Vol. 5. No. 7—Published by A. F. Penton & Co. at 60-62 Adelaide St. E., Toronto, Ont.

# RADIO

Incorporating "WIRELESS & AVIATION NEWS"

SEPTEMBER - 1922 Price 15c

# COPPERWELD

## Combines the Conductivity of Copper with the Strength of Steel

Tests show that Radio Frequency Currents are carried entirely by the "skin" of the wire. The "core" performs no current-carrying service. Copperweld is therefore the Ideal Radio Antenna Wire.

### Copperweld Antenna Wire

Has a pure copper exterior permanently welded to a solid steel core without the slightest loss of current carrying properties. This "Skin" is sufficiently thick to prevent nicking.

Copperweld is 50% stronger than copper wire of equal size and will stay up under severe sleet and wind loads when other wires would be wrecked. Copperweld may be strung taut so that the antenna will not sway in the wind; this insures clear receiving.

Copperweld does not sag and stretch with subsequent breaking as does hard drawn copper. A No. 14 Copperweld wire is as strong as a two-size-larger hard drawn copper wire and weighs 41% less.


**Handy Packages of 100, 150 or 200 foot Coils.**

---

*Ask your Dealer for Copperweld. If he can't supply you, write our nearest House.*

**Northern Electric Company**
LIMITED

MONTREAL TORONTO WINDSOR CALGARY
HALIFAX HAMILTON WINNIPEG EDMONTON
QUEBEC LONDON REGINA VANCOUVER

*"Makers of the Nation's Telephones"*

MANUFACTURING
Manual Telephones
Automatic Telephones
Wires & Cables
Fire Alarm Systems
Radio Sending and receiving Equipment

DISTRIBUTING
Construction Material
Illuminating Material
Power Apparatus
Household Appliances
Electrical Supplies
Power & Light Plants
Marine Fittings

*Place Your Order Now for*

# GILSON RECEIVING SETS

**With our large manufacturing facilities and organization, we will shortly be in a position to fill orders in any volume.**
**Our low prices will prove sensational.**
**The trade and public are urged to write at once for literature and prices.**

**GILSON MANUFACTURING CO., Limited, 131 York St., Guelph, Ont.**

# RADIO PANELS and OTHER INSULATION

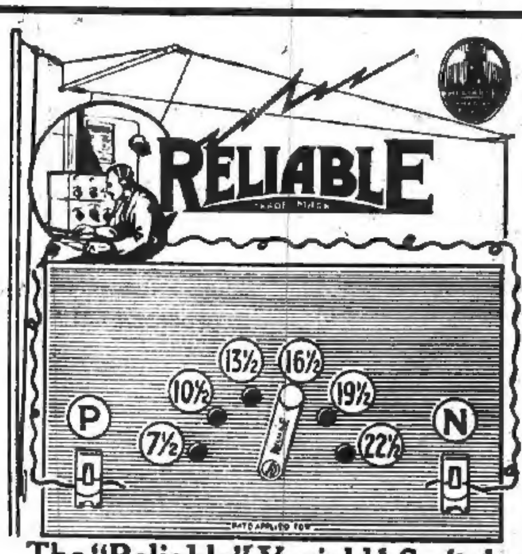
## FOR WIRELESS WORK

# BAKELITE-DILECTO

**Grade XX Black was used by the United States Government during the War for this purpose.** It is the **STANDARD of the WORLD**

**THE CONTINENTAL FIBRE COMPANY, Newark, Del.**

**85 Plymouth Ave., South Rochester, N. Y., and 1927 First Ave., South Seattle, Wash.**




## The "Reliable" Variable Switch

is the solution to the wireless battery problem.

By pointing the regulating arm to the voltage required (as indicated on dial), the voltage is increased while the amperage current remains the same. With the "Reliable" Variable Switch the Negative and Positive leads may be kept stationary.

Ask to see the "Reliable" Variable Switch at your Radio Equipment Dealers—you'll decide then to own one.

Use "Reliable" Unit 9122 or 9222 for Peanut Valve Filament.

*Manufactured only by*

**The Dominion Battery Co., Limited**

Toronto - Montreal - Winnipeg - Calgary - Vancouver

RADISCO AGENTS

# Concentrated Buying

## For Canada

**YOU can waste a lot of time and have some sad experiences by shopping for your radio supplies among many firms, but we offer you an alternative:**

We are RADISCO agents and, as such, our stock includes the entire lines of the Radio Corporation of America; Clapp-Eastham Company; John Firth & Co. Inc.; Westinghouse Electric & Manufacturing Co.; Radio Manufacturing Company; Acme Apparatus; Wm. J. Murdock Co., and certain specialties of other manufacture.

Your orders will be promptly attended to and the necessary triplicate certified invoices made out.

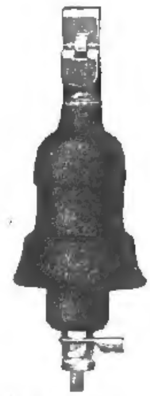
**A. H. CORWIN & CO.**

**NEWARK NEW JERSEY**


This book "Wireless-Telephone in Your Home," will be sent to you for a less-than-cost charge of 25 cents.

# BRACH Vacuum LIGHTNING ARRESTER

**LESSEN STATIC INTERFERENCE — INCREASE YOUR PLEASURE WITH RADIO**

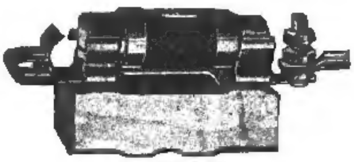


OUTDOOR TYPE

Posted Radio users now take the precaution to protect their outfits by installing the Brach Vacuum Lightning Arrester—the one specified by experienced engineers.

The Brach Arrester has demonstrated its superiority and dependability in the service of great railroad and telegraph companies and the U. S. Army by faithful performance throughout many years.

It is built up to a standard, not down to a price.



INDOOR TYPE

*Listed by the Underwriters' Laboratories*

Sold by leading Radio and Electrical Dealers

L. S. BRACH MFG. Co., Newark, N. J.

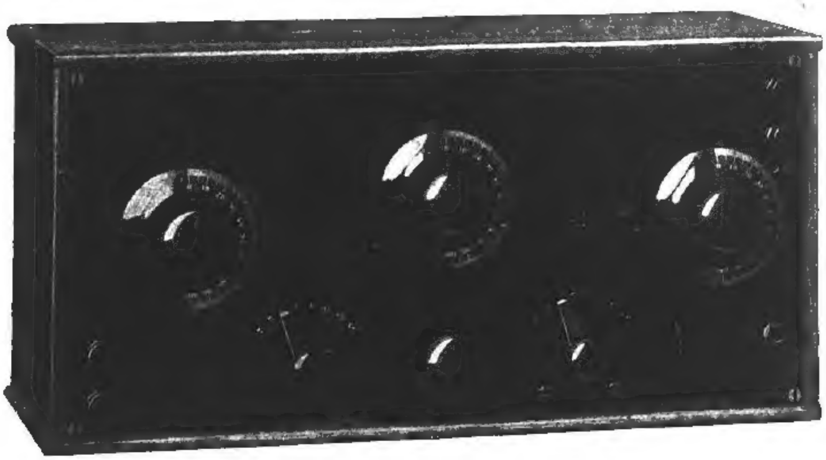
16 years Specialists in Lightning Protective Apparatus

*Also Makers of Solderall. Best for Soldering Radio Connections.*

Coast Representatives—Pacific States Elec. Co., San Francisco, Los Angeles, Oakland, Seattle, Portland, Spokane

---

*Quality*



*Service*

C-F Type A Receiver

FULL AND COMPLETE LINE OF RADIO EQUIPMENT

Argus Lightning Arrester, Frost Jacks and Plugs, Variable Condensers, 43, 23, 11 and 3 plate, Standard Sockets, Mullard Sockets and Adapters, Thordarson Transformers

## "CAM-FISH" CO., Limited

(Trade Mark Reg.)

**70 King Street Toronto, Ont.**

**Dealer's Catalogue now available for distribution.**

# BRANSTON RADIO BRANSTON RADIO

*We absolutely guarantee everything we make.*

*You take no chances.*

## COMPLETE RECEIVING SET

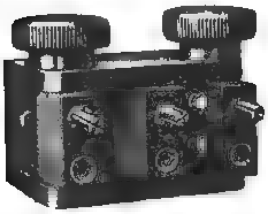
**Wave length range 150-21,000 metres. Vernier Adjustments—Mignon Circuit**

**Price, without Valves or Storage Battery. $140.00**

Audio-frequency Transformers. Very neat and compact. Provides maximum efficiency of operation. No. R. 65
Price $5.00

Lateral Wound Coils. All sizes, mounted or unmounted. The finished product resulting from many years' experience in coil winding
Prices $1.40 to $3.85

Branston Head Set, 2500 and 5000 Ohms. The highest possible quality at the lowest possible price
Price: 2,500 Ohms., $8.00
5,000 Ohms., $12.00



Three Coil Adjustable Mounting
No. R. 73
Price $5.00

## Radio Apparatus is High Frequency Apparatus

In nearly every part of the civilized world Branston "Violet Ray" High Frequency Apparatus has for many years been recognized as the Standard of the World.

To-day Branston "Radio" High Frequency Apparatus occupies the same position for quality and reliability.

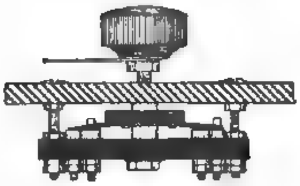
The name "Branston" guarantees you the highest possible quality at the lowest possible price and is backed up by a long established firm of international reputation.

**CHAS. A. BRANSTON LTD.**

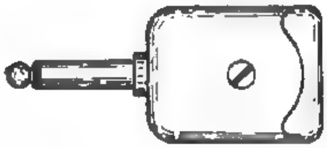
355 Yonge St. Toronto, Ont.

*Factories and Agencies also at*
Buffalo, N.Y. London, England Cape Town, S.A.
Wellington, N.Z. Shanghai, China, Etc.

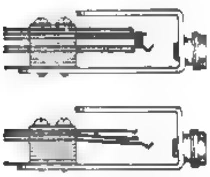
Bakelite Inverted V. T. Socket
No. R. 72
Price $2.50



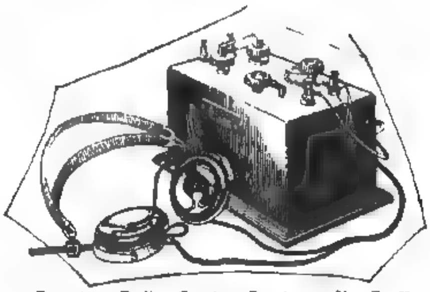
Series Parallel Switch. For back panel mounting. No. R. 6?
Price $1.50



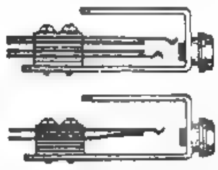
Universal Telephone Plug. Takes all connectors. No. R. 57
Price $1.25



Branston Standard Jacks. All styles. Very best quality
Prices 00c to $1.50



Branston Radio Crystal Receiver. No. R. 55
Price $20.00

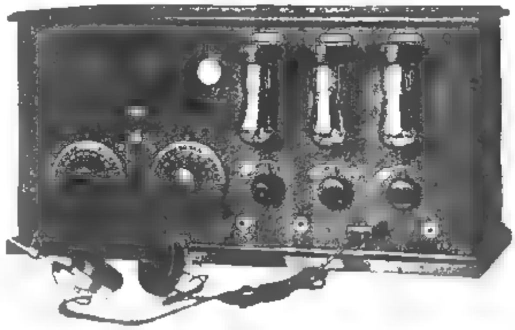


Branston Standard Jacks. Note protection frame tapped for sub-panels
Prices 00c to $1.50

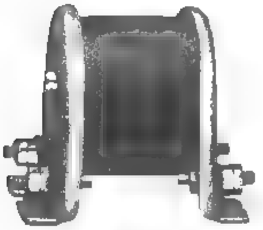
***Dealers should write for new complete catalogue, now on the press***

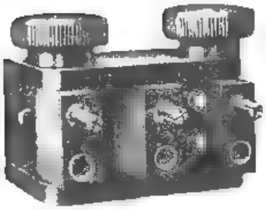
# BRANSTON RADIO  BRANSTON RADIO

*We absolutely guarantee everything*



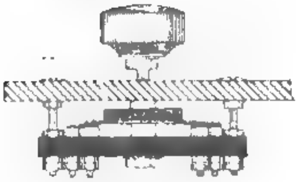
COMPLETE
RECEIVING SET





## Radio Apparatus is High Frequency Apparatus

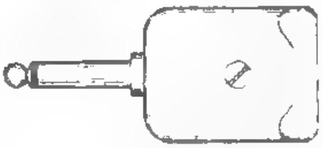
Bakelite inverted

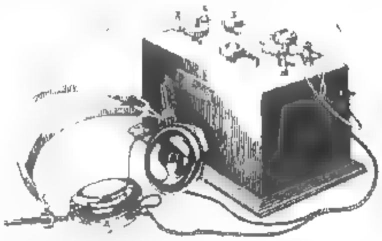


**CHAS. A. BRANSTON LTD.**

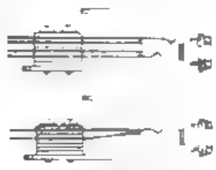
355 Yonge St.  Toronto, Ont

Buffalo, N.Y.  London, England  Cape Town, S.A.
Wellington, N.Z.  Shanghai, China, Etc.





Branston Radio Crystal Receiver
Price $20.00



Branston Standard

*Dealers should write for new complete catalogue now on the press*

RADIO

A. F. PENTON & Co., Publishers. (Member Canadian Business Publications Association)

60-62 ADELAIDE ST. EAST, TORONTO, CANADA.

C. LINCOLN-MITCHELL, Publication Manager.

Volume 5. TORONTO, SEPTEMBER, 1922. No. 7

# RADIO RECEPTION

**Instructive speech delivered by C. A. CULVER, Ph. D., of Toronto, at the recent Radio Convention.**

During the last year of the Great War the speaker was in charge of an extensive radio survey, which had for its object the determination of the optimum geographical location and other conditions, for transatlantic radio reception. That survey, conducted under military auspices, covered the eastern part of the United States, as far west as Denver, and from the Gulf of Mexico to Canada. It is safe to say that the survey first referred to was the most thorough and comprehensive investigation yet carried out in connection with radio reception

A resume of the results and observations then made appeared in the May, 1920, number of the Journal of the Franklin Institute. The results of the experience gained during the military work mentioned, and the experience growing out of the engineering development work conducted under the supervision of the speaker for the past three years, serves as a basis for the remarks contained in this paper.

I will assume that my readers are largely radio fans and not laymen.

Let us first consider the questions which confront the private party who attempts to receive radio broadcasting. One for the first problems which confronts him is the interference caused by the radiation from other receiving sets which are operated in an oscillating condition. It is well known that a receiving set when strongly oscillating, particularly one of the single circuit type, will cause serious interference throughout an area having a radium of several miles. This condition is particularly troublesome in a city where many receiving stations exist.

Again, when one considers the extermely narrow wavelength band covered by the American Stations as a group and the Canadian Stations as a group (though the latter is obviously not so serious at present), it is evident that any means which will assist in increasing the selectivity of receiving equipment would be a highly desirable thing.

Further, the tube has yet to be made which is entirely free from internal noises. These disturbances, when amplified by audio frequency means, become practically prohibitive after the second step and frequently after the first step. The question of how this difficulty can be overcome in order that higher overall amplification may be obtained is a question of prime importance to all users of radio receiving apparatus.

The desirability of the reduction of the effects of general atmospheric disturbances will likewise be conceded by all.

It is seldom that one finds in life one remedy for a number of ills. But fortunately there exists a common means which goes far toward effecting a solution of the problem just outlined. Reference is made to radio amplification. The writer confesses to being a reluctant convert to this means or agency. Conditions are such, however, at the present time, that R.F. when properly employed, appears to be a fairly satisfactory solution of the several problems enumerated, particularly when one confines one's attention for the moment to broadcasting reception.

To properly consider the question of R.F. amplification, it becomes necessary to glance for a moment at the fundamental conditions which must be fulfilled, if maximum and accurate amplification is to be secured. Confining our attention to voltage amplification, it will be recalled that to secure maximum amplification one must make the impedance of the plate circuit as nearly infinite as possible. The simplest and most direct way to make the circuit into which the tube acts have the maximum impedance, is to make its natural period equal to the periodicity of the voltage which is applied to the grid of the tube, and which voltage it is desired to magnify

To accomplish this we may introduce into the plate circuit of our amplifer tube a parallel arrangement of inductance and capacity as shown in Fig. 1. Suppose

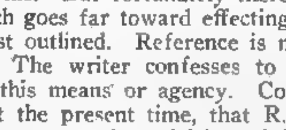



Fig. 1

we desire to amplify radiophone signals having a frequency of 833,300 cycles (360 meter wavelength). We would then tune the circuit L. C. to that frequency or wave. The amplification of whatever voltage is applied to the grid would then be a maximum—the actual amplification being determined by the constants of the tube and the point on the characteristic curve at which the tube is being operated.

Suppose we now wish to impress this amplified voltage upon the grid of a second tube, the second tube to serve either as another amplifying device or as a rectifier (detector). To do this we may inductively couple the plate circuit of the first tube to the grid of a second tube as shown in Fig. 2. $L_2$ may be a coil whose nat-

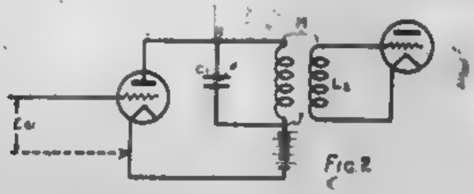


Fig. 2

ural period is approximately that of the input energy. The mutual inductance between $L_1$ and $L_2$ will naturally be a factor in determining the voltage step up obtained. Mathematically we may express the relation thus:-$Eg_2$ divided by $Eg_1$ equals Uo K times the square of $L_2$ divided by the square of $L_1$ U is the amplifying constant of the first tube and K is co-efficient of coupling say O.3.

By such a process we may build up the incoming high frequency voltage until it is of sufficient value to be acted upon by the detector. Further, each step of tuned radio frequency amplification serves as a filter circuit. In such tuned radio frequency step L of the plate coil should be relatively large. Indeed the latter may properly have a natural period equalling the frequency of the wave being amplified. By proper choice of circuit constants it is thus possible to step up the voltage by means of the intervalve radio frequency transformer, as well as by the amplifying tube itself. In this connection it should be remembered that in such a tuned radio frequency transformer we have a resonance transformer, and in such a case the voltage step-up is universally as the | C. Therefore, by making use of the distributed capacity of the inductance used in the grid coil and shunting the plate coil by a condenser of suitable value, we fulfil the conditions for maximum voltage step up in the transformer. This, when taken in connection with the voltage amplification given by the tube, results in a degree of amplification per stage which is in excess of that secured by units employing untuned R.F. intervalve transformers. It will then be noted that three desirable ends are attained by the use of tuned R.F. units. First, maximum voltage amplification is secured from the tube because the anode circuit has 8 Z; second, the transformer itself gives us a V amplification; third, selectivity is enhanced. The damping introduced by the introduction of iron or resistance into many R.F. intervalve transformers in an effort to make them answer for a considerable band of 7s results in low efficiency as well as the absence of voltage amplification in the transformer itself, as well as little, if any, filtering effect. Notwithstanding their relative inferiority such untuned R.F. transformers are better than none, and we believe that every effort should be made to encourage their use, if for no other reason than to prevent the radiation from OSC receiving sets. They are particularly useful when a minimum number of adjustments are desirable.

Another feature which should also be given consideration in this connection, is the fact that regeneration in the receiving set may be dispensed with, when R.F. is employed with the resulting freedom from distortion which frequently follows its use, particularly in unskilled hands. This is by no means an unimportant factor. The clarity and fidelity of voice reception when employing R.F. amplification is well known to all who have employed this means and have eliminated regeneration. Experience has shown that two steps of R.F. amplification and the detector will bring in the usual American stations with clarity and good volume and with two additional stages of audio amplification the American stations may be heard at practical audibility when using a two foot loop.

One important consideration should be borne in mind when assembling and using a R.F. amplifying unit, particularly of the tuned type. It will be noted that the component parts are so arranged as to result in a tuned plate circuit. This, of course, means that the R.F. amplifier will oscillate unless steps are taken to prevent this. The simplest method is to provide facilities for adjusting the grid voltage by means of a potentiometer as will be shown presently in a diagram. A point, however, in this connection should be noted, namely, that the potentiometer should be, if of wire, non-inductively wound, and in any event should be shunted by a radio by-pass condenser. If this is not done the presence of the potentiometer introduces a high resistance in the H.F. input circuit.

As to actual circuits of proven merit, we may now

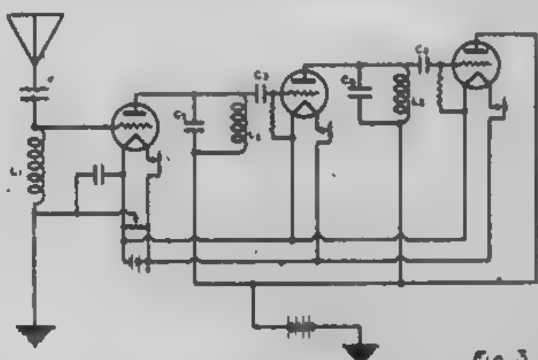


Fig 3

examine Fig. 3 and 4. The former shows a hook-up which though not as selective as that indicated in Fig. 4, is, however, comparatively inexpensive to assemble and

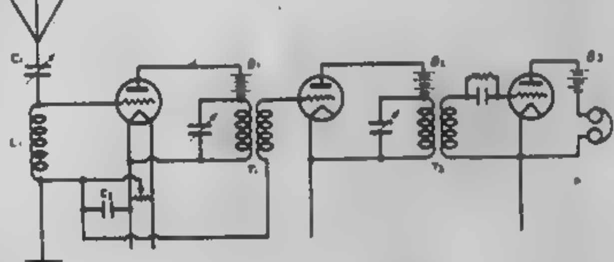


Fig 4

simple to operate. $L_1$ is a 50 turns D.L. Coil; $L_2$ is a 75 Coil; $L_3$ is a 150 Coil; $C_2$ and $C_3$ are condensers having a capacity of .0001—.09025 M.F.

A 3-step tuned R.F set, as shown in Fig. 4 and the apparatus embodying this is before us, connected in a loop.

R.F. Transformers of merit will soon be available on the Canadian market.

Leaving then the subject of radio frequency amplification, may we turn our attention for a brief period to the question of antennas and the relation to radio reception on comparatively short waves.

In the first place it may be set down as axiomatic that a vertical antenna is, other things being equal, the most efficient type of receiving system. Time will not permit us to analytically demonstrate this proposition, but indeed this is not necessary, as experience, both theoretical and practical, of radio investigators covering a period of many years, bears out this statement. There are, however, obvious practical reasons why a vertical antenna is not used for ordinary private reception. We are all also probably familiar with the fact that the next best aerial receiving system is the horizontal antenna, composed of one or more wires. The practical question arises in this connection concerning the most suitable form of such an antenna, having in mind both the strength of signals and the atmospheric disturbances.

Speaking generally it may be said that for the wavelengths used in broadcasting, a horizontal antenna consisting of two wires spaced not less than 5 feet apart and having a length of 100 to 150 feet with a height of the the order of 33 ft., will give very satisfactory results. Shorter antennas are, of course, in wide use with correspondingly lesser interception of energy. One factor should be borne in mind in this connection, namely, that the natural period of the antenna should, in general, be less than the wavelength which it is desired to receive. For receiving 360 to 400 meter waves, an antenna having a natural period of the order of 200 to 250 meters is a very satisfactory arrangement. Many people have the eroneous impression that several wires spaced quite closely together will intercept more energy than say two wires spaced as indicated above. The object in a multiplicity of wires is to add capacity to the antenna, and it is not generally realized that several wires spaced closely together, say of the order of 1 foot, do not have very much greater capacity than two wires spaced five or six feet apart.

It is a fact that an antenna system buried in the ground will functionate quite satisfactorily, but in arranging such a subterranean system, it should be made very much longer than one placed above the earth, in order to abstract an equal amount of energy from the advancing wave front. The speaker has received trans-Atlantic telegraphic signals on a single wire several hundred feet in length, enclosed in a lead sheath and buried in the earth. The ratio of signal strength to X's is somewhat better than on one of the aerial type. Such subterranean antennas are very directive, and if used, the free end should be insulated at a point in a direction opposite to the station from which reception is to be had. In using the longer subterranean systems for short wavelength work, it is possible to receive the wave at a harmonic of the antenna system. Indeed such a procedure is possible when using unusually long serial antenna systems. In fact it may be stated, as a general principle, that, as indicated above, a natural period antenna system should be less than the wavelength one uses to receive or several times the wavelength.

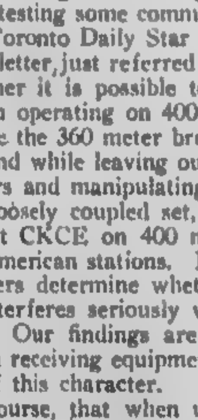
Parenthetically, one may remark at this point, that a tuned antenna system may be excited by a wavelength of double the value for which it is tuned. In fact, in such a case, we have what might be called a sub-harmonic or lower partial. The speaker has, at different times, been advised by radio experimenters that a station was radiating a strong first harmonic, when as a matter of fact repeated careful investigation by means of a wavemeter, disclosed the fact that no first or second harmonics existed. What was probably happening at the receiving station was that the antenna system was tuned to a wave of the order of 200 meters, and was being excited by a wavelength of approximately twice that value.

Indeed the whole question of interference from boadcasting and other stations might properly be touched upon at this point.

On several occasions the speaker has been advised that a certain radiophone station in the city could not be tuned out sufficiently to permit the reception of programs being broadcasted from the American stations at 360 meters. In fact, on one occasion there came to our attention a letter written to a third party in which a certan commercial organization was roundly scored for the interference being caused. This letter, by the way, is a unique human document.

It will be noted that the writer of the letter does not believe it to be possible to tune out the radiophone station in question when receiving signals from either Schnectady, Buffalo or Pittsburgh. Not long since the speaker had occasion to be testing some commercial receiving apparatus when the Toronto Daily Star station was operating. Recalling the letter just referred to, we investigated to determine whether it is possible to tune out a local broadcasting station operating on 400 meters sufficiently to be able to receive the 360 meter broadcast. As a matter of fact, we found while leaving our secondary circuit tuned to 360 meters and manipulating only the primary condenser of the loosely coupled set, it was possible to completely shut out CKCE on 400 meters and receive any or all of the American stations. I have recently had one of our engineers determine whether the 400 meter wave of CFCA interferes seriously with the 600 meter commercial wave. Our findings are to the effect that when using modern receiving equipment, there is no serious interference of this character.

It is true, of course, that when using single circuit tuners or certain receivers having a broadly tuned standby circuit, that interference probably will occur between both the 360 and the 400 meter wave, and the 600 meter commercial wave. However, when using an inductively coupled receiving system, there is no appreciable interference between the waves mentioned. This is shown by an audibility curve taken on a standard receiving set;




this curve I have before me. In setting up this cruve of audibility on the detector it has been plotted against wavelength. An examination of the curve discloses the fact that 360 meters station CFCA has an audibility of 2.5, at 400 meters (its working wavelength), it has an audibility of 200 meters, at 475 meters it has an audibility of 7½, at 500 meters it has an audibility of approximately 1. These quantitative measurements clearly show that when properly designed receiving equipment is used, no interference need to be experienced from CFCA when working on commercial wavelengths. The speaker would be glad to arrange to have any commercial company which is now experiencing interference from CFCA or CKCE supplied, without charge, with a receiving set, in order that they may be free from the alleged interference.

Continuing now our discussion of receiving antenna systems, it is desired to call attention to the so-called resonance wave coil brought out by the officers of the American Army Signal Corps.

The theory of the resonant wave coil has been thoroughly discussed from an analythical point of view by Flemming and others. It has been well known for many years that standard waves may be set up on a closely wound helix. These standard waves manifesting loops and nodes of potential, if we make the inductance and distributed capacity of such a coil of the proper value, so that its fundamental period will be the frequency which we desire to receive, we will have a potential loop at one end of the coil and a loop at the other end. This point of maximum potential may be connected to the grid of an audio (which, of course, is the potential device), and signals may be received thereby. Major Mauborgne and Captain Hill of the American Army have done considerable work with such an electrical organization. Our Mr. Logwood has developed a receiving circuit particularly adapted for use in connection with the wave coil. Such a circuit in conjunction with a resonant coil has been in use for some time by the Toronto Daily Star on its portable receiving station. We have before us an electrical organization of this character, and upon which Mr. Rogers will now attempt to receive the broadcasting from CFCA. The circuit used is shown in Fig 6.

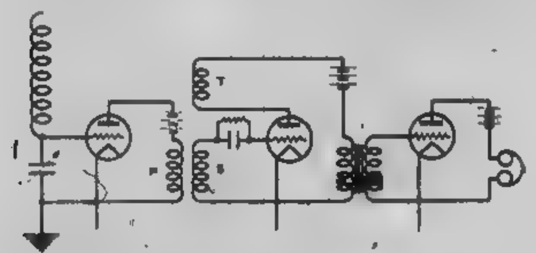


Fig 6

In efficiency the wave coil is comparable with a loop and for certain uses possesses the advantage that when in a vertical position, it is non-directional.

It was thought that it might be of interest to our readers to say a few words concerning one or two special receiving devices, one at least of which may be of more than passing interest to the radio experimenter.

During the latter months of the Great War, the writer developed an electro acoustic filter for use in long distance radio transmission. This device was developed for the purpose of lessening the effect of X's, and also of interference from spark stations when receiving long distance C.W. military traffic. We have before us one of these electric acoustic filters. It consists essentially of an electro magnetic system which is coupled to the amplifier in place of the ordinary head receivers. In front of the pole piece of the detector magnet is placed a steel reed fastened at one end; this reed is so proportioned magnetically that its natural is of the order of 800 cycles. Immediately adjacent to the reed is also placed an acoustic tuned chamber so arranged that its length may be conveniently varied. The sound is led to the ear pieces through a bifurcated tube. When connected to an amplifier which, in turn, is associated with a heterodyne receiver, the "beat note" is adjusted until it corresponds to the frequency of the steel reed. The tone chamber is then adjusted until acoustic resonance occurs. We thus have an amplification of the sound produced with the reed. The reed is so positioned with respect to the pole pieces that it is excited only in its fundamental. Experience has shown that a reed placed as it is in this device, responds only slightly to static, while the device as a whole responds with great loudness to the heterodyne "beat note." In a laboratory in the City of Washington, the writer has heard signals from Carnavon, when standing some eight or ten feet from the device. It is also possible with this contrivance to receive several spark stations operating on the same wavelength, providing the spark tone is different. Incidently it is interesting to note that the spark tone is smoothed out into a flute like note as it passes into this filter. It is not maintained that this device is a panacea for static, but we believe that it very materially assists in supressing extraneous disturbances. The device, is of course, not applicable to voice transmission, as it only responds to one frequency.

Another electrical organization which may be of particular interest to experimenters, is a circuit, discovered by the writer some three years ago, but not disclosed at an earlier date, due to patent conditions. This device will produce vigorous oscillations without any "B" battery. I have such a circuit set up here in a more or less crude form, but with it we will attempt to demonstrate that it is possible to cause an audion to oscillate without any potential applied to the anode, except that which may be secured through the proper selection of circuit constants. The circuit is shown in Fig. 5. The general form of the

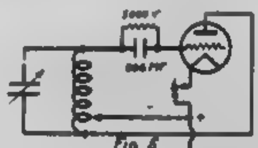


Fig 5

circuit is probably more or less familiar. The grid condenser should have a value of the order of 0.004 and the grid leak a value of the order of five to ten thousands ohms. By adjusting the variable grid tap, one may bring the circuit inito a regenerative and also into an oscillating condition, thus both speech and C.W. reception may be had when using this circuit. In fact by inserting the secondary of a modulating transformer in series with the plate and shutting the same by a suitable condenser, radiophone conversation may be carried on over several hundred yards. In such a case the tube acts as an oscillator and the voltage applied to the anode is caused to vary by means of the secondary and the microphone circuit. This circuit will be found useful as a wavemeter and also for external heterodyne work. We have never found a tube which would not oscillate in this circuit, in fact we have been able to secure oscillations when using an oxide coated tube when so small a current passed through the filament that it was not possible to detect any heat effect by the eye. We have not tried the so-called "Peanut" tube in this circuit, but in all probability it will function as have the others, in which case it will be possible to build a receiving outfit of extreme compactness, including all batteries involved.

We will conclude this paper by a few radio "DONT'S."

If you wish maximum amplification in a multi stage audio amplifier, and a minimum of noises, use separate "B" batteries in each stage of the amplifier.

Unless you desire to deliberately introduce unnecessary resistance in your receiving circuit, do not use a tapped coil.

Unless you wish to deliberately dissipate enegry in a receiving circuit, do not have metal parts within the field of your inductances. A widely advertised and much used variometer now on the market has metal parts directly in the field. The most popular receiving sets now on the market in the States has a condenser directly in the field of one of the inductances.

Unless you want speech distortion, do not attempt to receive, if you possibly can avoid it, with the set in an oscillating condition.

Unless you desire much trouble and annoyance do not buy cheap variable condensers; get only the best and be sure it has a reliable Vernier attachment.

Do not spend your good money for receiving sets which do not have space within the cabinet for the "B" batteries.

Above all, do not condemn a radio accessory or a complete piece of radio equipment, because you have failed to secure results. Have it tested by someone who thoroughly understands both the theory and practice of the radio art.

A radio experimenter has in the past contributed very materially in the progress of the art, and is to be encouraged by all legitimate needs. We should all guard against the tendency to feel that we have more or less mastered this intricate subject and we should be willing to accord to the "other fellow" the possibility that he may know more about the subject than we do.

We are all members of an intangible but nevertheless very real fraternity, and anything we may be in a position to do to assist one another in wrestling from nature her hidden secrets, we should earnestly strive to do. The next few years holds much in store. The last word in tubes and other accessories has by no means been spoken and the encouraging and delightful aspect of the situation is that each of us may have a part in this glorious work.

# Canadian National Exhibition and the First National Radio Convention

Those who had the privilege of being in Toronto and visiting these two exhibitions must have been strongly impressed with the very rapid strides and advancement that has been made in the past year in the way of radio equipment in all its varied branches. Both of these exhibitions go to prove that radio broadcasting and receiving has taken a great hold on the Canadian public, and is here to stay. The large amount of capital that is now invested in Canada in plants for the manufacturer of radio parts and sets is just another proof of the faith that the men who have devoted their lives to research in the electrical and telephone lines have in this new industry.

Speaking particularly of the Radio Convention which was held in the Prince George Hotel, this was the first of its kind in Canada. The interest shown by the manufacturers and distributors of Radio sets and parts and by the general public was really very encouraging, and the addresess delivered by some of our foremost engineers were most instructive. Copies of the leading addresses are published in this issue. The convention brought many distinguished visitors from all over Canada and the United States. Among these were Mr. K. B. Warner, editor of Q.S.T., and secretary of the A.R.R.L., and Mr. T. H. Schnell, traffic manager of the A.R.R.L. Both gentlemen delivered very instructive addresses to the Convention W.A.O.O. These men have probably done more for amateur wireless in North America than anyone else. They have been elected officers by the membership of the A.R.R.L., which now consists of about 12,000 members. Great credit is due to the officers of the W.A.O.O., of which Mr. A. H. K. Russell is president.

Mr. Russell presided at all the meetings, and to whose able leadership is attributed a great part of the success of the convention. Mr. Russell has been one of the keenest amateur in Canada, and everyone was very glad to see him win the first prize of the Star contest for building a tube tuner.

Mr. W. C. C. Duncan also had a large part in the convention, and he is probably one of the best known amateurs in Canada. He is also Radio Inspector for Toronto and environment. These two men, along with Mr. C. A. Lowry, are responsible for the success of our first convention. They had many difficulties and obstacles to overcome, and a good many were very skeptical as to the advisability of holding such a show, especially at the same time as the Canadian National Exhibition, but it has proved beyond a doubt that the able executive chose the right time and put this show across with enthusiasm and pep.

One of the features of the show was the Toronto Daily Star contest for the best amateur built receiving sets, for which they spent $150.00 in prizes. The result of the contest was as follows:—First class, valve tuners, the first prize being a two-stage amplifying unit, won by Mr. Keith Russell, of Toronto; second prize, Valley battery charger, won by Mr. R. Russell, Niagara Falls, Ont.; third prize, storage battery, 80 amp. hs., 6 volts, won by Mr. Robert C. Bush, of Toronto. Second class, crystal sets, the first prize being a pair of Brown head phones, 8,000 ohms, won by Mr. A. E. Crowhurst, of Humber Bay, Ont.; second prize, a variable condenser, with a DeForest Vernier, won by Mr. B. Wilson, of Toronto; third prize, vacuum tube amplifier, U.V. 201, won by Fred A. Burgess, of Toronto. We might mention here that Mr. Crowhurst's crystal set attracted a great deal of attention, and a special complimentary comment from Commander Edwards. The convention was concluded on Saturday evening with a banquet, which was remarkably well attended, and everyone present must have felt that it was a grand climax to an already very successful two days' convention. The principal speakers at the banquet, at which Mr. Russell presided, were Mr. Burgess, who proposed a toast to Radio, to which Commander C. P. Edwards, director of Radio for Marine and Fisheries Department, made a very able reply. Commander Edwards is the one who is chiefly responsible for the present regulations regarding Radio and the amount of freedom that the amateur now enjoys. The next toast to our visitors was proposed by Mr. R. A. H. Galbraith, and replied to by Mr. Taylor, of Buffalo, and Mr. Hewitt, of New York.

The toast to the A.R.R.L. was proposed by Mr. W.

C. C. Duncan, and was replied to by Mr. Warner and Mr. Schnell. Mr. Warner, in his remarks, said that he hoped we would soon have a Canadian R.R.L. and a British R.R.L. This would then make a complete A.B.C. of the Radio Relay League.

The other speakers were Mr. Wm. Gray, of Chatham, who is now playing a large part in the interests of Radio in Chatham, Ont., and is organizer of the Chatham Club, and Mr. Wiggs, of Quebec City, spoke on the future of Radio in the old Citadel.

## COMMENTS ON EXHIBITS

The Northern Electric Company had two very good exhibits—one at the Canadian National Exhibition and one at our W.A.O.O. Convention, at which they demonstrated their new set with a two-stage radio frequency and two-stage audio frequency, and also their now famous peanut tube and other parts.

In conjunction with the Marconi Wireless Company and the Canadian National Railway they were receiving from the Canadian National Railway model train at the Exhibition grounds, and were broadcasting from the steamship S.S. Dalhousie City, running between Toronto and St. Catharines. The set used was a WC3. We might say that their receiving set is going with the Canadian National Railway train to the Western Fair at London. The large broadcasting set that they have been testing out in Montreal is for the Manitoba Government Telephones, to be used for the benefit of farmers in the Province. We might mention that this set has given wonderful results. Their exhibit was in charge of Mr. Campbell.

The Salisbury Electric Company of Toronto had a very nice exhibit in charge of Mr. A. L. Ainsworth. The above is a photo of their booth at the convention.

The Toronto Daily Star booth was entirely composed of the sets of the competitors for their contests, and made an exceedingly attractive display. This was in charge of Mr. Lake.

The Canadian Wireless Telephone Company, Ltd., had a very good display of sets and parts, and they were very ably represented by Mr. Puddy.

Mr. Muir was in charge of the Marconi Wireless Telegraph Company of Canada, Ltd.'s exhibit, of Montreal. They were showing a portable wireless telephone and telegraph set, Type YB, and Marconi Model C complete receiver and the "Radio Blue" head sets made in Montreal. They were also introducing two new tuner units, one being a single circuit combination with detector in compact case, the other with coupled circuit and detector combined.

The Burgess Battery Company's booth, in charge of Mr. Baker, from the head office, was very prettily decorated with black and white.

The Diamond State Fibre Co., Ltd., exhibit, in charge of Mr. Webster, were displaying genuine condensite, celoron panels, bases for condensers, sockets, rheostat and detectors, insulators, dials, knobs and panels. This made a very attractive display.

The Vawter-Luckett, Ltd., Toronto, in charge of Mr. Luckett, had a very attractive booth, demonstrating their "Lefax" Radio Handbook. We might mention here that this book is now a source of authentic radio information, and which will enable you to get expert results with radio right in your own home. It covers every phase of radio in everyday language. It has articles by such well known men as Dr. A. H. Dellinger, chief of the United States Bureau of Standards Radfio Laboratory, and Mr. L. E. Whitmore, alternate chief.

The Eveready Storage Battery Company, in charge of Mr. Walsh, was probably one of the best decorated booths in the show, being done in black and yellow, which was striking and attractive.

The Perkins Electric Company, Ltd., of Montreal, were exhibiting, in conjunction with Canadian Brandes, Ltd., whose products they are distributing. Mr. Hawes, radio sales manager, and Mr. Kerrin, district manager, were both present, and Mr. Rypinski was representative for the Canadian Brandes, Ltd.

Owing to the scarcity of space, the Toronto Radio Company, Reliable Battery Company, and the Vimy Supply Company shared one booth. We might mention that they did not lose out in their joint display, and their booth attracted a great deal of attention.

The Jack V. Elliot booth was in charge of Mr. Baby, and their J.V.E. loud speaker, made in Canada, attracted a good deal of attention for its clearness of tone.

A. H. Winter Joyner Company, in charge of Mr. Walker, were demonstrating the new Bristol loud speaker.

The Radio Shoppe, in charge of Mr. Ingleby, were showing parts and sets.

The Federal Telephone Company, in charge of Mr. A. H. Dyson, had a very attractive booth.

Chas. A. Branston Company had a large corner stand in charge of Mr. Stayley, and were demonstrating their Branston "Standard" head sets, audio frequency transformer, crystal receiving sets, and a complete line of parts.

Powley & Moody, of Toronto, in charge of Mr. G. N. Middleton, were demonstrating their transmitting and receiving sets

Radio Devices, Ltd., of Gananoque, Ont., interests were looked after by Mr. Lowry. They had a very prettily decorated booth.

John Millen & Son's booth was in charge of Mr. Weese, their radio manager.

The Canadian Inedpendent Telephone Co., Ltd., was in charge of Mr. H. L. Varcoe.

The Radio Equipment & Supply Co. booth, in charge of Mr. Murray, were showing their tube receiving sets demonstrated with an inside aerial. They are also showing the Acmephone.

BURGESS
"B"
BATTERY

The Canadian Electrical Equipment Co., Ltd., in charge of Mr. Moody, were demonstrating their Valley battery charger, one of which was given away as a prize in the Star contest.

---

Canadian Westinghouse Company (Mr. Lovell), Hamilton, Ont.—First type made in Canada two-stage amplifier, 900 miles receiving broadcast.

---

Jewett Radio Phonograph, Ltd., Walkerville, Ont.—Radio Phonograph, combining a high-class phonograph and a long distance Radio receiving set, utilizing one hour for amplifier.

---

T. Eaton Co., Ltd., showing DeForest set, with S. G. Brown loud speaker and head sets, using inside aerial. Their booth attracted considerable attention.

---

Stromberg-Carlson Telephone Mfg. Co., 35 McCaul Street, Toronto, at the C.N.E., gave out tags with numbers. Anyone finding the person wearing a tag with their number received a head set free. This created a great deal of interest in their exhibit. 18 sets given away.

## HAMILTON FIRM TAKES PACENT RADIO LINES

Colonial Radio, Limited, John Street North, Hamilton, Ont., have acquired exclusive manufacturing and distributing rights for Canada and the British Empire for the well known Pacent line of radio essentials. The Pacent name has long been associated with important developments in the radio field. Pacent universal plug and Pacent radio jacks were the first products of their kind on the market, and have isnce become the recognized standard.

Every Pacent product is built for service and convenience, and is designed and constructed with a thorough knowledge of the duties it has to perform.

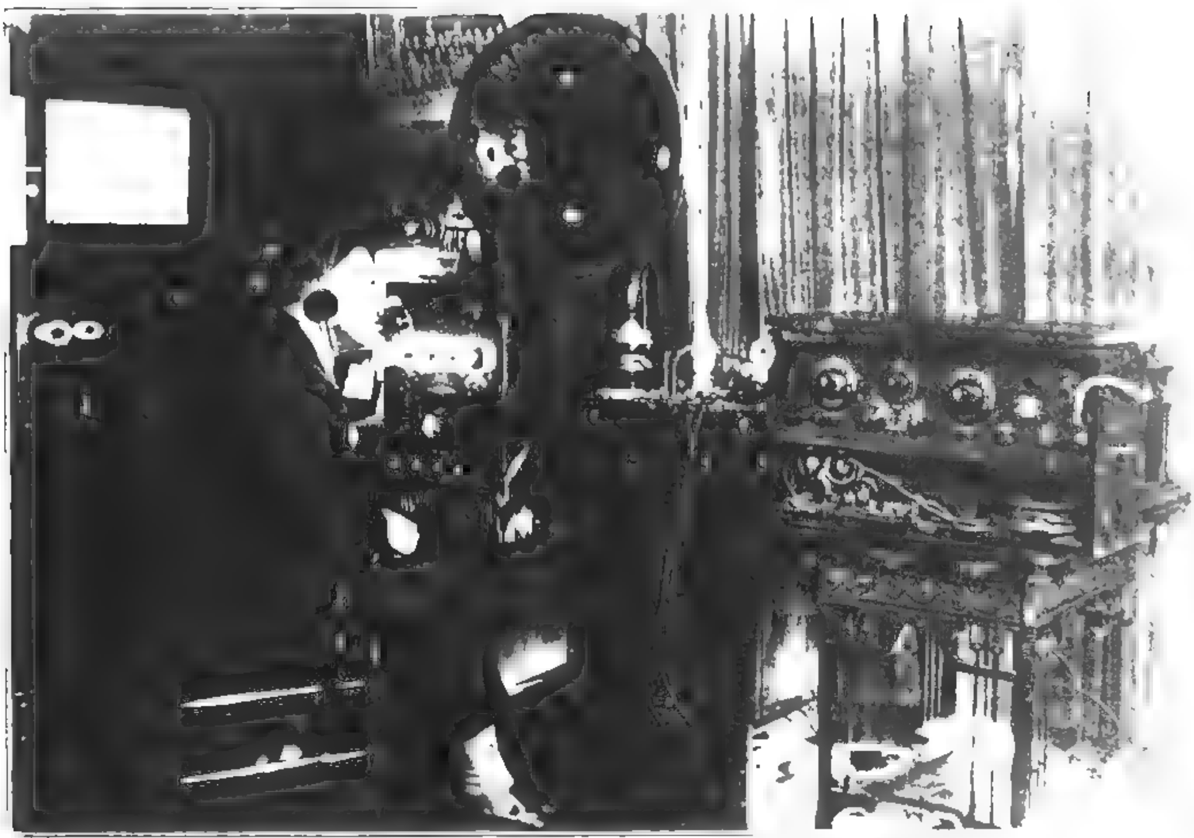
In a recent test just held before the Institute of Radio Engineers, Major E. H. Armstrong demonstrated his new super-regenerative receiver with Pacent radio essentials. He was able to receive from the W. J. Z. Station at Newark, 25 miles distant, with three vacuum tubes, although only a loop aerial was used in the steel frame building of the Engineering Society, New York City.

Colonial Radio, Limited, is now making arrangements for dealers and distributors in various Canadian cities.

The above is a photograph of William M. Gray, of Chatham, Ontario, Canada, at his private Radiophone Station, 3FM.

Mr. Gray, more commonly known as "Bill," has been interested actively in radio since 1910, and is one of the oldest amateurs, in point of service, in the Western Peninsula of Ontario. He has always taken great pride in the development of radio, and has been largely responsible for the starting of the Radio Club which is functioning so successfully in Chatham, at present, holding the position of Honorary President.

In business capacity, he is Vice-President of the Gray-Dort Motors, Limited, manufacturers of motor cars.



[illegible]

In business [illegible] President [illegible]

# RADIO

## RECORD OF CANADIAN PATENTS

221498. **Electric Transformer Arrangement**—Frederick Edmunds Benj. Hayes, Middlesex, England, July 25, 1922.

221517. **Method of Making Electro-Deposit Windings**—The Marathon Electric Manufacturing Co., assignee of Austin Kimble, both of Wausau, Wis., July 25, 1922.

221521. **Electrode**—The Toronto Power Company, Limited, assignee of William G. Allan, both in Toronto, Ontario, Canada, July 25, 1922.

221523. **Electrolytic Bell**—The Toronto Power Company, Limited, assignee of William G. Allan, both in Toronto, Ont., July 25, 1922.

221869. **Insulator**—Peter Christian C. Fridrichen, Independence, Miss., U.S.A., August 8, 1922.

221894. **Insulator** — Horace Preston Liversidge, Bala, Penn., U.S.A., August 8, 1922.

221895. **Insulator Support**—Horace Preston Liversidge, Bala, Penn., U.S.A., August 8, 1922.

221901. **Apparatus for Telephonic Transmission**—Benjamin Franklin Miessner, New York City, N.Y., U.S.A., August 8, 1922.

221964. **Frequency Changer**—The Canadian Westinghouse Company, Limited, Hamilton, Ont., assignee of Frederick W. Meyer, New York City, N.Y., U.S.A., August 8, 1922.

221969. **Electric Measuring Device**—The Canadian Westinghouse Company, Limited, Hamilton, Ont., Can., assignee of Chester T. Allcutt, Pittsburgh, Penn., U.S.A., August 8, 1922.

222093. **Antennae**—The Canadian General Electric Company, Limited, Toronto, Ont., assignee of Ernest F. W. Alexanderson, Schenectady, N.Y., U.S.A., Aug. 8, 1922.

222095. **Electric Battery**—The Canadian National Carbon Company, Limited, Toronto, Ont., Can., assignee of David C. Reed, Flushing, N.Y., U.S.A., August 8, 1922.

221136. **Vacuum Tube Socket**—The International Western Electric Company, Incorporated, assignee of George H. Stevenson, both of New York City, N.Y., U.S.A., August 8, 1922.

222159. **Battery Terminal**—William C. Grabau and Frederick G. Guenther, co-inventors, both of Seattle, Wash., U.S.A., August 15, 1922.

222387. **Sound Amplifier**—Wilson F. Smith, East Liverpool, Ohio, U.S.A., August 15, 1922.

222571. **Fire Proof Fibre**—Nicholas M. Miller, West Bend, Wis., U.S.A., August 15, 1922.

222703. **Rheostat**—Napoleon Victor Marcotte and Toussaint Laurin, assignees of one-half of the interest, both of Montreal, Que., Can., August 15, 1922.

222828. **Electric Soldering Iron**—Arthur B. Nelson, Aberdeen, South Dakota, U.S.A., August 22, 1922.

222994. **Protective Device**—The Canadian Westinghouse Company, Limited, Hamilton, Ont., assignee of Chester T. Allcutt, Pittsburgh, Penn., U.S.A., August 22, 1922.

223020. **Vibration Recorder**—The Service Recorder Company, assignee of Henry R. Cool, both of Cleveland, Ohio, U.S.A., August 22, 1922.

220950. **Aerial for Wireless Telegraphy and Telephony**—Marius Latour, Paris, France, July 18, 1922.

220722. **High Frequency System**—The Canadian General Electric Company, assignee of William C. White, dated July 11th, 1922.

220723. **High Frequency System**—The Canadian General Electric Company, assignee of William C. White, dated July 11th, 1922.

220726. **Amplifying System**—The Canadian General Electric Company, assignee of Harry C. Thompson, dated July 11th, 1922.

220438. **High Potential Detector**—The Canadian Westinghouse Company, Limited, assignee of Cletus Clinton van Voorhis, dated July 4th, 1922.

220727. **Amplifier**—The Canadian General Electric Company, assignee of Edward W. Kellogg, dated July 11th, 1922.

223529. **System for Producing Oscillations**—The General Electric Co., Ltd., Toronto, Ont., Can., assignee of Albert W. Hull, Schenectady, U.S.A., September 12th, 1922.

The combination in a system for producing oscillating currents of an electron discharge device.

223530. **Electric Oscillator**—The Canadian General Electric Company, Ltd., Toronto, Ont., Can., assignee of Irving Langmuir, Schenectady, N.Y., U.S.A., September 12th, 1922.

An electron discharge device, comprising a sealed container, a cathode therein adapted to be heated independently of a discharge in said device, an anode, and a filling of helium gas, having a pressure about 5 to 75 microns of mercury.

223532. **Radio Receiving System**—The Canadian General Electric Co., Ltd., Toronto, Ont., Can., assignee of Charles W. Rice, Schenectady, N.Y., U.S.A., September 12th, 1922.

The method of operating a radio receiving system, comprising a plurality of widely separated receiving antennae connected by transmission lines to a central receiving station which consists in selectively impressing upon receiving apparatus signalling currents received upon the different antennae and selecting for the desired reception of signals the received currents having the most favorable stray ratio.

223533. **Radio Receiving System**—The Canadian General Electric Co., Ltd., Toronto, Ont., Can., assignee of Edward W. Kellogg, Schenectady, N.Y., U.S.A., September 12th, 1922.

A method of operating a radio receiving system.

223536. **Radio Receiving System**—Canadian General Electric Co., Ltd., Toronto, Ont., Can., assignee of Edward W. Kellogg, Schenectady, N.Y., U.S.A., September 12th, 1922.

Method of operating a radio receiving system.

223537. **Amplifier**—The Canadian General Electric Co., Ltd., Toronto, Ont., Can., assignee of John H. Payne, Jr., Ballston Spa, N.Y., U.S.A., September 12th, 1922.

The combination with an electron discharge device.

223539. **Method of Frequency Transformation**—The Canadian General Electric Co., Ltd., Toronto, Ont., Can., assignee of Ernest F. Q. Alexanderson, Schenectady, N.Y., U.S.A., September 12th, 1922.

The method of increasing the frequency of an alternating current.

223519. **Radio Receiving System.**—The Canadian General Electric Co., Ltd., Toronto, Ontario, Canada, assignee of Burke Bradbury, Schenectady, N.Y., September 12th, 1922.

Claim—The combination in a signal receiving system of a detector, a circuit upon which currents of audio frequency produced by said detector may be impressed.

**223520. Signal Receiving System**—The Canadian General Electric Co., Ltd., Toronto, Ont., Canada, assignee of Burke Bradbury, Schenectady, New York, U.S.A., September 12th, 1922.

The combination in a signal receiving system of an electron discharge device.

**223521. Electron Discharge Apparatus**—The Canadian General Electric Co., Ltd., Toronto, Ont., Canada, assignee of William K. Kearsley, Jr., Schenectady, New York, U.S.A., September 12th, 1922.

An electron discharge apparatus, comprising an electron discharge tube.

**223522. Electrical Apparatus**—The Canadian General Electric Co., Ltd., Toronto, Ont., Can., assignee of Walter R. G. Baker, Schenectady, New York, U.S.A., September 12th, 1922.

In an electrical system, an oscillator, a modulator or amplifier of the vacuum tube type.

**223523. System for Producing Oscillations**—The Canadian General Electric Co., Ltd., Toronto, Ont., Can., assignee of William C. White, Schenectady, N.Y., U.S.A., September 12th, 1922.

The combination in a system for producing electrical oscillations of an electron discharge device.

**223528. Signal Receiving System**—The Canadian General Electric Co., Ltd., Toronto, Ont., Can., assignee of Albert W. Hull, Schenectady, N.Y., U.S.A., September 12th, 1922.

The combination in a signal receiving system of a circuit upon which signalling potentials may be impressed.

**223540. Radio Receiving System**—The Canadian General Electric Co., Ltd., Toronto, Ont., Can., assignee of Ernest F. W. Alexanderson, Schenectady, N.Y., U.S.A., September 12th, 1922.

A receiving system for radio signals, comprising a substantially horizontal receiving antenna.

**223541. Radio Transmitting System**—The Canadian General Electric Co., Ltd., Toronto, Ont., Can., assignee of Ernest F. W. Alexanderson, Schenectady, N.Y., U.S.A., September 12th, 1922.

The method of operating a directive radio transmitting system.

**223542. Radio Receiving System**—The Canadian General Electric Co., Ltd., Toronto, Ont., Can., assignee of Ernest F. W. Alexanderson, Schenectady, N.Y., U.S.A., September 12th, 1922.

Means for eliminating disturbing effects in a radio receiving system.

**223543. Radio Signalling System**—The Canadian General Electric Co., Ltd., Toronto, Ont., Can., assignee of Ernest F. W. Alexanderson, Schenectady, N.Y., U.S.A., September 12th, 1922.

The combination in a signalling system of an antennae.

**223544. Electron Discharge Apparatus—The Canadian** General Electric Co., Ltd., Toronto, Ont., Can., assignee of Henry J. Nolte, of Schenectady, N.Y., U.S.A., September 12th, 1922.

The combination with an electron discharge device.

**223662. Method of Controlling Alternating Current**—The Canadian General Electric Co., Ltd., Toronto, Ont., Can., assignee of Ernest F. W. Alexanderson, Schenectady, N.Y., U.S.A., September 12th, 1922

The method of controlling the flow of an alternating current in a circuit which consists in varying the impendence of said circuit by controlling the electrical current.

**223663. Electric Apparatus**—The Canadian General Electric Co., Ltd., Toronto, Ont., Can., assignee of Paul R. Fortin, Schenectady, N.Y., U.S.A., Sept 12th, 1922.

An electrical apparatus, two series connected oppositely wound coils and a third coil in series with said first mentioned coils and movable from a position in close inductive relation to one of said first mentioned coils to a position in close inductive relation to the other of said first mentioned coils.

**223664. Commutator**—The Canadian General Electric Co., Ltd., Toronto, Ont., Can., assignee of S. R. Bergman, Nahant, Mass., U.S.A., September 12th, 1922.

In combination, a rotary ring member for conveying electrical current.

**223666. Electrical Condenser**—Joseph Francis Bernard, London, S.W.1, and John Bruce, Bolito, London, S.W., assignor of Frederick George Goldstone, London, S.E. 18, all in England, September 12th, 1922.

A variable electrical condenser, comprising a plurality of condenser surface elements.

Drawings and further particulars of above mentioned patents can be supplied upon application to RADIO Magazine.

## DICTAGRAPH LOUD SPEAKER REDUCED

The early announcements of the Dictagraph Radio Loud Speaker for the home resulted in such a public demand that it has been possible through increased production to reduce the price originally announced.

It is obvious how sensitive and finely constructed this instrument must be to perform its delicate work One of the chief essentials is the transmission of sound in its natural tones, free from distortion, and this quality of the Acousticon has been incorporated in the Dictagraph Loud Speaker.

The loud speaking unit incorporated in the Dictagraph Radio Loud Speaker is a specially devised loud speaking element. The design and construction is such as to permit of maximum amplification and the elimination of side tones, distortion, mechanical vibration and the metallic sound common in the phonograph and in other radio loud speakers.

The new loud speaker was not produced in a few months' notice to "cash in" on popular demand, but represents several years of patient research and development. Announcements of the Dictograph Radio Loud Speaker were withheld until the Dictograph Products Corporation was absolutely satisfied that this instrument could not be improved upon.

The Dictograph Radio Loud Speaker is adapted for use in all types of radio receiving sets in which a detector unit and two stages of amplification are employed. It is not recommended for use with crystal receiving sets unless these sets are located close to a broadcasting station, and the volume of the sound received through a head set is quite strong. It is manufactured by the Dictograph Products Corporation, 220 West 42nd Street, New York.

# The Vacuum Tube and Its Proper Use

By Samuel Ruttenberg.

The vacuum tube is the only part of the more common radio receiving sets which requires replacement. It is, therefore, important that the amateur have a correct understanding as to its proper use.

A detector or amplifying tube is nothing more than a highly evacuated incandescent lamp containing a plate and a grid. In fact, Edison made his first tube by inserting a wire in the top of an ordinary electric lamp. The principles which apply to the care of lighting lamps apply equally as well to detector and amplifying tubes. Only after scrapping a tube or two does the amateur realize that he has a delicate instrument, for a very slight increase in current above its correct operating conditions is usually fatal. The difficulty is introduced by the necessity of operating the tube so near its danger point. Very few people realize this fact.

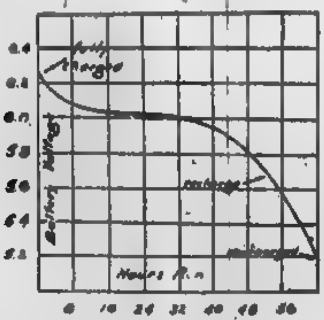
There are three ways by which a tube may fail.

1. Leak in the bulb—air leaks in and the filament is burned up.
2. The filament is actually melted.
3. The filament is crystallized, causing it to become brittle and break.

A leaky bulb is due to poor construction, and is beyond the control of the user.

The melting of the filament is due to excess current. The fine tungsten filament is raised to its melting point by only a slight turn of the rheostat knob. By the way, do you know the melting point of tungsten? It is 3,350 degrees Centigrade—higher than that of any other substance on this earth except carbon. Iron melts at a white heat, but that is only 1,500 degrees Centigrade. Melting of the filament occurs when the battery is fully charged. Six or more volts are impressed across the tube, causing enough current to pass to raise the filament to its melting point. This is eliminated by using some type of resistence in series with the battery.

Then why don't we use resistences on the lights in the office? So you would if you tried to put a 110-volt lamp on a 220-volt line. The more common vacuum tubes are designed to take approximately five volts. The ordinary storage battery, however, varies between 56 volts and 63 volts, according to the condition of the battery. Then why do we not make six-volt tubes? Well, if they made six-volt tubes and your battery was a little low on the night of the party, the old victrola would be forced back into service. The tubes are, therefore, designed to operate in conjunction with a device with which the current may be regulated at all battery voltages.



Curve showing change in voltage of a 6-volt, 60 ampere-hour storage battery during discharge.

There are several types of such devices which may be used in the filament circuit. The one most commonly used to-day is the ordinary wire wound rheostat. This has been widely used in the past, but has its many defects. The amateur does not understand its proper use, with the usual result of short-lived tubes. When the concert doesn't seem to be coming just right, the average amateur will immediately force the tube. He does not realize that a very slight increase above the proper operating conditions tremendously decreases the life of the tube and often burns it out.

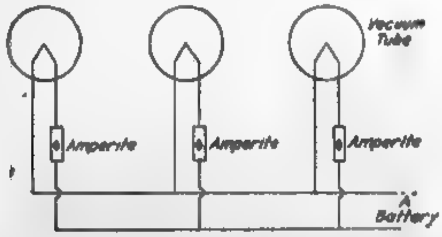
Another defect of the wire-wound rheostat is the method of bringing the filament to its proper operating temperature. This is done by gradually increasing the current until it reaches the required luminosity. Contrary to popular conception, this is not the proper method of turning on a vacuum tube, or any other tungsten filament lamp. If it was, a similar arrangement would be used for turning on the tungsten lights at home, in the factory, and the office. A tungsten lamp should be turned on so that it instantly flashes to its operating temperature—but not above it. Burning the lamp below this temperature causes the filament to crystallize and then break when subjected to slight vibration.

If you were to look at a tungsten filament under a high power microscope, you would see a structure similar to that of a bundle of small twigs. Tungsten must have that structure to make it ductile and strong. Before the days of the tungsten lamp, scientists throughout the world spent a good part of their lives trying to make tungsten ductile. The larger companies engaged the best metallurgists and chemists and spent millions of dollars on experimental work just to make ductile tungsten.

Why pick on tungsten? Because tungsten has the highest melting point of all metals. And since the light efficiency increases rapidly with the temperature, the metal which can stand the highest heat makes the most efficient filament. The problem was finally solved in the General Electrical Laboratories at Schenectady by Dr. Coolidge. Thanks to the ingenuity of the American scientist, the world now saves millions of dollars in electric light bills.

But what have these highly theoretical investigations to do with my two-step amplifier? If you will look through the results of the investigation you will find page after page written about the proper structure of ductile tungsten and the intricate methods of obtaining that structure. You will also learn how easily the proper structure is lost if the filament is used improperly. Heating the filament to a temperature 200 degrees Centrigrade below the proper operating temperature changes the fibre structure of the metal to a block structure. If now observed under a high power microscope, the filament will look as if composed of a train of small cubes. Such a filament if bent gives way between the cubes. The comparison in strength is similar to the old story of the strength of a bundle of twigs as compared to single stick.

Fortunately we do not have to worry about all these changes in the tungsten in our ordinary incandescent lamps every time we turn on the light. The engineer in the lamp works does all that worrying for us. He designs the lamp so that it will flash to its proper operating temperature when the switch is turned—provided that the automatic voltage regulator in the power house is working and keeps the voltage constant.




Now, the natural question which we, whose minds run in radio channels, would ask—could we not use a similar regulating device in our vacuum tube circuit?

Well, the problem is a little different. The device used in the power house is expensive and bulky. But a more simple device is now manufactured, which bids fair to fulfil the requirements for radio work. This device is known as "Amperite," and illustrated below. This automatic current adjuster dampens the current when it tends to increase and vice versa. It also permits flashing of the tubes to their proper operating temperature, thus preventing crystallization of the filament. In other words, it is designed to operate the tubes under proper conditions, irrespective of the condition of the battery or the peculiarities of the tubes.

Radio manufacturers and distributors, are sole agents for this new device.

## WORKRITE E-Z-TUNE DIAL

Radio fans who want the best and latest in radio material will be interested in the new WorkRite E-Z-Tune Dial. This dial is an improvement over the old style dials now in use, in that it has a grip on the rim. Whenever an operator wants to move the dial of his variometer or variocoupler the slightest fraction of an inch to clear up a long distance concert he invariably grasps the dial by the rim. That is where this dial has a grip that fits the hand. The E-Z Tune Dial is made from the finest material, highly polished, and with very distinct figures. It is 3½" in diameter. Made for either ¼" or 3/16" shaft. For further information, write The WorkRite Mfg. Co., Cleveland, Ohio.

Mr. Scholl, formerly of the Splitdorf Electrical Co., has lately become sales manager for the Everett Electric Corporation of New York. Mr. Scholl is no stranger to the trade, as he was with the Splitdorf for seven years, and made many friends, who will wish him every success in his new connection.

## FIRST RADIO EXHIBITION AEROPLANE

**Above is shown the highly powered aeroplane of the well known "Canuck" type, owned by Mr. Jack V. Elliott, equipped with radio set, manufactured by the Jack V. Elliott Company, of Hamilton, Ont., of which Mr. Elliott is the proprietor. This progressive method of bringing the Elliott line of radio apparatus to the public notice created great interest at the Exhibitions recently held at London, Toronto, Burlington, Stratford, Seaforth, Cayuga, Brampton, etc., when Mr. Elliott, one of the pioneer Canadian radio manufacturers and jobbers, personally flew above the Exhibition crowds and gave them numerous thrills.**

**FIRST PICTURE TO BE SHOWN OF THE DELEGATES TO THE FIRST NATIONAL RADIO**

**Mr. Keith Russell, President of the W.A.O.O., who presided, is seen in the centre of the picture holding These three are the men who were chiefly responsible for the success of the convention. This picture is the more Canada in a leading position in connection with the development of radio communication.**

## EASTERN CANADIAN RADIO CLUBS

A radio club has been formed among the employes of the Canadian National Railways at Moncton, the divisional headquarters of the system. It is at Moncton that the machine shops, repair shops, general offices, carpenter shops, and painting shop of the railways are situated. The radio club has started out prosperously, and indications are for a successful career. There are many radio enthusiasts employed at the Moncton headquarters of the C. N. R.

At the Kentville Sanitarium, Kentville, N.S., sponsored by the Nova Scotia Government, a radio club has recently been organized. The club has started with about forty members. At this institution are about two hundred tuberculosis patients. The radio club is progressing rapidly.

The radio club at St. Andrews has been exceptionally successful during the summer months, when St. Andrews is a thriving centre. Summer tourists to the extent of fifteen hundred are quartered at St. Andrews during the summer—some of them in cottages and mansions, and others at the hotels, the Algonquin being a big Canadian Pacific Railway hotel open only during the summer and early fall. Among the radio enthusiasts at St. Andrews now is Lord Shaughnessy, former head of the Canadian Pacific Railway, and who is one of the pioneer summer residents of St. Andrews. Some of the most expensive receiving sets manufactured are utilized at St. Andrews, and not until the first of October or the latter part of September will the radio enthusiasts at St. Andrews be diminished in number. The number of townspeople in grip of the radio germ is large compared with the population of the town. This is ascribed to the extent to which the summer residents became attached to radio.

Edmund Lebre, a resident of Tignish, which is located on the northern tip of Prince Edward Island, had the distinction of picking up two songs broadcasted from the Newark station the latter part of August. This is the first time any radio enthusiast on Prince Edward Island has picked up the Newark station. Lebre has what is more or less a home-made outfit. He says he will not rest until he has made a broadcasting outfit. He is at work on this at present, and looks forward to having the outfit completed late in the fall. He feels sure his product will be practicable.

Radio dances are being held in St. John, and will be continued all through the fall and winter. The music for the dancing is supplied by the radio, picked up from the Lynn station mostly.

The tuberculosis patients at the River Glade Sanitarium, River Glade, N.B., owned by the New Brunswick Government, have organized a radio club, and a number of sets have been purchased. The patients are evincing a keen interest in the radio, it being a wonderful diversion for those confined to the sanitarium, which is located four miles from River Glade, a small village on the Canadian National Railways, eighteen miles west of Moncton, on the St. John and Moncton line of the C. N. R.

The aviation school at Truro is booking aviators for the fall fairs of the Maritime Provinces. This school has been in existence since the close of the war, and has supplied many of the aviators seen at eastern Canadian fairs.

Some of the Maine fair managements have been seeking aviators from Canada for the fairs in the Pine Tree State of New England. However, not being able to secure the birdmen, most of the fairs were forced to go without a Canadian aviator as a special attraction.

VENTION HELD IN THE PRINCE GEORGE HOTEL, TORONTO, SEPTEMBER, 8 AND 9.

. Mr. W. C. O. Duncan, is on his right and Mr. Lowry, Secretary-Treasurer, is the second figure to the left. because it includes a large number of the men of various provinces of the Dominion who are helping to place

H. V. MacKinnon & Son, dealers in radio supplies in St. John, are showing apparatus in the display windows of their Prince William Street establishment. There are two large windows connected with the store, and these permit of advantageous window displays. As a boosting feature, a dozen cartoons centring around the radio are displayed with the supplies.

Some of the daily newspapers of the Maritime Provinces are installing radio sections to cater to the radio enthusiasm. Interest in the radio is further generated and increased by the publication of instructions and hints to users of the radio. It is safe to state that the radio is thrice more popular in the Maritime Provinces now than at the inception of the radio wave. Most of the cities and towns are taking hold of radio in approved style. It is only a question of time when the rural folk will follow the lead of the urban residents.

## COMPUTING WAVE LENGTH BY MEANS OF FORMULA

Many radio fans, when they first install a set of receiving instruments experience difficulty in hearing the broadcast concerts, while the code signals can be heard with marked intensity. In many instances the absence of the radio music and voice in the phones is caused by the natural period or fundamental wave length of the antenna being too large. When inductance is added to a radio receiving or transmitting circuit the wave length is increased. For example, if your set is capable of tuning to 1,500 metres and you wish to hear the Arlington (Va.) time signals on a wave length of 2,500 meters, you switch a leading coil into the antenna circuit. To install a long antenna produces the same result as adding too much inductance, which would make it impossible to hear the low wave length stations. After the antenna is erected it cannot be varied at will by the movement of contacts in the same way as a loading or tuning inductance. Therefore, if the natural wave length of the antenna itself is 400 or 500 metres, it will be difficult to hear the broadcast stations employing a wave length of 360 metres. A condenser placed in series with the antenna lead or ground lead will help to reduce the natural period of the antenna wires, but it does not tend for efficiency such as may be had from an antenna of proper size and construction.

Radio operators may calculate to an approximate degree the wave length of their antenna by adding the length of the antenna, the length of the lead-in, and the length of the ground wire, then multiply the total length of all by three by one and one-half. For example, the antenna of a set is 100 feet long, the lead-in is twenty feet, making a total of 150 feet. Multiply the 150 feet by one and one-half, which gives a result of 225, the natural period or wave length of the antenna itself.

Mr. Edward J. Nally, president of the Radio Corporation of America, announces that at a meeting of the Board of Directors of the Radio Corporation of America, held September 8th, Mr. Sarnoff was elected vice-president and general manager of that corporation.

At this same meeting Mr. William Brown was elected to the office of vice-president and general attorney. Mr. Brown has been connected with the Radio Corporation of America for a number of years, during which time he has handled many of the important legal matters that have been incidental to rapid growth of this organization.

"Home," says the neighborhood wit, "is where a man keeps his radio set."

# Building Radiophone Receiving Sets

With the rapidly increasing popularity of radio, almost every man, woman and child wants to own a radio receiving set of some sort, and it is the purpose of these articles to describe in few words how a set may be constructed from the simplest form to the more complicated ones.

For receiving radiophone signals at a short distance only the simplest apparatus is required, which one can readily construct without the use of a machine shop. For instance, those within ten to fifteen miles of a radiophone transmitting station may readily hear their signals by use of one single coil of wire, piece of galena crystal, fixed condenser and head-set, together with antenna and ground connections. To receive greater distances one requires the use of the audion tube, an invention which has made the radiophone of to-day possible.

For instance, if one wanted to hear the broadcasting stations of Pittsburgh, Newark, Detroit, Schenectady, etc., it would require the use of the audion tube, several tuning instruments known as variometers, the necessary batteries and head-phones; various circuit arrangements, showing what instruments to use and how they may be placed in the circuit, will be shown later. By using one or other of these regenerative audion circuits it will be possible to hear from distant points, and these received signals may be amplified to any desired volume by the addition of amplifiers and a loud speaker.

Amplifiers and loud speakers have greatly developed during the last few years, so much that it is possible starting with the very minute power picked up on the receiving fire, amounting to less than one hundred millonth of that taken by an ordinary incandescent electric light globe, to so amplify this energy that it can reproduce it just as received, but strong enough so that the reproduced sound signals can be heard over a mile from the source.

It is now possible to entirely do away with the antenna wires and ground connections and substitute for same a simple coil of wire several feet in diameter. This is made possible by the use of an additional amplifier in conjunction with the radio frequency amplifier used for amplifying the signal strength. This amplifier, called a "radio frequency amplifier," brings up the strength of the received currents on the small coil used in place of the antenna, so that they are strong enough to operate the receiving set.

In explanation of the above, it might be well to state that all electrical conductors pick up radio waves even to an object the size of a pin. The amount of the received energy depends upon the size of the conductor within certain limits, size meaning length and area. The receiving wires from the radio waves are called "the antenna."

It is somewhat difficult to describe to the layman and put down on paper the proper data which one wishes to set forth. The following description covers constructional details for the making of a simple receiving set by which anyone may listen in on the Diamond State concerts and other broadcasting within short range:

Procure a Condensite Celoron or Diamond fibre tube measuring about four inches outside diameter, and having a 1-16" or ⅛" thick wall, 6 inches long; next get about ½ pound spool of number 22 or 24 cotton covered wire. You will need ten contact points, together with a switch arm, knob and bushing complete. A crystal detector, together with a small fixed condenser and head-set, will complete the equipment, except the antenna wire, which can be conveniently made of the family clothes line, telephone wire, or anything else in the line of a metallic conductor, even to the bed spring.

Wind the tube with 110 turns of wire, tapping every tenth turn, first baring the wire of its insulation before twisting; arrange the contacts and switch arm together with the detector, condenser, and connecting posts on a condensite celoron panel, measuring about 7½" square by ⅛ or 3-16" thick. All of the above parts may be purchased from the local supply stores selling radio parts.

All of the parts are mounted on the panel. The coil can be mounted on a bracket supported under the panel, the wires being brought up and fastened on to the contacts as shown. Four binding posts are required—one each for antenna and ground connections and two for headphone connections.

By studying the various types of sets on the market, one can readily gain an insight into the construction of these sets.

By the time this set is built you will be ready to learn how to operate same and connect up to your antenna. Full details of the operation of set will be taken up in the next issue.

---

## Canadian Radio Receiving Licenses

### TORONTO LEADS FOR JULY

The Department of Marine and Fisheries at Ottawa announces that Toronto leads the Dominion for the number of radio receiving licenses issued during the month of July, 110 having been issued by the Postmaster of that city. Vancouver comes second with 103, and Windsor again well up with 90. The total number of receiving licenses issued during the current fiscal year to the end of July is 3,270.

Radio enthusiasts are again reminded that it is necessary for all persons operating radio equipments to have a license, the charge for a receiving license being $1.00 per annum.

The Department is pleased to announce that the facilities for obtaining radio receiving licenses have been extended, whereby this class of license will, in addition to the post offices already announced, be obtainable at the following post offices:

| | |
|---|---|
| New Westminster, B.C. | Chatham, Ont. |
| South Vancouver, B.C. | Stratford, Ont. |
| Brandon, Man. | Guelph, Ont. |
| Fort William, Ont. | St. Thomas, Ont. |
| Port Arthur, Ont. | Kingston, Ont. |
| Sault Ste. Marie, Ont. | Lachine, Que. |
| Peterboro, Ont. | Westmount, Que. |
| St. Catharines, Ont. | Three Rivers, Que. |
| Niagara Falls City, Ont. | Sherbrooke, Que. |
| Kitchener, Ont. | Verdun, Que. |
| Sarnia, Ont. | Glace Bay, N.S. |
| Galt, Ont. | Moncton, N.B. |

An official list of the radio stations in the Dominion is being prepared by the Department of Marine and Fisheries, and will be ready for issue at an early date.

# CONVERTING 'PHONES FOR WIRELESS

With a few exceptions, it is necessary that the telephone headgear for wireless work be wound to a high resistance, anything from 500 to 3,000 ohms per receiver being general. The statement "high resistance" is perhaps apt to mislead the reader; what is actually meant, of course, is that the magnet coils

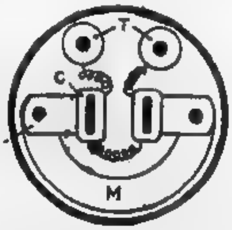



Fig. 1.—Diagram of interior of Receiver.

must be wound with a great number of turns of fine wire in order to produce a maximum magnetic effect with very little current. The resultant resistance is, therefore, merely a necessary evil, unavoidable in all magnetic devices which are more or less voltage operated.

Another point about wireless phones is that the diaphragms are much thinner than those used on ordinary commercial telephones. This makes them more sensitive to small variations in the magnetic force from the coils. At the same time, the diaphragms are more easily damaged, an excessisve current causing them to buckle.

### Construction of Receivers

Second-hand receivers, of the type known as watch-pattern, may be picked up very cheaply at most large dealers in electrical sundries; many of these are surplus Government instruments and well made. The general arrangement of a receiver of this pattern is shown in Fig. 1, the ebonite earpiece and diaphragm having been removed. A permanent magnet M of semi-circular shape is screwed to the outer containing case, and mounted on the poles are two pole-pieces P, which are bent at right angles and carry the magnet


Fig. 2.—Wound Coil on Magnet.

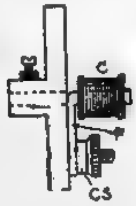



Fig. 3a


Fig. 3

Figs. 3 and 3a.—Magnet and Spool Mounted for Winding.

windings C. The ends of the windings are connected direct to the terminals T, which pass through insulated bushes in the metal case and serve to connect the coils C with the main receiving instruments.

The coils C when removed from the ordinary receiver will be found to contain fairly thick wire, the resistance being about 30 ohms. The task, therefore, is to strip them and rewind with much finer wire to a resistance of 2,000 ohms each receiver. Fig. 2 shows the general appearance of the coil when wound, the figures in the sketch corresponding with the reference letters in Figs. 1, 3, 3a and 4.

It will be seen that with such a small coil and with only a bent strip of metal P to hold, winding the empty bobbin by hand would be an extremely awkward job; in fact, it would be almost an impossibility to wind the wire with sufficient evenness to get anything like the required amount on the coils

Again, the wire being so fine, it is necessary to use great care to avoid breakage, which would mean starting all over again, and also the coil being so small, it would be almost impossible to hold it without getting cramp long enough to get all the wire on at once.

There are several ways of getting over this difficulty, with winding machines of various types, and the writer has tried them all with varying degrees of success. Most of them had the disadvantage that it was necessary to have an assistant, either to turn the handle or to guide the wire; the time taken to wind,

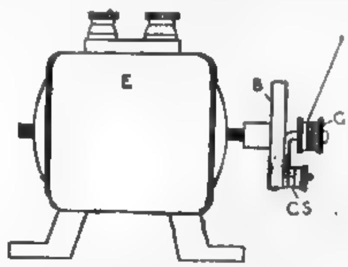



Fig. 4.—Motor with Magnet Mounted.

even with practice, was considerable, and the result not entirely satisfactory. Some little time ago, however, the idea occurred of using a small-power electric motor with the coil directly mounted on the armature shaft. The result was entirely successful, and from that day the writer's circle of wireless friends has increased considerably, at least amongst those with receivers to wind. The arrangement is clearly shown in Fig. 4, E being a small electric motor 4 or 6 volt, using current from an accumulator and having a variable resistance in the circuit to regulate the speed. Clamped to the end of the armature shaft is a circular block of ebonite or fibre B on which the telephone coil C is mounted, being secured in position by means of the clamping screw C S, which passes through the holes in the pole-piece P. It will be noticed that the coil C is arranged to rotate as near as possible in the line of the armature shaft, so that, in spite of the coil itself being rectangular in shape, it will revolve with as little wobble as possible. This is very necessary, as any tendency of the coil to revolve eccentrically will tend to break the very fine wire. The ebonite block B is tuned up in the lathe and a hole bored through whilst still in the chuck to take the armature spindle;

this can either be a good tight fit in the first instance or the block may be clamped on the shaft by means of a small set-screw, shown in Fig. 3a. A second clamping screw C S is fitted, to hold the coil C in position for winding. This screw must be accurately positioned to ensure the coil C running true. The best plan is to hold the coil in position and then mark the place for the screw by means of a scriber passed through the hole in the pole-piece P.

**Revolving the Magnet**

Returning for the moment to the question of true and steady running, it is most important that the hole to take the armature spindle is accurately bored, and also that the armature spindle runs absolutely true, otherwise the coil C will wobble and difficulty will be experienced, not only in the wire continually breaking, but also in getting it to fill in close to the cheeks of the coil. If the motor E is of the type in which the armature shaft extends at both ends, the opposite end to which the block B is mounted may be used to carry a small knurled knob fitted with a short piece of brass wire about 1/8 in. in diameter to form a handle. This will prove particularly useful for controlling the motor or for winding certain portions of the coil by hand.

**Winding**

With regard to the most practical method of winding the coils, the following procedure is considered by the writer to be the most satisfactory:

The motor should be connected up to the accumulator and regulating resistance and tested to see that it is in running order. The block B is then permanently fixed to the armature shaft and one of the coils to be wound clamped in position and trued up. Some fairly thin shellac varnish should be near at hand, together with a strip of silk ribbon, this latter cut to the width of the inside of the coil.

A single layer of silk ribbon is stuck on the core of the coil with shellac varnish, one layer of wire is then wound on and covered with a second layer of ribbon soaked in shellac. The free end of the wire is then carefully brought outside the coil and secured to the clamping screw C S for the time being. It is taken for granted, of course, that the sides of the coil C are already insulated with varnished ribbon or paper; at the same time it is a good plan to stick a small piece of varnished ribbon over the free end of the wire, to insulate it from the subsequent layers of wire when these are wound on. The main winding is now ready to start. The bobbin on which the wire is purchased should be mounted on a small brass rod so that it is free to rotate, and with the wire resting lightly across the second finger of the right hand, the motor should be started on the first speed, gradually increasing the speed of the motor as confidence is gained.

It is far better to go slow at first than to risk breaking the wire when the coil is partly wound and having to commence all over again. Naturally, a little practice is needed at first, but the knack of holding and guiding the wire is soon acquired, and after a time it will be possible to wind a coil and finish it off in fifteen minutes.

When the coil is almost full a single layer of silk ribbon should be put on, the last layer of the wire being wound over this, leaping about six turns from the end empty. The top layer is then held in position with the thumb and finger, while an assistant quickly soft-solders a short length of double-silk-covered No. 28 S W G wire to the winding. The last six turns will consist of thick wire, when the coil should then be covered with two layers of ribbon and the whole thoroughly soaked in shellac varnish and allowed to dry before touching again. The second coil should then be treated in the same way.

**Assembling**

When both coils are perfectly dry they may be remounted on the magnet poles in the receiver case, and the winding connected to the terminals.

It is a matter of opinion as to whether the inside ends of the winding should be connected to leading-in wires of a stouter gauge, some contending that the heat used in soldering tends to make the fine wire brittle and liable to break. Having finally connected up to the terminals T, the whole of the case should be filled with melted paraffin wax up to the level of the top of the coils, the loose connecting wires will thus be firmly embedded and a break in the wire rendered almost impossible.

**Diaphragms**

A special thin diaphragm should be purchased in place of the comparatively thick one originally fitted. The ear-piece is then screwed on, clamping the diaphragm in position, and the receivers are ready to be fitted with the headgear. This can easily be made from a length of old clock main-spring, the ends being softened, holes being punched or drilled in to take small screws, with which to secure the spring to the back of the cases. With a little trouble the ends of the spring can be slotted to take the screws, so that an adjustment is possible to make the receivers adaptable to heads of various sizes. The only remaining thing to be done is to attach the flexible leads to the instruments. These leads may be ordinary silk flex of good quality. The wires should not be twisted together, however, as in ordinary practice, but should be quite separate. The two receivers should be wired in series and the two ends of the flexible leads can be soldered to terminal tags or plug connectors.

With a little adjustment, the phones should be as sensitive as a specially constructed pair of wireless receivers purchased in the shops, and will well repay the trouble involved.—A. W. H.

## WIRELESS USED TO START INTERNATIONAL TRADE SPECIAL TO CHILE

In the presence of an assemblage of business leaders of the Pittsburgh district, the International Trade Special, carrying 33 cars of equipment for the electrification of the Chilean State Railways, was started this week by wireless.

This is the first time in history that such a wireless feat has been accomplished and it portends the tremendous possibilities for the use of wireless in railroad work.

The release of the controller by wireless started the International Trade Special and marked a notable event in wireless engineering.

## FRENCH TRAVELERS WANT AIR WARNINGS

Paris, France.—Because of the numerous disastrous accidents on French railways in the last two years, which have spread alarm among the traveling public, French railway officials are experimenting with radio telephone communication between moving trains and stations.

# A SINGLE VALVE RECEIVING SET AND HOW TO MAKE IT

At the outset it may be remarked that to make everything which appears in the accompanying drawings from the rough material would require a well-equipped workshop, but most, if not all, of the parts which require special machining can be bought ready made. Those who have already made a crystal set will not have had their labour in vain, for most of the apparatus can be used in the set to be described. Those who have not made or used a crystal set are advised to do so before they attempt the valve set for two reasons. The first is that it needs a little experience to know how to get the best results from a home-made set, and the second that the mere use of a crystal set will thoroughly instil into the mind of the amateur that he must have all his apparatus thoroughly efficient.

One can sometimes afford to be a little wasteful when signals are amplified, but when it is impossible to put more energy into the telephones than is received by the aerial, which is the case of the crystal set, much

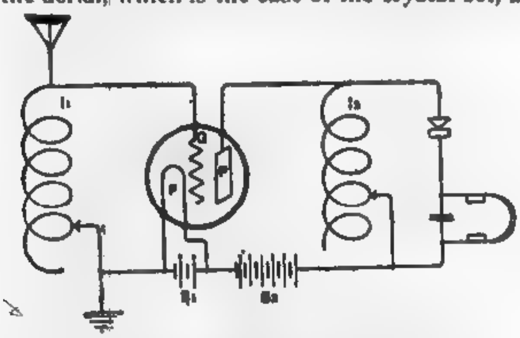


Fig. 1.—Valve as High-frequency Amplifier with Crystal Detector.

will be learnt of the advantages of keeping insulation and apparatus up to the mark.

### The Circuits

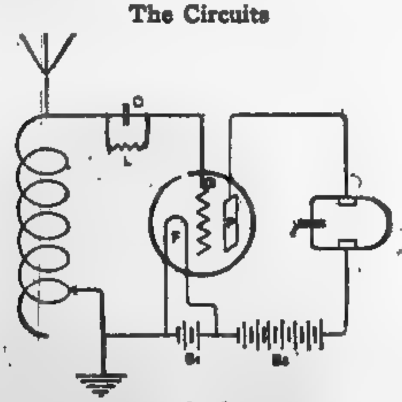


Fig. 2

Figs. 1 and 2 show alternative circuits which will give good results if the instructions are carried out in full. In both these circuits the valve acts as an amplifier. In the first it amplifies the radio-frequency currents which oscillate in the aerial circuit, and these magnified currents are passed on to the detector circuit on the right.

Fig. 3 may help to explain the meaning of the terms used. The top line represents two groups of high-frequency oscillations in the aerial circuit. These may be supposed to have been considerably amplified (increased in strength) by the valve. On passing through the detector circuit they are deformed in

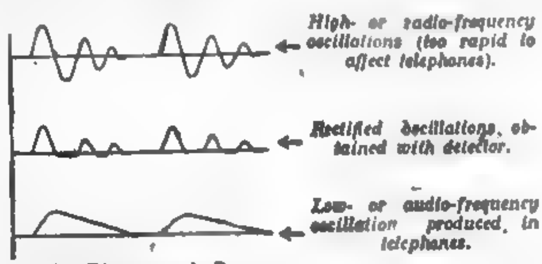



Fig. 3.—Diagrammatic Representation of Oscillations.

shape to be something like the second line, and the effect produced in the telephone may be likened to the third line oscillations, hence the term audio-frequency. In Fig. 1 the valve magnifies the radio-frequency current and allows it to pass on to the detector, and in Fig. 2 the valve performs the two operations of amplifying and rectifying together.

### Apparatus

The apparatus needed for circuit No. 1 comprises:

1. A complete receiving set.
2. An additional aerial tuning inductance.
3. A valve holder.
4. Battery B1 of 4 volts and battery B2 of 30-40 volts.

For circuit No. 2:

1. Aerial tuning inductance.
2. A valve holder.
3. Batteries B1 and B2.
4. Telephones with condenser.
5. Grid condenser C and grid leak L.

If the amateur has already two tuning inductances it would need less work to fit up circuit No. 1, but if he has not, it might be easier to adopt circuit No. 2; the latter also has the advantage that it can be very easily converted to a "regenerative circuit."

### Valve Panel

The valve panel is illustrated by Figs. 4 to 8. The top is made of a piece of ebonite 4 in. by 2½ in. by 3/16 in. thick; ⅛ in. thickness would do, but the thicker material will be stronger. The edges can be trued up and finished off smooth with an iron smoothing plane set very fine. Failing that, a "dreadnough" file will cut it better than any other. Fig. 6 shows the layout of the holes. The four holes for the valve legs should be marked out very carefully; they are drilled 3/16 in. in diameter so as to allow a little play for adjusting the valve legs, which are screwed No. 4

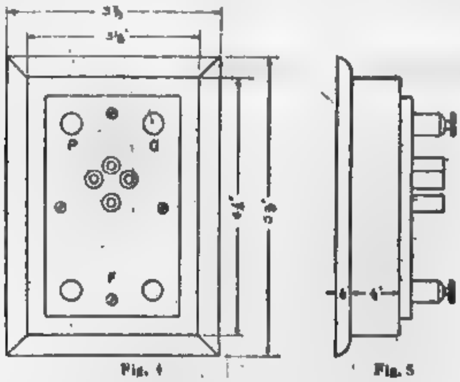
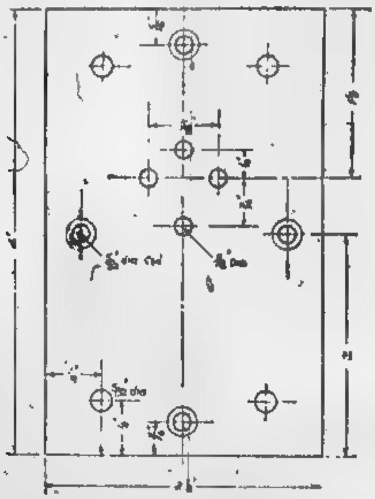


Fig. 4 Fig. 5

**Figs. 4 and 5.—Plan and Side Elevation of Valve Panel.**

B.A. They can be adjusted by placing them in position and pushing a valve right home. The nuts are then tightened up. If the valve legs cannot be made at home they can be bought for a few pence.



Top of panel 3/8" Ebonite Sheet

Fig. 6

The legs and terminals should be polished and lacquered or they will quickly get dull on account of the sulphur in the ebonite. After the holes have been drilled the top can be finished off smooth with fine emery cloth, and a little rubbed over the surface will give a good colour.

The wooden part is made out of two solid pieces of mahogany or teak (or soft wood will do) 7/8 in. and 1/4 in. thick, respectively. Some of the thick piece has to be carved away to leave room for the terminals, valve legs and connecting wires, this, of course, being done when all the parts are assembled on the ebonite panel. If the maker is good at engraving he can mark the letters to the terminals of the plate, grid and filament, but otherwise they should be stamped on or marked in ink on the wood underneath. The connections of the terminals to the valve should be made with No. 20 gauge bare copper wire. A little piece of rubber tubing should be slipped over the plate connection which has to cross one of the filament wires.

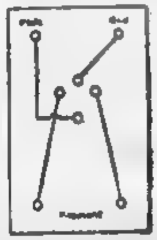


**Fig. 7.—Diagram of Connections of Valve Panel.**

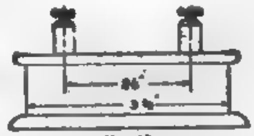


Fig. 10

**Figs. 9 and 10.—Case for Grid Leak and Condenser.**

## Grid Condenser and Leak

The next piece of apparatus is the grid condenser and leak, which will be needed for circuit No. 2. These are shown in the diagrams Figs. 9 to 13, and also in the photograph. The condenser is made up of copper or tinfoil, both of which can be purchased from any electrical stores. There are six pieces of mica 1⅞ in. by 1 in. and about 0.003 in. thick. The mica can be bought in thick pieces and is split with a sharp penknife. The thickness should be checked with a micrometer if possible, otherwise the only way to measure the thickness is to cut up a piece into ¼ in. squares with a sharp pair of scissors and pile thirty-four of these little squares together, when they should measure 1/10 in. total thickness.

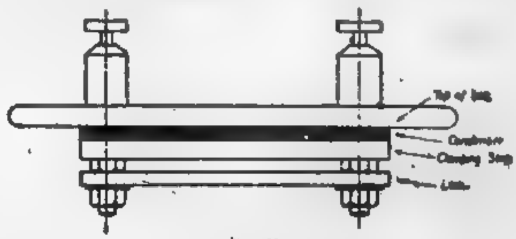


Fig. 11

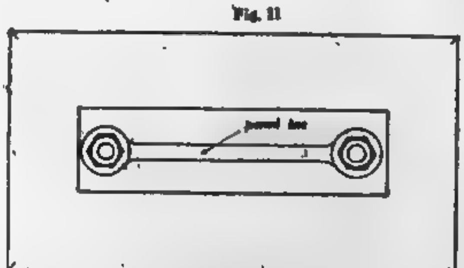


Fig. 12

**Figs. 11 and 12.—Elevation and Under Plan of Grid Leak.**

A little over or under will not matter very much. Care should be taken to obtain the mica as clear as possible. It can usually be obtained in 2 in. squares, and two of these should be ample for the purpose. The tinfoil is cut up into six strips 2 in. by ¾ in. and a hole punched 3/16 in. from the end of each one. Copper foil is better than tin because it will not tear so easily, but tinfoil will answer quite well.

The "leak" is made of a piece of sheet fibre or ebonite 2⅝ in. by ¾ in., with two holes made at each end 2¼ in. apart. Fibre is preferable; if ebonite is used it must be roughened with emery cloth. A thick line with an HB pencil is drawn from one hole to the other, and the pencil is well rubbed in round the holes, as shown in the drawing, to make good contact with the clamping nuts. The box for the leak should be made of hard wood if possible. It is easiest to make it solid and carve the centre out like the valve panel, the bottom piece being glued on. A piece of wood or, better, ebonite 3/16 in. thick, is cut to the same size

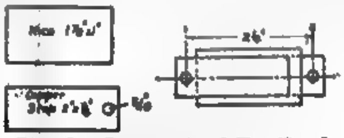


Fig 13.—Constructional Details of Condenser.

as the leak; this is to clamp the condenser down with. The terminals should be as shown in the drawing, with nuts and washers.

The condenser can now be assembled. First the terminals are pushed through the holes in the lid of the box, then the condenser is assembled in the following order; a piece of copper foil on one terminal, a piece of mica, a piece of foil on the other terminal, a piece of mica, and so on. These must be carefully laid on, one exactly over the other. When the last piece of foil is in place the ebonite strip should be pushed over the terminals and then the fibre with the pencil mark outwards. Washers and nuts are used to clamp the whole tightly together. The capacity of the condenser should be about .0003 microfarads and the resistance of the leak 2,000,000 ohms. The condenser will not need any adjustment once it is put together, as it will be approximately of the stated value if it has been made properly, but the leak will have to be adjusted when the set is in use. The method will be described later.

**Batteries**

The low-tension battery next claims attention. This is needed to light the filament of the valve, which may be an M or R type. These valves take a current of about ¾ amp. The two most suitable sources of current are accumulators or dry cells, and if there is any difficulty in getting accumulators charged, the writer would certainly recommend dry cells. The initial cost of four good cells (they must be large ones) will be about 12s. These should easily have a life of about fifty hours; a good cell has a total capacity of 70 ampere-hours. If not used too often they would perhaps last for three months or more, and when unfit for this purpose they can be added to the high tension battery.

A 40-ampere-hour 4-volt accumulator will cost about 25, and must be charged every month whether it is in use or not. The cost of charging usually depends on the conscience of whoever does the job. It will probably be about 2s per time. Of course, if more than one valve is used it would pay to have the accumulator because of the extra current consumed. A big disadvantage of accumulators is that they are messy and not easily portable.

It will be noticed that no filament resistance is included in the apparatus or diagram of connections. When using accumulators the writer considers that it is not worth the extra cost and trouble to have a 6-volt battery and variable resistance. A 4-volt battery can be connected straight on to the filament of the valve without the least danger of burning out, whereas one has to be careful with a 6-volt battery. When using dry cells it would be worth while including a rheostat, but instead a short piece of resistance wire could be inserted as a connection to get over the difficulty.

In this connection the writer would emphasize the need for a voltmeter if valves are used. It should preferably read up to 6 volts. It should also be used to check the voltage across the filament in order to see that it never exceeds 4.5.

The high-tension battery may be obtained in a number of ways. In the writer's case it consists of about thirty discarded electric-bell dry cells. When the voltage of a cell drops below 1 a hole is drilled in the top and a little water added; this usually freshens it up. Very little current is taken from the high-tension battery, so that there is no need to have new cells for the purpose if old ones can be obtained. An alternative is made up of three units of eleven cells; these units can be purchased for about 5s each. Also twelve to fifteen pocket lamp batteries (3½ volt) might be used. It has already been stated that if dry cells are used for lighting the filament they can be passed on for this service when they are too old for the former.

When using old cells care should be taken from time to time to see that the voltage of any cell does not fall below 0.7 volt. The battery should be carefully insulated. It may rest upon glass plates, such as old photographic negatives, and preferably it should be enclosed in a box.

**Operation**

Having now described all the apparatus which is needed, a few words on the working of the set may not be out of place.

Always take the valve out of the holder when making connections. If you accidentally connect the high-tension battery across the filament it will be a costly mistake.

To further obviate accidents a piece of ½ ampere fuse wire may be connected in series with the H. T battery. No. 1 circuit will need two inductances; these should be about the same size, and when everything is connected up and you are listening for signals you should tune both circuits at once.

In circuit No. 2 only one inductance is used. The brid condenser is taken out of its box. When signals are heard, thicken the pencil line on the grid leak and the signals should gradually become stronger. If too much pencil has been added it can be rubbed out. As it may take a little time to adjust the leak, it should be done when a station is transmitting for a long time; for instance, the Paris weather report or the Admiralty signals. When the leak is finally adjusted it is put back in the box and the edges are sealed round with paraffin wax to prevent the ingress of moisture. —J. F. S.

# RADIO Guide to Canadian Broadcasting Stations

| *Name* | *Wavelength* | *Call Signal* |
|---|---|---|
| **Montreal** | | |
| Marconi Company | 440 metres | CFCF |
| Dupuis Frères Limitee | 420 " | CJBC |
| Northern Electric Co. | 410 " | CHYC |
| La Presse | 430 " | CKAC |
| Can. Westinghouse Co., Ltd. | 400 metres | CFZC |
| B. L. Silver | 420 metres | CHCX |
| Bell Telephone Co. of Can. | ........ | CKCS |
| **Toronto** | | |
| Bell Telephone Co. of Can. | ........ | CFTC |
| Can. Westinghouse Co., Ltd. | 420 metres | CKCZ |
| T. Eaton Co. | 410 " | CJCD |
| Evening Telegram | 430 " | CJSC |
| Globe | 420 " | CHCZ |
| Independent Tel. Co. | 450 metres | CKCE |
| John Miller & Son | 410 metres | CHFC |
| Marconi Company | 440 " | CHCB |
| Metropolitan Motors | 410 " | CHVC |
| Radio Equipment & Supply Co. | 410 metres | CKKC |
| Star | 400 " | CFCA |
| Simons Agnew Company | 410 " | CJCN |
| United Farmers of Ontario | 410 metres | CJCH |
| **London** | | |
| Free Press | 430 " | CJGC |
| London Advertiser | 430 metres | CFCX |
| Radio Shoppe | 410 metres | CHCS |
| Radio Supply Co. | 410 " | CKQC |
| **Hamilton** | | |
| Can. Westinghouse Co., Ltd. | 400 metres | CHIC |
| Wentworth Radio Supply Co. | 410 metres | CKOC |
| **Ottawa** | | |
| J. R. Booth, Jr. | 400 metres | CHXC |
| **Fort Frances, Ont.** | | |
| International Radio Dev. Co. | 400 metres | CFPC |
| **Walkerville** | | |
| Motor Products Corporation | 440 metres | CFCI |
| **Kitchener** | | |
| News Record, Ltd. | 420 metres | CJCF |
| **Calgary** | | |
| Radio Corporation of Calgary | 430 metres | CFAC |
| W. W. Grant Radio, Ltd. | 440 metres | CFCN |
| Edmund Taylor | 420 metres | CJCY |
| Can. Westinghouse Co., Ltd. | 400 metres | CHCC |
| Albertan Publishing Co. | 410 " | CHBC |
| Western Radio Co. | 400 " | CHCQ |
| **Edmonton** | | |
| The Journal | 450 metres | CJCA |
| **Nelson, B.C.** | | |
| J. G. Bennett | 400 metres | CJCB |
| **St. John, N.B.** | | |
| McLean, Holt & Co. | 400 metres | CJCI |
| Jones Electric Radio Co. | 400 metres | CKCR |
| **Winnipeg** | | |
| Can. Westinghouse Co., Ltd. | 440 metres | CFCD |
| T. Eaton Co., Ltd. | 450 metres | CKCB |
| Lynn V. Salton | 420 " | CKZC |
| Manitoba Free Press | 410 " | CJCG |
| Radio Corp. of Winnipeg | 430 metres | CHCF |
| Salton Radio Engineering | 420 metres | CKZC |
| Tribune | 400 " | CJNC |
| **Regina** | | |
| Leader Pub. Co. of Regina | 420 metres | CKCK |
| **Vancouver** | | |
| Marconi Company | 440 metres | CFCB |
| Geo. Melrose Bell | 430 metres | CHCF |
| Vancouver Daily Sun | 420 " | CJCE |
| Vancouver Daily Province | 410 " | CKCD |
| Victor Wentworth Odlum | 400 metres | CFYC |
| Radio Corporation of Vancouver, Ltd. | 430 metres | CHCA |
| Can. Westinghouse Co., Ltd. | 400 metres | CHOC |
| **Halifax** | | |
| Marconi Company | 440 metres | CFCE |
| Eastern Telephone & Tel. Co. | 410 " | CJCS |
| **Iroquois Falls** | | |
| Abitibi Power & Paper Co. | 400 metres | CFCH |

## AMRAD'S NEW BROADCASTING STUNT

Setting-up exercises by radio, beginning at 7 o'clock each morning, is the latest use to which the radio has been put. On September 5 a series of weight-reducing and weight-gaining exercises for various members of the family was inaugurated and broadcasted from the Amrad Station "WGI" at Medford Hillside, Mass., as a regular feature of its program

The object of this course is to place at the disposal of all radio users the most approved methods of securing physical efficiency. Three exercise classes, lasting 15 minutes each, are held every morning. These personal efficiency courses are in charge of Arthur E. Baird, head of the Department of Physiotherapy, at Caines College of Physical Culture.

While this latest use for radio is entirely an experiment, being the first time such a course has ever been attempted by radio—in fact, the first time a radio broadcast has been given at this hour of the day—reports indicate that the exercises are being tried by people all over the New England district. One young lady wrote in that the little girl of the house, arising early one morning, saw her mother bending over and waving her arms with the telephone receivers on her head. She was so frightened, because she didn't know what her mother was doing, that she notified the neighbors.

The three sets of exercises are graded as follows: The first for the normal business man or woman who wishes merely a set of toning-up exercises; the second for those who are over-weight, and wish to reduce; and the third for those who are under-weight, and wish to build up. The exercises are accompanied by explanatory talks dealing with all phases of personal hygiene, such as diet, bathing, recreation and the like.

# 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

## Radio Dealers

We are the exclusive Manitoba Agents for the "De Forest" line of patents, as manufactured in Canada by the Canadian Independent Telephone Company, Limited. We carry a complete stock of receiving apparatus and parts. We can also supply transmitting outfits.

**Radio Corporation of Winnipeg**
Limited
370 Donald Street, - - WINNIPEG

## DIRECT FACTORY SHIPMENTS

Jobbers and Dealers write us for Prices

### Everything in Radio

**STERLING SPECIALTIES**
FACTORY REPRESENTATIVES
213 Somerset Bldg., - - WINNIPEG, Man.

## Specializing Everything Radio

Mail Orders Solicited. Write for Price List.

AUTHORIZED DEALERS **AMRAD** PRODUCTS

**INDUSTRIAL RADIO STORE**
Industrial Bureau, Chas. D. Floria WINNIPEG, MAN.

Manufacturers and Jobbers of

## RADIO SUPPLIES

**Cummings Brass & Wire Works**
310 Good Street, WINNIPEG, Man.

## FREE ADVICE

Send Stamped Addressed Envelope.

**RADIO EQUIPMENT & SUPPLIES**
**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

# Western Canada



## MANITOBA RADIO ASSOCIATION FORMED

**By Andrew O'Malley.**

The Manitoba Radio Association was formed on Friday, August 29. This organization was formed with the idea of bringing together the amateurs of the province, and also to keep in touch with the different clubs in the smaller towns.

The last meeting was held on September 11, in the Engineering Building of the University of Manitoba. Professor Fetherstonhaugh, Dean of the College of Engineering, addressed the meeting, and encouraged the association on the good work that it will accomplish.

The next meeting will be held on October 2, and during the winter regular meetings will be held on the first and third Mondays of each month.

The following were elected at the last meeting:—Mr. L. V. Salton, President; Mr. E. Nielson, Vice-President; Mr. J. R. Foster, Secretary; Mr. J. Rutland, Treasurer.

Over 150 were present. Anyone caring to get in touch with the association will write to Mr. R. J. Foster, Secretary, care of Free Press Radio Department, Winnipeg.

Mr. B. G. Jones, of the Acme Magneto & Electrical Company, Limited, Winnipeg, reports that he received quite clearly concerts broadcasted by "K. S. D.," St. Louis Post Despatch. This was received on his Acme set, with one stage of amplification and with the Standard Amateur Aerial.

The last concert he heard the American Legion Band of St. Louis play several selections.

## MR. D. R. P. COATS LOCATES IN WINNIPEG

Mr. D. R. P. Coats, formerly with the Marconi Wireless Telegraph Co. of Canada, is now in Winnipeg in charge of the Radio Department of Perkins Electric, Limited, of Montreal.

Mr. Coats needs no introduction to the followers of wireless, as he was with Marconi Co. for many years in various capacities, from marine operator to publicity manager and editor of the "Canadian Wireless" Magazine. In the latter paper he wrote under the nom-de-plume of "Anthony Pyke" and "Anticap." Under the last name he wrote the "Diary of a Ham."

His many friends wish him success in his new field of endeavor.

---

Small loud speakers, which will reproduce sounds loud enough to be heard at the farthest end of the average living room, can be made by using an ordinary gramophone sound box or any type of horn, either fibre or metallic.

# Western Canada



## MANITOBA RADIO ASSOCIATION FORMED
By Andrew O'Malley

[illegible]

[illegible]