcasting of each station separately.

This also assumes, of course, that all amateur stations which are operating on interfering wave lengths would be closed on that night.

If this arrangement were possible, it would give the listening public an opportunity to compare these various stations. In my opinion it would lead to the solution of some of these problems, thus testing the desirability of limiting the number of stations permitted to broadcast, and of selecting those most capable for such service.

But the problem is not merely one for the legislators, although their problem is one that we must all support and urge to the end of organized regulation and limitation of the stations that are permitted to broadcast. In a later talk this phase of the problem will be discussed at length and suggestions made as to how you can exert your influence to bring this about.

The second division of our problem is that of program quality and development.

Now, in the matter of programs we are all vitally interested. Have you ever thought what a task it is to provide a daily program, hours in length, seven days in the week, each of which will be pleasing and satisfactory? Especially when it is recognized that the service given is gratuitous by those who appear in these programs?

KDKA is especially anxious to give programs that are pleasing to the larger number of its listeners. We ask your co-operation. This co-operation can be given by suggestions, and by encouragement to the artists who appear. A small effort on your part may mean a great deal in our success, and words of praise to the performers will make our task easier in stimulating the desire of performers to appear.

Nothing discourages an artist so much as a cold audience, and I think we must all admit that there is nothing colder than a radio audience unless we will each of us recognize that we have a duty that exists beyond the mere listening of the programs.

There are hundreds of thousands—yes, millions—of listeners to the nightly programs of the broadcasting stations. At the present time this is a gratuitous service, and as far as I can personally see it is likely to always remain so.

But even recognizing this, what is the attitude of the listeners? Are you always to remain passive and take what is offered by the broadcasting stations, or will some way be found to correct this?

I apeal to you, therefore, for help. Write to KDKA, KYW, WJZ, WLW, WGR, WCY, CFCA, CKAC, CFCF, etc.—whichever is nearest to you—and give criticisms or suggestions. Thousands have done this, but the number is only a small fraction of the vest unknown and unseen audience. We promise you our best efforts to follow the will of the majority, if you will respond.

The third division of our problem belongs to the radio engineer.

I want you to realize that this service of radio broadcasting is only a little over two years old.

Obviously, with so young an undertaking, much has to be done in the way of improvement and development, which is bound to occur if those who have the ability, means and facilities to accomplish it are encouraged and permitted to do so.

There are only a relatively few individuals and organizations so situated that they can accomplish this necessary and desirable end. This work must be done by those who can do broadcasting and who can make the receiving apparatus.

I have already indicated how few wave bands are available in the limits permitted by the Government for broadcasting. With the apparatus now available for transmitting and receiving, this limits the number of broadcasting stations that can operate without interference to a relatively small number of widely separated points.

The radio engineers, therefore, have the problem of devising apparatus for transmitting that will permit sharper tuning, and thus allow more broadcasting stations; and similarly, receiving apparatus that will be more selective to allow a desired station to be tuned in without interference from other stations that may be broadcasting at the same time. This is possible, and in due course much will be accomplished along these lines.

To make the program interesting, speech and music must be so transmitted and received as to allow the listener to receive the true tone qualities. A good deal has been accomplished in two years in this respect, but a great deal is still left to be done.

These problems are being worked upon with intense activity in the research laboratories of the large electrical organizations, for the problem is essentially electrical, and by those organizations, and by them only, is the solution possible. None of this development work is possible by other organizations not so situated. Please do not forget this.

I have not said anything about the cost of broadcasting. There has been much said about this, however, and a great deal of worry has existed as to the permanency of broadcasting because of the lack of revenue to those who are doing the broadcasting.

Personally, I believe this is one of the least of the worries you should indulge in. Rather than worry about the expense to those who are broadcasting, you should be more concerned about the confusion to which I have referred, and the failure of the authorities to show inclination to correct it, which is discouraging to those who have development, quality and service in mind. Results along these lines are impossible to obtain under conditions as they exist at the present time.

I believe the solution is in your hands, and in yours only. This situation will be rescued only when you, the great public, take organized action to bring your wishes before those who make the laws, and to the attention of those who are doing the broadcasting.

Loudspeakers

By A. Nyman, Radio Engineer, Westinghouse Electric and Manufacturing Company.

"Loudspeaker" is a new word which came into popular use about the same time as the word "Radio."

The loudspeaker is really the voice of the radio, converting the radio set into a musical instrument. Like any voice, it may be good or bad, and a careful selection of a loudspeaker should be made with regard to its quality, volume, and purpose, in order to be sure that the sound it gives will correspond to the sound sent out from the radio station.

It is a well-known fact that any sound can be regarded as vibration in air. Some sounds are vibrations at a definite rate, or pitch; others are vibrations at an irregular rate of rising or falling magnitude. You can distinguish between a pure sound of a definite and continuous pitch, such as the sound of an organ pipe or a flute; a complicated sound, which may consist of a blending of a number of pitches, as the voice of a person; or an abrupt sound, like the sound of a piano. It is evident that a complicated or an abrupt sound is much more difficult to reproduce than a pure sound.

The loudspeaker which is to reproduce all the musical instruments, and also all the voices that may be transmitted over the radio, must contain the qualities of all the different voices and instruments to be able to reproduce all sounds without any of its own characteristics. So far no loudspeaker has fully achieved this perfection. Any instrument possessing a horn, a diaphragm, or a reed, will have its own characteristic sounds, which may be suppressed to a certain extent, but not entirely eliminated. It remains with the listener to decide which loudspeaker is most capable of reproducting the largest number of instruments and voices with the greatest fidelity.

Almost all loudspeakers will reproduce a pure note with a fai rdegree of accuracy. If a pure note gives a rattling or scratching sound, it is certain that the loudspeaker cannot reproduce a complicated sound; but, on the other hand, the fact that a pure note comes through clearly does not necessarily mean that a complicated sound will be faithfully copied. The same loudspeaker may reproduce a low-pitched not much weaker than a high-pitched note. A complicated sound, which contains both these pitches, will appear distorted because its low pitched component will be weak compared to its high pitched component.

This shows two qualifications necessary in a good loudspeaker. The first is clearness of pure sound at different pitches; the second is equal loudness of sound at different pitches. But even these qualities are not sufficient to reproduce all complicated sounds correctly. A third necessary qualification is that in a complicated sound the individual pitches should get through in the same proportion that they have in the original sound. A fourth qualification is that the natural sound of the loudspeaker should be eliminated as much as possible. The natural sound of the loudspeaker is dependent on the horn more than anything else. The longer horn gives the effect of a lower and a more pleasing pitch. By a suitable design this effect can be reduced to its correct proportion.

A person desiring to choose a loudspeaker with the best qualities possible should make the following tests:

First.—Listen for a pure sound, such as that from an organ or a flute, or from a clear voice singing a sustained note; or if such tones are not available, the usual kind of "Howl" on the radio set may be used. If you run this howl through the full range, you can tell fairly well if any particular pitches come through unusually loud, or if other pitches are somewhat weak. If the loudspeaker gives all pitches without a rattle, and at a fairly even volume, you may expect this loudspeaker to give a rather good reproduction of all kinds of music. If one or two notes are particularly prominent, you will find that in reproducing music these notes will always ring too loud, and if the voice happens to strike these notes they will distort the quality of the voice. However, if one or two notes are missing, the quality is not impaired to any great extent. It is only when a range of notes is missing (for instance, all the low notes, or all the high notes) that the quality of both music and speech will be impaired considerably.

This test by means of the "howl" of the set will, as a rule, show you better than any particular selection of music or voice whether a loudspeaker can reproduce all kinds of music and voice satisfactorily.

The second test is made with piano notes. The piano gives a very abrupt sound, generally consisting of a blending of several pitches which are known in music as the fundamental and its overtones. In order to reproduce this sound correctly, the loudspeaker must have superior qualities. Sometimes the low notes no the piano seme to come through very clearly but, somehow, a musician would not think that the piano is reproducing correctly. He would speak of it as sounding "tinny." This would give a fair indication that these low notes miss their fundamentals and only reproduce their overtones, or high pitches.

A third test, and probably the most important, is the test of the voice. The voice, and particularly the speaking voice, is an extremely complicated sound. It consists, generally, of a blending of a number of pitches. Sometimes as many as twenty or thirty pitches are necessary to produce the quality and the inflection of the voice.

An increase or decrease in any one of these pitches will change the quality or inflection. Personal judgment is, of course, the only way to determine the quality of the loudspeaker. If you hear a person, whose voice you know, talking by radio, you can judge the quality of the loudspeaker by the naturalness of the voice, particularly by its inflections. The pitch of your friend's voice may appear lowered or raised a certain amount, due to characteristics of the horn, but that would not necessarily impair the quality. If you do not know the person talking, the best test you can make is to get far away from the loudspeaker and try to understand what is being said. With a good loudspeaker it is possible to go to a different part of the house, shut the door, and yet understand clearly.

In addition to clearness, another quality of speech should be considered also. A loudspeaker may give very clear speech, but with an accent on some particular sound, as the "ah" sound. Although this does not necessarily make the loudspeaker undesirable, yet the effect of thiis accent during a long talk will probably be annoying and cause some of the listeners to beg to have it shut off.

In testing the loudspeaker, and also in using it, it is essential that the radio station, the radio set, and the amplifier with which it is used all give good quality. A poor amplifier, or a radio set improperly adjusted, will make the best loudspeaker sound like the worst. It is sometimes difficult to get a distant station on the loudspeaker to sound clear. The usual effect is to accentuate the low notes and suppress the high ones. All voices are pitched low, and the music seems to consist of the booming of drums and the low notes of the piano or orchestra. This effect is due to the closeness of adjustment of the set and can be corrected only by the use of a more powerful set which does not require such close adjustment.

In conclusion, let us consider the place where the loudspeaker is to be used. In an ordinary living room of a small house, it is not necessary to have a loudspeaker that gives a large volume of sound. Quality is far more important, and a weak loudspeaker with a good quality will be found far superior and more pleasing. A loudspeaker capable of an enormous volume has its uses for outdoor demonstrations, dance halls, or auditoriums. A house with large rooms, where the loudspeaker may be used for dancing, requires a fairly large volume from the loudspeaker. As a rule, dance music must be made louder than speech or purely artistic value.

A person desiring a loudspeaker for any particular use will find in almost any radio store one that will satisfy his need. It will pay him, however, to choose one according to its merits for the particular use for which he desires it, since the same loudspeaker may be suitable for one place and very unsatisfactory when used in another.

RADIO REACHES OUT-OF-THE WORLD PLACES

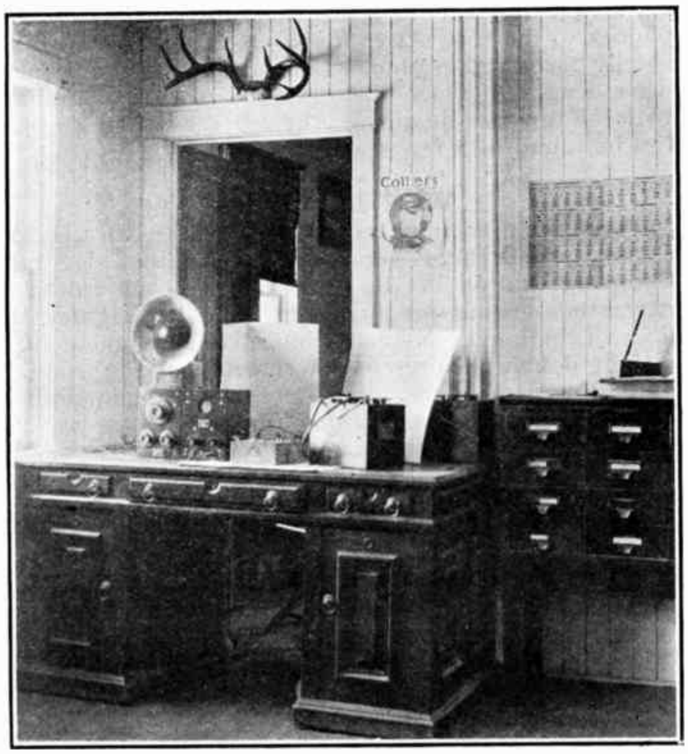
The Indian Lake Lumber Co., Ltd., have a camp at Osaquan (via Ignace, Ont.), not found on any of the published maps of the world. Until radio came along they were "on the edge of the Aurora Borealis—many miles from any town of importance."

Now they consider themselves the centre of the world. On February 17 Mr. Appleton wrote: "Last night we listened to two concerts between 9.30 and 11 p.m. Both Schenectady, N.Y., and St. Louis Post Despatch were broadcasting between these hours. With the dials all set, we listened to both sets by simply moving the tuner from 51 (W.G.Y.) to 58 (K.S.D.); the intervals of one concert being taken up by the selections of the other, and we had a three-hour concert in the space of one hour and a half, every piece of which came through the loud speaker as loudly as if the performers were in the building with us.

"One of the most beautiful and perfect concerts we got was on December 4th last, when we had a fierce blizzard from the north, which piled up most of the snow we now have. We heard 'The Flower Wreath' programme from Fort Worth, Texas, every selection clearly through the loud speaker. In fact, we seem to get better results when there is the opposition of a wind. Clear, still and intense cold nights, and results are not so good.

"I am satisfied we have a set as nearly perfect as can now be obtained, and that this perfection is due to the careful selection which was made of the component parts of the set, and which included Burgess 'B' batteries."

Those who are talking pessimistically about the future of radio should think of the vast good humanity in the isolated places receives. Think of the wonderful mission we who are interested have in spreading the good word to these people and showing them what radio can do for them. And from indications as to the type of men who have allied themselves with the industry there is every reason to believe a good job, well done, will be the final outcome.



Mr. Appleton's set in his office.

TOO MANY SIZES OF BASES

Nothing could better illustrate the lack of organization back of radiophone development in this country than the unstandardized system of making certain component parts for use in receiving sets, and of this the vacuum tube is undoubtedly the most striking example.

At the present moment there are receiving tubes on general sale which have three different types of bases, each of which requires a special socket of its own. Now a fourth type is about to be placed on sale. In addition to these, there is the original "Peanut" or "N" tube (which at the present time can only be bought in Canada), that has still a different sized base from all the others. As there is every possibility that reconsideration of existing agreements may shortly release this tube for general sale, the resulting confusion can easily be imagined.

It is not only in the matter of bases, however, that confusion exists—the tubes themselves are so arranged that each type requires a different voltage on its filament, and consequently a rheostat of special resistance value to care for it and eliminate the possibility of burning out the filament.

BROADCASTING REACHES 30,000 ISLANDS

From one of the 30,000 islands of the Georgian Bay, Ontario, has been received one of those letters which help radio station personnel, and artists feel that their efforts are relieving the sum total of loneliness in the world. L. E. Monck, on Wahsoune Island, Sans Souci, Ontario, Canada, writies:

"We are all very much attached to the entertainments being broadcasted by the different stations. These take us back to the cities and bright lights, and for the duration of the programs forget we are alone on one of the 30,000 islands of Georgian Bay, and for weeks at a time cut off from all communication with the rest of the world.

"Our nearest winter post office is Parry Sound, eighteen miles away, and when the ice is too thick to use a boat and not thick enough to walk on, we just stay here and hope for good ice, so as to be able to get out either with dog team or horse to get our mail. Just now the ice is good, and we make the trip every eight or ten days, but soon now the ice will start to break up, and then we are marooned until clear enough for a motor boat."

Another lonely radio fan in the Middle West is J. W. Morton, of Tofield, Alberta. He wrote: "I live on a farm 200 miles north of Calgary, and have been getting concerts off and on all winter, and when I do get them they are very distinct. I have a one-tube, home-made affair."

RESERVOIRS OF ENERGY ARE RADIO CONDENSERS

Condensers are a very necessary part of any radio set. They are reservoirs of electrical energy, in which the oscillations from the antenna circuit are stored up before they are passed on to devices that detect, amplify and throw out the music of speech in the form of sound waves.

Condensers may be so grouped that the total capacity of the unit is larger than that of any one condenser, or so that it will be less. Sometimes it becomes necessary to change the capacity of a circuit containing fixed condensers. This can be done by connecting the condensers in the required fashion.

The capacity of condensers is measured in a unit called "farad." As this unit is very large and the capacity of condensers used in radio work is so very small, it is customary to take a unit which is a millionth part of the farad, and is, therefore, called a "microfarad." This is abbreviated mfd. for short and the standard in radio apparatus.

The Gilliams Service

RADIO FOR YACHTS

As sailing days come near yacht owners are equipping their palatial crafts with the newest pastime, Radio apparatus, as a new aid to add to the pleasures of cruising, and to such an extent that it is reaching the proportions of a fad. Photograph shows a fair yachter off the Pacific coast, where yachts cruise all the year round, listening in on the radio with which her yacht is equipped.

RADIO A BOOM IN THE HOME

A woman, recently asked what was the greatest modern invention, said: "The radio—it keeps the old man home nights." A man, asked the same question, said: "The radio; it keeps the old girl quiet while I read the paper after supper."

But seriously the radio seems like a God-sent agency to restore and keep intact the family circle and the home life of our city that was being torn apart by so many other diversions, appealing as they did to the overwrought nerves of our people to be ever on the move. From an address on radio by Rev. Lyman R. Hartley, pastor of Fort George Presbyterian Church, New York City.

NO RIGID INSPECTOR PLANNED FOR RADIO

Bill Proposed by Hydro Would Only Safeguard Erection of Aerials.

In the proposed bill before the Legislature to give the Hydro-Electric Commission control of all radio installation, there is nothing to indicate that the Commission is planning a house-to-house canvass to inspect homes in which radio sets have been installed. The Hydro Commission has for a number of years had control over all electrical installations, and the proposed bill merely seeks to extend its safety regulations to include radio.

In this respect, the utmost to which owners of radio receiving sets could be affected would be in a few requirements regarding outside aerials, which are already observed by nine out of ten radioists. For instance, that the aerial be free from risk of coming into contact with power wires, and that a lightning arrester or switch be used in every case. The principal effect of the bill would be to provide inspection of amateur and commercial broadcasting stations.

This explanation is made for the benefit of those who may have views similar to a reader, signing himself "Radialis," who wrote in protest against the proposed bill, mention of which was made on this page last Wednesday.

"How will the boys like to be supervised in their attempts by some authority clothed with official power to interfere and suggest 'improvements' and 'necessities?' " he asks. "It will be the beginning of the end for many, if adopted.'"

"It would seem unnecessary to state the impertinence of the proposal on grounds of safety," he goes on, "except possibly in cases where the set is plugged into the small percentage, no doubt. The less control the industry receives, consistent with public safety, the better. Proposed installers will certainly resent it."

NO TECHNICAL KNOWLEDGE NEEDED TO INSTAL A SET

If a person has no knowledge of radio terms, symbols and hook-ups, it will be less expensive in the end if he buys a good set outright instead of trying to construct it himself. In building a set one learns more about radio theory, construction and operation than if he purchased a set. However, the practical experience of building a set will be found more expensive than buying unless the builder is familiar with radio theory and practice.

No technical knowledge of radio is necessary to instal a complete receiver. The binding posts are marked so that by following directions it requires but a few minutes to connect the antenna, ground, batteries and phones to the set. After the connections are made it is only necessary to tune the instruments to the proper wave length. Once the operator becomes familiar with the tuning adjustments the different wave lengths can be found in a few seconds.

WGR TO MOVE

Through an arrangement between the Statler Hotel Company and the Federal Telephone and Telegraph Company. station WGR, Buffalo, will be moved to a new studio being prepared for it on the eighteenth floor of the hotel. New and improved equipment furnishing double the present power will be used throughout. Two large pipe organs, one in the main dining room, the other in the ballroom of the hotel, as well as the orchestra under the direction of Vincent Lopez, of Pennsylvania Hotel, New York City, will easily be broadcast by means of a permanent cable connection with the set upstairs.

RADIO PATENTS

No. 228,573. Secret Signalling.—The International Western Electric Company, Incorporated, assignee of Burton W. Kendall, both of New York City, New York, U.S.A., 6th February, 1923. Filed 8th July, 1921.

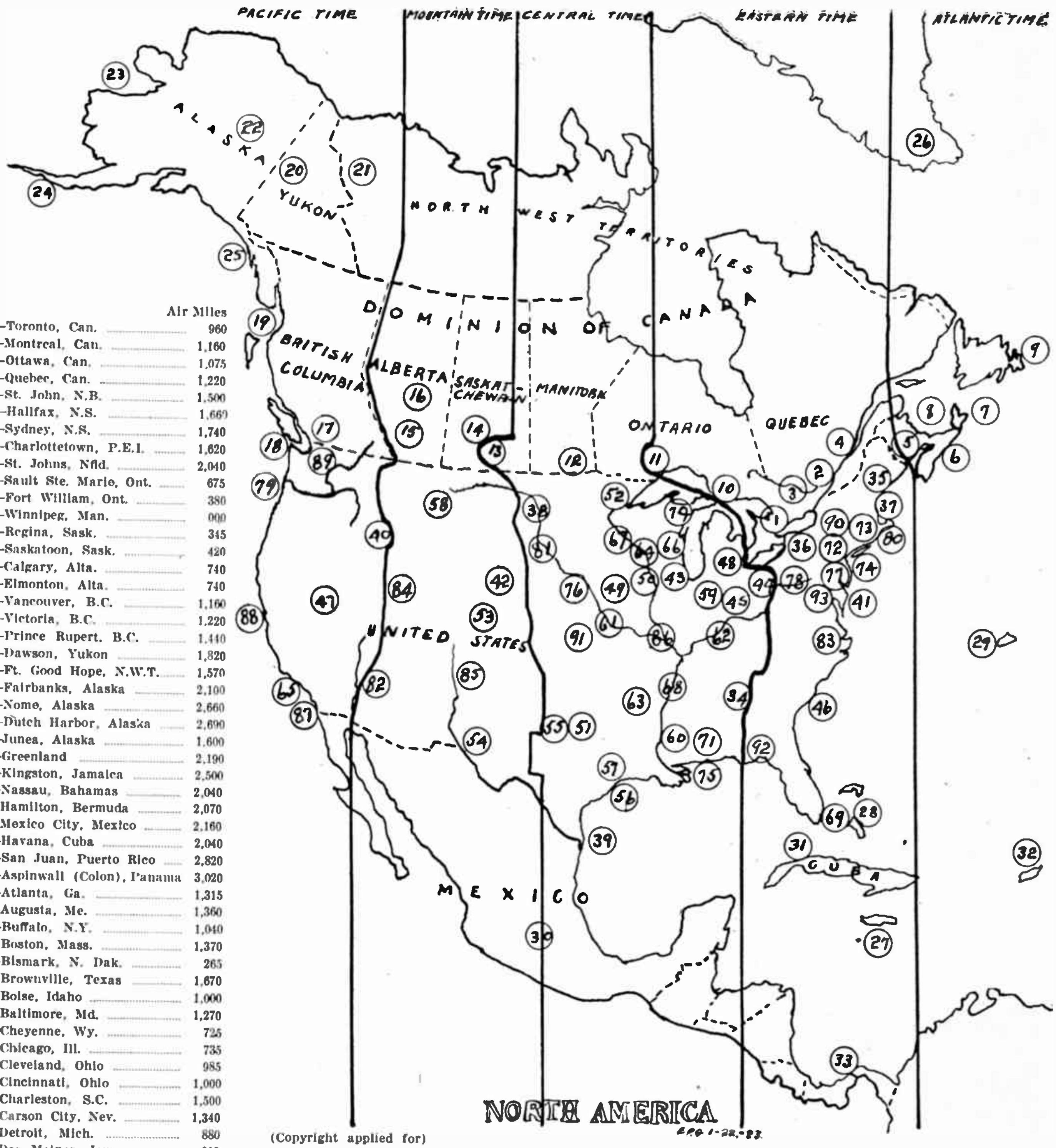
Claim.—1. The method of secret signalling which comprises modulating a wave by currents of signalling frequency, suppressing the unmodulated components of both the signalling frequency and the wave, transmitting only one side band of the modulated wave, modulating a second wave by the transmitted band and transmitting to the distant station only one side band of the second modulated wave, the frequency of one of said waves being continuously varied.

11. A system for producing a pure modulated high frequency wave and for suppressing currents of all frequencies incident to the production of said wave except those comprised in a single side band, said system comprising means for producing an unmodulated wave, means connected thereto for modulating said wave, a filter for selectively passing frequencies lying to one side of said unmodulated wave frequency, but preventing the transmission of said unmodulated wave and currents of all frequencies to the opposite said of said unmodulated wave frequency, means for modulating a high variable frequency wave in accordance with current of the frequencies passed by said filter and a filter for selecting for transmission only those currents comprised in a single side band resulting from the modulation of said high variable frequency wave which lacks the component representing either of said different high frequencies.

25. The method of transmission which consists in producing waves of signalling frequencies lying within a predetermined range extending from near zero frequency, modulating by said signalling frequency waves, a carrier frequency wave displaced in the frequency spectrum from said modulating frequencies by an amount sufficiently small so that the resultant side bands due to modulation will encompass a relatively large portion of the total range of frequencies extending from zero up to the upper limit of the upper band, selecting one of said side bands and transmitting energy corresponding thereto to a distant joint, receiving said transmitted energy, and reproducing therefrom the waves of signalling frequencies lying within said predetermined range.

Claims allowed, 52.

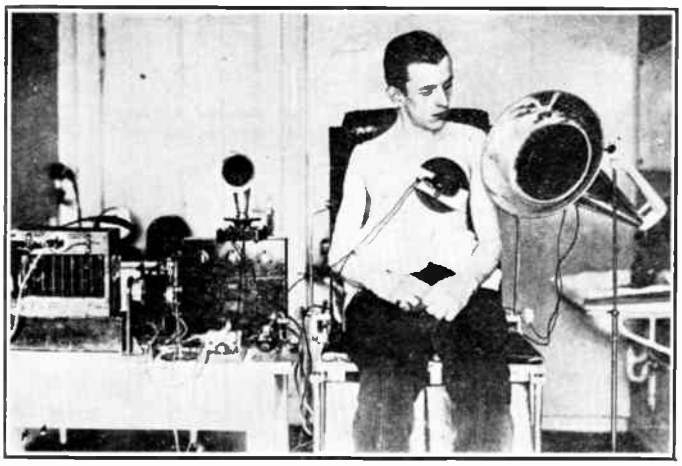
Air Line Distance, between Winnipeg, Canada and the following Cities, with Map and Key



(Copyright applied for)

	Air Miles
1—Toronto, Can.	960
2—Montreal, Can.	1,160
3—Ottawa, Can.	1,075
4—Quebec, Can.	1,220
5—St. John, N.B.	1,500
6—Halifax, N.S.	1,660
7—Sydney, N.S.	1,740
8—Charlottetown, P.E.I.	1,620
9—St. Johns, Nfld.	2,040
10—Sault Ste. Marie, Ont.	675
11—Fort William, Ont.	380
12—Winnipeg, Man.	000
13—Regina, Sask.	345
14—Saskatoon, Sask.	420
15—Calgary, Alta.	740
16—Edmonton, Alta.	740
17—Vancouver, B.C.	1,160
18—Victoria, B.C.	1,220
19—Prince Rupert, B.C.	1,440
20—Dawson, Yukon	1,820
21—Ft. Good Hope, N.W.T.	1,570
22—Fairbanks, Alaska	2,100
23—Nome, Alaska	2,660
24—Dutch Harbor, Alaska	2,690
25—Junea, Alaska	1,600
26—Greenland	2,190
27—Kingston, Jamaica	2,500
28—Nassau, Bahamas	2,040
29—Hamilton, Bermuda	2,070
30—Mexico City, Mexico	2,160
31—Havana, Cuba	2,040
32—San Juan, Puerto Rico	2,820
33—Aspinwall (Colon), Panama	3,020
34—Atlanta, Ga.	1,315
35—Augusta, Me.	1,360
36—Buffalo, N.Y.	1,040
37—Boston, Mass.	1,370
38—Bismark, N. Dak.	265
39—Brownville, Texas	1,670
40—Boise, Idaho	1,000
41—Baltimore, Md.	1,270
42—Cheyenne, Wy.	725
43—Chicago, Ill.	735
44—Cleveland, Ohio	985
45—Cincinnati, Ohio	1,000
46—Charleston, S.C.	1,500
47—Carson City, Nev.	1,340
48—Detroit, Mich.	880
49—Des Moines, Iowa	610
50—Davenport, Iowa	680
51—Dallas, Texas	1,210
52—Duluth, Minn.	320
53—Denver, Colo.	800
54—El Paso, Texas	1,360
55—Ft. Worth, Texas	1,200
56—Galveston, Texas	1,460
57—Huston, Texas	1,440
58—Helena, Mont.	720
59—Indianapolis, Ind.	910
60—Jackson, Miss.	1,310
61—Kansas City, Mo.	775
62—Louisville, Ky.	1,010
63—Little Rock, Ark.	1,100
64—La Crosse, Wis.	500
65—Los Angeles, Calif.	1,565
66—Milwaukee, Wis.	660
67—Minneapolis, Minn.	400
68—Memphis, Tenn.	1,100
69—Miami, Fla.	1,940
70—Marquette, Mich.	550
71—Mobile, Ala.	1,430
72—Newark, N.J.	1,320
73—New Haven, Conn.	1,350
74—New York City, N.Y.	1,310
75—New Orleans, La.	1,440
76—Omaha, Neb.	600
77—Philadelphia, Pa.	1,300
78—Pittsburgh, Pa.	1,070
79—Portland, Ore.	1,230
80—Providence, R.I.	1,395
81—Pierre, S. Dak.	400
82—Prescott, Arizona	1,325
83—Raleigh, N.C.	1,370
84—Salt Lake City, Utah	1,000
85—Santa Fe, N. Mexico	1,095
86—St. Louis, Mo.	870
87—San Diego, Calif.	1,575
88—San Francisco, Calif.	1,520
89—Seattle, Wash.	1,150
90—Schenectady, N.Y.	1,235
91—Topeka, Kan.	770
92—Tallahasse, Fla.	1,530
93—Washington, D.C.	1,280

Radio's World Wide News



The Gilliams Service

RADIO TO HELP IN HEART DIAGNOSIS

One of the most unique and promising of the new uses of radio is that just introduced by Dr. Leo Jacobsohn of Charlottenburg, Germany, a famous heart specialist who has devised a unique and remarkable radio instrument which amplifies the sound of the beating heart enormously and has resulted in the discovery of new data on the human heart in general. Photograph shows this remarkable appliance in operation in Dr. Jacobsohn's office.

LEPER COLONY BRIGHTENED BY RADIO

At Porto Rico's leper home on Cabras Island, there is now instaleld a radio receiving set complete with loud speaker. After long dreary years and silent nights this isolated spot has at last been able, through modern science, to obtain entertainment for its lonely and unfortunate patients by means of radio.

Few installations of radio receiving sets have been watched by a more eager and interested group of spectators than this one. The thirty-six lepers now find life on this island, where the sun beats fiercely and the surf pounds ceaselessly, a little more pleasant.

Heretofore there has been absolutely nothing to break the awful monotony of existence. Thus radio again comes to the fore in aiding humanity, and the shut-in ones, keeping them in touch with what is going on in the world.

COMMERCIAL BROADCASTING IN GERMANY

Eight Hundred Scattered Subscribers Getting News From America Through the High Power Station at Nauen.

After four months of experimenting, the Express Service Company (Eildienst Gesellschaft), Berlin, has begun a daily service of financial and commercial news, broadcasting to subscribers in various parts of Germany, according to a report to the Department of Commerce from Consul E. V. Richardson, Berlin. This company is financed by German capital, and is purely a private undertaking. Having arranged with the National Government for the use of the radio station at Koenigswusterhausen on a limited basis for a definite period, a regular service of financial news is received from the United States, Switzerland, Sweden, and other countries, via the high power station at Nauen, Germany.

This information is broadcasted immediately by radio telephone to subscribers of the company. These number at present about 800, and are mostly banks and industrial institutions located in some 200 towns and cities. It is expected that New York quotations handled by this service will be available generally to subscribers within ten minutes of their despatch from New York.

Each subscriber rents from the company the necessary receiving apparatus, paying for the service itself an annual fee of 300,000 marks, and for the apparatus an annual rental of approximately 200,000 marks. There are 2½ hour schedules daily, beginning at 9.30 a.m. and 5.00 p.m. The Express Service Company is represented in New York by a large American news agency.

QUEEN MOTHER BROADCASTS HER GREETINGS TO THE NATION BY RADIO

Queen Alexandra, on the occasion of the 60th anniversary of her arrival in England, celebrated by broadcasting a message to the nation in the following words:

"I am very glad upon the 60th anniversary of my arrival in England to send my affectionate greetings to the British people through the broadcasting service.

"From the day when I received such a magnificent welcome upon landing upon these shores in 1863, up to the present time, I have always experienced the greatest kindness and consideration from all classes, and I shall ever remember with gratitude the loyal and devoted sympathy shown to me in both my joys and sorrows.

"With a full heart, I sincerely thank them.

"ALEXANDRA."

In her 79th year, Queen Alexandra is as beloved as she was when she came to England as the bride-elect of the heir to the throne at the age of nineteen.

During the war she was a tireless worker in the Red Cross, and many Canadians who fought overseas will always remember her visits to the hospitals in which they were confined in and around London. She always had a smile and a word of cheer for everyone.

Owing to the unfavorable weather, her Majesty spent the day indoors at Marlborough House, and, although there was no special celebration, there was a continuous stream of callers at the Lodge in Pall Mall to sign the visitors' book, and thus express their affection and good wishes. The buildings in London were bedecked with flags.

The Mayor, aldermen and burgesses of Margate sent their greetings, for it was at this port that the then Princess Alexandra of Denmark landed on March 6, 1863, on board the Royal yacht Victoria and Albert, and the Mayor and several aldermen went to sea in a lugger to meet her and present an address of welcome. Thus they were the first Englishmen to greet her.

AMATEURS IN CANADA STIR UP INTEREST IN HOLLAND

Of late there has been a remarkable increase in the popularity of radio throughout Holland. Several large broadcasting stations have been planned, and they now are broadcasting directly from The Hague, on a 2,600-metre wave length. This interest has sprung up rapidly, and is a direct result of the reports of the American and English transatlantic tests, in which amateurs from this continent did such remarkable work.

London.—William Marconi is on the track of wireless directional control. The inventor revealed to-day that he hoped soon to perfect a device by which radio messages would be received only by the person for whom they are intended.

This problem, long one of the greatest difficulties in wireless development, has occupied Mr. Marconi's attention for some time, and, while declining to divulge his secret, he asserted he was confident he could overcome the obstacle.

Mr. Marconi has made numerous experiments to this end already. The chief tests of his device, however, will be made in April on his yacht Electra. The yacht is now at Southampton, and will leave shortly for a cruise along the coast of Spain and Western Africa.

"The entire matter is only in the experimental stage; it will at least point the way for a successful device of this kind, which may be improved later. If successful it will revolutionize wireless telegraphy."

Privacy to be Assured.

Mr. Marconi explained that the greatest difficulty with regard to wireless is the listening-in by strangers to private communications. Under the new method, it would convert the radio to a sort of telephone as far as privacy is concerned.

If the new device accomplishes its purpose, it will be possible to send radio messages from one station to another across the Atlantic without anyone listening in.

Both Mr. Marconi and his associates are maintaining a close guard over his new secret, which will be continued until the invention has proved itself. It is understood here, however, that the plan follows somewhat the lines of receiving instruments, whereby stations can tell the point of the waves' origin to a small fraction of a second or arc.

The air waves' origin has long been the problem of those seeking a method of directional wireless. If Mr. Marconi succeeds in this, it will mean reducing the sending of radio messages to the simplicity of telephone calls—and they would be equally private.

The inventor is also experimenting with other ends of wireless development, and hopes to increase transmission, as well as to improve accuracy.

Regulating Air Waves.

If this new device is successful, as regards controlling the air waves which carry messages, it will prevent waves spreading as they do now. Details cannot be gone into yet, but the hope is expressed that it may be practical to regulate air waves, even as far as across the Atlantic. On the trip going south, so as to be near port, instead of in mid-ocean, they will try the tests on the far countries.

Messages will be sent to the yacht from Carnarvon, Wales, and they can cruise about and tell exactly over how wide a space the messages can be received.

RADIO CONTROLLED AIRCRAFT

Rear-Admiral William A. Moffett, chief of the bureau of aeronautics of the United States navy, pointed out in his recent talk on the subject of naval aeronautics, delivered from the Waldorf-Astoria through WJZ, that the United States now has planes which can be controlled entirely through the medium of radio. This is the more impressive when it is understood that no pilot, observer or single person need be in the aircraft thus controlled.

SWEDISH FIRM CAPITALIZED AT $170,000

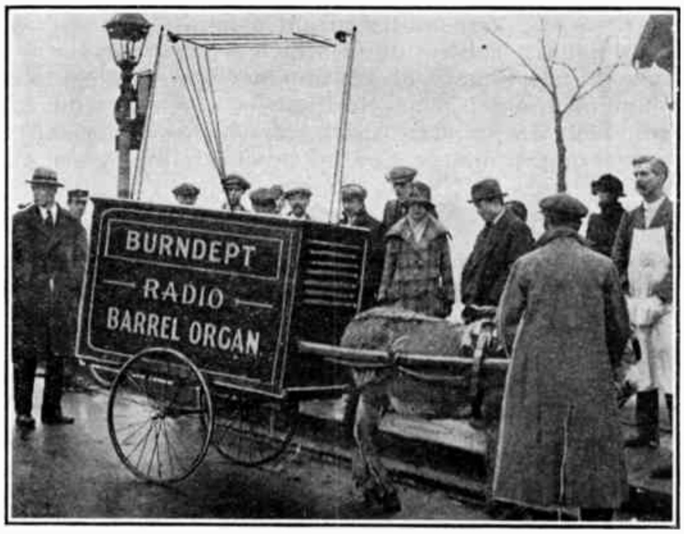
A stock company has been formed in Sweden, with a capital of $170,000, to broadcast news, market reports and entertainment from Stockholm. Remarkable interest has been shown in the new science, as evidenced by the generous purchase of radio goods throughout the kingdom.

NEW STATION IN SWEDEN

The Department of Commerce, Washington, D.C., announces plans for the establishment of a transatlantic commercial station at Gothenburg, Sweden, which is expected to be in operation by the end of the year. A direct circuit will be established with the Rocky Point station of the Radio Corporation of America, thus providing the first direct radio communication between the two countries.

SIGN OF THE TIMES

Here in Canada, when the street piano makes its appearance on the streets and fills the air with music played by handle, it seems to tell us that spring has come. With this new radio street broadcasting barrel organ making its appearance on the streets of old London, it not only tells us spring has come, but that radio has come to make itself felt as a real power throughout the entire world. Burndept, Limited, London, here show again their leadership in wireless by being the first to replace the old barrel organ so well known throughout England, with the radio broadcasting



barrel organ shown in the illustration. Burndept have also accomplished, by experimental work, the new feat of receiving in an aeroplane concerts broadcasted by land stations. Burdept are now established in Canada at 172 King St. W., Toronto, Ont., where high grade British-built products can be seen and demonstrated.

GIGANTIC RADIO SET ON BOARD LEVIATHAN

The radio installation aboard the Leviathan, which re-enters the trans-Atlantic service some time in June, will be the most powerful and elaborate steamship equipment of its kind in the world. The contract to equip the Leviathan with a super-power marine radio installation has just been signed, and work in connection therewith is now in progress.

The Leviathan's radio equipment will enable her passengers to exchange messages with two continents, regardless of her position on the high seas. With equipment six times as powerful as that carried by the average ocean greyhound, uninterrupted communication with points 3,000 miles distant is assured. Upon leaving her berth in New York harbor the Leviathan's radio officers will be able to link the huge vessel with various marine centres in Europe, and to communicate with America when leaving European ports.

In addition to telegraph service, a radio telephone installation, which will provide voice contact with other vessels and shore stations, is also to be installed. While it is not expected that a commercial telephone service will be inaugurated immediately upon the Leviathan going into commission, it is quite probable that shore stations will in the no distant future be erected to handle wireless telephone traffic from ships in mid-ocean to points inland over the conventional land line system.

A special emergency set will also be installed, so that if one or two sets become useless due to a mishap, the third or emergency set may be relied upon to summon assistance. Furthermore, two of the lifeboats are fitted with emergency radio apparatus.

The principal transmitter consists of a high-power vacuum tube outfit which will deliver to main antenna about six times as much power as the apparatus now used on the average steamship. A rapid transfer switch will enable the operator to shift the wave-length of this transmitter in an instant. The second is a duplex telephone outfit which will permit simultaneous telephone and continuous wave telegraph communication. The third or emergency sending equipment is a standard spark set, which will normally operate on 600 metres. Several super-sensitive vacuum tube receivers will be used for reception.

CUBAN STATION HEARD BY SEVERAL AMATEURS

Following the announcement that a Toronto amateur had picked up a Cuban station which he could not identify, several fans have written to report that they have received concerts from the same station on different occasions.

W. A. Smith, of Orillia, and Dr. G. H. Field, of Cobourg, both identify the station as that of Frank H. Jones, Tumiboo, Cuba, a sugar plantation 200 miles east of Havana.

"This station has not been assigned a call number," Mr. Smith writes, "but it is a regular licensed station. It is on 315 meter wave length, 100 watt output."

"I frequently hear this station," said Dr. Field, "but I think Mr. Milton did very well to get it with no amplification."

Letters have also been received from F. B. Hummel, Omaha, Nebraska; Donald Kay, Peoria, Illinois; J. A. Taylor, Rensselaer, N.Y.; Virgil Hepp, Gladbrook, Iowa; W. J. Hans, St. Louis, Mo.; F. G. Smith, Sarnia; Miles Kaltwasse, Wooster, Ohio; S. J. Mahuring, Brookfield, Mo.; W. C. Haines, Clarksburg, Ontario.—Toronto Daily Star.

RADIO BROADCASTING IN NORWAY

The Norwegian Telegraph administration, says Vice-Consul H. E. Carlson, Christiana, has recently made public a memorandum to the effect that the company to which a license for broadcasting is to be issued must be a stock company in which only Norwegian capital is represented, and in which Norwegian radio manufacturers, Norwegian press, and local amusement syndicates must have an interest. Material to be broadcasted will be limited to entertainment, general information and news.

RADIO REPLACES ORCHESTRA IN FRENCH CAFES

The Minister of Finance recently increased the tax on orchestras in France. Several cafe and dance hall proprietors let their orchestras go and installed radio receiving sets. Customers may now listen to music or dance with their meals at a cheaper rate than before.

According to the Under-Secretary of Posts and Telegraphs, owners of more than 50,000 private radio installations are now listening in to the concerts passing through the ether lanes over France.

UNDERGROUND RECEPTION

Radio has now yet another new feat to its credit. Experiments made at the Baggeridge Colliery (England) resulted in successful communication between the deepest section of the working (some 700 yards down) to the mouth of the mine.

NEW WEST INDIES STATION

Station WKAQ, the second broadcasting station in the West Indies, is now in operation at San Juan, Porto Rico. Programs are supplied on Thursday and Saturday evenings, starting at 7.30 o'clock, Eastern standard time. The station is an exact duplicate of PWX, Havana, a 500-watt type.

PAMPHLETS ISSUED BY SIGNAL CORPS

The United States Signal Corps is issuing a series of radio communication pamphlets describing the principles and operation of radio apparatus, with particular reference to the types of apparatus employed in the radio service of the Signal Corps.

ENGLISH FAN PAYS FINE

With the object of making it known that wireless apparatus cannot be installed or operated without first securing a license from the Postmaster-General, an action was taken against a radio fan in Royton, Lancashire, England, lately, and a fine of forty shillings imposed. He was also ordered to pay five shillings on two additional charges of unlawfully operating his set.

The English Government is enforcing this law in their usual thorough manner.

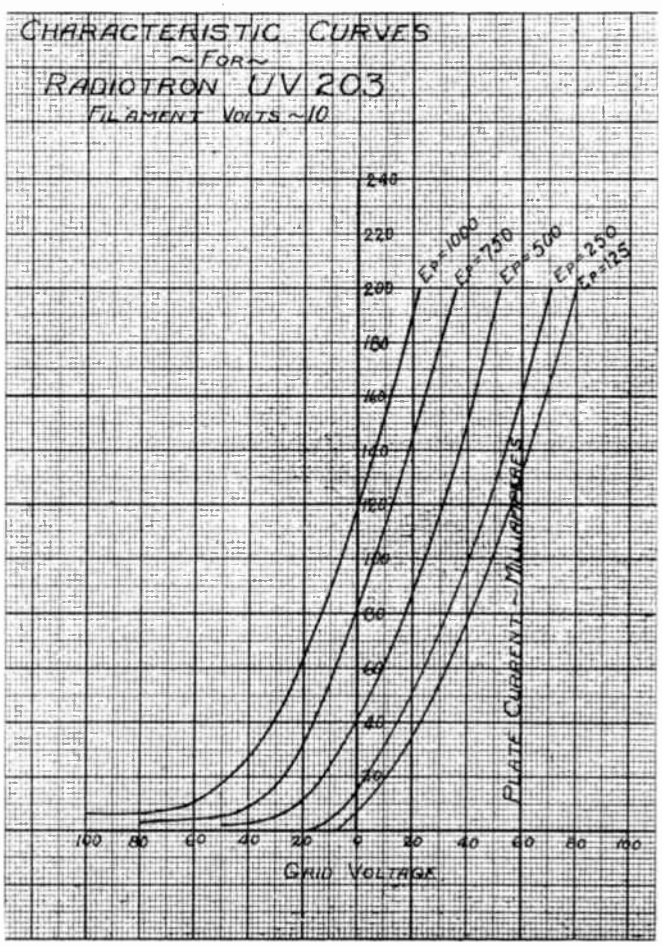
RADIO RESEARCH CLUB OF CANADA

The Audion as a Morse Telegraphic Relay

Chas. A. Culver, Ph.D., Chief High Frequency Engineer, Canadian Independent Telephone Co., Limited.

Lecture delivered before the Radio Research Club of Canada on January 5th, 1922.

Among the various problems which present themselves to telegraph engineers are those connected with the failure of Morse operated lines, due to excessive leakage, and the difficulty experienced in the use of high resistance lines. Since in certain radio uses of the audion it is employed as a potential operated device, it was thought that possibly one might combine the audion with an ordinary relay, in such a manner that Morse operation might be effected by means of potential applied to the line, rather than by the current in the line, and thus overcome certain troubles which result from wet weather, and also from high line resistance. The fact that the audion, when operated as a relay, functions without inertia, is an advantage in this connection. Work was begun on the problem early in 1921, and has now progressed to the point where there is considerable promise of a practical operating organization being available.



Courtesy of "Telephone & Telegraph Age," New York City, U.S.A.

In developing this new device, advantage was taken of the well known characteristics of the audion. If, for example, one selects a tube having static characteristics of the character shown in Fig. 1, it will be apparent that when operated at its normal anode voltage of 500 and zero grid potential, the plate current will be of the order of 40 milliampere. If, however, the tube be operated at an anode potential lower than normal, say, 125 volts, the space current will be only 6 milliamperes, or less, when the grid potential is zero. If then, under the latter condition, we impress upon the grid a potential of 40 volts positive, the plate current will increase from 5 milliampere to something of the order of 80 milliampere. A current of this order is sufficient in magnitude to operate a standard 150-ohm relay. It will thus be evident that we have in the audion a device which will function as a potential operated mechanism for ordinary telegraphic purposes.

In Fig. 2 is shown two typical circuits, which may be used for Morse traffic—one a full metallic circuit and the other a circuit having an earth return. From an examination of the figures it will be obvious that the audion when functioning as a Morse relay operates on "open circuit." Conditions could obviously be arranged so that such an electron relay would operate on "closed circuit," the signalling being done by reducing the voltage applied to the grid to zero. Such an arrangement would, however, possess little advantage over existing electro-mechanical relay operation.

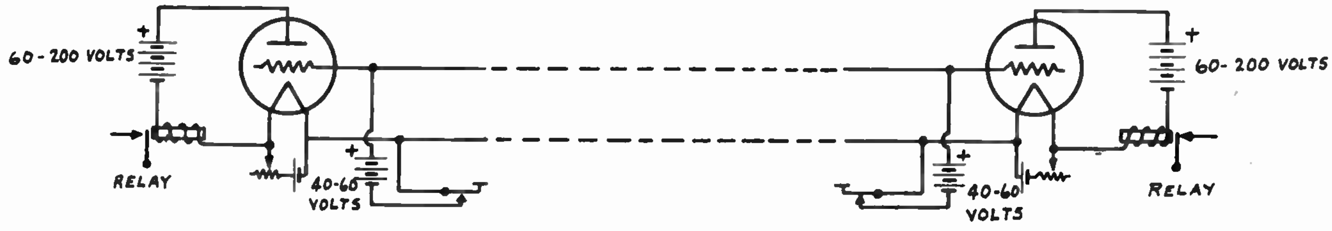
Again referring to Fig. 2, it will be seen that uopn closing the key at station "A," for example, there will be impressed upon the grid of the audion relay at that station a definite predetermined positive potential, and the space current will instantly rise to a value which will give positive operation to the Morse relay in the plate circuit of the electron or audion relay. This procedure simultaneously impresses upon the grid of the audion at the distant station "B" a like potential (except for the slight fall of potential due to the resistance of the line), and the distant audion relay will function in a manner similar to that at station "A." At both terminals the local Morse relay in the plate circuit may be adjusted so that they will be operated as "closed" or "open" organizations, as convenience dictates.

Since in using this device the line current is of extremely low value (only 1 to 5 milliamperes), and since the resistance of the signalling circuit is chiefly due to the grid-to-filament resistance of the tubes, the resistance of the physical line itself is of secondary importance

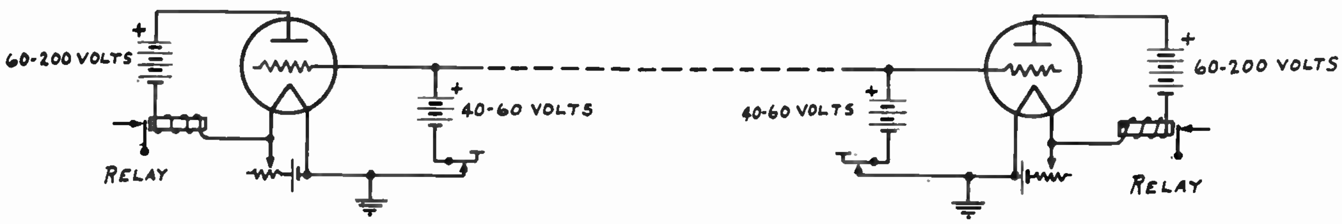
Laboratory tests over artificial lines and actual field tests have demonstrated that we have in this device a means by which one may successfully operate a

Morse relay circuit over lines of high ohmic resistance, and also over lines showing comparatively low insulation resistance. It would appear that lines of iron wire will function satisfactorily. Tests over artificial and actual lines appear to indicate that the audion relay when operated over standard copper lines will give satisfactory commercial service over lines up to 800 and possibly 1,000 miles without repeaters. The magnitude of the energy consumed in the line is extremely low, and hence the magnetic field set up by signalling is of very small value, hence the interference with adjacent telephone circuits is reduced to a negligible quantity. For the same reason it is also possible, by means of this device, to establish either a simplex or composite circuit, without the use of the usual retardation coils and condensers. In a trial over actual lines, helephone relays were operated while conversation was in progress, and practically no sound could be detected in the telephone circuit.

While the audion has certain marked advantages over the ordinary relay, as outlined above, this device may also prove to have certain limitations, due to the fact that it is a potential operated mechanism. Positive potentials induced in the lines from extraneous sources may tend to result in abortive operation of the relay. However, so far as the writer has tested the audion as a signalling device over actual lines, this phenomenon has not presented itself. Only by extended practical operation can these limitations be determined. However, notwithstanding such possible limitations, we have in this new application of the audion a device which will undoubtedly assist in the improvement of Morse operations.



STATION "A" STATION "B"



Counterpoise System of Reception

Now that the static season will soon be upon us, we are looking around for substitutes for aerials that will bring in the desired stations without static.

Then again there is the summer time vacation set. The peanut tube has hepled a whole lot in this direction with the battery problem and portability, but there is the aerial which is not such a great problem in the camp outside of static until it comes to the canoe, car or a location devoid of trees for aerial supports. There you turn to radio frequency, reflex and super regeneration to serve your aerial problem. Here's where you kill the portability of your set. It will be of rather large proportions to contain any of the above circuits and then again none of these circuits are really universal. They don't work as well as they did on their original aerials or in their original locations, so their operating characteristics combined with bulk and number of controls in my opinion kill their vacation possibilities.

With static and the summer time vacation set problem in mind, I have succeeded in producing a circuit that should meet with approval of both the radiophone fans and the telegraphy amatures, and you relay workers will sure appreciate it when the Q.R.N. is heavy.

Fig. 1 shows a honeycomb coil circuit, the departure from teh usual circuit being in the common battery connection which, instead of going straight to ground as is customary, it first passes through an inductance which is placed in inductive relation with the aerial or primary coil.

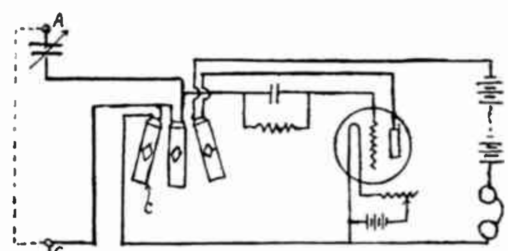


Fig. 1

HONEY COMB OR SPIDERWEB COIL CIRCUIT A AND G SHORTED
C = COUNTERPOISE COIL

The A battery connection may run straight to ground as usual with the negative lead of the B battery only passing through this counterpoise coil before joining the A battery, or the nepative of the B battery may pick up the ground connection with the A battery lead passing through the counterpoise coil, results being obtained with either arrangement although both battery leads passing through the coil appear to give the best results, but it is advisable to try each arrangement and choose the one that gives the best results for your particular conditions.

This counterpoise system is absolutely universal and is adaptable to any circuit. It is not necessary that you have to make any radical changes in your present existing set and a further advantage it may be made as a separate external attachment to any set, the only material required being a variometer or the usual standard coupler.

Keeping in mind that you already possess a receiving set I will attempt to make the counterpoise attachment applicable to your particular set. The three coil honeycomb or spider web being the most popular will be tackeled first. Fig. 1 shows the three coils, primary coils and tickler are left intact, the change being made in the secondary or middle coil. The drawing pretty well explains itself, the only precaution being to reverse the connections to the middle coil. The counterpoise coil is here shown on the left, although any combination may be adopted. oCunterpoise in the middle, primary on either one side or the other, tickler coil in the middle.

Fig. 2 shows another popular circuit using the vario-

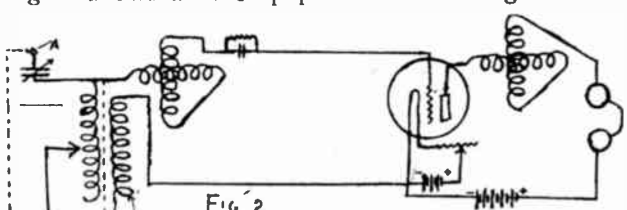


FIG. 2
VARIOCOUPLER VARIOMETER. CIRCUIT A AND G SHORTED
C= COUNTERPOISE COIL

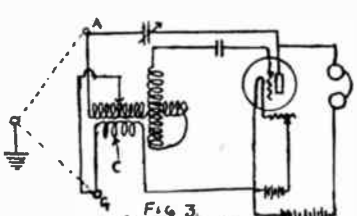


FIG. 3
REINARTZ CIRCUIT. A.G NOT SHORTED
C= COUNTERPOISE COIL

coupler and two variometers, the changes being made only in the coupler, the dotted lines showing suggested changes and should not be used as a combination, that is, try one of the dotted connections first, then disconnect and try the other.

Fig. 3 is the typical Reinartx circuit, the addition being the counterpoise coil which if desired may be arranged to slide inside the primary coil, keeping in mind to reverse the connections to the counterpoise coil. There are many users of the Reinartz circuit who have made a slight departure from the circuit shown on Fig. 3, but the counterpoise coil is still applicable as shown.

Fig. 4 is the now popular Flewelling circuit and is the last circuit I have tried out with the counterpoise. The addition being here in the additional coil which is shown in the circuit after the condenser bank. This calls for a triple coil mounting, and as some of you have already a triple caoil mounting fitted to your "Flew" you will be able to make a quick change. The same combination as in Fig. 1 may be tried out by placing the counterpoise coil either in center or opposite ends. I have tried the counterpoise coil in various positions in the "Flew" circuit such as before the condenser bank and after on the ground side and in the common battery leads before they pick up the condenser bank, this arrangement appears to give the best results, as it permitted the tuning in of stations without the carrier wave.

I will now show how this counterpoise system may

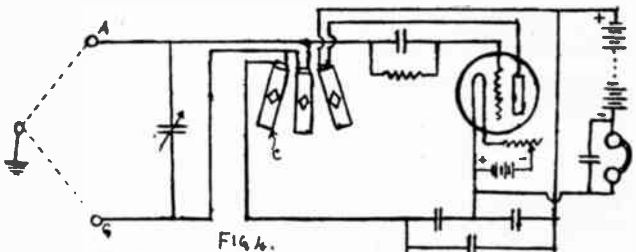


FIG. 4.
FLEWELLING CIRCUIT. A AND G NOT SHORTED. C= COUNTERPOISE COIL

be used as an external attachment so that the wiring of your set may not be disturbed.

In Fig. 5 is shown the imaginary set, no matter what the circuit may be. Obtain a variocoupler or a variometer (which should be split to function as a coupler), connect it as shown in Fig. 6.

Another method is to wind a coil of about 30 to 50 turns on a form that will either slide inside or over your primary coil, connecting your battery lead to one side and the other side to the primary on the ground side. If a series condenser is in use in your circuit your A and G bindinp post should be shorter.

As I have already mentioned, I was chasing up a portable set for vacation use, so I confined my experiments on the counterpoise system to peanut tubes, resulting in a cabinet, 7 x 7 x 7, containing detect and two steps and all batteries, all tuning being done with a 23-platt condenser (single control). No rheostats were used. To those who have the vacation set in mind a few suggestions will be quite in order. If you have used peanut tubes, especially the Northern Electric (Canadian), you have noticed that the adjustment on the rheostat is not critical and requires a very low adjustment. This being evident, I decided I could work the tube with a fixed resistance, same applying to the amplifier tubes, so I divided the resistance element of a rheostat into three equal por-

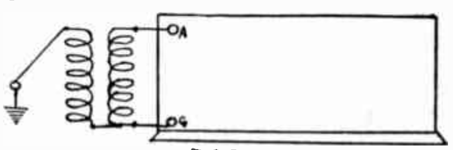


FIG. 6
EXTERNAL ATTACHMENT

tions, placing one in each leg of the three tubes. A cheap rheostat will answer this purpose, as only the element is needed. To obtain the single control I tried out several single circuit arrangements, choosing the circuit that gave the largest range of control with the condenser only, the inductance kept in a mean fixed position. The circuit decided upon, the counterpoise coil was introduced, and was arranged to pick up the mean position, that is, with a suitable range on either side. This position was about at right angles to the primary; in this position the counterpoise coil was fixed. Two honeycomb or spider web coils will answer the same purpose. This is the vacation outfit for use in car, canoe or camp.

Would state that the various circuits submitted in this article have all been tried with the counterpoise attachment, and are not merely suggestions. Each circuit in turn came up to the decided standard. On detector alone using the variocoupler, variometer

Continued on page 42

RADIO TRADE REVIEW

What is Formica ?

The newcomer in radio is almost sure to ask that question. The exact nature of the shiny, highly polished material of which radio panels are made is a mystery. It looks like rubber, and yet it doesn't. It's a question that needs explaining.

Formica is now almost universally used in the radio sets manufactured by the makers of complete sets and by a great many of the parts manufacturers. It is one of the standard and staple radio articles that figures practically wherever radio is used.

The base material in formica is a fibrous product somewhat akin to paper. This material is soaked in and impregnated with a varnish or resin called redmanol. The varnish is produced under the patents of the Gemeral Bakelite Company.

Then it is cut in sheets and the sheets arranged in piles, according to the thickness of the piece of formica that is to be produced. On each side of the sheet is placed a burnished plate of metal. Then the piles are put into a great press and subjected for some time to great heat and pressure.

The fibrous sheets are vulcanized or welded during this process into a solid insoluble sheet of formica. The effect of the burnished metal is like that of a squee-gee plate on a photographic print. It imparts a high polish to the surface, which is one of the characteristics that is highly valued in formica panels for use in high quality receiving sets where appearance is an important consideration.

After the formica comes from the press it is finished except for trimming the edges of the sheet on a saw and sawing up large sheets of formica into smaller ones of suitable size for use in radio panels.

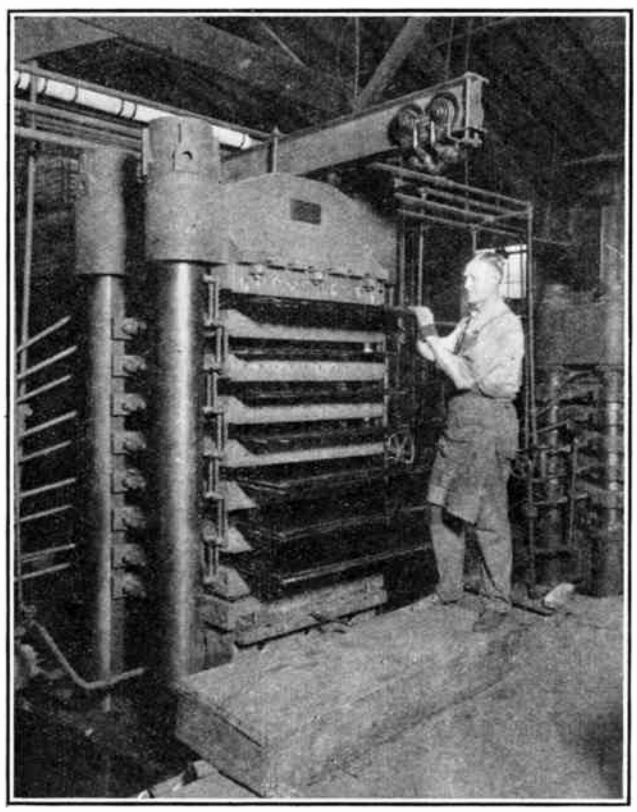
Formica is almost universally used in radio, and is very widely used in all sorts of electrical manufacture. In these uses it has largely replaced hard rubber and vulcanized fibre, older materials that were once generally used.

With relation to hard rubber, formica has the advantage of greater tensile strength and less likelihood of cracking and breaking when it is worked on with tools, or when it is accidentally dropped. Formica does not soften under heat, nor does sunlight discolor it. The dielectric strength, which is high when the material is new, improves with age and does not deteriorate.

As against vulcanized fibre formica has the advantage of not absorbing moisture, and so remains a perfect insulator in humid weather or damp climate. It has the tensile strength and same working qualities with tools as vulcanized fibre.

An important quality in insulating material for radio purposes is uniformity in dielectric strength, and it is one that erquires great care in manufacture to obtain. The resin is composed of two substances, which react on each other, and to secure a uniformly good product it is essential that the reaction should have progressed to the same extent in each case in which the resin is used.

To secure this perfect uniformity the Formica Insulation Company buys these substances separately and mixes them in their factory, so that it is certain



that the resin will be the same each time. The special fibre base is also manufactured accurately to formica specifications.

Formica is a highly useful material made for a wide range of purposes in a number of grades. The dielectric strength of the material is determined by the percentage of resin used in its manufacture. Some electrical purposes require higher dielectric strength than others. Radio demands the best possible insulators.

To secure greater mechanical strength formica is made with a base such as cotton duck, which is used in gears and pinions where silence and ability to absorb shocks is required. Formica is also used for pump valves.

The Second Annual Radio Convention

The Second District Annual Radio Convention and exhibit, held at Hotel Pennsylvania, New York City, March 1st to 3rd, was a marked success. Much that was new in the way of radio equipment and many novel stunts were features of this show.

The exhibit starting on Thursday noon consisted of twenty-five of the most erpresentative manufacturers. The Radio Corporation had a large display board, some ten to twelve feet square, with their initials R. C. A. spelled by use of over three hundred audion bulbs of their manufacture. The Bristol Company, manufacturers of loud speakers and other units, had a powerful 10-step amplifier connected up to 10 speakers, 6 of which were in the exhibit room and the others at various points. The tremendous volume produced by these speakers was such that anyone on the floor was enabled to hear plainly and distinctly all announcements, lectures and broadcasting. This arrangement was also used to page wanted persons.

Another feature of the show was the use of large models of radio parts and equipment.

The Adams-Morgan Company of Upper Montclair, N.J., featured a model of the well known "Paragon" receiver built on a three to one proportion. Its panel, made from condensite celoron, measured 57 in. long by 19½ in. wide. The dials, one foot in diameter, were made the exact image of the smaller dial, the lines being all carefully engraved and the dial machined from a solid piece of condensite celoron. Even to the binding posts and contact points the exact proportion was carried out.

Along the line of new equipment the Reflex receiver, manufactured by the DeForest Radio Telegraph and Telephone Company, and the Neutro-Dyne receiver, manufactured by the Freed-Eisemann Radio Company, and the F. A. D. Andrea Company, had the centre of attraction. Many possibilities are claimed for these types of sets, and they no doubt represent a distinct advance in the radio industry.

The booth of the Diamond State Fibre Company, manufacturers of condensite celoron, was especially attractive. Standardized panels was the feature of this exhibit. This company, recognizing the need for standardization of panel sizes, have, after much study and investigation covering many months, adopted seven sizes, which cover over 90% of the demand. These panels are carefully cut to size, cleaned and wrapped in glassine bags, on which is printed directions for working. This method of putting out panels represents an improvement over the old method of merchandizing whereby one had to order a panel and then wait for a half-day or more until it was cut. The high quality of these condensite celoron panels was particularly noted, especially the freedom from surface blemishes and other defects commonly noted. This company also exhibited a large amount of radio equipment manufactured by representative manufacturers, showing applications of the panel material. Sets from the Clapp-Eastham Company, Adams-Morgan Company, New York Coil Company, Freed-Eisemann Radio Company, condensers from the U. S. Tool Company, Heath Radio & Electric Mfg. Company, Eisemann Magneto Company, and many other machined specialties from condensite celoron and vulcanized fibre.

The convention ended with a banquet in the ballroom of the hotel. This banquet, a strictly amateur affair, was attended by many prominent men in the radio field. The younger set were supplied with whistles, which made the place sound like a boiler factory. One novel feature of the show was pulled off by the Adams-Morgan Company, who had their large model receiving set, mentioned above, placed up in the balcony. A Bristol loud speaker was placed on top of it, and the hall listened to sweet strains from a young lady's voice. It was apparently radio music, for Mr. Paul Godley, of radio fame, was tuning the instrument. After a few selections, the lid over the cabinet was raised and out came the lady. After much applause, speeches were enjoyed from Mr. H. P. Maxim, Mr. Schnell, Mr. Warner, and many others of note.

From the observations of one who attended last year's show, one could honestly say that radio has made a distinct advance during the preceding year.

THE NEW FILKOSTAT

In the Filkostat, a new filament control just perfected by S. R. Hipple, well known as an inventor of apparatus for the control of electrical currents, there is at last presented an instrument which is distinctly designed to utilize the great tuning possibilities of the vacuum tube itself. Radio set builders, amateurs and manufacturers have been looking forward to the advent of just such a device. They have realized that all rheostats, and other so-called filament regulators, are merely adaptations of pre-radio day devices, not capable of adjusting the infinitesimal graduations of filament Heat which adjustments are essential to perfect tuning.

Perfect Tube Control.

The Filkostat permits perfect regulations of filament heat. Since the heat emitted varies as the square of the current, fine current regulation becomes extremely necssary to accomplish. This governs the flow of electrons. Proper control of the electronic flow in the tube permits the very finest tuning conceivable. The fine adjustment of the Filkostat starts slightly before the tube begins to function. With other filament controls, what minute adjustment there is, starts when the filament is almost at maximum heat—the Filkostat control is so fine that increases of temperature are fractions of a degree, with corresponding variations of electronic flow from the filament to the plate, are obtainable.

Longer Tube Life; No Noises.

The initial inrush of current prevents the crystalization of the filament which so many experts claim occurs when the current is fed too slowly at first as is done in other forms of filament controls. This means considerable incrase in tube life. Furthermore the extreme degree of fineness in increase and decrease of electronic flow by infinitesimal variations, makes the Filkostat control ideal.

The perfection of design including ample internal contact is the cause of this new instrument being non-michrophonic, absolutely silent, and free from all noises.

Proven Best by Laboratory Test.

The Filkostat superiority has been proven by tests made on Bureau of Standard, instruments. Comparison was made of the area of fine adjustment control of the wire rheostat, all other well known filament controls and the Filkostat. In case the gradual and perfect increase and infinite adjustments which the Filkostat permits was clearly indicated.

The area of the fine adjustment line on the graphs for the Filkostat is 19 times that of the line for the wire rheostat and more than twice that of the next best filament control. However while one can visualize the difference in area of those lines, the actual difference in area of fine adjustment is far greater—by reason of the nature of the resistance element in the Filkostat.

The WDTP'S curve the graph is eloquent testimony as to the Filkostat's adaptability to any dry cell tubes. These tubes using only a fraction of an ampere demand an instrument that is so finely adjusted that this fractional current can be perfectly regulated. This the Filkostat accomplishes.

Other Filkostat Features.

The Filkostat has a definite off. It is so designed that the filament extinguishes abruptly indicating that the A battery supply is completely disconnected.

At full on the Filkostat resistance is practically zero.

The Filkostat consists of a hollow cylinder containing the special resistance material placed between two large adjustable contacts controlled by turning the knob.

The resistance element is so finely divided that no further division is possible. There are no disks to break or chip.

The resistance remains constant at any position eliminating current variations once set. Such variations are not apparent to the person tuning excepting in "fading out" of stations, and noises. But in the laboratory where such a test as that shown on the graph mentioned above can be made by anyone, this feature and all the other points of superiority of the Filkostat are immediately apparent.

The Filkostat which will retail for $2.00 is being manufactured by the DX Instrument Company of Harrisburg, Pa. The entire international distribution is in the hands of Radio Stores Corp. of New York. An extensive advertising campaign to reach the dealer and consumer has been planned by the Arthur Rosenberg Co. Advertising Service.

THE VIMY SUPPLY CO., LIMITED.

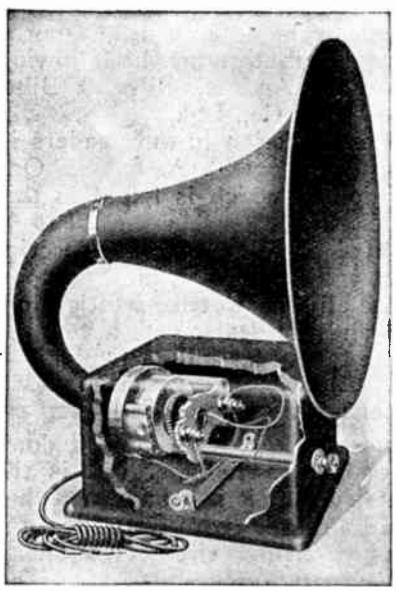
It is with a feeling of pride that we can say a few words about the firm who signed the firts radio advertising contract for the Aviation News and are still with us. This firm was one of the first to realize what service and quality meant to the budding amateur, and served their requirements well in the old spark days.

Customers of those days are customers now. Apparatus made by reliable manufacturers only is stocked. Their mail order service stretches from coast to coast, both to dealers and amateurs.

An item of interest just added to their stock is the McTighe storage "B" battery, 22½V, using Edison plates. The cost of upkeep is very low, and also the great disadvantage of a noisy "B" is eliminated. Acid and oil are supplies for charging.

Keep up the good work, Vimy.

THE DICTOGRAND RADIO LOUD SPEAKER



The Dictograph Products Corporation, 220 West 42nd Street, New York City, has placed on the market the new Dictogrand Radio Loud Speaker. This new loud speaker is mounted in a mahogany finished hardwood cabinet. By referring to the accompanying illustration, it can be seen that an adjusting dial in the front of the cabinet increases or decreases the air gap or distance between the pole shoes and an especially made secret alloy diaphragm. The adjusting mechanism operates through a shaft, pinion and gear. Changing the air gap varies the pull of the magnet upon the diaphragm, thus enabling the loud speaker to be tuned up in complete harmony and resonance with the receiving set.

The unit is an entirely new and novel arrangement, consisting of laminated pole shoes, with special dictograph coils wound with No. 44 magnet wire. The harsh, jarring sounds, the noises and overtones, defects common to all other loud speakers, have been overcome in the dictogrand. It creates the illusion that the artists are in the very room with the listener.

The new wonderfully effective design and mechanical arrangement for adjusting the air gap of the Dictogrand Loud Speaker regulates the magnetic flux as simply as the flow of water is controlled through a faucet.

The diaphragm is of special composition, restricted solely to Distograph Loud Speaker production. The entire unit is subjected to a rigid inspection and test both during sub-assembly and final completion, and is guaranteed against all mechanical and electrical defects for a period of one year.

The horn is of spun copper, handsomely finished in mahogany. The tone-arm is a die casting, especially designed for resonance and lack of vibration. Each loud speaker is equipped with five feet of flexible silk cord, with standard terminals.

The Dictogrand Radio Loud Speaker is designed to operate on any vacuum tube receiving set, using two stages of amplification, but good results are often secured on sets employing but one stage of amplification, dependent upon the type set used and the distance from the broadcasting station. This loud speaker required no external batteries. In its design and construction is concentrated 20 years' leadership in the art of sensitive sound transmission. Dictograph experience in the manufacture of the Accousticon for the deaf, the Secret Service Dictograph, and the Dictograph System of Interior Telephones, has enabled the production of this perfected radio loud speaker.

RUSSEL RADIO SET

Illustrated in the advertising columns of this issue is a complete radio receiving set, now in production by the Russell Gear & Machine Company, Limited, Toronto.

The circuit arrangement is that which experience has shown to be most satisfactory for reliable everyday service—honeycomb coil tuner, detector, and two stages audio amplifier. Such a circuit is selective, easily operated, and is the only simple means of efficiently receiving all waves used for radio communication. This latter point is of considerable importance in view of the inevitable change of wave length by many broadcasting stations in the near future. It also makes possible reception of other than the ordinary broadcasting stations and of telegraph signals on all waves.

The layout of the set makes for convenience of operation. All parts are mounted on a celoron panel, 7½ in. high x 20 in. long, thus bringing all controls to the proper level for operating with the arm resting on the table. Flament control jacks are, of course, provided.

This set is supplied complete with aerial equipment, batteries, tubes and phones, and the stamp of a reputtable manufacturer assures that all parts are of the highest quality. It is supplied unwired, the accompanying blueprint showing in detail exactly how connections are made. The few hours required for this work will not only reduce the cost of a set, but will amply repay the user by giving him an insight into "what is in the box."

A. Carey & Sons have now moved into their new location, 274 King Street E., Hamilton, where they have a large showroom for demonstrating purposes, also large stock rooms.

They are now handling extensively a complete line of high-class radio products for both wholesale and retail trade

They are distributors for the Canadian Westinghouse Co., Dictograph Products Corporation of America, Burgess Batteries, Ltd., Bremer-Tully Radio Co., Radio Corporation of America, Dyer Radio Co., Chelsea Radio Co., and many other high-class manufacturers' products.

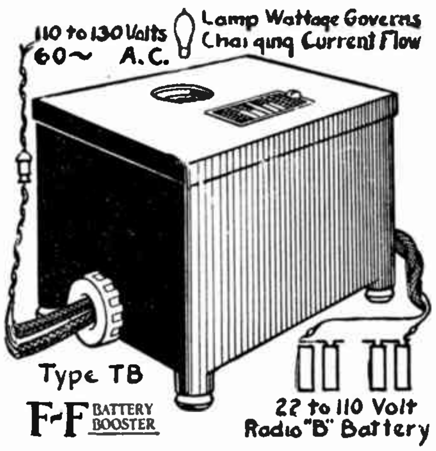
They have now every facility for handling all orders promptly, and will be pleased to send price lists on application to any legitimate radio dealer

LATEST F-F RECTIFIER CHARGES "B" STORAGE BATTERIES ONLY

Charging "B" storage batteries of 22 to 100 volts from alternating current can be easily, economically, and cleanly done with the type TB mechanical rectifier, recently added to the line of F-F battery boosters made and marketed by the France Manufacturing Company, Cleveland, O.

The manufacturer states: "We developed this low-priced equipment to overcome the uncertainties of electrolytic rectifiers, with their attendant mussiness, short life, and great voltage loss. Type TB is always ready for instant use. It has no parts to get out of order or to deteriorate."

Any group or Lead or Edison cells equivalent to 22 to 100 volts can be charged in series at the same time. The current rate is regulated by an ordinary tungsten lamp screwed into socket shown on rectifier. Usually a 60-watt lamp meets the requirement.



A "B" storage battery is charged by first disconnecting it from the receiving set. Clips supplied on ends of battery cords coming from rectifier are snapped on battery terminals—positive to positive, negative to negative—no chance for reversed currents. The extension cord is then plugged into any convenient A.C. lamp socket.

Size is 5 in. x 5 in. x 3 in.

Shipping weight, 4 lbs.

For full details address the manufacturer.

A GUARANTEED CRYSTAL

Standard brand crystals are made of mineral radiocite by the Standard Mineral Co. of Newark, N.J. They think so much of this product that each and every crystal is guaranteed unconditionally to give satisfaction. This means a great deal to the reliable dealer who is doing business with the amateur, and must give quality merchandise if he expects to hold their trade.

WILL THIS BE A RADIO SUMMER?

The belief that radio is a one-season hobby is surely losing ground. Reports show that the demand for radio material is on the increase, and both manufacturer and dealer are looking for a real good summer.

J. V. Elliot Company of Hamilton claim that the vacation and other usual summer attractions will in no way interfere with radio this summer. Whether they go motoring, canoeing, fishing, hiking or camping, their radio set is going right along with them.

This statement is strengthened owing to the increased demand for peanut tubes, which suggests vacation sets.

Mr. Elliot goes on to say that the market for portable sets this summer will be exceptionally good, and with this in mind he will, in all probability, be handling a "no aerial set" at a reasonable price.

STARR 3,000 OHM RECEIVERS

This is a new product of the Starr Metal Products Co. Due to not having space available to devote to the making of their receiver, they are manufactured in the plant of the Automotive Products Co. under their supervision.

These are a high-grade phone. Among the many features are forged magnets, matched coils, and the phone terminals cannot short on the head band, head bands being of spring steel, nickel-plated, is most sanitary, and are very comfortable fitting, not having too much spring tension, and easily adjusted.

These phones may now be purchased from any Starr dealer for $7.50 per set, and are sold with the regular Starr guarantee.

NEW RADIO WHOLESALE HOUSE

C. R. Fraser & Co. have opened offices at 8 Colborne Street, Toronto, and are distributors for the following high grade lines: T. A. D. Andrea, Bilts & Bilts, Radiolo Co., Northern Electric Co., Ltd.

These lines need no introduction to our readers in Canada, except possibly the new T. A. D. A. "One Sixty" set, full description of which is found in this issue.

Samples can be seen at above address, or full description, dealers' prices, etc., will be gladly sumbitted upon request. These lines are all well worth investigating.

The list price is 25c, and the dealer gets a very attractive discount. Write to-day for full particulars.

COUNTERPOISE SYSTEM OF RECEPTION—Concluded from page 37

circuit, Memphis, Tennessee, was picked up. I don't suggest that the variocupler, variometer set, is the most efficient of these tried out; it just happened that conditions atmospherical and otherwise were ideal for transmission when this particular circuit was being experimented with.

With the counterpoise system the rheostats are in a tuned circuit, and any adjustment of the rheostat will affect the tuning, for this reason, non-inductive rheostats, such as the Bradley rheostats, are recommended; this will permit bringing the tube to its best operating point without weakening signals due to detuning. Of course, where the filament adjustment is fixed the tuning effects of the rheostats need not be considered. Theory:—The reception of signals without the use of an aerial would suggest super-regeneration or super-sensitivity; but no super-effects are present, for when the aerial is used no unusual increase in signal strength is noted. With this counterpoise system some value other than the collector value of the aerial is being substituted.

The relation of the counterpoise coil to the aerial circuit is very similar to the outside counterpoise aerial, and the same theory appears to be applicable. With the counterpoise coil system we can obtain the counterpoise effect right inside the cabinet, which is a decided advantage when the cost and labor of the outside counterpoise is taken into consideration.

To fully appreciate this circuit it should be tried out on a night that static is bad, and you relay hams will need it.

S. HAMILTON.


RADIO
Tune in for Results obtained from Advertising in
RADIO
We can reach new customers for you at once.
*
Our **Detector Tube** is Circulation.
Our **Amplifier** is Public Confidence.
Circuit the Dominion of Canada.

Western Canada

STATION CKY, WINNIPEG, CANADA, OPERATED BY THE MANITOBA TELEPHONE SYSTEM

Station CKY was equipped on September 26th, 1922, as an experimental telephone station and was operated for some months as a telephone experiment and incidentally broadcasting concerts as requested. A series of concerts two evenings a week were broadcasted for a period of seven months for one of the local newspapers. The station was, at that time, equipped with 100 watts power, two 50-watt tubes being used for modulation and two 50-watt tubes were used in the oscillating circuit. The Western Electric Company's speech amplifier was also used.

On March 17th of this year, the Manitoba newspapers ceased broadcasting operations by mutual arrangement and the Manitoba Telephone System continued to broadcast regular concert programs, news items, etc. The station CKY was re-equipped with larger tubes, and music room re-fitted. This station is now the only broadcasting station operating in the Province of Manitoba and has a power output of 500 watts.

The equipment consists of a speech amplifier containing three stages of amplification, the radio high frequency transmitter being equipped with two 250-watt oscillator tubes and two 250-watt modulator tubes and one 50-watt additional amplifier connected between the speech amplifier and the radio transmitter.

The power supply is furnished from the commercial power operating one 5 h.p. motor, mounted on the same shaft as the generator which supplies 44 amperes at 18 volts for filament current. On the same shafting is mounted the high tension generator supplying 5 amperes at 1600 volts. The power plant is automatically controlled from the operating room by means of a power switchboard. All of the operating room equipment is enclosed in metal casing making it fireproof and preventing accidental contact with high tension circuits by the operator.

The currents used in the tubes are as follows:—

Plate voltage (oscillating and modulating), 1600 volts.
Filament voltage, 14.3 volts.
Oscillator plate current, 650 milli-amperes.
Modulator plate current, 195 milli-amperes.
Oscillator grid current, 95 milli-amperes.
Atenna, 7.3 amperes.

The speech amplifier is equipped with 3-stage amplification. The currents in these tubes are as follows:—

Filament current (first 2 stages), 1.25 milli-amperes.
Filament current (3rd amp. tubes), 1.30 milli-amp's.
Plate voltage, 130 volts.
Grid voltage, 9 volts.
Plate current (first and second), 2 milli-amperes.
Plate current (3rd amplifier), 6 milli-amperes.

The current in the fourth amplifier tube is as follows:—

Plate voltage, 16$$ volts.
Filament current, 3.7 amperes.
Plate current, 250 milli-amperes.
Filament voltage, 10.5 volts.

This last tube controls the large 250-watt modulator tubes which are connected in parallel thus modulating 500 watts of power furnished to the antenna circuit.

The antenna circuit is primarily responsible for the radio frequency; it consists essentially of a large variometer in series with the capacitance of the antenna and the frequency is adjusted by changing the inductance in the variometer; the antenna circuit is coupled to a tuned plate circuit to receive the output of the oscillator and coupled to an untuned grid circuit for supplying the oscillator input.

Modulation is accomplished by what is known as the constant current or Heising method. In this system, the modulator and oscillator plate currents flow through a common choke coil, the inductance of this choke coil is large enough so that the current through it cannot change with the changes that occur at and above voice frequency. As a result when the modulator plate current increases, the oscillator plate current must decrease and vice versa, since the sun cannot change; thus the radio frequency output of the oscillator is forced to change in accordance with the changes in the modulator plate circuit, and this in turn is controlled by the modulator grid voltages. By connecting the speech input to the grid of the modulator, voice modulation of the radio frequency is obtained.

The speech input is supplied from the speech amplifier controlled by a special type of microphone into which, the music is sung and in front of which, the speaker stands.

The whole of this equipment was supplied by the Northern Electric Manufacturing Company of Montreal, Canada, and the new tubes were manufactured by this company at Montreal, Canada.—H. E. Brockwell, Chief Engineer Manitoba Telephone System.

RADIO LINKS TWO CONTINENTS

The government has decided to erect a wireless station for communication with the Dominions, so Premier Bonar Law announced in the House of Commons. The government has also decided to license the erection of private wireless stations in Great Britain for world-wide communication, the Premier stated.

An Empire wireless policy has long been urged upon the government, as well as the encouragement of private wireless enterprise.

The Times has been one of the strong advocates of an Empire wireless chain under central control, and it recently said: "At present it is often a matter of comment that more news of the Dominions does not appear in the newspapers here. A substantial part of the reason for any dearth there may be of news from overseas lies in the high cable rates. One of the first results that it is hoped to reap from a co-ordinated wireless system is a cheap news service."

RADIO COLLEGE

The State College at Pullman (Washington) is erecting a radio station, with which it is proposed to send out complete educational courses for the benefit of ranchers.

Western Canada

Western Canada Radio Co.

of WINNIPEG

Offices
Suite 846 Somerset Block

Factory
61 Heaton Ave.

REPRESENTATIVES
in the
PRINCIPAL CITIES and TOWNS
of WESTERN CANADA

Write for illustrated and descriptive catalogue containing full particulars regarding our Receiving Sets, Plan and Locations for Broadcasting Stations, and valuable information regarding Aerial Erection and Operation of Radio Receiving Sets. This catalogue will be sent to any address upon request, with the name and address of our representative in your district.

WESTERN CANADA RADIO CO.
846 Somerset Block,
WINNIPEG, Manitoba

We Give

SERVICE

A Complete Stock of Sets and Parts

'NOORDERTOOSMALL'

AMRAD
WESTINGHOUSE
MARCONI
BRITISH COM—

Exclusive Agents for Leading American and English Radio Firms

Complete Sets Sold on the Instalment Plan

Dealers and Jobbers Write for Quotations

WHOLESALE ∴ RETAIL

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5 HOME BANK BLDG., - WINNIPEG

STERLING SPECIALTIES

213 Somerset Bldg. - - WINNIPEG, Man.

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Electric Mfg. & Sales Co.
American Hard Rubber Co.
Mitchell Rand Mfg. Co.
Stay-Ot Mfg. Co.
Emeloid Co. Inc.
True-Tone Radio Mfg. Co.
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United Specialties Co.
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Specializing Everything Radio

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AUTHORIZED DEALERS *AMRAD* PRODUCTS

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VINCENT THOMAS,

Radio 4-C-E 535 Somerset Block - WINNIPEG, MAN.

RADIO SUPPLIES

COMPLETE SETS and PARTS

Quality Goods Only

ACME MAGNETO & ELECTRICAL CO., LTD.

148 Princess Street, - - WINNIPEG

Magnavox *prices* are the result of Magnavox *quality*

IN the long run, the price of the really successful and satisfactory product is set by the *purchaser*—not by the *maker* or the *dealer*.

Because when the manufacturer and dealer charge too much for a product, they destroy its market; and when they charge too little they destroy its quality—which results in the same thing—loss of market.

Magnavox Radio products are of the highest quality—and their prices bring them within reach of every serious radio user.

R2-18 Magnavox Radio
(With 18-inch horn)

This instrument is intended for those who wish the utmost in amplifying power; for clubs, hotels, dance halls, large audiences, etc. It requires only .6 of an ampere for the field.

R3-14 Magnavox Radio
(With 14-inch horn)
As illustrated

The ideal instrument for use in homes, offices, amateur stations, etc. Same in principle and construction as Type R-2.

AC Magnavox Power Amplifier
As illustrated

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

2 and 3 stage.

Magnavox Radio, can be used with any receiving set of good quality. Ask your dealer to demonstrate it *with* the Magnavox Power Amplifier, as illustrated. This combination produces the most satisfactory results.

What matters bad weather when Radio entertains?

RADIO'S "every-hour-every-where" broadcast schedule is the most stupendous organization of the means of entertainment the world has ever witnessed.

So responsive have people been to the opportunity of enjoying these programs at their best that Magnavox equipment has become synonymous with the full enjoyment of radio music and speech for an ever-greater circle of satisfied users.

Magnavox Products can be had from good dealers everywhere. Our interesting new booklet will be sent on request.

The Magnavox Co., Oakland, California
New York: 370 Seventh Avenue

MAGNAVOX
Radio
The Reproducer Supreme

Up-to-Date & Popular RADIO BOOKS

Covering details on—How to Operate a Set. How to Build a Set. Principles of Vacuum Tubes. Radio Hook-up, etc., etc.

EXPERIMENTAL WIRELESS STATIONS—By P. E. Edelman.

Tells how to make apparatus to not only hear all telephoned and telegraphed radio messages, but also how to make simple equipment that works for transmission over reasonably long distances. The first and only book to give all the recent important radio improvements, some of which have never before been published. 392 pages, 167 illustrations. Price, $3.00.

HOW TO MAKE COMMERCIAL TYPE RADIO APPARATUS—By M. B. Sleeper.

This book describes in detail many commercial types of spark and vacuum tube telephone transmitting and telegraph and phone receiving equipment of all kinds. The experimenter will be able to get a world of ideas for the design and construction of his next piece of radio equipment from the very clear descriptions and the 98 clearly illustrated figures. Price, 75c.

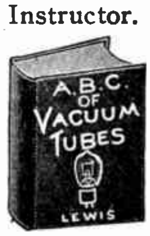
RADIO HOOK-UPS—By M. B. Sleeper.

A book that gives you not only clear diagrams for all kinds of telephone and telegraph receiving and transmitting sets, but simple descriptions of each circuit shown and spaces for notes of results obtained. Price, 75c.

WIRELESS TELEGRAPHY AND TELEPHONY SIMPLY EXPLAINED—By Alfred P. Morgan.

One of the most complete and comprehensive treatises on the subject ever published. A study of its pages will enable one to master all the details of the wireless transmission of messages. The author explains in simple language the theory and practice of wireless telegraphy and telephony. 154 pages, 156 engravings. Price, $1.50.

THE A.B.C. OF VACUUM TUBES USED IN RADIO RECEPTION—By E. H. Lewis, Radio Instructor.



Written particularly for the person who "knows nothing about radio," but who would like to gain an understanding of the elementary principles of operation on vacuum tubes and various circuits in which they are used for the reception of radio-telegraph signals and radio-telephone music and speech. Illustrated. Price, $1.00.

CONSTRUCTION OF NEW TYPE TRANS-ATLANTIC RECEIVING SETS—By M. B. Sleeper.

There is a peculiar fascination about receiving radio messages from the high-power stations of England, France, Germany, Russia and Italy, as well as those located in the Pacific Ocean and the Oriental countries. Several types of simple receiving sets for this purpose are described with detectors and amplifiers to accompany them. Suggestions are also given for operating relays and reproducing the signals on a phonograph. Schedules of operating time for high powered stations are given. In addition there is some valuable data on home-made wavemeters for testing and experimenting. Price, 75c.

THE RADIO EXPERIMENTER'S HAND-BOOK—By M. B. Sleeper.

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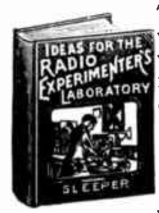

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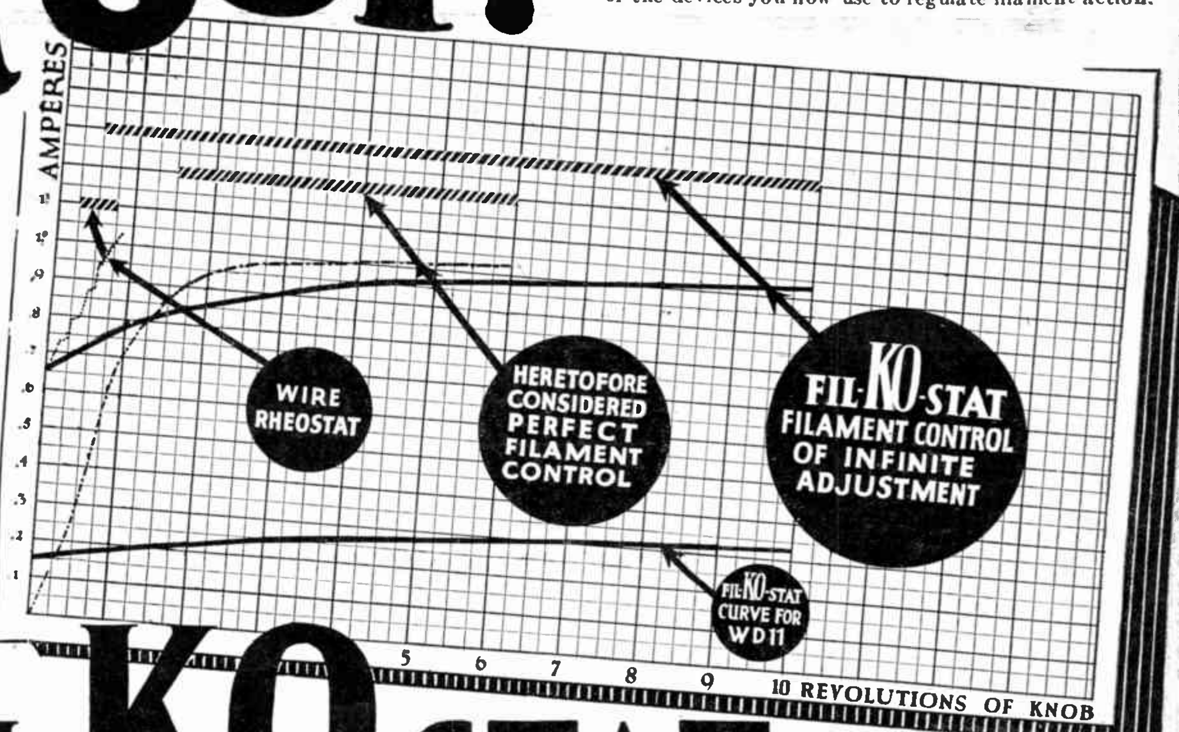

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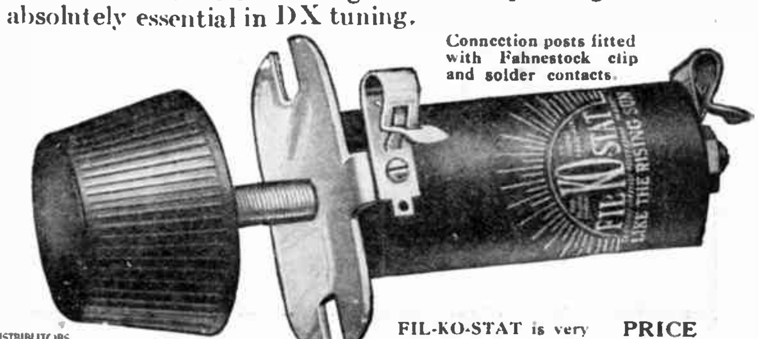

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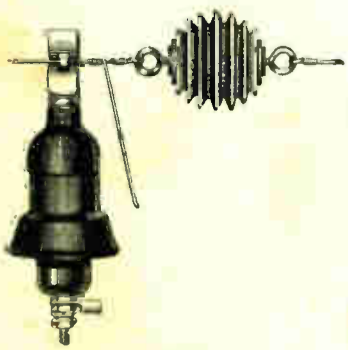
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