The WIRELESS WORLD AND RADIO REVIEW

WIRELESS AND SCHOOLMASTERS.

By The Editor.

THERE has been considerable discussion in the daily Press recently on the question of whether broadcasting in the home is going to have a detrimental effect on the standard of education of the next generation. It has been pointed out that quite apart from the fascination of wireless for the average schoolboy, which has the effect of tempting him to devote the whole of his spare time to the subject, there is also the question of home-work; at least one headmaster has written to the Press complaining that home-work is being neglected and that the excuse is given that the loud speaker at home has made concentration impossible.

We are quite prepared to admit that broadcast reception with a loud speaker is no aid to study and if boys are expected to do their home-work in the same room in which the loud speaker is in use, then they have every excuse for neglecting their home lessons. The broadcast programmes would, in part, tempt the boy to listen or, if they did not do so, would at least be a distracting accompaniment to study. But broadcasting and a loud speaker are not the only possible causes for interference with home lessons and surely the responsibility rests with parents to see to it that reasonable quiet is afforded for the period of the evening during which home-work is to be done. We cannot imagine that parents would be so blind to their responsibilities in the matter of a son's education as to expect him to progress in his studies whilst affording him no suitable facilities.

For boys who detest home-work there have always been temptations which could serve to distract their attention. Stamp collecting and a host of other hobbies were in existence long before broadcasting was introduced but these do not seem to have caused the same amount of anxiety on the part of schoolmasters. The purpose of home-work is not only to cram into the day work in excess of that which can be done during the supervised hours in school, but to give the student the opportunity of training himself to study on his own without the moral support to concentration which school supervision provides. If the scholar does neglect, as we may suppose, the study of say Greek and Latin, we believe that the broader education which he can derive from listening to broadcasting may at least be of equal benefit in his future career.

Broadcasting provides a means of general education which past generations have been denied and if one weighs in the balance the advantages against the disadvantages of broadcasting in the matter of education, we believe that the weight will be all in favour of broadcasting.

TO OUR ADVERTISERS.

IMPORTANT NOTICE.

The Proprietors of *The Wireless World and Radio Review* beg to announce that the arrangement whereby Messrs. Bertram Day & Co., 9 and 10 Charing Cross, S.W.1, have acted as sole advertisement representatives, has been terminated by mutual agreement, as from December 31st, 1924, and that in future, all communications on the subject of advertisements, together with advertisement copy, blocks, etc., should be sent direct to the offices of the paper at 12–13 Henrietta Street, Strand, W.C.2.

Telephone: Gerrard 2807.

SPEAKING FILMS

By C. F. Elwell. M.I.E.E.

One of the first public demonstrations of the speaking film was given before the Radio Society of Great Britain by Mr. C. F. Elwell on December 17th, 1924. Although primarily intended to be a demonstration, the lecturer described in some detail the development of the system and we publish his remarks in the present article.

SEVERAL decades ago the study of the phenomena associated with the discharge of electricity from hot bodies was entirely in the hands of physicists. To-day applications of thermionics in telephone, telegraph and radio engineering, as well as other branches of pure and applied science, represent a considerable percentage of the applications of electricity for the benefit of mankind. A year or two ago the study of photo-electrics or electrical changes brought about by the action of light was mainly in the hands of physicists, and there were not many applications from an engineering point of view. Much has happened in the last two years, and one would be bold to say that the research work done in photo-electrics has been done in vain. With more minds familiar with the subject, there is no saying what valuable applications may be discovered in the next decade. The large number of keen and skilled amateurs now working with thermionic phenomena constitutes an army the potential mental strength of which is enormous. From thermionics to photo-electrics is a very short step, and within the next few years I am sure there will be other papers on applications of photo-electrics read before this Society. At the present time photo-electrics owes a lot to wireless. Photo-electric currents are so small that practical applications would certainly be few if it were not for the three-electrode valve amplifier. Currents of the order of one-hundred-millionth of an ampere is what one has at one's disposal from photo-electric cells. But by means of valve amplifiers these small currents can be increased at will. Both the photo-electric cell and the valve amplifier are utilised in talking motion pictures. You can, therefore, see that talking motion pictures have to do with wireless, and the matter is attached to your past work, and

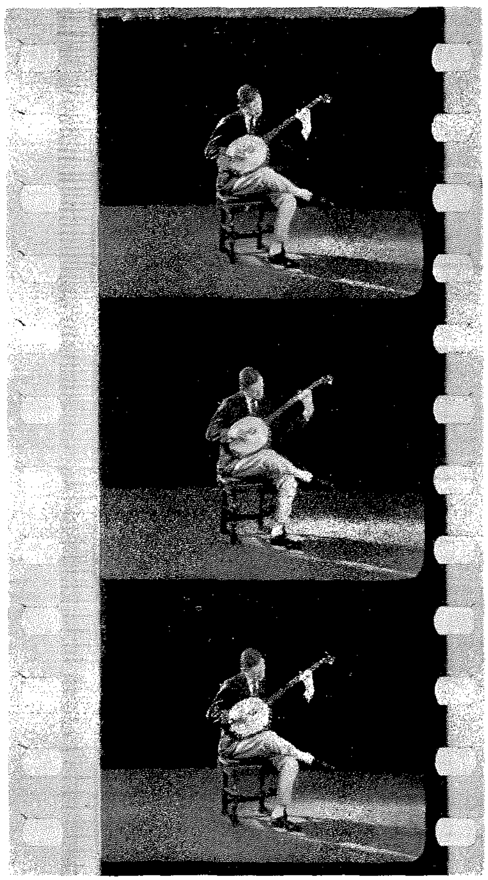


Fig. 1. A short length of film showing the pictures, and on the left, the sound record consisting of a number of lines of varying width but constant length.

they are also indebted to photo-electrics, which I am sure will not be unknown to you in your future work.

Now to turn to talking motion pictures. Inventors have been dreaming of them ever since motion pictures became an established fact. The first and palpable method was to synchronise the moving picture with a gramophone record. First came the "Cameraphone," the method employed being to take the motion picture while a stock wax cylinder type of record was being played. The actors sang, or pretended to sing, and the camera photographed the lip motion.

Then Thos. A. Edison, with his "Kinetophone," made a distinct step in advance by making the phonograph record simultaneously with the taking of the motion picture negative. Results were far superior, as the synchronisation of the sounds with the lip motion was good, but the reproduction of this synchronisation was difficult, as so much depended upon the skill of the operator, who generally had another man to start the phonograph record and keep it in step.

Other inventors tried to improve upon these methods, and many patents were taken out on mechanical and electrical devices for keeping the sound record and the picture exactly in step. When the film became mutilated the difficulties became greater.

Wireless, through the medium of the three-electrode valve, has made perfectly synchronised talking motion pictures a reality.

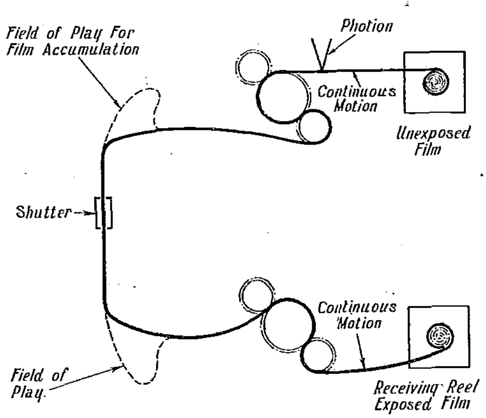


Fig. 2. A schematic diagram explaining the method of recording sound on the film.

I will first describe how sound is recorded simultaneously with the taking of the picture, and upon the same standard film as the picture, and then how the photographically-recorded sounds are reproduced, and then you will note the part played by photo-electrics.

Dr. de Forest conceived the idea of making talking motion pictures, or "phonofilms," as he called them, quite a number of years

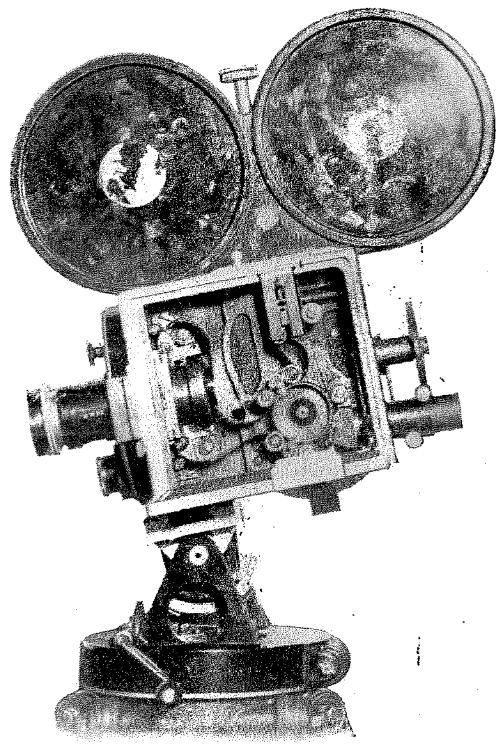


Fig. 3. The camera employed when taking motion pictures simultaneously with the sound record.

ago. It was only recently that he attacked the problem, and he then laid down as a first essential to the commercial success of these "phonofilms" that only standard film, as used in the cinema, should be employed. On a narrow strip only 0·1 in. wide he has succeeded in recording all kinds of sounds. The balance of the width of the film, which, as you know, is 1 in. in width, is used for the picture in the ordinary way. This narrow sound record is marked with a large number of light and dark horizontal lines, varying in width, but not in length (Fig. 1).

How is sound, as represented by these lines, recorded upon this narrow strip of celluloid? In reality it is all very simple, with the aid of the three-electrode valve.

Fig. 2 represents a film on edge. The picture is taken in the ordinary way by means of the ordinary cinema camera, and the method consists of holding the piece of negative in position for a fraction of a second, taking the picture, pulling the film down, and taking another picture, and so on. In ordinary cinematograph work about 16 pictures are taken per second, but in our work we take about 20 per second. The sound must be put on continuously; we could not have the spaces between the pictures, for example, appear in a sound record. A sound record must be continuous, so that it is put on the film before the jerking action takes place. In the camera a small gas-filled lamp is placed. The method of recording is as follows:—The sounds emitted by the speaker are picked up by means of a very sensitive microphone. The very small electric currents, which represent the sounds emitted before the microphone, are highly amplified, and this is done in order that the variations of the electric currents shall be large enough to affect the light emitted by the lamp in the camera. The lamp consists really of a two-electrode valve. The lamp is called by Mr. Case the A. E. O. —alkali-earth-oxide. These amplified currents, representing speech before the microphone, vary the actinic light from the lamp. The light is allowed to shine through a very fine slit, placed as close as possible to the celluloid film. It is one and a-half thousandths in width, and you can see that a steady light will print a line on the portion of the film reserved for the sound record. The sound record is 0·1 in. in width, and if the film were standing still a line one and a-half thousandths wide and 0·1 in. long would be recorded. The variations of the intensity of the light from the lamp are thus recorded

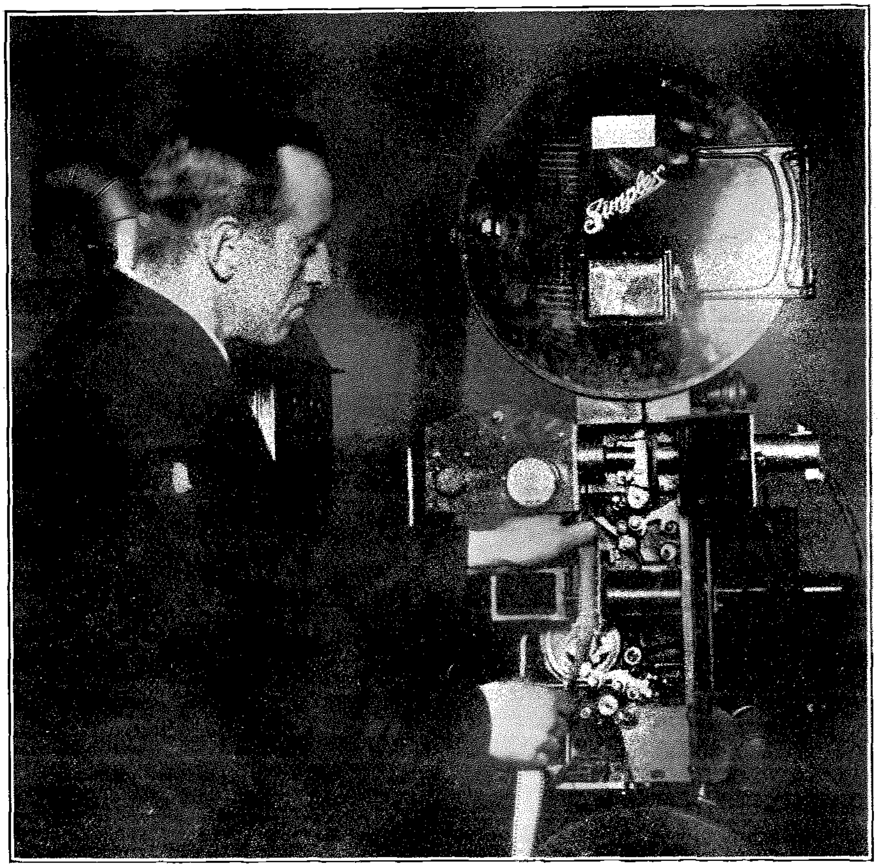


Fig. 4. A cinema projector fitted for "speaking films."

photographically on the film in the form of horizontal lines of varying width and gradations of black and white. From the negative, after development, any number of positives can be made.

Fig. 3 shows the camera for taking motion pictures simultaneously with the sound record. This method guarantees perfect synchronisation. There are two lenses, one for focussing and the other for taking the picture.

The next question is, "How are these photographic sounds reproduced?" The roll of positive film is placed in an ordinary cinema projector (Fig. 4) to which has been fitted an attachment containing a small incandescent lamp, a fine slit of similar dimensions to that used for taking sound records, a guide for the film, and a photo-electric cell. The light from the small incandescent lamp (Fig. 5) shines through the fine slit, and the film is guided so that the portion of the film upon which the sound is recorded passes before the illuminated slit. The intensity of the light which passes through the more or less translucent film is governed by the number and width of the horizontal lines. This fluctuating beam of light falls on the photo-electric cell, and it is the property of a photo-electric cell that its resistance changes with the intensity of the light falling upon it. The cell we use, and which must be used for talking motion pictures, must be instantaneous in its action, and the photo-electric cell invented by Mr. T. W. Case, and known as the Thalofide cell, is used. It consists of a deposit of

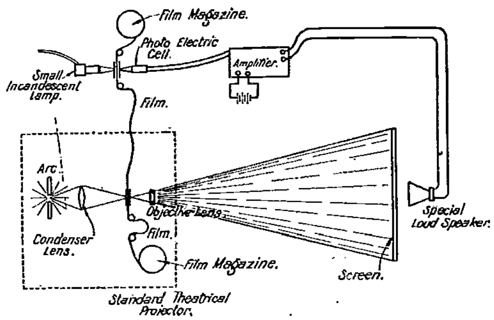
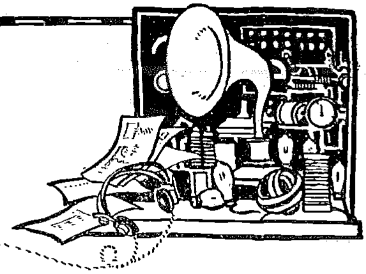


Fig. 5. The arrangement of the apparatus for reproducing the film simultaneously with the sounds.

thallium and sulphur on a quartz disc, ¾ in. diameter. It is very sensitive in action, but of very high resistance, sometimes as much as 500 megohms. The current from the cell is taken through an amplifier and amplified sufficiently to enable it to actuate the loud speaker. Remember that the sound has had a long journey through the air. The microphone currents have been amplified, taken through the two-electrode valve, the light from this has been passed through a fine slit, and has been recorded on a film. This has then been through a photographic bath, and a print has been made from it. For reproducing, there is a small incandescent light shining through the slit, through the film, on to the cell, there is amplification again, and finally, the loud speaker, which is probably the weakest link in the chain. I think you will agree that the results are wonderful, when you consider the long path through which the sound has passed.

The interest which H.R.H. the Prince of Wales takes in wireless matters was again shown when he recently visited 2SZ, the Mill Hill School Wireless Station. The photograph shows the Prince conversing with Mr. C. W. Goyder, the operator.

NEW APPLIANCES.



Sparta One-Valve Amplifier.

This is a very simple and neat instrument of compact construction and makes use of a dull emitter valve of the 0.06 type. It corresponds in overall dimensions with the Sparta crystal set, for which it is intended for

A novel arrangement for an amplifier by Fuller's United Electric Works, Ltd.

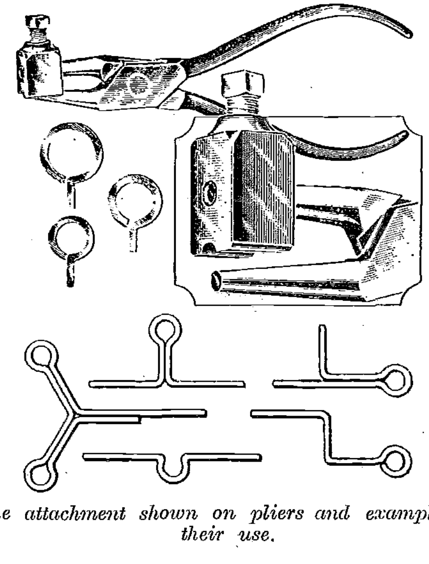
use as a single low frequency amplifying stage. When once the filament resistance has been adjusted the case can be closed, thus safeguarding the valve from breakage.

Glazite Connecting Wire.

Intended to replace the ordinary tinned copper wire, this latest product of the London Electric Wire Company and Smiths, Ltd., has a coloured covering which gives ready identification of the various leads and prevents short circuits should the wires be pressed into contact. The covering is both damp and flame proof, and is obtainable in four colours: red, blue, yellow and black. Not only does the use of this wire prevent accidental short circuit between the leads, but it gives a very attractive appearance to a receiving set. It is difficult, however, to make "T" joints owing to the fraying of the protective covering, but this is no disadvantage for it is much more satisfactory to distribute all these from a strip of connecting tags.

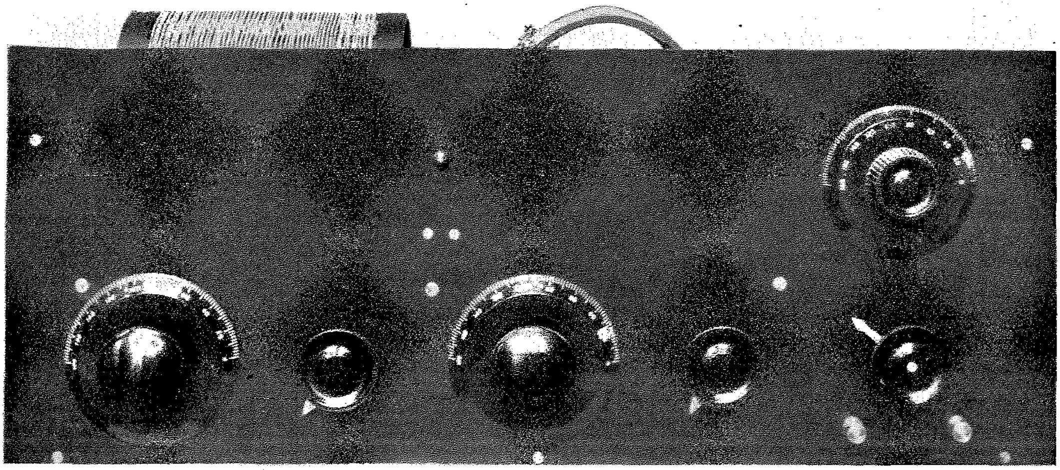
Wire Bending Pliers.

Supplied as an attachment for fitting to round-nosed pliers this clever device produces, with great rapidity, looped bends of uniform size. The advantage is gained that the wiring may be given suitable bends whilst in position, and without removing it



The attachment shown on pliers and examples of their use.

as is usually the case when using ordinary square-jawed pliers. It is a product of the Rockwood Co., Ltd., to be found amongst their useful range of tools specially designed for instrument work.



A front view of the receiver showing the tuning condensers, neutralizing condenser, filament resistances, variometer and switch and the tops of the H.F. transformers.

IDEAL RECEIVERS—II.

A THREE-VALVE RECEIVER.

With one H.F., Valve Detector, and one stage of L.F.

In the following article we describe the construction of the Three-Valve Receiver discussed in the last number of this journal.

By W. JAMES.

THE REACTION VARIOMETER.

IT will be seen from the theoretical diagram (Fig. 1, page 439 of last number) that a variometer is connected in the anode circuit of the detector. A large variometer is employed with a switch to connect the windings in series or parallel. If the receiver is to be employed principally for the reception of short wavelength signals, there is no need to use such a large variometer with a switch—a small variometer of the ordinary type, such as is used in receivers tuning over about 300-500 metres may be employed instead. The purpose of this variometer is, of course, to provide reaction effects, and so to enable one to increase the signal strength and selectivity. Should the variometer be so adjusted that oscillations are produced, these will be confined to the detector valve circuit, and will not reach the aerial, because the first valve is "balanced." The increase in signal strength and selectivity obtained by adjusting this variometer is well worth while, and does not complicate the tuning of the set. When the desired signal is heard, it is only necessary carefully to adjust the variometer and second tuning condenser, C_2.

A fixed condenser, C_5, of 0·001 microfarad, is connected across the transformer to carry the high frequency component of the rectified current.

THE NORMAL GRID VOLTAGES.

The grids of the valves are given a suitable normal voltage as indicated in the figure. For the first valve (the H.F. amplifying valve) the grid is made about 1·5 volts negative by a single dry cell connected between the grid return wire and the negative side of the filament battery; this is a suitable bias when a D.E.5 type valve is employed with an anode voltage of about 60 volts, or a D.E.5 B valve with 120 volts.

To obtain good rectification, the grid return wire of the tuned circuit connected to the grid of the detector is connected to the positive side of the filament.

The third valve, which is coupled through a transformer to the detector, works into the loud speaker or head telephones, and therefore has a negative bias of $4\frac{1}{2}$ volts obtained from a three-cell unit. This bias is satisfactory when a D.E.5 type valve is employed with an anode voltage of 120. When the set is used at a place about 15 miles from the 2 LO broadcast station, however, I find the grid bias should be about 12 volts negative, with a correspondingly higher anode voltage. The signal strength is very great—sufficient, in fact, to overload ordinary household loud speakers—and the quality of the signals is excellent. Control of the volume may be obtained by adjusting the view to obtaining the strongest possible signals. A very satisfactory combination comprises a D.E.5 B valve and a Marconiphone 6 to 1 Ideal transformer.

THE NEUTRALIZING CONDENSER.

This is a variable condenser having a maximum capacity of about 10 micro-microfarads. There are a number of condensers on the market which are quite suitable for use in this receiver.

CONSTRUCTION OF THE RECEIVER.

The accompanying photographs and drawings show the construction and wiring of the

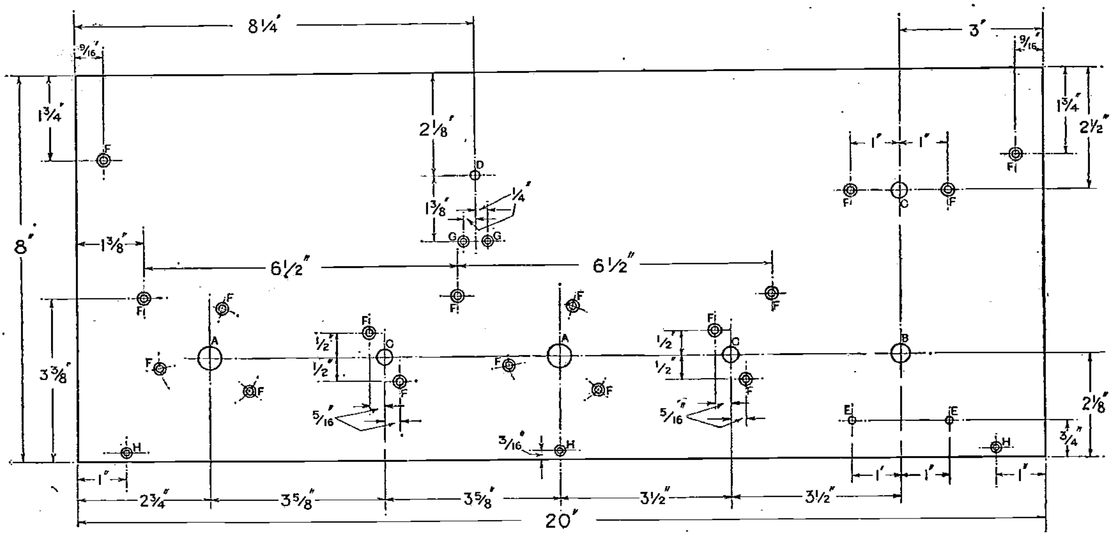


Fig. 3. Layout of ebonite panel with particulars of the holes when Burndept 0·0002μF tuning condensers, Ormond filament resistances, an Igranic type S.R. variometer and a Utility three-pole switch are employed. When other components are used, modify the layout accordingly. Drilling details:—A, ½ in. dia.; B, ⅜ in. dia.; C, 5/16 in. dia.; D, 3/16 in. dia.; E, 5/32 in. dia., countersunk; G, ⅛ in. dia., countersunk; H, ⅛ in. dia., countersunk.

variometer, the filament current of the first valve, and the anode voltage of the detector valve.

THE L.F. TRANSFORMER.

When the receiver is employed for telephony, the first requirement is good quality. The intervalve transformer, T_3, is therefore chosen to match the detector valve, and in this instance a Marconiphone Ideal transformer having a ratio of 4 to 1 is employed with a D.E.5 type valve as the detector. For the reception of Morse signals, however, the principal requirement is volume. Distortion does not matter. Hence the transformer and valves should be chosen with a receiver. There is an ebonite front panel measuring 20 ins. by 8 ins. by ¼ in., which carries the tuning condensers, neutralising condenser, filament resistances, variometer, variometer switch, and telephone terminals. This panel is fastened by two brackets to a base of hard wood measuring $19\frac{1}{4}$ ins. by $8\frac{7}{8}$ ins. by ⅜ in., which supports the low frequency transformer, grid battery G_2, fixed condenser C_5, the anode battery condenser C_6, and the terminal strip. The baseboard also carries the coil and valve platform. Three-ply wood is employed in the construction of the platform, with pieces of ebonite, and the valve holders let in at suitable points.

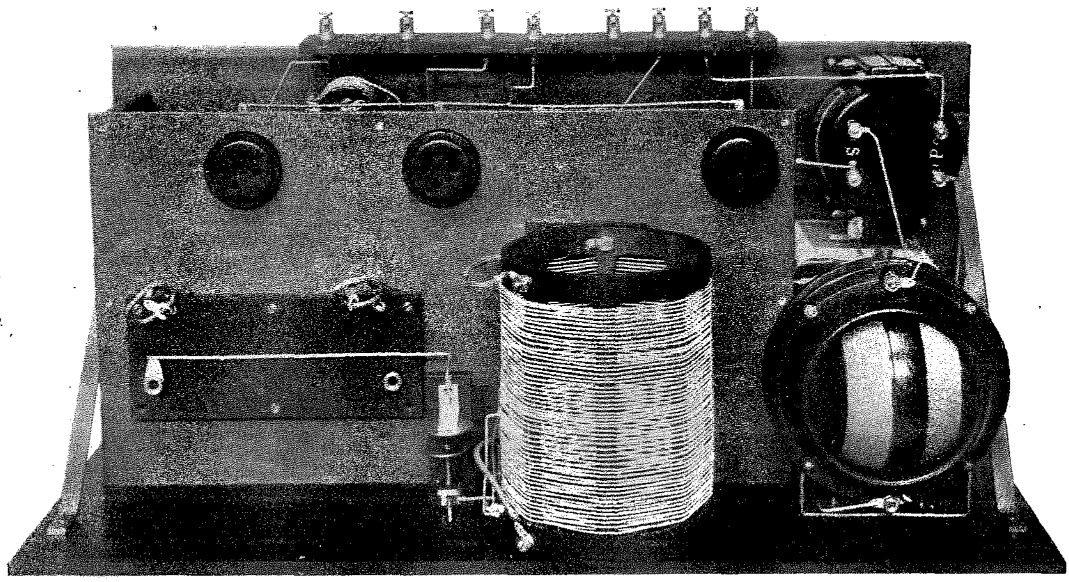


Fig. 4. A view of the top of the receiver showing the connection strip, the valve holders, one coil-holder, one coil, the neutralizing condenser, the variometer, the L.F. transformer, and the grid battery.

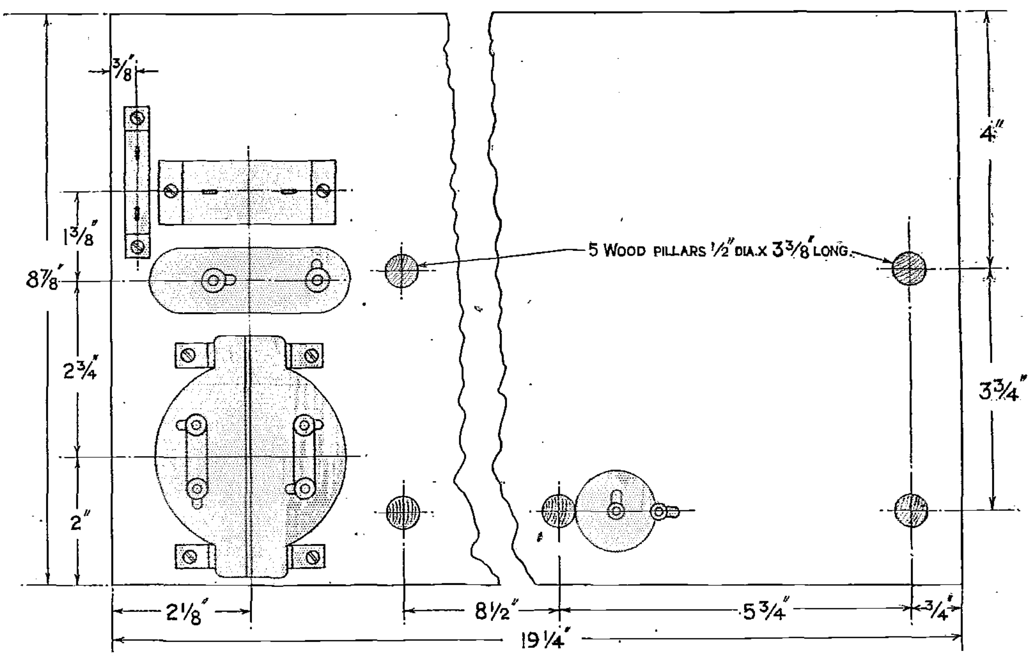


Fig. 5. Details of baseboard. A Marconiphone Ideal transformer, Burndept 4½ volt grid battery, two fixed condensers, a single dry cell, five wooden pillars and a terminal strip are mounted.

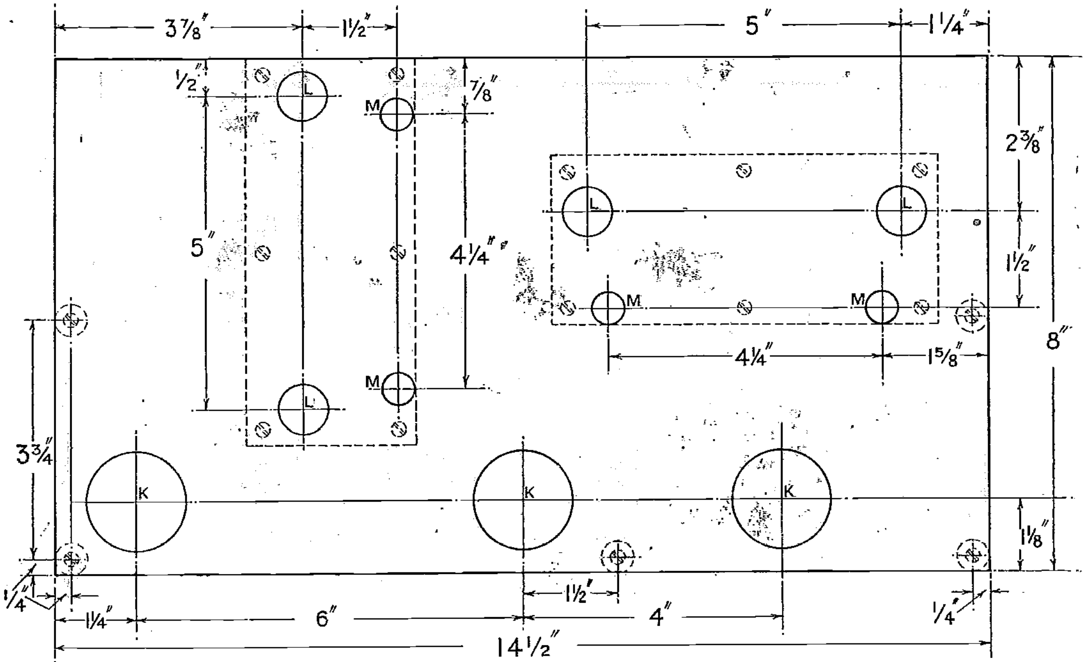


Fig. 6. Details of platform, which is of three-ply wood. Drilling details:—K, $1\frac{9}{16}$ in. dia.; L, $\frac{3}{4}$ in. dia.; M, $\frac{1}{2}$ in. dia.

Commence the work by trueing the $\frac{1}{4}$ in. ebonite panel to 20 ins. by 8 ins., and mark it out in accordance with the drawing of Fig. 3. Then drill the panel, and finally, assemble the components and see to the action of the resistances and condensers. The appearance of the front of the set when assembled is clearly shown in the photograph at the head of this article.

Then attend to the baseboard. This should be of a hard wood, measuring $19\frac{1}{4}$ ins. by $8\frac{7}{8}$ ins. by $\frac{3}{8}$ in., and have the components arranged on it as indicated in Fig. 5. It is secured at right angles to the ebonite panel by two brackets, as may be seen from Fig. 4.

Next secure a piece of three-ply wood measuring $14\frac{1}{2}$ ins. by 8 ins. (Fig. 6). This is supported on five short pillars of round wood, $\frac{1}{2}$ in. diameter by $3\frac{3}{8}$ in. long, which have their ends screwed to the baseboard. Mount the three valve holders (Burndept anti-phonic valve holders are employed in this set) by cutting holes in the platform as indicated in the figure, and fix them so that their bases are below the platform, while the tops of the holders project a little above the surface. Two pieces of ebonite are let into the platform. Details of these pieces are given in Fig. 7, and the portions of the platform to be cut away are indicated in Fig. 6. On the ebonite pieces are mounted sockets to take the pins attached to the coils,

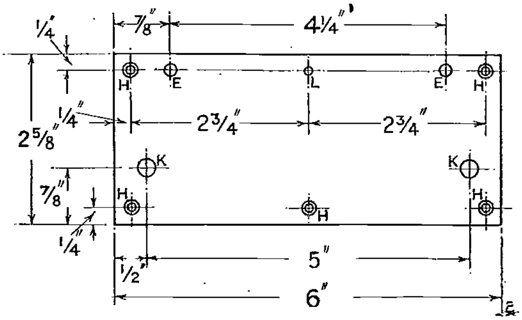


Fig. 7. Details of ebonite pieces for platform Drilling particulars:—E, 5/32 in. dia.; K, $\frac{1}{4}$ in. dia.; H, $\frac{1}{8}$ in. dia. and countersunk; L, tapped 4 B.A.

and two small terminals supplied with short flexible connecting wires. The piece of ebonite which acts as a holder for the second H.F. transformer has an additional terminal with a connecting wire, which is employed to connect one side of the neutralising condenser.

Each piece of ebonite therefore carries two sockets, which are connected to the secondary circuits, two terminals with flexible connect- of the second H.F. transformer to the neutralising condenser.

Having assembled the whole of the

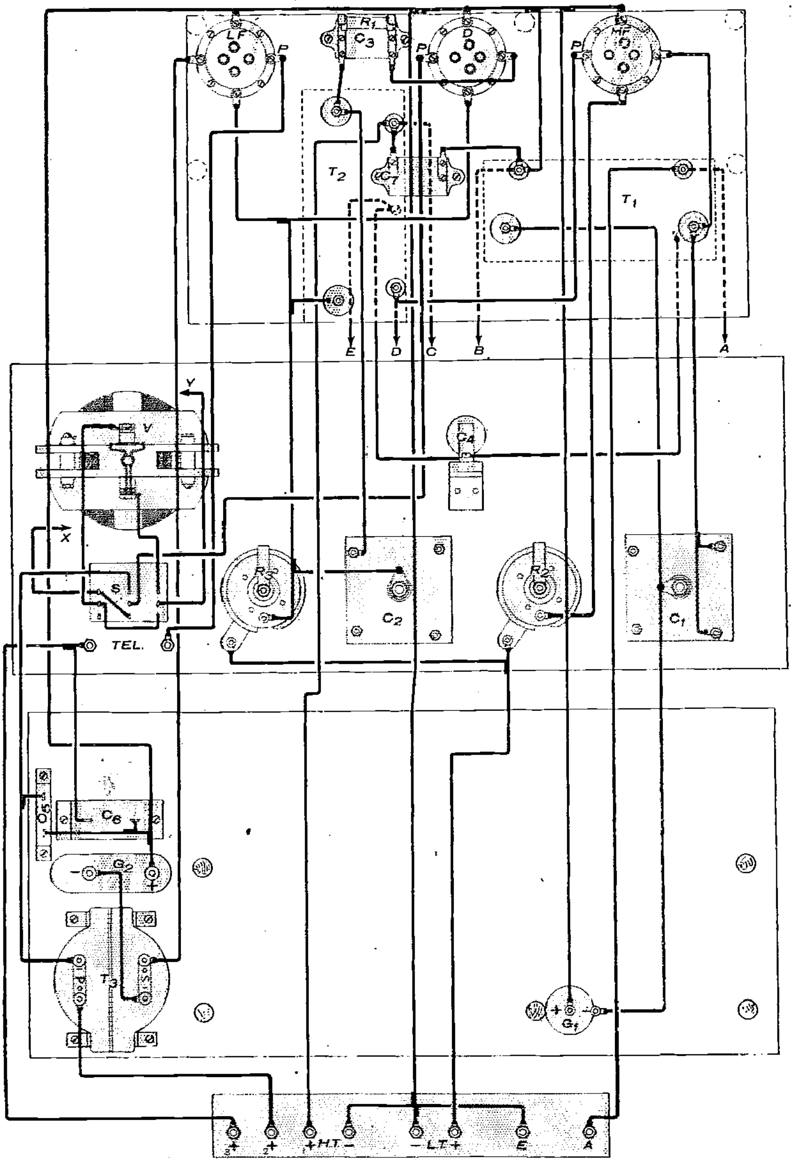


Fig. 8. Wiring diagram. T_1, aerial transformer; T_2, intervalve H.F. transformer; T_3, Marconiphone Ideal transformer; C_1, C_2, Burndept 0·0002 μF tuning condensers; C_3, grid condenser, 0·0002 μF; C_4, neutralising condenser; C_5, fixed condenser, 0·001 μF; C_6, fixed condenser, 2μF; C_7, fixed condenser, 0·002 μF; G_1, one dry cell; G_2, 4½ volt Burndept grid battery; V, variometer; S, series-parallel switch. The wires X and Y connect to the terminals of the variometer on the panel side.

ing wires which are joined to the primary windings of the coils, and one has an additional terminal and connecting wire for connecting the tap on the secondary winding

receiver, study the wiring diagram of Fig. 8. It will be seen that there are several wires running between the tuning condenser, coils, filament resistances, and valves, which lie below the platform. The baseboard should therefore be removed carefully, and these connections made, using a stiff wire, such as No. 18 tinned copper wire. Those wires which connect to the terminal strip should be run in the approximately correct position and be soldered to the terminals of the strip later on. Wire also as many as possible of the components mounted on the baseboard. Proceed with the wiring by putting the baseboard in position and connecting the wires to the terminals of the connection strip.

OPERATION.

With the wiring completed and carefully checked, put the H.F. transformers in position and connect them to the circuit by attaching the flexible wires secured to the terminals on the ebonite pieces let into the platform. Notice that the transformer with the tapping on the secondary winding is the one mounted in the centre of the set. Then connect the aerial, earth, batteries and telephones. Tune in a signal by adjusting the two tuning condensers, with the variometer windings in parallel and set at zero. The condenser tuning the aerial transformer will have a lower value than the one tuning the intervalve transformer. It will probably be found that when the two circuits are in tune the set is oscillating. To neutralise the first valve, turn its filament resistance to the off position and readjust the first tuning condenser; if the signal is still heard, adjust the neutralising condenser until the signal is very weak, or is not heard at all. Then turn the resistance on again, and make a further slight adjustment to the condenser. The correct setting of the neutralising condenser is easily found if the coils have been wound and connected as described above.

Pairs of high frequency transformers may be wound to suit any band of wavelengths. To receive the high-power broadcast station (1,600 metres), the secondary winding may consist of 300 turns of No. 30 S.S.C. wire with a tapping from the 50th turn (from the filament end) of the secondary of the intervalve transformer for the neutralising condenser, and a primary winding of 50 turns of No. 26 D.S.C.

For a minimum wavelength of 100 metres the secondary windings may have 24 turns of No. 16 D.C.C. wire, and the primary 4 turns of No. 16 D.C.C. wire, with a tapping at the 5th turn for the neutralising condenser.

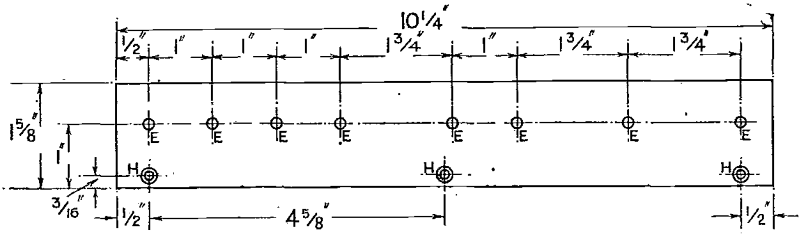
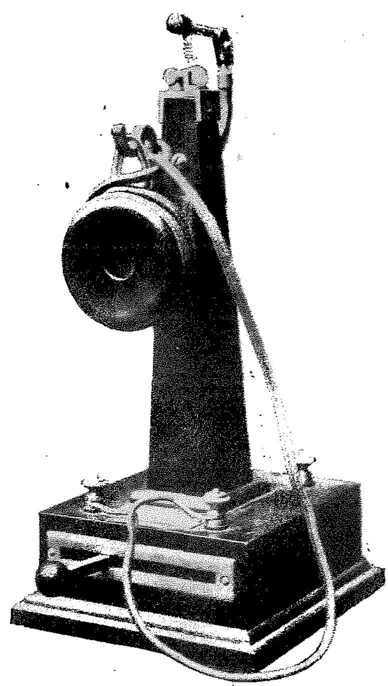


Fig. 9. The terminal strip. Drilling details:—E, 5/32 in. dia.; H, ⅛ in. dia. and countersunk.



A simple design for a crystal receiver which is popular in Paris for reception of local broadcasting stations.

Z 4AG

A DESCRIPTION OF

THE FIRST NEW ZEALAND STATION TO BE HEARD IN THIS COUNTRY

By RALPH SLADE.

Mr. Ralph Slade here gives in his own words a description of his station and its development. The equipment of the station will probably cause some surprise among experimenters in this country for it is certainly not lavish in its layout.

WHEN the first cable came to hand from Radionic, London, and which I received on October 18th (Saturday morning), I can tell you that I did no more work that morning. I was more excited even than when I first heard the American stations in 1922. It seemed almost impossible to believe at first that my signals had been received in England but, of course, it has more or less been proved that nothing is impossible in wireless nowadays.

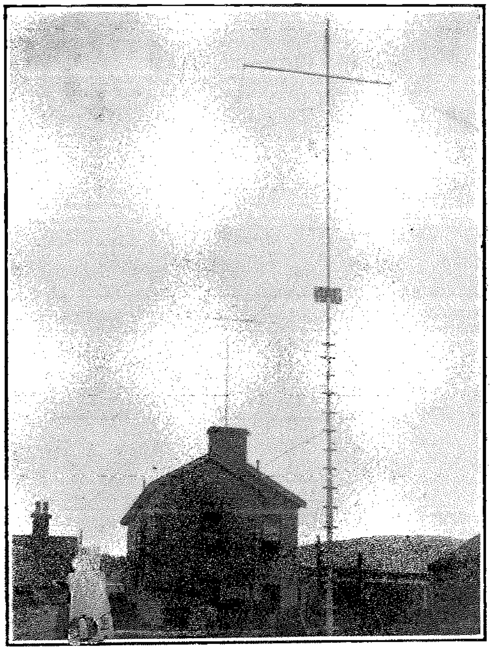
I give below a few particulars of my transmitting and receiving equipment so that those stations with whom I have worked in England and those who have intercepted my signals may know something about the station.

The transmitting circuit used is the four-coil Meissner arrangement, possessing the following features :—

(1) High efficiency—*i.e.*, low input for high output (has far greater output/input ratio than any other circuit I have tried).

(2) Adjustments are not complicated.

(3) All the output is on one wave—the fundamental. Here is a sample of some readings taken in the same town. On 100 metres the audibility of the fundamental was 400, while the audibility of the half-wave was 11 at the most and as low as 8 for different adjustments.



The three-wire aerial. It is 70 feet in height and 43 feet in length.

The half-wave cannot be heard outside the town and yet I can read quite loud the half-wave of Z 1 AH and Z 1 AC (over 650 miles away), while the half-wave of Z 2 AP is 75 per cent. as strong as his fundamental and he is over 400 miles away.

(4) Key thumps negligible.

(5) Interference on waves other than the fundamental nil.

With the old 5 watt set (Armstrong's reversed feed-back circuit) I used to get numerous QRM reports, but do not get any now.

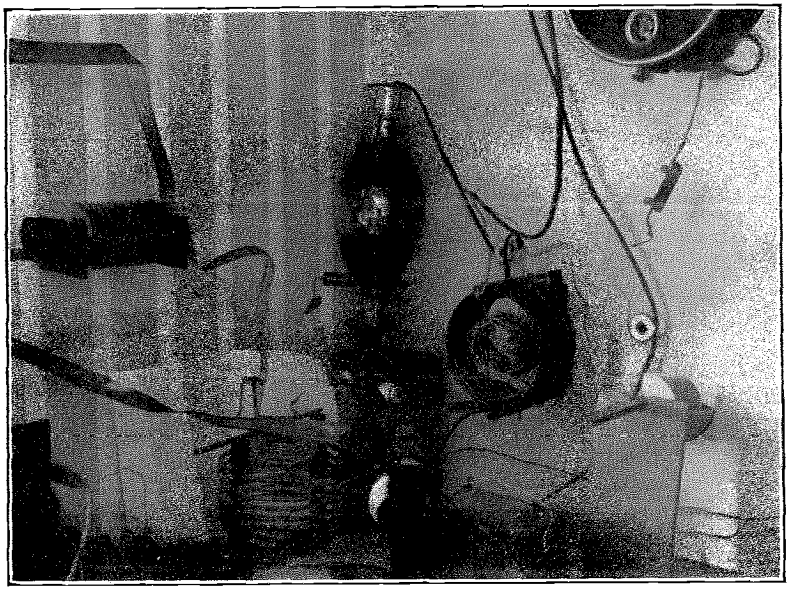
(6) Wave extremely sharp, and several other advantages of minor importance.

The accompanying illustrations give various views of the equipment and many of the component instruments can easily be identified.

The aerial coils are $5\frac{1}{2}$ ins. diameter, wound with $\frac{1}{4}$ in. copper tube (easier to work than wire). There is 3/16 in. spacing between turns and there are seven turns in each coil.

Aerial and counterpoise leads (no earth used) are of copper ribbon soldered to the copper tube (no clips). These aerial coils are supported by two narrow strips of good ebonite.

in diameter, wound low-loss fashion, with the turns not jammed up too tightly and is of 14 S.W.G. (even this gets rather hot). It must be tightly coupled and it goes better when the current flows through it in one particular direction, depending upon the manner in which the grid coil is connected. Across the plate circuit is what was originally a 0·001 μF variable condenser, but it had to be double-spaced to prevent flash over so that the capacity is now 0·00025 μF. The plate coil is suspended centrally inside the other aerial coil, being hung from the aerial coil supports by the leads from the coil.



Part of the transmitter. The components are simple in design yet undoubtedly efficient.

The grid coil is coupled to the lower aerial coil and just hangs from an ebonite rod, which rests across the ends of the two aerial coil supports. The grid coil is fairly loosely coupled. It consists of 16 turns of No. 14 gauge wire wound low-loss fashion and is $2\frac{3}{4}$ ins. in diameter. Across this coil is a 0·00025 μF variable condenser. A clip also is supplied with this coil for varying the wavelength outside the range of the condenser.

The plate coil in my opinion is the whole secret of the circuit. For high power you must have heavy wire and the coil must be the right diameter. Mine is 18 turns, $2\frac{5}{8}$ ins.

The grid condenser is best at about 0·0001 to 0·0002 μF. For telephony a variable of small capacity is better and I might add that my speech signals have been heard by X 3 AA, 5,000 miles away. The grid leak is at present an old Ford coil secondary. The liquid leaks were tried and work better —for a while—until bubbles of gas form on the metal plates and after which it is useless. Normally the grid current averages about 6·5 mA., but varies between 5 and 8 mA.

The input varies from 100 to 205 watts, but is normally about 150-170 watts. The plate voltage varies a bit, of course, but is generally 2,000 and the plate current generally about 80 mA.

The aerial series condenser has a capacity of 0·00025 μF and is double spaced. The plate by-pass condenser is of 0·002 μF with plenty of mica.

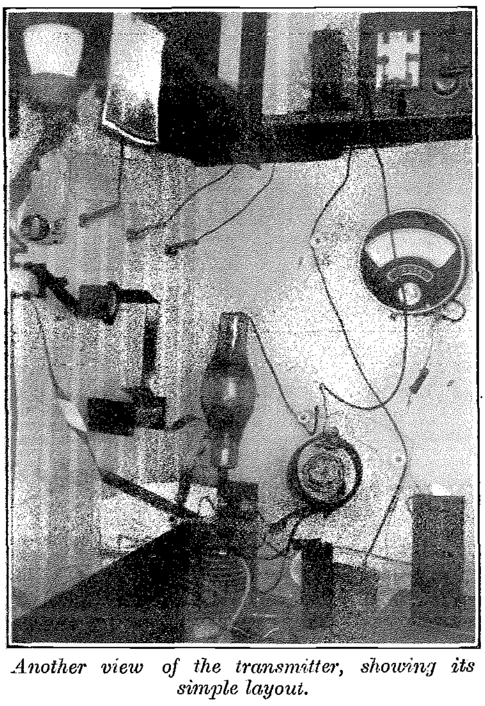
The valve is a Phillips Z.4 and has a plate dissipation of 240 watts but, of course, is worked considerably under the rated value. The normal plate voltage given for this valve is 3,000 and the normal plate current is 300 mA.

The aerial current at present on 150 watts input is 1·6 amps., but with 205 watts input it is 2·2 amps, on 83·5 metres.

The plate supply is at present fed through two transformers in series delivering 2,500 volts A.C.

I could not obtain a synchronous motor so had to use electrolytic rectifiers. I have 84 2-lb. jam jars in a shed and am using the bridge method with 21 jars in each leg. The aluminium plates are made of $\frac{1}{4}$ in. welding rod, bent double, while the lead plates are 3-lb. sheet lead with about 3 by $1\frac{1}{2}$ ins. immersed in the solution of borax tap water, with a little ammonia added. At first I used to use distilled water, but have given up that idea as the rectifier gets just as dirty with distilled water as with tap water, and the latter is a lot cheaper. The voltage drop across the rectifier is high, being about 500 volts, and as a result possibly wastes about $\frac{3}{4}$ kW.

The complete station.


Another view of the transmitter, showing its simple layout.

When I first started I had a filter, but the filter condensers soon broke down. Although the note is not too good, there are no key thumps. The keying is done in the centre tap of the filament transformer. There are also a couple of $\frac{1}{4}$ μF condensers connected from the centre tap to each of the filament legs.

A grid choke is used wound with No. 19 wire and of about 30 turns, 1 in. diameter.

The aerial is 70 ft. high at the free end and 45 ft. at lead-in. The lead-in is a three-wire cage, 30 ft. long and 1 ft. diameter at top and 5 ins. at bottom. The aerirl is flat topped and consists of three wires, 43 feet in length. Spreader at free end is 16 ft. and at lead-in end is 10 ft.

The counterpoise is a six-wire fan 55 ft. long and is 10 ft. high and encloses an area of 1,500 square feet. The leading-in wires pass through the wall through gauge glasses.

The receiver is the ordinary low-loss type.*

* *Q.S.T.*, February, 1924.

The valve is a V.24, and has put up a wonderful performance. Some time back it was the only valve I had and I used to put it into the transmitter and send to local amateurs.

I give herewith a concise copy of my log

LOG OF ENGLISH STATIONS RECEIVED FROM OCTOBER 19th to NOVEMBER 9th 1924.

Date	Call.	Wavelength.	Period during which readable.	Audibility.	Max. strength.	Order of Merit.	Conditions.	Weather.
19.10.24	2 NM 2 OD 5 LF	About 100	5.55-6.30 p.m.	2 NM 12 2 OD 15 5 LF 7	About 6.15 p.m.	See Audibility	QRM local valves. QRN bad.	——
20.10.24	2 NM 2 OD 2 SH 2 SZ	Between 95 and 101 m.	5.55-6.55 p.m.	2 NM 25 2 OD 21 2 SH 15 2 SZ 7	About 6.15 p.m.	,, ,,	QRM spk. coil. QRN nil.	——
21.10.24	5 NN 2 NM 2 SZ 2 OD	,, ,,	? -6.45	5 NN 7 2 NM 15 2 SZ 9 2 OD 13	About 6.25 p.m.	,, ,,	Power leaks bad ..	Fine and clear, little wind.
23.10.24	2 OD	About 98 m.	5.35-6.0 p.m. (see conditions)	2 OD 12	About 6.20 p.m.	,, ,,	Someone had a buzzer tuned to receiving set and swished round over 2 OD nearly the whole time.	——
24.10.24	2 SZ	101 m.	6.14-6.25 p.m.	2 SZ 5	About 6.20 p.m.	,, ,,	Bad night, QRM and QRN. Power leaks bad.	Windy and wet.
25.10.24	2 NM 2 SZ 2 OD	100 m. (95 m. later but was 100 m. at first) 99 m.	5-50-6.45 p.m.	2 NM 42 2 SZ 27 2 OD 34	About 6.10 p.m.	,, ,,	Good minimum QRN as QRM.	Dull but fine, no wind.
26.10.24	2 SZ 2 NM	97 m. 101m.	6.3 -6.35 p.m.	2 SZ 5 2 NM 8	About 6.15 p.m.	,, ,,	QRN bad	Dull, showery and thundery.
27.10.24	2 NM	101 m.	6.14-6.40 p.m.	2 NM 6	About 6.15 p.m.	,, ,,	QRM bad as usual	——
28.10.24	2 NM 2 KF 2 OD	101 m., about 97 m. 99 m.	6.5 -6.40 p.m.	2 NM 8 2 KF 6-5 2 OD 7	About 6.15 p.m.	,, ,,	Night not much good for receiving. QRM.	Dull, N.E. wind.
29.10.24	2 NM 2 OD	101 m—98 m., about 99 m.	6.10-7.00 p.m.	2 NM 34 2 OD 25	About 6.30 p.m.	,, ,,	QRM from power leak at times and from land station (VLA).	Calm night, cloudy.
30.10.24	2 NM 5 LF 5 NN 2 WJ	Between 95 and 101 m.	6.20-7.17 p.m.	2 NM 15 5 LF 10 5 NN 9 2 WJ 12	About 6.30 p.m.	,, ,,	Good night, QRN nil, until later.	Clear night, N.E. wind.
31.10.24	2 NM 2 KW 5 LF 5 NN	Between 95 and 101 m.	6.0 -7.00 p.m.	2 NM 23 2 KW 11 5 LF 16 5 NN 14	About 6.30 p.m.	,, ,,	Good night	——
1.11.24	2 NM 2 SZ	101 m. about 96 m.	6.10-6.40 p.m.	2 NM 30 2 SZ 21	About 6.25 p.m.	,, ,,	QRN getting bad ..	N.E. breeze.
2nd	2 SZ 2 NM 2 OD	96 m., 101 m. about 97m.	6.5 -7.15 p.m.	2 SZ 5 2 NM 12 2 OD 9	About 6.25 p.m.	,, ,,	QRM valves	——
4th	2 NM	101 m.	6.20-6.35 p.m.	2 NM 6	—	—	—	——
9th	2 NM	100 m.	6.13-6.50 p.m.	2 NM 4	About 6·15 p.m.	,, ,,	QRN	N.W. winds first, cloudy, then S.W. wind, been very hot all day and now changed again to N.W.

for a few days as relating to my work with England.

So far the signals from 2 NM are the most consistent and the others following in order are G 2 OD, G 2 SZ, G 2 WJ, G 5 LF, G 5 NN, G 2 SH, G 2 KW. The notes of G2 OD and G 2 WJ are the steadiest and easiest to read.

I am glad my signals were the first to be heard in England, and I was unlucky in not being the first to work, but I had the rotten luck to burn out one of the transformers the very day the first cable came, so was on reduced power, as I could not obtain another replacement till the next day.

Anyway, Z 4 AA deserves to be first to communicate with England, since he has not the same facilities as we have in the town as to power. He has a private installation and naturally his power is limited, but he is getting all he can out of it.

PHOTOGRAPHS BY WIRELESS.

In the recent interesting experiments in the wireless transmission of photographs between London and New York the apparatus at Radio House in London consisted of a transmitter only. A view of the receiver, as installed in the Radio Corporation's office in New York, is shown in operation in the accompanying photograph, General J. G. Harboard, President of the Radio Corporation of America, seen on the right, is an interested spectator. No doubt it will be possible, when suitable receiving apparatus has been installed in London, to carry out "two-way" transmissions of a very interesting kind.

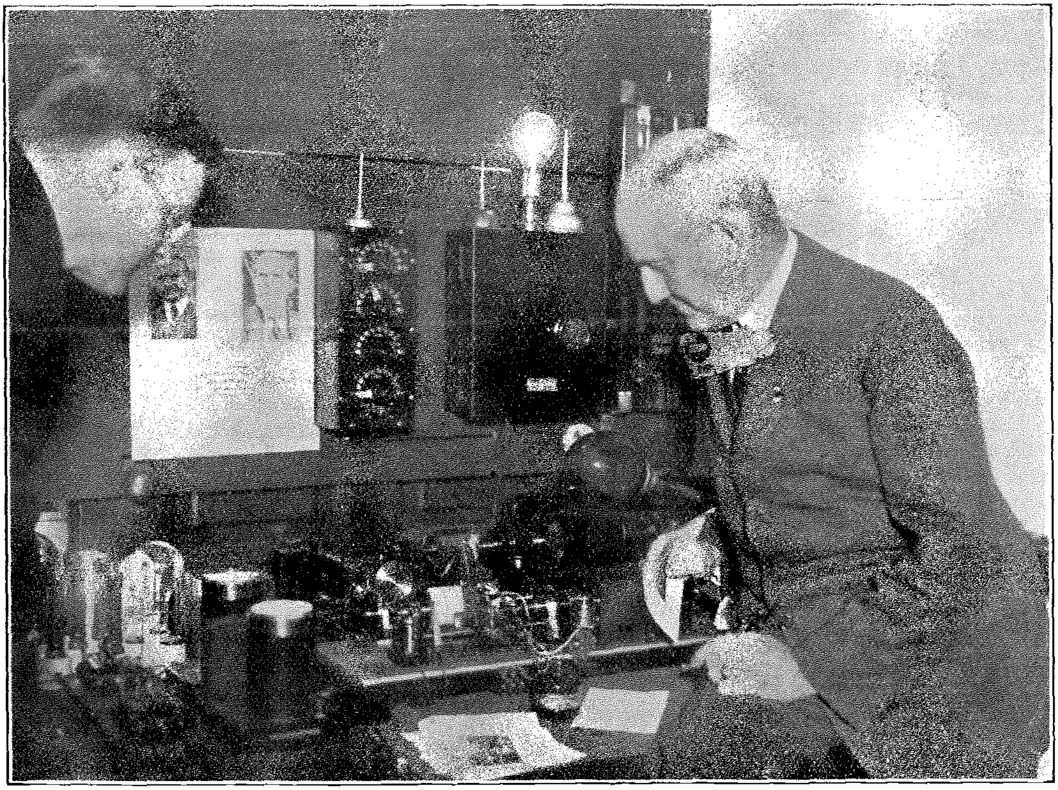
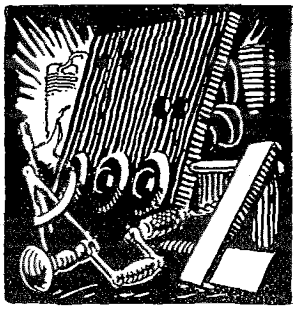


Photo: Kadel & Herbert.

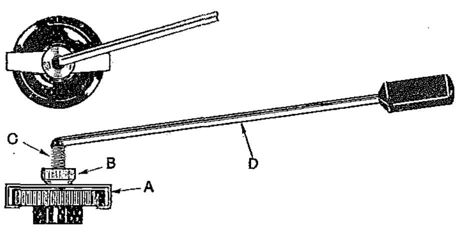


READERS' PRACTICAL IDEAS.

This section is devoted to the publication of ideas submitted by readers and includes many devices which the experimenter will welcome.

Making an Anti-Capacity Handle.

EXPERIMENTERS troubled with hand capacity effects may find the following gadget of interest.



Useful extension handle.

The construction may easily be followed from the details given. It will be seen that the extension handle consists of a clip bent to the shape shown at A, so that it will grip the knob when the screw C is forced down by the action of the milled nut B. The bridging-piece A must be of sufficient thickness to take a thread so that B is in effect a lock-nut. The arm D is soldered to the end of the 2 B.A. screw, and if it is inserted into a slot or tapered into a hole, a strong joint will be produced.

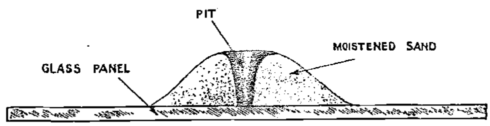
The ebonite handle is attached to the end of D and may be of a suitable length to entirely eliminate the capacity effect produced when the hand is brought near the instrument for adjustment.

E. A. D.

"Drilling" Glass.

MANY experimenters would like to make their instrument panels of glass, which, in addition to possessing good insulating properties, would enable the various component parts to be seen. The process of drilling the necessary holes may not only be very tedious but it will require a certain amount of skill and there is always the chance that the glass may fracture when the work is nearly completed.

An alternative process for making a limited number of holes is as follows. Obtain a handful of sand, moisten it with warm water and place a heap on the panel over the spot where the hole is desired. Then with a pencil make a small pit in the centre of the sand, as shown in the accompanying illustration. A small quantity of molten solder is now poured into the pit and owing to the rapid and local rise in temperature produced, it will usually fracture the glass, leaving a clean hole. It is even possible to make square holes by suitably shaping the bottom of the pit. It would, of course, be as well to try this method on a few pieces of scrap glass before practising on the actual plate and the writer thinks that the "knack" of how to proceed will soon be learned.

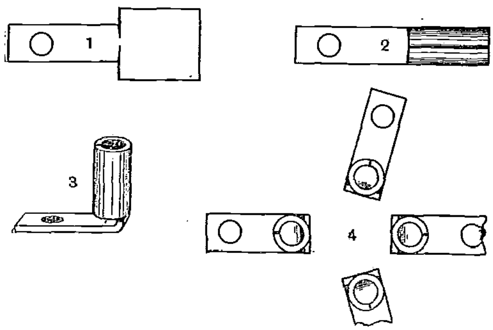


Making a hole through a pane of glass.

R. S. R.

A Valve Mounting of Low Capacity.

THE capacity presented between the electrodes of the valve is sometimes added to by using a valve holder of poor design. A good method of reducing valve holder capacity to a minimum consists of making up suitable tubular tags from sheet brass and mounting them on a piece of good ebonite. Fig. 1 shows the brass suitably cut to shape, whilst in Fig. 2, the wide end



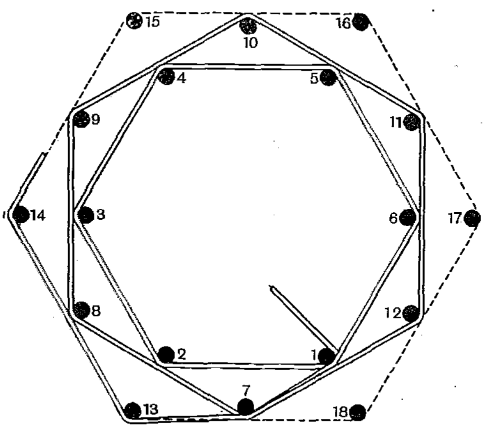
A low capacity valve holder.

pieces have been bent round to produce a tube which will securely grip the valve stem. Fig. 3 shows the tube bent up, while in Fig. 4, four pieces are mounted to form the valve holder.

T. C. S.

A New Method of Winding Tuning Coils.

A TUNING coil possessing very low self-capacity can be constructed as follows. Twelve french nails are driven into a block of wood in the positions as shown and



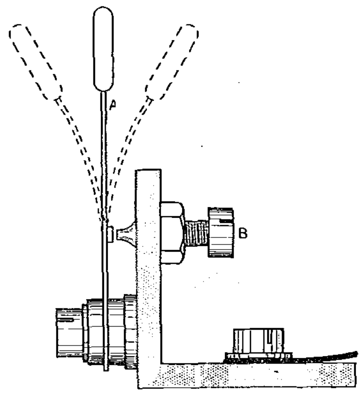
Method of winding tuning coil of low self-capacity.

numbered 1 to 12. Using No. 22 D.C.C. wire, winding is commenced round the first row of nails, the turns being put on side by side to the required depth. A second layer is wound around the second row numbered 7 to 12 to the same depth as the first layer. The coil is then shellaced and removed when hard. A two-layer coil with 14 turns per layer and shunted with a variable condenser having a maximum value of 0·0005 μF tunes over the broadcast band of wavelengths. Additional layers may be put on as shown by the pegs 13 to 18. The complete coil can be easily mounted on a standard plug.

A. R.

A Reliable Buzzer.

A BUZZER making use of an electro-magnet to operate the armature usually suffers from the defect that the contacts stick and are difficult to adjust.



A buzzer that never fails.

A buzzer which will never refuse to work can very easily be made up by mounting a short piece of steel spring in front of a battery contact. In the accompanying diagram this contact is shown attached to the screw B, which, is threaded through the upright piece and held firmly by a locknut. A piece of steel spring is also carried on the upright but is insulated from it by means of an ebonite bush. This piece of spring carries a small leaden weight A and it is only necessary to apply a sideways pressure to A and release it to set the buzzer in operation. A buzz having a duration of 30 seconds is easily produced and is usually quite sufficient for making a simple tuning adjustment or to effect the setting of a crystal.

E. L.

THE EXPERIMENTER'S NOTE BOOK.

By W. JAMES.

Types of Oscillator for a Superheterodyne Receiver.

IN the last issue of this journal I outlined the principles underlying the operation and design of a superheterodyne receiver. The reader will remember that a local generator of oscillations is coupled to the grid circuit of the first detector, and that when the set is employed for the reception of continuous wave signals a second oscillator is employed. The second oscillator is usually coupled to the grid circuit of the second detector. When receiving telephone signals, the second oscillator is not required.

The local oscillator may, of course, comprise a valve associated with suitable circuits forming part of the complete receiver, or one may employ a distinct unit which is coupled to the receiver when required. No doubt many readers will prefer to employ an oscillator designed to be a separate unit. Then it may be coupled to the superheterodyne receiver when desired, or it may be used as a heterodyne wavemeter which is suitable for use with a transmitter or receiver, and for other purposes—for instance, testing coils and condensers.

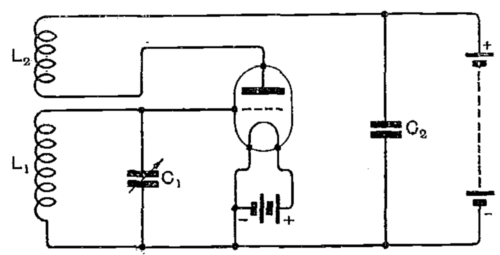


Fig. 1. A simple oscillator having a tuned grid circuit and a reaction coil

There are, of course, several satisfactory methods of connecting a valve to operate as an oscillator. Two usual schemes are given in Figs. 1 and 2. In Fig. 1 the anode circuit comprises the H.T. battery (shunted by a large fixed condenser, C_2), and the coil L_2. The grid circuit contains a coil L_1 and tuning condenser C_1. When the circuits are completed and coils L_1 and L_2 are brought together, oscillations will be generated provided the coils are suitably connected, and the frequency or wavelength of the oscillations may be varied by adjusting the tuning condenser C_1. Oscillations will not be generated if the

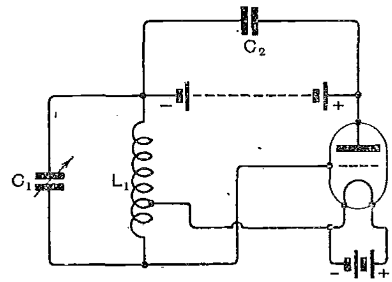


Fig. 2. Another oscillator which differs from that of Fig. 1 by employing a tapped coil with a tuning condenser connected right across it.

filament current is too low, if the voltage of the H.T. battery is too low, if the tuning condenser C_1 is too large, if the coil L_2 is wrongly connected with regard to coil L_1, or if these coils are too far apart. A simple method of finding whether or not the valve is oscillating is by watching a milliammeter connected in the anode circuit (between the filament and negative H.T.). When the valve is oscillating the anode current falls when the grid is touched with the finger. By employing a milliammeter in this way it is possible to determine with ease and accuracy the best values for the anode coil, H.T. battery and filament current; there is also a best degree of coupling of coils L_1 and L_2.

With some valves it is advisable to employ a grid condenser and leak; on the other hand results are generally quite satisfactory when the simple circuit of Fig. 1 is used as given. I have found that good results are obtained by using a D.E.R. valve, a 2-volt accumulator for heating the filament, and an H.T. battery of 30 volts.

The band of wavelengths tuned in by the oscillator of Fig. 1 is practically that which may be determined from a knowledge of the constants of the coil L_1 in the grid circuit and the tuning condenser C_1. The reaction coil, L_2, is usually smaller than the grid coil. It is therefore possible to tune over two bands of wavelengths by connecting the tuning condenser first across the grid coil L_1 and secondly across the reaction coil L_2. A simple change-over switch for altering the wavelength range could therefore be connected to the oscillator.

Further changes to the wavelength range can, of course, be made by changing the coils. In some instances they may be mounted together to form a single unit when all that is necessary to tune over a different wavelength band is to remove the coil unit in the oscillator and replace it with another unit containing coils of the required size. Alternatively the coils may be quite separate—being mounted, for instance, in the two plugs of a two-coil holder. This arrangement of coils is quite convenient in experimental work.

For suitable values of coils the reader is referred to the manufacturers' particulars of their tuning coils. To tune over 350 to 750 metres with a 0·0005 μF tuning condenser, for instance, a No. 75 coil could be employed in the grid circuit and a No. 50 in the anode circuit.

Another scheme of connection often employed is indicated in Fig. 2, where L_1 is the tuning coil and C_1 the tuning condenser. A large fixed condenser, C_2, is connected across the H.T. battery. It will be observed that the tuning condenser is connected across the whole of the coil, and that the filament is connected to a tapping on the coil. The most suitable position for the filament tapping should be found by experiment, but is often between one-third (from the grid end of the coil) to half-way along the coil.

To secure accuracy of calibration it is necessary to operate the oscillator always under the condition which obtained when the calibration was made. The wavelength changes as the filament current or H.T. voltage varies, and of course if the position or the constants of the coils change. If the oscillator is part of a superheterodyne receiver there is usually no need to employ instruments for indicating anode and filament voltages; but if the instrument is to be used as a heterodyne wavemeter where constancy of calibration is a first consideration, then it is advisable to take the precaution of setting the H.T. voltage and filament current to the values they had when the instrument was calibrated.

OSCILLATORS BEWARE !

A determined effort to rid the district of the bugbear of oscillation is being made by members of the Dulwich and District Wireless and Experimental Association. The accompanying photograph was taken on a recent evening when some exciting experiments were made with D.F. apparatus in an effort to discover the whereabouts of local "howlers." Frame aerials were employed with two mobile sets, and a number of bearings were taken.

VALVE TESTS.

MULLARD D.06 VALVES.

WE have just completed our standard series of tests on some new Mullard valves sent us by the makers. Known as the D·06, these valves are of the "60 milliampere" type, and, in accordance with the policy of the makers, are issued in two forms: one for high frequency work and rectification (D·06 H.F.), the other (D·06 L.F.) for low frequency amplification only.

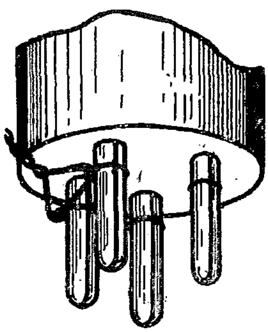


Fig. 1. Sketch of base of Mullard D.06 valve showing the wire link between the grid and filament pins of a new valve.

On taking these valves from their boxes it was noticed that a simple device has been employed which will prevent any used valve being sold to the public. This consists of a piece of wire connecting the grid and one filament terminal (Fig. 1), the ends of the wire being sealed. While therefore it is possible to test the filament for continuity, the valve cannot be used in a set without removing the short circuiting wire. We welcome any such innovation as it ensures the purchaser new and unused valves.

As to the valve itself it is to be noted that the new type of construction which employs the tunnel shaped anode has not been adopted in the D·06, the electrodes being similar to and mounted on the slant as in the D.F. Ora. The question therefore arises, are these new valves additional to or are they designed to replace the D.F. Ora? We incline to the latter view.

THE D·06 L.F.

Filament characteristics for the L.F. variety are given in Fig. 2, the current and emission at the normal voltage being ·071 ampere and 6·2 milliamperes respectively. This seems quite sufficient emission for ordinary purposes, such as for which the tube is designed, and the efficiency works out at 29 milliamperes per watt.

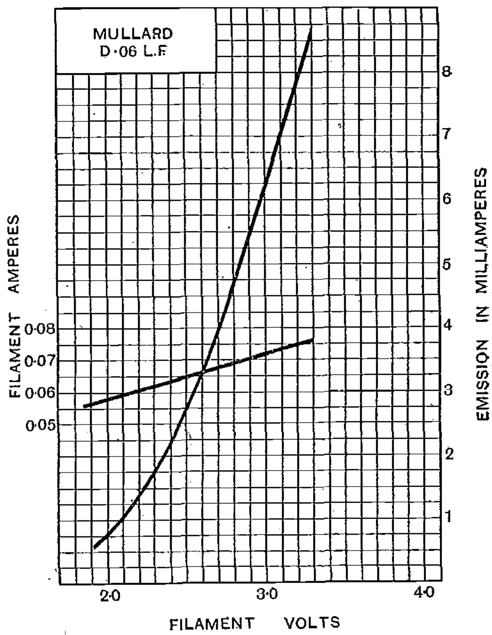


Fig. 2. Curves showing how the emission and filament current vary with filament voltage.

The plate current characteristics in Fig. 3 are very suitable for the work the valve is intended to perform and a long operating range is afforded when the plate potential is raised to 80 volts. Saturation is commencing at zero grid volts, so that no useful purpose is gained by a further increase in plate potential. Actually subsequent tests showed that no material advantage was to be gained by using more than about 60 volts H.T. (See curve C, Fig. 4). The D·06 L.F. has a magnification factor of about 7, but varies slightly above or below this figure according to the H.T. The impedance at normal operating potentials is about 13,300 ohms. The effect of saturation is reflected in curve C, Fig. 4, which is seen to rise for plate potentials above, say, 65 volts. The dotted curve " D " shows the value of the plate impedance when the grid is set at —5 instead of zero, the latter grid potential being the one usually employed when determining the values for the impedance curve.

On circuit test the behaviour was such as would be expected from the curves already obtained. With 70 volts H.T. and a bias of —5 on the grid, we obtained excellent

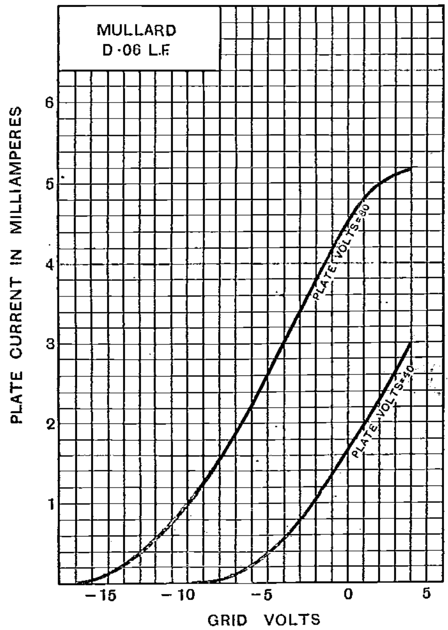


Fig. 3. Grid voltage-plate current curves.

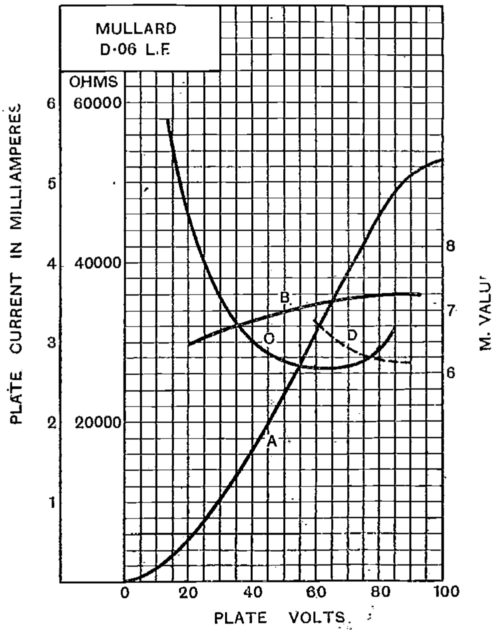


Fig. 4. Curves showing variation with plate volts of plate current (A), amplification factor (B) and impedance (C).

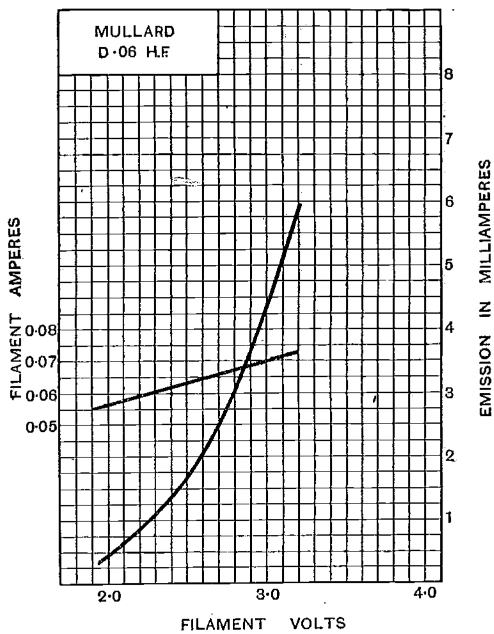


Fig. 5. Curves showing how the emission and filament current vary with filament voltage.

results and provided the set was not forced, no distortion was noticeable.

THE D·06 H.F.

The curves relating to this valve are given in Figs. 5, 6 and 7. The emission at normal voltage was slightly lower than in the previous case, but was nevertheless quite sufficient for H.F. work. Actually in the valve under test it proved to be 4·25 milliamperes.

The two sets of plate current curves illustrated in Figs. 3 and 6 should be com-

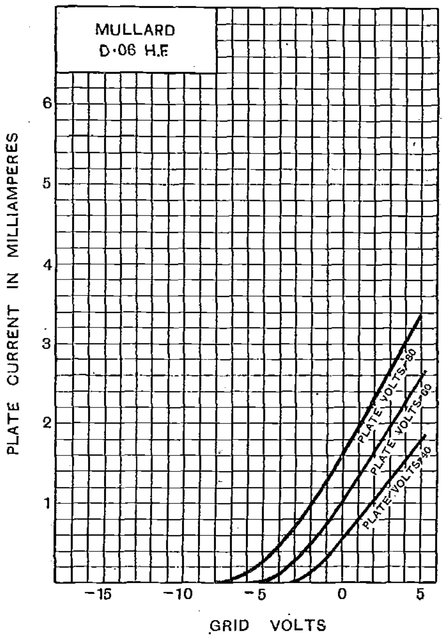


Fig. 6. Grid voltage-plate current curves.

pared for they differ very considerably and it will at once be recognised that the H.F. type has a much higher magnification factor and impedance. A comparison of Figs. 4 and 7 will also prove interesting. From the latter we find the magnification and im-

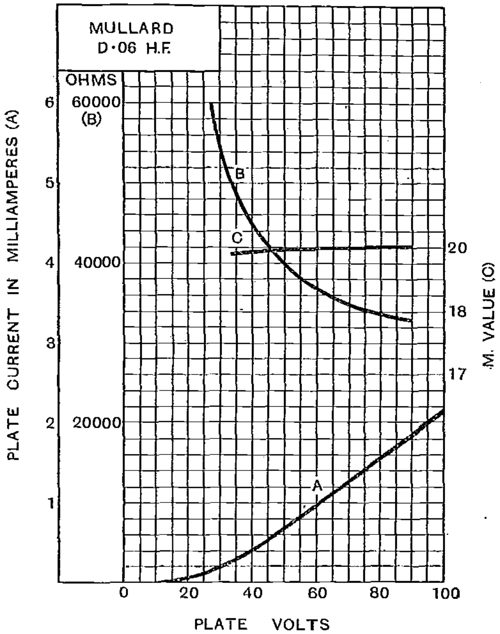


Fig. 7. Curves showing variation with plate volts of plate current (A), impedance (B), and amplification factor (C).

pedance to be approximately 20 and 40,000 ohms respectively.

The results of our circuit tests were most successful; 50 volts plate potential appeared to be about the best to use although it was found that critical adjustment was not necessary.

Although we did not test for it, we incline to the belief that the H.F. type would most probably function very well in resistance capacity coupled circuits.

Finally, both of the valves under review may be considered as excellent examples of their class. It is interesting to note, however, that contrary to the design of the bright emitting single ring valves, the present ones are designed with widely different characteristics and they should therefore be better suited to the special work for which they are intended.

GERMAN-SOUTH AMERICAN WIRELESS SERVICE.

As the result of experiments on short wave-lengths between Nauen and Buenos Aires, a regular ten-hour service has been opened between the two stations for the transmission of commercial messages on a 30-metre wavelength with a power of two kilowatts, says *The Times*. The most favourable period has been found to be from 10 p.m. to midnight. Further experiments are being made.

STANDING WAVES.

This, the concluding instalment, gives the results of the wavelength measurements on a parallel wire system.

By GUSTAV LAMM and EDWARD GRAHAM.

(Concluded from page 437 of previous issue).

Fig. 7. ($\propto$).—The wires as in Fig. 6. The wavelength was found as follows :—

Node 1 at (5·0845 ± 0·001) metres.

Node 2 at (10·1735 ± 0·001) metres.

The point of short-circuiting, A, must not be used because one is not able to fit its position with sufficient accuracy.

y = node 2 — node 1 = (5·089 ± 0·002) metres. K is 0·000785 for the corresponding wavelength and

λu_0 = (10.178 × 1·000785 ± 0·004) metres.

λu_0 = (10·187 ± 0·004) metres.

Thus the wavelength is determined with an accuracy of more than 0·4 %

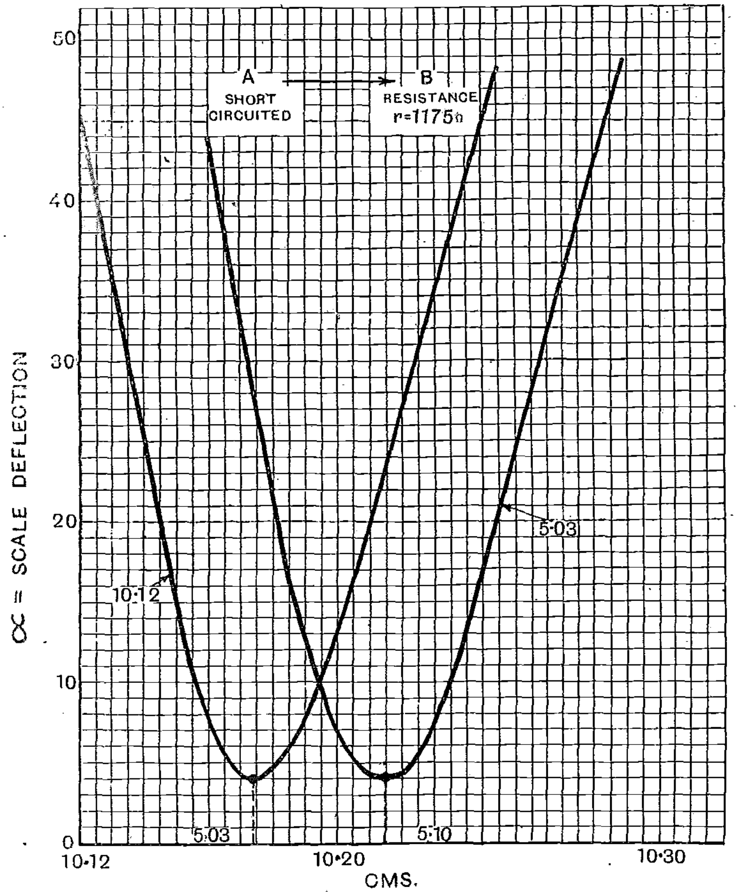
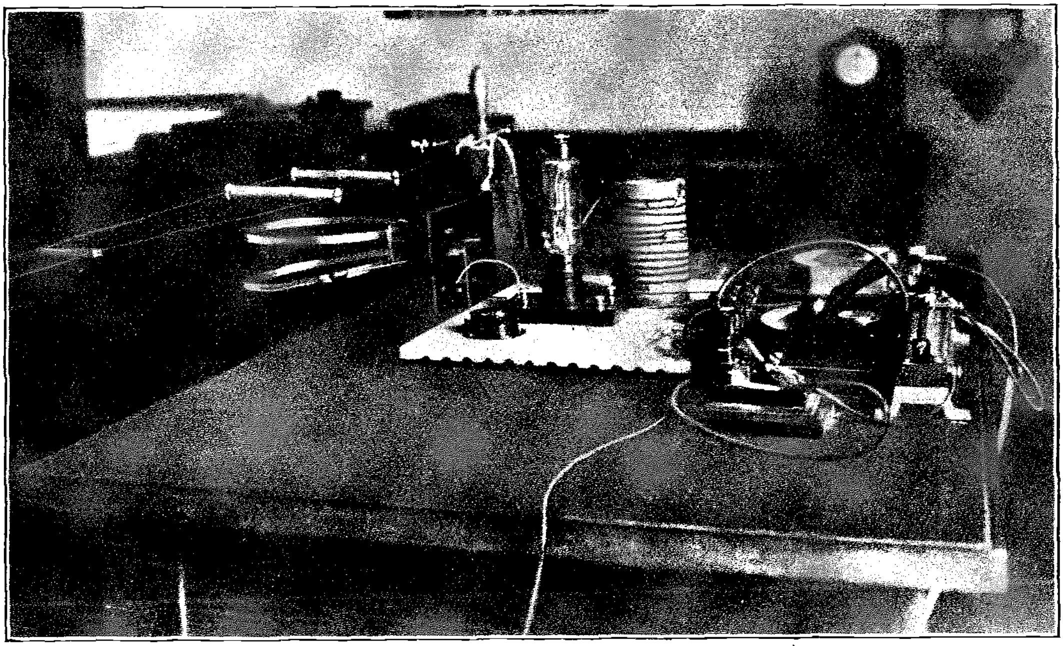


Fig. 7. Curves from which the wavelength may be found.

In most practical cases it will suffice to use the y value without corrections. The difference between the right value 10·187 metres and the value 10·178 metres, is only 0·009 metres.



A view of the parallel wires and the valve generator of short wavelength oscillations.

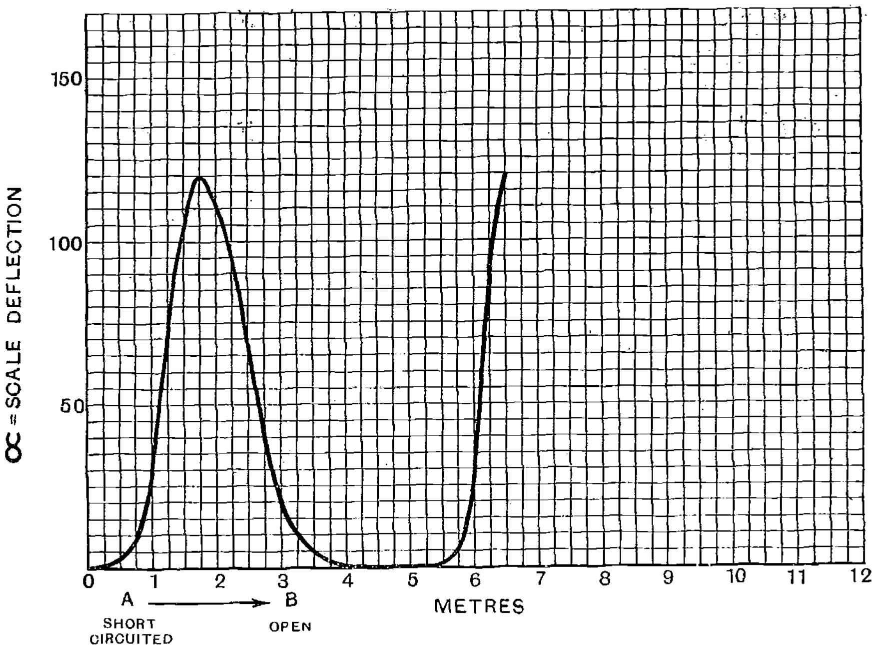


Fig. 8. The curves obtained when a valve voltmeter was employed.

Fig. 8 (∝).—The wires as in Fig. 4.

The curve is obtained using the thermionic tube voltmeter, E, Fig. 3. Theory and practice coincide.

RESULTS.

If we compare the curves obtained with the thermo arrangements with the one obtained with the valve voltmeter we at once see the difference in their characteristics. The thermo-junction can be considered as having only resistance, but the valve acts as a capacity load. Here theory and practice go side by side.

We have further seen that we are really able to get any curve form at the measurements though we have induced a pure sine voltage upon the wires.

To secure very accurate wavelength values we have to proceed in the following manner: Method of measurement: vacuo-thermo-junction with millivoltmeter (*M* about 10), at A the wires should be short-circuited; between the B terminals we put in an electrolytic resistance with a value making the two maximum points per half-period equal and giving a symmetrical curve. The measurements should be taken at the nodal points where the accuracy may be, say ± 1 millimetres.

Now it is only necessary to make the theoretical correction according to the formula: $\lambda u_0 = 2y \ (1 + K)$.

For practical purposes it is quite sufficient to use the valve method and measure the distance between two points of the same maximum voltage.

CORRESPONDENCE.

Reception of Zurich Broadcasting.

To the Editor of THE WIRELESS WORLD AND RADIO REVIEW.

SIR,—I read in your columns that the Zurich broadcasting station has been received in this country on two valves.

I have been receiving Zurich for about a month past on one valve with reaction, the plate current being supplied from the A.C. lighting mains (205 v.) *via* a rectifying valve. The strength is equal to all stations except 2 LO, Radiola, Brussels and Aberdeen, and the only thing which mars reception is the incessant jamming from broadly-tuned spark stations working on (nominally) 600 m. Despite the fact that only one valve is used there is no noticeable fading, and reception is possible on certain occasions in daylight.

I should be interested to know whether any other of your readers receive this station on one valve.

E. J. A. KENNY.

Dulwich, S.E.21.

A Tungar Rectifier Hint.

To the Editor of THE WIRELESS WORLD AND RADIO REVIEW.

SIR,—For some years I have been using a Tungar Rectifier for charging batteries, and have found that after a certain number of hours (about 1,500), the charging current drops down to nil, despite the fact that the valve is unbroken. The rectifier I use is the tapped transformer type and I find that by raising the tap to one higher (230 v. to 210), current commences to flow again and continues to do so for about another 1,000 hours. The tap can then be raised to 190 v. with the same results. By this method I have succeeded in obtaining about 5,000 hours from a single bulb. The slight increase in input wattage is well worth the extra life. I think your readers using this type of charger may be glad of this tip.

RODNEY F. COSSER.

London, S.E.24.

Misuse of Call Signs.

To the Editor of THE WIRELESS WORLD AND RADIO REVIEW.

SIR,—I have lately received various reports of reception of C.W., on about 125 metres, supposedly from my station 2 AS.

It is evident that some unauthorised person is making use of my call sign, as I neither use this wavelength, nor do the reported times of transmission agree with my log entries.

The matter has been reported to the competent authority, who is taking action, and perhaps the publication of this letter will also have the desired deterrent effect on the offender.

W. HARWOOD MOON (2 AS).

Penarth, Glam.

To the Editor of THE WIRELESS WORLD AND RADIO REVIEW.

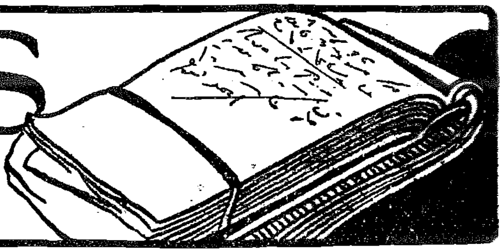
SIR,—I see in your issue of November 26th, that Mr. Stanley Ward complains of the misuse of the call sign 2 QS. I should like to point out once again that my own call sign, 2 US, is frequently reported to have been heard in the Manchester area. It would appear that 2 US and 2 QS are both being misread, and that some transmitter in the Manchester area is either misusing one of these call signs, or fails to pronounce his own distinctly. During the last few weeks I have received an average of six reports per week, all from the Manchester district, of concerts transmitted on Sunday evenings.

Should this come to the notice of the transmitter concerned, I trust that he will endeavour to pronounce his call sign in such a way as will prevent confusion between 2 US, 2 QS and the correct letters. This has been going on for over a year now, and I cannot persuade myself that anybody would persistently misuse the same call sign for so long. If 2 QS's reports are all of Sunday transmissions my theory would appear to be confirmed.

J. F. STANLEY (2 US).

Highgate, N.6.

NOTES & NEWS



The Municipality of Vienna proposes to levy an entertainments tax on the Vienna Broadcasting Company.

* * * *

Four hundred accumulators belonging to listeners-in have been destroyed by fire at a re-charging plant in Carr Street, Stepney.

* * * *

NFF, the Hilversum broadcasting station in Holland, with a wavelength of 1,060 metres, is shortly to increase its power tenfold.

* * * *

A Post Office official states that although a special form of licence has been issued for broadcast reception at sea, only fifty have been applied for.

* * * *

The successful six months' test of the experimental wireless beacon at Nash Point, Bristol Channel, will probably lead to the erection of similar beacons round the coast.

* * * *

Captain Jackson, of the Moravian mission boat *Harmony*, states that the one wireless receiver in Labrador regularly picks up New York broadcasting, but cannot get the British programmes.

DX WITH MEXICO.

Two-way working with Mexican BX was established by Mr. E. J. Simmonds (2 OD) of Gerrard's Cross, Bucks, on December 19th at 7.15 a.m. The communication took place on 78 metres, and signals were received well at both stations. In the course of transmission, Mr. Simmonds sent the following message: "Greetings to Mexican amateurs from Radio Society of Great Britain." BX is the call sign of Mr. Harold Mapes, of Guanajuato, Mexico.

BELGIAN AMATEUR WORKS CANADIAN.

In the course of the Transatlantic communication tests, the Belgian amateur 4 YZ has succeeded in working with the Canadian C 1AR on two occasions, at 5.30 and 6.0 a.m. respectively. In the first attempt a power of 14 watts was employed by 4 YZ, which was increased to 20 watts on the second occasion.

NKF's SCHEDULE.

The short wave transmissions from NKF, the U.S. Naval Research Laboratory at "Bellevue," Anacostia, D.C., are continuing until further notice. These signals have been received by a number of British amateurs. The times given in the following schedule are given in Eastern Standard Time, which is five hours behind G.M.T.

54·3 metres.—Mondays, Wednesdays and Fridays, 8.0 to 8.10 and 9.0 to 9.10 p.m.

72 to 82 metres.—Mondays, Wednesdays and Fridays. 8.30 to 8.40 and 9.30 to 9.40. Exact wavelength will be announced during each test.

54.3 and 32 metres.—Simultaneous transmission, daily except Sundays, beginning at 10.0 p.m. working traffic with NPL.

Reports of the reception of these signals will be welcomed at the above address, and should include date, hour, and minute, wavelength, audibility, steadiness, presence or absence of disturbance and atmospherics, and weather.

COURSE IN A.C. WORK.

A useful course in "Alternating Currents and Electrical Oscillations" is to be given by Mr. D. A. Owen, B.A., D.Sc., F.Inst.P., at the Sir John Cass Technical Institute, Jewry Street, London, E.C.3. The course will consist of ten lectures, accompanied by practical demonstrations, and will be held on Tuesday evenings from 7 to 8.30 p.m., commencing Tuesday, January 13th, 1925. For residents in the administrative County of London, the fee for the course is 10s. Students under 18 years of age are admitted at half fees.

NEW AMERICAN BROADCASTING STATION.

The recent opening of KOA, the new broadcasting station of the General Electric Company at Denver, in the Rocky Mountains, was hailed with delight from all corners of America. According to reports received, congratulatory telegrams and telephonic messages were sent in within thirty minutes of the preliminary announcements from California, Chicago, New York, and Texas.

One of the most powerful of the American stations, KOA operates on Mondays, Wednesdays, Fridays and Sundays, on a wavelength of 323 metres.

PROPOSED FINNISH RADIO IMPORT DUTY.

The question of the construction of a wireless station at Helsingfors, has been under consideration by the Ministry of Communications of Finland. Some time ago the Finnish Government granted a concession for a station to an American, who, however, failed to obtain the necessary capital. It is thought that the best way to reorganise radiocasting in Finland will be for the Government to erect a complete station, with the view of later renting it to a private company which would take over the responsibilities of carrying on its operation. It is proposed that in order to defray the expenses of the station, the State should levy an extra tax of 10 per cent. of the value of imported wireless equipment and materials.

AMERICAN AMATEUR'S TRAGIC DEATH.

Radio station 6 CTE, states the News Bulletin of the A.R.R.L., permanently signed off the *air* the other night when its operator, Tom Banzhaf, went to his death while listening to the dots and dashes. Banzhaf, whose home was at 3,466 Twenty-first Street, San Francisco, died following an attack of heart strain before the headphones could be removed.

Banzhaf was an active transmitter, in spite of chronic heart trouble, and besides being the recipient of many QSL cards, 6 CTE had sent his own cards to amateurs all over the United States.

WIRELESS AND CAMELS.

A strange blending of the modern and the primitive is a feature of the journey to be undertaken from Angora to Mosul by a Commission of the League of Nations, appointed to establish the frontier between Turkey and Mesopotamia. The journey from Angora onwards, under escort of a strong Anglo-Turkish force, will be made on camels, while communication with the League at Geneva will be maintained by wireless.

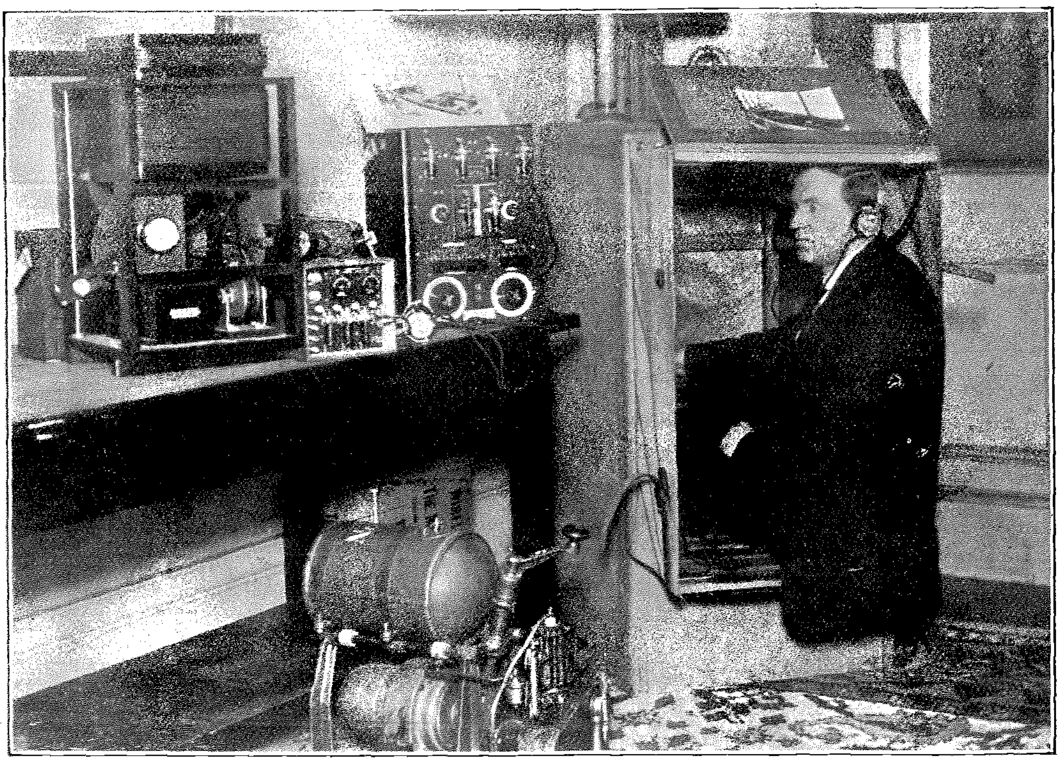
BELGIAN AMATEUR DESIRES REPORTS.

M. A. L. Stainier (4 ALS) of 19 Boulevard de Tirlemont, Louvain, the Belgian amateur whose signals have frequently been heard in this country of late, would be extremely glad to receive QSL cards from British amateurs. All such communications are answered at once. M. Stainier is considerably increasing his power in the new year, and will work in the neighbourhood of 80 metres.

THE B.B.C.'s NEW HIGH POWER STATION.

The British Broadcasting Company's new high power station now under construction at Daventry will incorporate many interesting features designed to give a maximum power output.

Situated in open country, the site of the new station is 600 ft. above sea level, and nearly 400 ft. higher than the surrounding land. A "T" aerial will be used, and two masts are being set up 500 ft. and 800 ft. high respectively. The transmitter will be situated directly under the centre. In designing the antenna care has been taken to make the natural wavelength as near as possible to 1,600 metres, the station retaining the same wavelength as 5 XX. Although the power rating will be 25 kilowatts, the actual consumption on the station will probably reach 100 kilowatts. A novel earth system will be employed consisting of a circular



The new Marconi lifeboat set. Using a quenched spark transmitter, the installation has a range under normal conditions of 50 miles. The receiving gear includes a direction finder.

metal plate laid underground, with a radius of 100 ft.

An overhead telephone line will connect the station with the London studio, and an underground cable will also be installed for emergency use.

It is claimed that the situation of the Daventry station will permit crystal reception within a circle of 100 miles. The first programme should take place in the spring. Transmissions will be made in the afternoon and evening, and the new station will provide programmes of its own twice a week, a provincial relayed programme on a third day, and relays of London programmes for the remainder of the week.

IDENTITY OF WGH.

Many readers have reported the reception of a short wave experimental station with the call sign WGH. The following information is contained in a letter from the American Radio Relay League, to Mr. John G. Gibson of Harrow.

WGY is one of the Radio Corporation stations located on Long Island, N.Y. This station has been transmitting "ABC de WGH" and other test signals for a number of months; it also appears to be handling some regular traffic. WGH is understood to be working on a power of kilowatts, on a wavelength of 107 metres. It is licensed to transmit on a number of wavelengths between 92 and 110 metres.

ADVICE ON TRANSATLANTIC RECEPTION.

British amateurs hoping to work on short waves with America, should at present confine themselves to the 95 to 98 metre band, according to the considered opinion of Mr. D. B. Knock (6 XG), who has recently met with great success in Transatlantic working.

In support of his advice Mr. Knock states that when working a short time ago with U IBHM, on 102 metres, the American amateur reported bad disturbance from WGH at Tuckerton, whose wavelength is 105. "To go below 90 metres," says Mr. Knock, "is equally disastrous as local interference is very pronounced between 80 and 90 metres, so that an American amateur would find it next to impossible to sort out a weak signal from this side—out of the great number of Americans all calling CQ at once!"

U.S. AMATEUR'S TESTS.

Mr. J. L. Reinartz (1 XAM), the famous circuit designer, is transmitting a useful series of short wave signals from his station at 371 Hartford Road, South Manchester, Conn. A semi-automatic transmitter is used, and the following is the present schedule :—

25 metres.—Daily from 6.0 to 7.0 p.m. (E.S.T.).
55 metres.—Daily from 7.0 to 8.0 p.m. (E.S.T.).

Mr. Reinartz welcomes reports, which should be as complete as possible.

FINNISH 2 NCB.

If the Finnish amateur 2 NCB would be good enough to communicate to us his name and address, we should be glad to put him in touch with a British amateur who has heard his signals.

Radio Society of Great Britain

An ordinary meeting of the Society will be held at the Institution of Electrical Engineers, Savoy Place, W.C.2., at 6 p.m., on Wednesday, the 21st January, 1925, when Sir Oliver Lodge, D.Sc., LL.D., F.R.S., the newly elected President of the Society, will deliver an address entitled "Matter and Radiation."

An informal meeting of the Society will be held at the Institution of Electrical Engineers, Savoy Place, W.C.2, at 6 p.m., on Wednesday, the 14th January, 1925, when Mr. Stanley Ward will give a talk entitled "Some Notes on Short Wave Reception."

AN EXPERIMENT WITH ATMOSPHERICS.

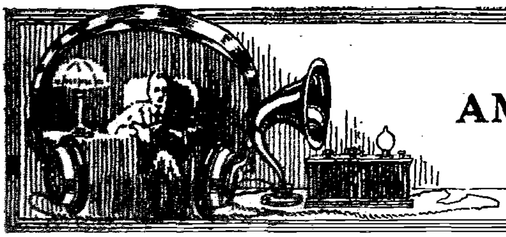
That a number of the wireless problems awaiting solution can be tackled by the non-technical amateur was the theme of the Radio Society's talk from 2 LO, recently delivered by Mr. R. J. Hibberd.

A fortune awaited the man who overcame the problem of atmospherics, said Mr. Hibberd, and he proceeded to describe an interesting little experiment which could be carried out by all who were able to receive the transmissions of rhythmic scientific signals from the Eiffel Tower, transmitted nightly at 10 o'clock. The signals consist of a series of 300 dots formed by a single spark, and sound to the listener like the second ticks of a clock.

"The amateur or listener-in," said Mr. Hibberd, "should plot out these beats on a piece of graph paper beforehand. The second dots might be placed five small square intervals apart on the graph so that each square will represent one-fifth of a second. Now having prepared your graph chart, with pencil in hand, listen in immediately the time beats commence. Directly you hear an atmospheric make a line on your graph at the time and place at which it occurred. You would continue this procedure throughout the whole period of the time beats. Another point you must consider is whether the atmospherics are long or short in duration. If they are long you will make your pencil line long to correspond with its duration and if they are short your pencil line will, of course, be made proportionately short. A third observation may be attempted, and this is to denote whether the atmospheric is strong or weak. If strong, make your pencil line thick, and if weak make it thin.

By carrying out these three operations you will find approximately the time of the atmospheric, its length and strength. When the observations have been made a curve may be produced by joining the tops of the pencil lines, and from it you can deduce the periods when the atmospherics were similar.

"This little experiment may be carried out each night for a week, month or year, as desired, and when you come to sum up your results much useful information may be obtained. Those who wish to go more deeply into the subject might obtain the daily meteorological observations from the Air Ministry, who will post them daily to anyone in the United Kingdom for an annual subscription."



AMONG THE SOCIETIES.

(Correspondence intended for Hon. Secretaries of Societies may be addressed c/o The Editor of this Journal.)

A highly satisfactory report of the year's work was presented at the Annual General Meeting of the City of Belfast Y.M.C.A. Radio Club, held on December 11th.

The activities of the members up to the beginning of the present session were primarily confined to the practical side of wireless, but during the winter special attention is being given to theoretical matters and an instructive series of lectures has been arranged.

* * * *

"The Construction of Broadcast Receivers," was the title of an instructive lecture delivered by Mr. F. H. Haynes before the Ilford and District Radio Society on December 9th. In the course of his remarks Mr. Haynes dealt comprehensively with the complete installation of a broadcast receiver, first giving attention to the aerial and earth system, and then describing the most suitable crystal and valve circuits. The elimination of distortion in loud speakers received careful attention, and the speaker advocated the use of resistance capacity coupling for securing the best results.

* * * *

The many kinds of rectifiers which are or have been in use in wireless were recently discussed before the Wimbledon Radio Society in a lecture by Mr. C. E. P. Jones. Among the many types mentioned were the chemical, vibratory, mercury vapour and the thermionic valve.

Mr. Jones's lecture was preceded by a reading of Captain Eckersley's lecture entitled "Faithful Reproduction by Broadcast," recently delivered before the Radio Society of Great Britain.

* * * *

With the object of initiating research work, members of the Manchester and District Radio Transmitters' Society have been asked to submit—(1) any recorded results from past experience; (2) any ideas which they would like considered; and (3) any abnormal and peculiar effects which he thinks may merit further investigation. This information is being collected by Mr. A. Simpson (5 BH), of 28 Westgate, Burnley, who requests that all data, which should be as precise and accurate as possible, should reach him by January 17th.

The Society is holding a dinner on January 20th at 7 p.m., and full particulars can be obtained from the Hon. Secretary.

* * * *

"The Principles Governing the Action of Crystal Receivers" formed the title of an interesting talk and demonstration recently given before the City of Belfast Y.M.C.A. Radio Club by Mr. John Wylie, B.A. The speaker gave a concise explanation of inductance and capacity, and proceeded to outline the principles of tuning. An instructive demonstration was given to show how the crystal acts as a detector.

* * * *

At the annual general meeting of the Bristol Centre of the Radio Society of Great Britain reference was made to the rapid growth of the Society during recent months. It is still felt, however, that many more members are needed. New members can attend the special lectures on wireless now being given at the Merchant Venturers College, in addition to other lectures and demonstrations at the University. Among the officers newly elected at the meeting were Mr. R. Hodge, as Chairman, and Mr. J. R. C. Murray, B.Sc., as Hon. Secretary.

* * * *

A successful exhibition of wireless and scientific apparatus was organised by the Peckham Radio Research Society at a sale of work held in St. Luke's Parish Hall, Peckham, on December 12th and 13th. More than 141 exhibits were staged, mostly the handiwork of members, and included a four-valve wireless receiver, various transmitters and numerous crystal receivers. Messrs. Alfred Graham & Co. kindly lent the Society a power loud speaker which was used to address the audience in the main hall.

An interesting lecture on "Dynamos and Motors" was given by Mr. R. M. Dougan on December 17th, and was followed by a discussion on insulation, especially in regard to short wave work.

FORTHCOMING EVENTS.

WEDNESDAY, JANUARY 7th.

Institution of Electrical Engineers (Wireless Section). Ordinary Meeting. At 6 p.m. (light refreshments at 5.30). At the Institution, Savoy Place, W.C.2.

Radio Research Society, Peckham. Lectures: "Electrical Measuring Instruments," "The Dynatron."

THURSDAY, JANUARY 8th.

Bournemouth and District Radio Society. Visit to Bournemouth and Poole Electricity Supply Co.'s Works.

Luton Wireless Society. Lecture by Captain P. P. Eckersley, M.I.E.E. (Chief Engineer of the B.B.C.).

FRIDAY, JANUARY 9th.

Sheffield and District Wireless Society. At 7.30 p.m. At the Department of Applied Science, St. George's Square. Elementary Lecture: "The Valve." By Dr. Watts.

BROADCASTING.

REGULAR PROGRAMMES ARE BROADCAST FROM THE FOLLOWING STATIONS.

GREAT BRITAIN.

STATION.	CALL SIGN.	WAVE-LENGTH.
Chelmsford	5 XX	1,600
Aberdeen	2 BD	495
Birmingham	5 IT	475
Belfast	2 BE	435
Glasgow	5 SC	420
Newcastle	5 NO	400
Bournemouth	6 BM	385
Manchester	2 ZY	375
London	2 LO	365
Cardiff	5 WA	351
RELAY STATIONS (on Low Power):		
Leeds-Bradford	2 LS	346
Plymouth	5 PY	335
Hull	6 KH	335
Dundee	2 DE	331
Edinburgh	2 EH	328
Nottingham	5 NG	322
Swansea	5 SX	318
Liverpool	6 LV	315
Stoke-on-Trent	6 ST	306
Sheffield	6 FL	301

FRANCE.

Radio Paris	—	1,780
Lyon	—	550
Paris (Ecole Superieure des Postes and Telegraphes)	—	450
Paris (Petit Parisien) (Tuesdays, Thursdays and Sundays.)	—	345

GERMANY.

Koenigswusterhausen (Sundays only)	—	2,800
Berlin	—	505
Munich	—	485
Frankfort	—	470
Konigsberg	—	463

GERMANY—*continued.*

STATION.	CALL SIGN.	WAVE-LENGTH.
Leipzig	—	454
Stuttgart	—	443
Breslau	—	418
Munster	—	410

BELGIUM.

Brussels	SBR	265
Haeren	BAV	1,100

HOLLAND.

Hilversum	—	1,050

DENMARK.

Lyngby (Except Sundays)	OXE	2,400

SWEDEN.

Stockholm (Telegrafverkat)	—	440

SPAIN.

Madrid (Radio Iberica)	—	392

ITALY.

Rome (Union Radiotelephone)	—	425

SWITZERLAND.

Lausanne (weekdays)	HB 2	850
Zurich	—	515

AUSTRIA.

Vienna (Wien)	—	530

HUNGARY.

Buda-Pesth	MT 1	950

CZECHO-SLOVAKIA.

Prague	—	1,150
Kebly	OKP	680

IRREGULAR PROGRAMMES AND TESTS ARE BEING TRANSMITTED FROM THE FOLLOWING STATIONS :—

GERMANY, Hanover 296 m. **HOLLAND,** Amsterdam PCFF 2,125 m. **SWITZERLAND,** Geneva HBI 1,100 m. **DENMARK,** Copenhagen 470 m., Ryvang 1,025 m. **SWEDEN,** Gothenburg SASB 290 m., Boden 2,500 m., Malmoe SASC 270 m. **ITALY,** Centocelle ICD 1,800 m. **SPAIN,** Madrid (Radio-Espana), 335 m., Barcelona 325 m., Seville 350 m. **CZECHO-SLOVAKIA,** Komarov OKB 1,800 m. **JUGO-SLAVIA,** Belgrade 1,650 m.

READERS PROBLEMS

Readers desiring to consult the "Wireless World" Information Dept. should make use of the coupon to be found in the advertisement pages.

INTERFERENCE FROM ELECTRIC LIGHT MAINS.

MANY readers have written complaining of humming noises in their receivers, due to various causes, such as near-by electric light mains, tramways or electric motors in near-by shops or cinemas, and have asked us to suggest remedies.

In a number of cases we have noticed that readers state that the noise is caused by a motor on their own premises. In this case, of course, the trouble may be attacked at its source by making sure that the framework of the motor is earthed, completely screening the motor with metal and experimenting with condensers of large capacity across the brushes, as the commutator of a D.C. motor is a frequent source of trouble in this respect. In the case of interference from near-by cinemas, it would be well if amateurs in the neighbourhood who suffer from this nuisance could get into touch with each other with a view to approaching the cinema management collectively on this matter, as much could be done if the cinema authorities could be induced to have their apparatus inspected by a competent electrical engineer.

There are several remedies, however, which can be tried at the receiver end. The more commonly recommended of these is, of course, connecting the cores of the low frequency transformers either to earth or in some cases even to H.T. positive, completely screening the receiver in a metal case, etc., whilst of course care should be taken to see that neither the aerial, lead-in, or earth wire runs parallel to or near to any electric mains.

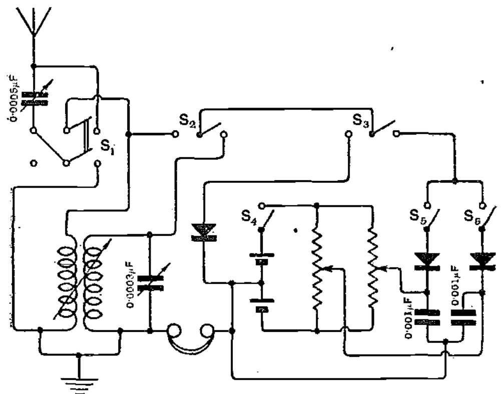
In very many cases, however, which have been brought to our notice, the interference has been caused not by induction but by earth currents, and in nearly every case this can be cured by dispensing with the use of an earth connection and employing a counterpoise instead. Of course, we realise that in very many cases the amateur has not the necessary space at his disposal for the erection of a counterpoise under his aerial, but this need not deter any one from attempting to eliminate humming noises in this manner, as often if a length of covered wire 30 ft. or so in length is attached to the earth terminal and just led away anywhere, either round the skirting board of a room or outside the house (the far end not being attached to anything), the humming will be found to be conspicuous by its absence, and possibly a great deal of crackling noises hitherto attributed to atmospherics will be found to have disappeared also, and in a very large number of cases it is found that signals are stronger and greater distances can be achieved than when the earth connection was used. The reason for the latter is probably because the distance between the earth terminal of set and the earth was far too long. In a large number of cases where dwellers in an upstairs flat make use of a water-pipe as the earth connection, better results can be obtained by attaching 30 ft. or thereabouts of insulated wire to the earth terminal of their set, and either hanging it out of the window or placing it round the room. Another remedy which is sometimes effective in eliminating these extraneous noises is to place a condenser of large capacity, say 2 μF in the earth lead. Tuning will not be greatly affected by this, as the capacity of the condenser is very large. The use of a counterpoise is, however, usually more efficacious.

THE BALANCED CRYSTAL METHOD OF OBTAINING SELECTIVITY.

A READER has sent in a number of queries concerning the balanced crystal method of reception. He asks whether it is possible to obtain increased selectivity and elimination of atmospherics by this method, and also asks us to give a brief technical explanation of the principles involved in this method of reception.

In order to make use of this method of reception, it is necessary to employ two carborundum crystals, each having independent potentiometer control. The use of carborundum crystals has been greatly neglected by the average crystal user since the advent of broadcasting. Usually their sensitivity is not so great as is that to be obtained with the galena-catwhisker combination, but they have the advantage that, once set, they are extremely stable and not likely to be thrown out of adjustment by vibration or the accidental jarring of the table on which the receiver stands, as a flat steel plate pressing very firmly on the top of the crystal is used instead of a catwhisker. If greater sensitivity is desired, a steel needle, adjusted with firm pressure and not lightly as with a catwhisker, may be used instead of the plate, an ordinary gramophone needle being excellent for this purpose. We illustrate on next page a suitable circuit for balanced reception, alternative steel-carborundum or galena-catwhisker combinations being made available by switch S3.

In order to obtain a rectification effect with the carborundum crystal, we make use of the well-known fact that the asymmetrical conductivity properties of this crystal become very sharply defined when a certain critical potential is applied to it. If a potential is applied to this crystal and gradually increased, the current increases very slowly indeed until a certain critical point is reached where the current increases enormously with a very small change of voltage. As the voltage is increased further, a second critical point is reached where the increase of current in respect of voltage increase again falls to a very low value. The normal potential of the crystal is adjusted critically on the sharpest portion of the lower bend of the characteristic curve. It is then obvious that one half cycle of the oscillatory potential set up across the tuning circuit by the incoming signal adds itself to the normal applied voltage, and since this is adjusted on to the lower bend, a great increase in the normal current flowing through crystal and 'phones is brought about, whilst the second half cycle produces a very minute decrease in the normal current. Thus rectification is accomplished; the sharper the bend of the curve, the more efficient is the rectification obtained.



A circuit using balanced crystals for eliminating interference.

When using the balanced crystal method for obtaining selectivity, it is possible for weak incoming signals to be read through stronger ones on exactly the same wavelength; in fact, the stronger signals can be almost entirely eliminated and the weaker ones only can be heard in the telephones if careful adjustment is made by means of the potentiometer. In the ordinary methods of obtaining selectivity by means of the tuning elements of the circuit, it is only possible to eliminate unwanted signals provided that their wavelength differs from that of the ones it is desired to receive. Using the balanced crystal method it is also possible to conisderably reduce the strength of atmospherics in proportion to weak signals.

In order to make use of balanced reception, two carborundum crystals are used, each having separate potential control. The two crystals and their respective steel plates are placed the opposite way round to each other in the circuit, so that when they are both individually adjusted, so that their normal potential comes on the lower bend of their respective curves, it is obvious that no rectification can take place, as when one half cycle is causing a slight decrease in the normal current through one crystal, it is causing a large increase in the current through the other crystal, and the result is, of course, that although rectification takes place at each individual crystal, no rectification effect is felt in the external circuit, due to the fact that the two crystals are rectifying in opposite directions.

Now suppose we slightly move the potentiometer of crystal No. 2, so that the normal potential of this crystal is slightly away from the lower bend, along the horizontal portion of the curve. It will be seen that we can obtain rectification of weak signals whilst stronger ones on exactly the same wavelength and also very strong atmospherics will be unheard in the telephones, as they will not be rectified. The reason for this is that although the potential of No. 2 crystal has been adjusted further along the horizontal portion of the curve away from the bend, yet strong signals sufficiently increase the normal voltage applied to this crystal, so that it is taken beyond the bend, and a large increase of current takes place through No. 2 crystal, whilst a small decrease is taking place through No. 1 crystal and *vice versa*, as before. In the case of weak signals, however, the extra voltage applied to No. 2 crystal by the incoming signal is not sufficiently large to carry it beyond the bend, and rectification is accomplished not by No. 2 crystal, which is known as the balancing crystal, but by No. 1 crystal, which is known as the rectifying crystal.

In practice switch S_5 should first be closed and the crystal associated with it adjusted carefully with the potentiometer, and then switch S_5 should be opened and the other crystal adjusted by closing switch S_6. Both crystals should now be switched in, and if correctly adjusted, no signals, or at any rate very faint ones, even from a near-by station, should be heard. Unless the crystals are exactly matched, it is of course impossible that their two rectifying actions be exactly balanced out. The crystal that shows the most sensitivity should be chosen for rectification, and the remaining one adjusted for balancing by moving the potentiometer slightly. In general it may be said that the less the difference between the volume of the unwanted strong signal or atmospherics and the desired weak signal, the less should be the movement of the balancing potentiometer.

The usual applied voltage does not exceed $1\frac{1}{2}$ volts, and so a dry cell can be used. The circuit we illustrate shows two dry cells arranged so that up to $1\frac{1}{2}$ volts positive or negative potential may be applied to each crystal, it being remembered that zero potential is obtained when the two sliders are in the centre and not at one end. Two small dry cells can be used, and will last several months, provided that battery switch S_4 is opened when the receiver is not in use. The potentiometers can be of 300 ohms resistance. Either of the carborundum crystals may of course be used separately by closing either switch S_5 or S_6 and adjusting with the potentiometer. As loose coupling can be employed, if desired, by means of switch S_2, the selectivity of this circuit should be very high, and by using suitable plug-in coils of the correct value, it should be possible to completely eliminate the local station and receive Chelmsford when quite close to the former. The circuit will be found remarkably stable and efficient.

The WIRELESS WORLD AND RADIO REVIEW

RADIO TOPICS.

By The Editor.

FOREIGN APPARATUS.

THERE are already indications that manufacturers of wireless apparatus abroad have not been slow to take advantage of the opportunity presented to them by the removal of the ban by the Postmaster-General on the use of foreign apparatus in wireless receivers, and agents are already active in this country taking steps to introduce components and sets of foreign origin.

As we have already mentioned in a previous issue, we do not think that the British manufacturer of high-class apparatus has any serious reason to feel uneasy at the prospect of competition from abroad, but it is those whose products are of a lower standard who are likely to feel the effect most keenly.

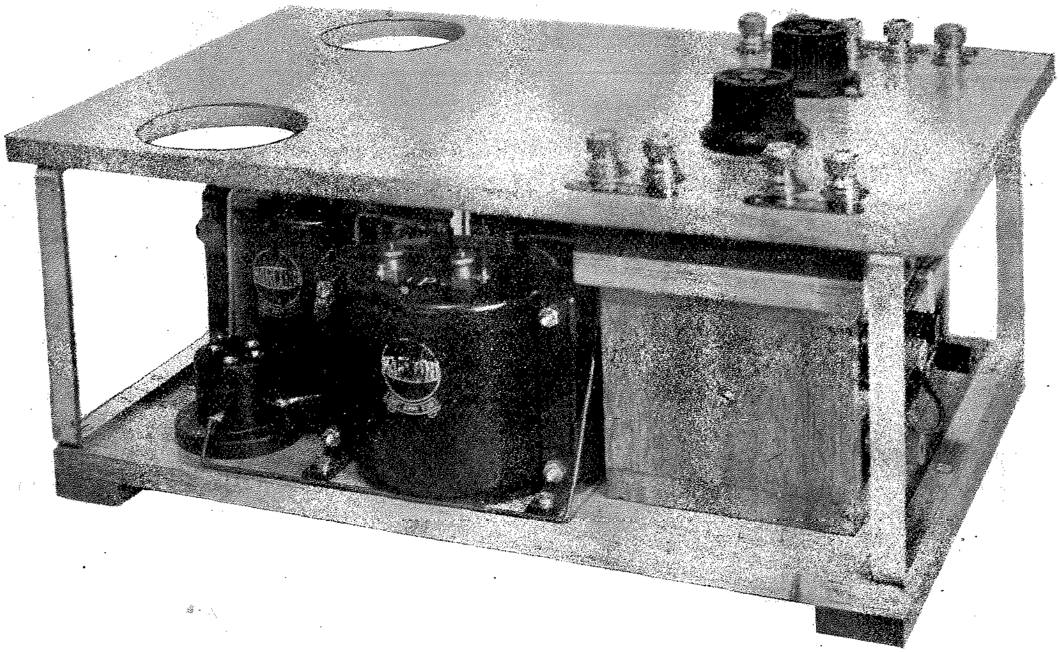
There will always be a good market for the best because experience and skill is required to produce first-class goods, whereas almost any manufacturer can put out products of inferior grade.

But we must not lose sight of the fact that America, for example, has had a longer experience of broadcasting than we have had in this country, whilst the conditions there have also been rather special in character. The number of broadcasting stations in America is very great, and in certain thickly populated areas there has been not only the question of oscillation of receivers to contend with, but the many broadcasting stations working with but very narrow wavelength spacing between them have brought about the necessity for special attention to be paid to the design of apparatus and receivers for obtaining selectivity. It is not so much in the quality of components perhaps that these conditions have shown their effect as in the special contrivances which are so numerous on the American market.

Considering the advance made by manufacturers in this country in other directions it is rather surprising to find how little serious attention has been paid to the problem of selectivity and mechanical devices to assist in fine tuning. Taking as an example the variable condenser, there are a few manufacturers in this country who provide a simple vernier adjustment or an additional single plate for a vernier control, but in America much more attention has been paid to the problem and the most popular device for very fine adjustment of variable condensers is to employ gearing to give a step-down ratio between the control knob and the spindle of the condenser, providing what is known as a slow movement dial adjustment.

Those who have used condensers of this type for precise tuning would probably never go back to other methods because of their convenience and the superior results which can be obtained from their use.

One has only to glance through the advertisement pages of an American trade wireless journal to appreciate how much attention has been paid to refinements in controls to provide accurate tuning adjustments and a comparison with the products of British manufacturers leads us to believe that this is one of the weakest points in our own apparatus when it comes to a question of competition with producers in the United States.



The two-stage power amplifier. The top wooden panel is attached by six 4 B.A. screws, and can be removed by releasing the grub screws in the filament resistance knobs. The end projections rest on battens across the cabinet.

BUILDING A

POWER AMPLIFIER.

Complete constructional details will be found for making up a high grade amplifier having two low frequency stages. The design can be copied by the beginner, and he will find that he will not come up against any difficult operations beyond his skill and requiring liberal workshop equipment, whilst the wiring layout will be found easy to follow. It will be seen that while certain high priced components have been used to ensure the best possible performance, wooden panels are employed to simplify the construction and economise in cost. Several new constructional features will readily be noticed.

By F. H. HAYNES.

FOR use after valve detection, this amplifier gives the necessary increase in signal strength for loud speaker work.

The circuit (Fig. 1) is a usual one in which the first valve is operated through an input transformer, and transformer coupled to the second valve, whilst an output transformer is used to feed the loud speaker so as to remove it from direct electrical connection with the high tension batteries and also to limit the current flowing through its windings. Each valve can be supplied with its requisite plate potential, and two grid batteries give the very necessary grid potential control. It is better to use separate batteries for each valve to avoid the coupling between the valve circuits which would occur should one of the cells become faulty and create a high resistance. If a high resistance path becomes common in the grid circuits of both of the valves low frequency oscillations will be set up and a continuous note will be emitted from the loud speaker.

The parts required are—

2 Intervalve transformers, which, ordinarily, may have step-up ratios of 3 or 4 to 1.

1 Low ratio intervalve transformer for use as an output transformer.

2 Ashley filament resistances.

2 1 mfd. condensers with extension pieces for screwing down to the baseboard.

2 9-volt Hellesen's grid batteries with plugs.

9 Terminals with stems $\frac{5}{8}$ in. to $\frac{3}{4}$ in. in length.

6 ft. hard brass strip $\frac{3}{8}$ in. by $\frac{1}{8}$ in. This should be reasonably straight and free from kinks or abrasions.

3 ft. $\frac{3}{8}$ in. mahogany 9 ins. in width.

Piece of ebonite sheet $2\frac{1}{4}$ ins. by $3\frac{3}{4}$ ins. by $\frac{3}{8}$ in.

Small piece of $\frac{1}{4}$ in ebonite sheet, say about 2 ins. by 1 in.

2 Valve holders.

1 dozen 4 B.A. by $\frac{3}{4}$ in. cheese-headed brass screws, with nuts and washers for holding down the transformers (10 only required, and all other quantities of screws are slightly in excess).

2 dozen small connecting tabs (brass or tinned brass) for inserting under the transformer terminals, and connecting up to the L.T. distributing strip.

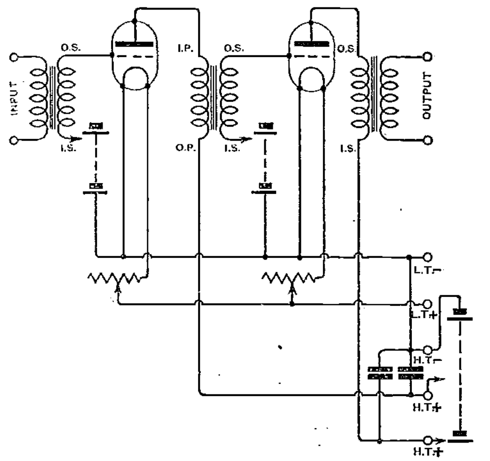


Fig. 2. Circuit of a transformer coupled low-frequency amplifier. Considerable amplification will be obtained, and should the loud speaker be overloaded, leak resistances of 0.25 megohms may be shunted across the secondary windings.

$1\frac{1}{2}$ dozen larger tags for inserting under terminal locking nuts and filament resistance connections.

1 dozen 6 B.A. by $\frac{1}{4}$ in. cheese-headed brass screws for securing tags to L.T. distributing strip.

2 dozen No. 4 by $\frac{3}{4}$ in. countersunk headed brass wood screws for attaching the

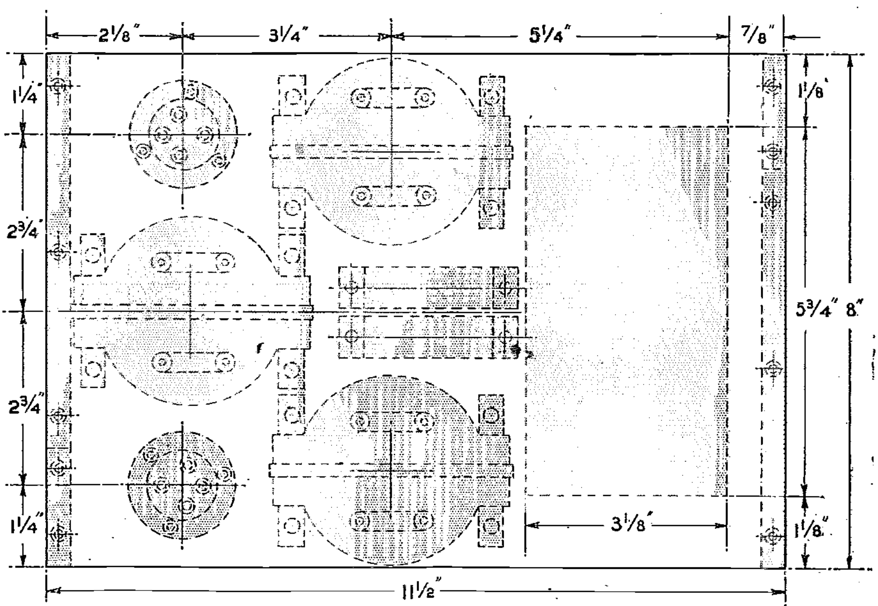


Fig. 1. Positions for assembling the components.

brass rectangles to the base, and constructing the grid battery box.

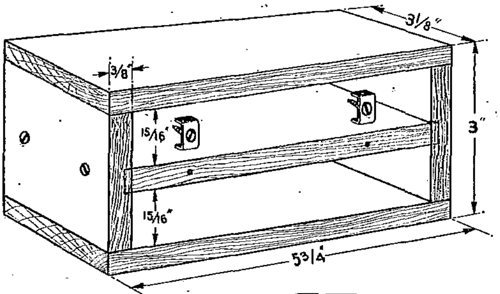
$\frac{1}{2}$ dozen 4 B.A. by $\frac{1}{2}$ in. countersunk headed brass screws for securing top panel to the brass rectangles.

1 dozen nuts to fit terminal stems (2, 3 or 4 B.A.).

1 dozen countersunk headed brass wood screws, No. 4 by $\frac{5}{8}$ in., for attaching the batten pieces.

$\frac{1}{2}$ dozen No. 4 by $\frac{1}{2}$ in. countersunk or round-headed brass screws for attaching the valve holders.

1 dozen No. 4 by $1\frac{1}{4}$ ins. countersunk headed brass wood screws for attaching



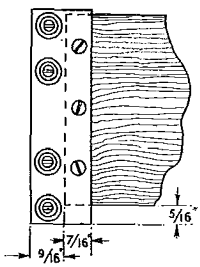


Fig. 3. Details for making up the grid battery box and terminal strip.

terminal strips and L.T. distributor piece.

Tack-on labels, "Input," "Output," "+ L.T. −," "+ H.T. −" and "+." The last-mentioned can be cut from a larger label.

4 10-ft. lengths of "Glazite" connecting wire in blue, red, yellow and black.

The wooden base panel is made up with the grain running along its length. This is quite easily done with a saw and a small plane, provided a good planed board is used exact to thickness. A pair of cross battens are fitted at the ends on the under side, made from the same wood and about 1 in. in width. After finishing with fine glass-paper both sides may be varnished or polished.

The small wooden box which houses the grid batteries is shown in Fig. 3. For simplicity the dividing piece between the two batteries is not shown with its ends let into

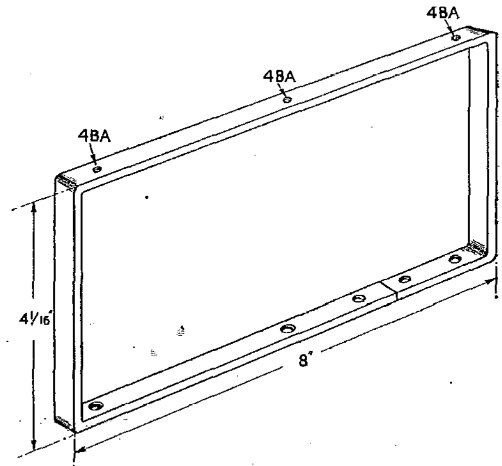


Fig. 4. One of the brass rectangular spacing pieces. Width $\frac{1}{2}$". Thickness $\frac{1}{8}$".

the uprights, though if a tenon saw and narrow chisel are available this may be done, as was the case with the actual set illustrated here. Working to the dimensions given, this box will accommodate the two

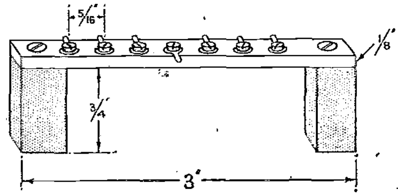


Fig. 5. The connecting bar of the leads running to L.T. minus.

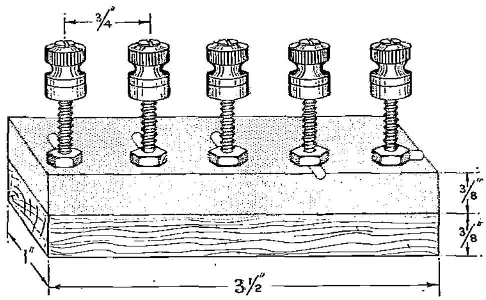


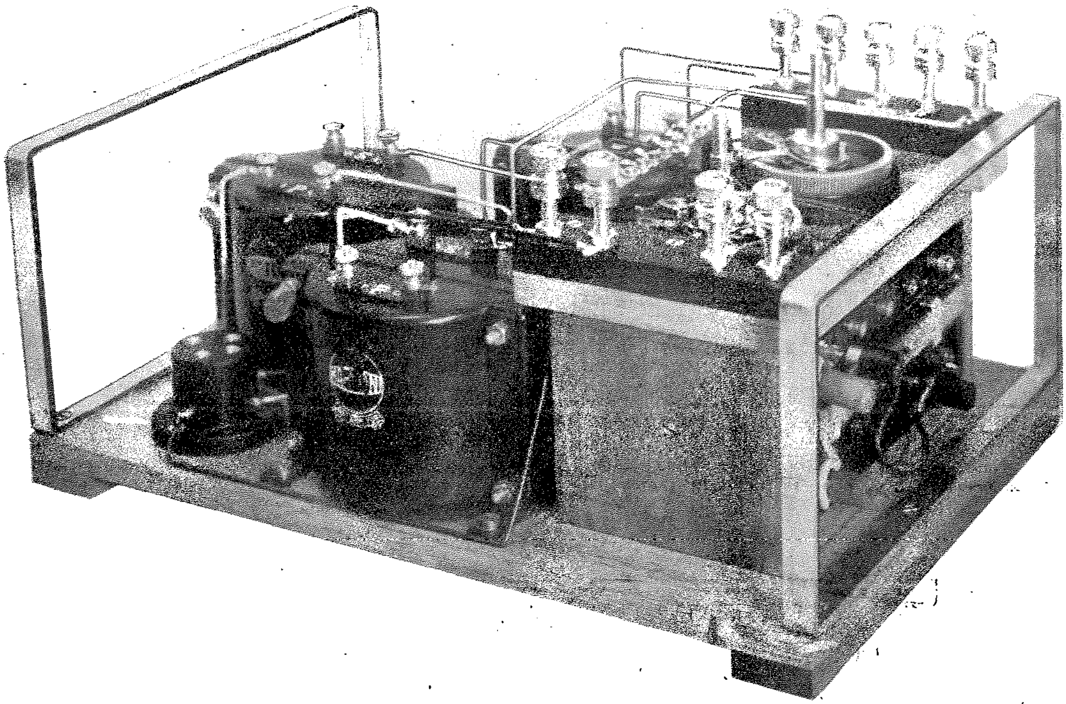
Fig. 6. Method of securing the elevated terminals.

"Hellesen's" 9-volt batteries, and at the same time support the filament resistances at a suitable height, so that when the main top panel just covers the transformers the spindles of the resistances will suitably project. It also gives support to the terminals in the manner shown in Fig. 6. Holes are tapped right through the ebonite pieces and the terminals are prevented from turning by means of lock nuts, which also hold down connecting tags.

Attention may be drawn here to the fact that connecting tags are used throughout the entire set, which is a practice that should be adopted by every amateur in all his sets. It avoids the overheating of terminals and the spoiling of threads with solder, gives a good area of contact, and permits of ready dismantling.

A thin piece of wood ($\frac{1}{8}$ in.) or two thin cross strips should be attached to the back of the grid battery box to prevent the batteries falling through. Small brass or wooden stops may at the same time be made for clamping the batteries down in the box.

The brass brackets (Fig. 4) used to carry the top cover panel are made from $\frac{1}{8}$ in. by $\frac{3}{8}$ in. hard brass strip. G-eat care must be taken when bending to avoid a fracture. It is advisable to bend the brass while red hot, clamping it in the vice and hammering it over. Only a small bend should be made at first, and the



A side view showing the brass rectangular pieces, the grid battery box and the terminal supports.

rule applied to the strip to make sure the bend is taking place at exactly the required point. The four bends should be made to produce an overlap and the saw passed through at the joint. After drilling the holes and tapping those which are to be along the top, the brass should be polished bright with fine emery and given a protective covering of pale gold lacquer.

The use of these brass brackets can be avoided if thought to be too difficult to make up, by substituting a wooden piece at the valve holder end and two vertical pieces at the grid battery end, though it will be necessary, now, to fit cross battens to the top panel to prevent it warping. Small brass angle brackets are obtainable with sides 1 in. in length by ⅜ in. wide by about No. 16 S.W.G. in thickness, and already drilled with four small countersunk holes. make. A feature of the layout adopted is that the wiring leads are all short and direct.

With all components in position the wiring-up can be followed from the practical wiring diagram (Fig. 7). No. 16 tinned

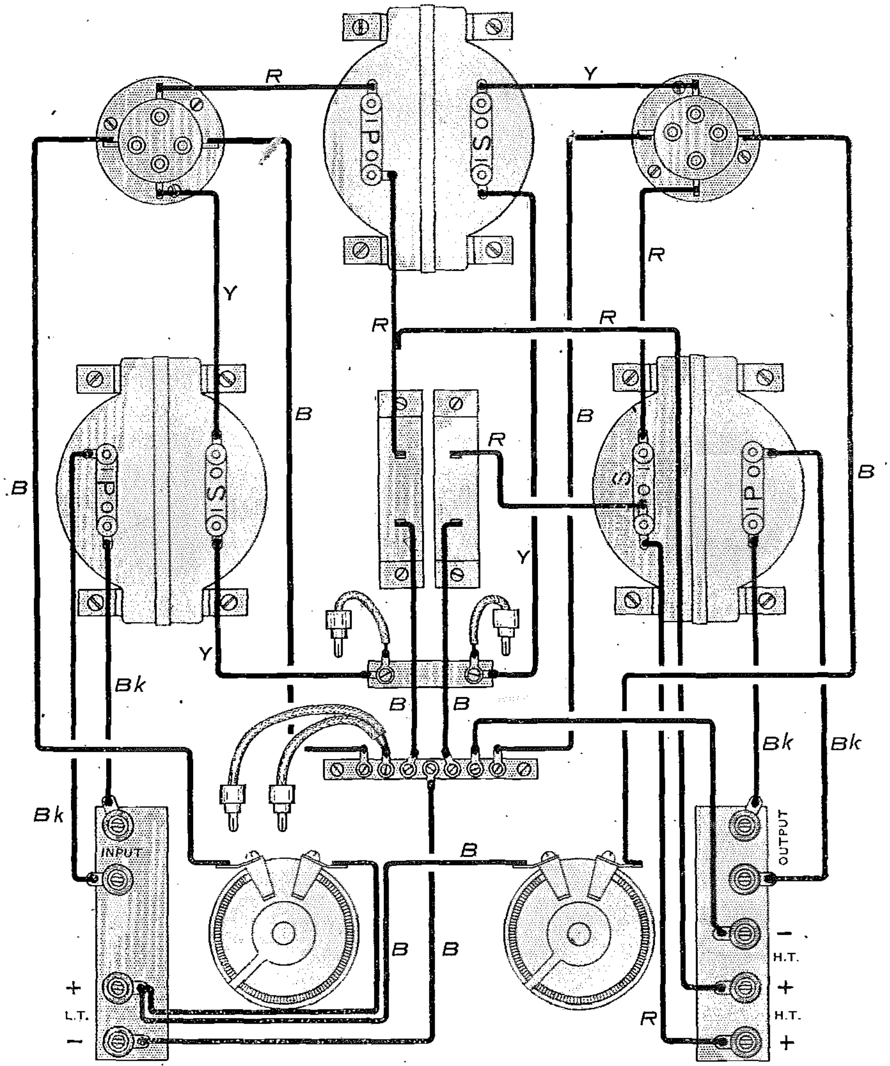
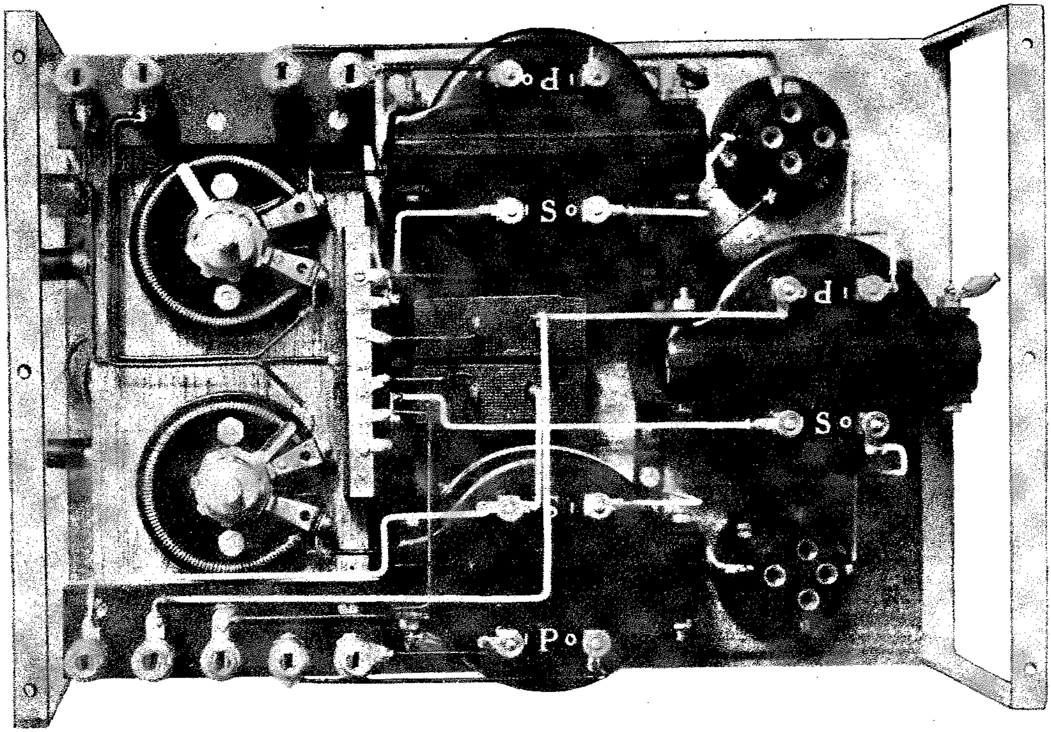


Fig. 7. Practical wiring diagram. The components are shown in their exact relative positions and the wires are run by the paths shown. The Glazite connecting wire does not permit of making "T" joints, and the L.T. connections are distributed from a strip of tags. Red, yellow, blue, and black covered leads are used, though the wiring may be rendered inconspicuous by using black throughout.

These can be used with advantage if wooden end pieces are adopted.

The layout of the components is shown in Fig. 1, and there is plenty of room for the inclusion of transformers of almost any copper wire may be used, though in this instance the new "Glazit" wire was employed, which is about No. 17 S.W.G. tinned copper, with a glazed fireproof covering and obtainable in a range of colours.



The wiring and arrangement of the components is here clearly shown.

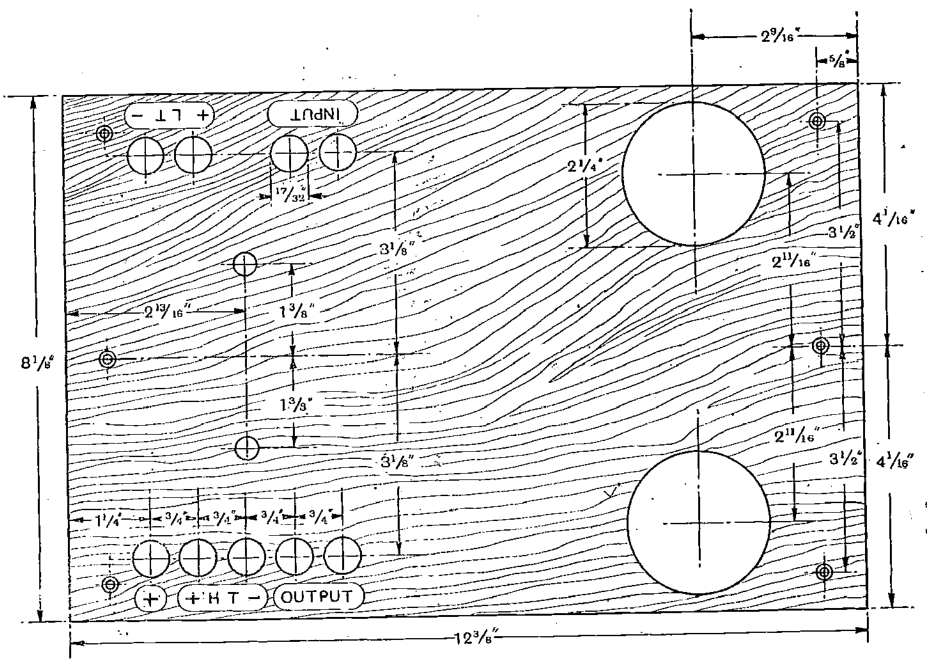


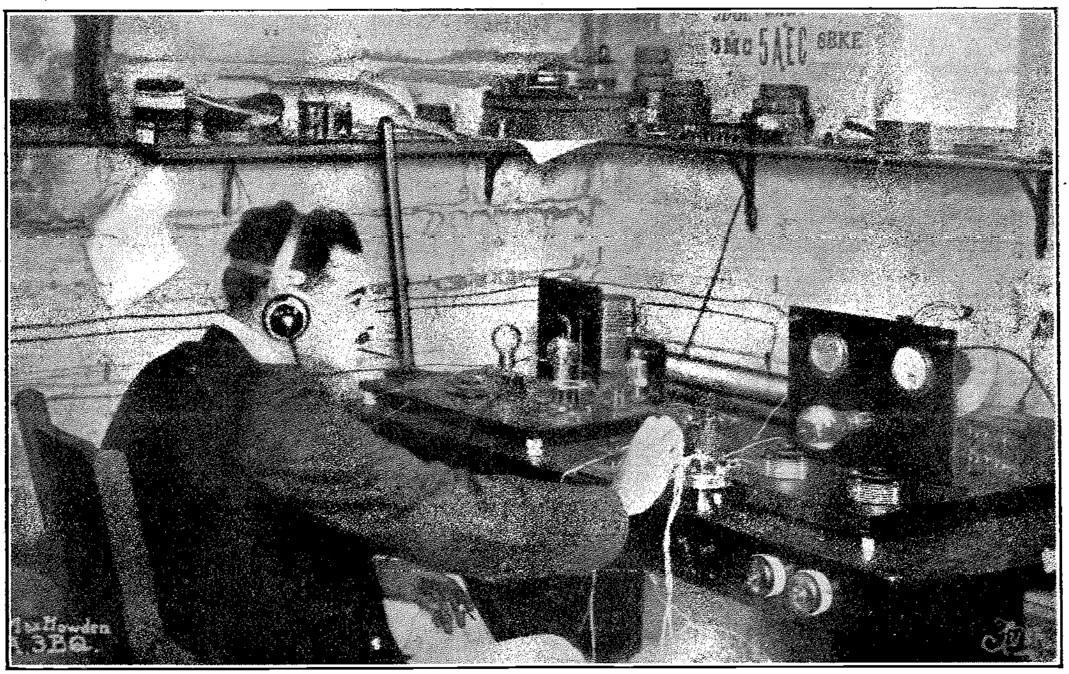
Fig. 8. Constructional details of the top wooden panel made in planed mahogany ⅜" in thickness.

This wire does not lend itself to making "T" joints, which is no disadvantage, as it is advisable in an instrument of this sort to distribute all leads independently, having no parts common to other circuits. For this purpose a small bus bar has been made up, and is seen supported by the grid battery box. This connects to all leads in the L.T. minus circuit, and makes a really nice job.

The cover panel is shown to scale in Fig. 8, with holes giving good clearance to the valves, and through which they can be inspected and at the same time affording protection. The terminals pass through clearance holes with their bases flush with the top of the set. It will be noticed that the cover panel is longer than the base carrying the components, so that when all is finished it may be inserted into a cabinet, and with its ends resting on fillets.

In operation one must take care to use suitable valves and adjust the grid bias very carefully according to the H.T. potential applied. The instrument was tested out with M.O. valves of the D.E.5 class, and gave very satisfactory results, though for really high power work when the grid potential of the last valve may be fluctuated over a very wide voltage range it is advisable to use a special power amplifying valve such as an L.S.5, for the final stage.

MAX HOWDEN (3 BQ), OF BOX HILL, VICTORIA, THE FIRST AUSTRALIAN AMATEUR TO EFFECT TWO-WAY COMMUNICATION WITH AMERICA.



Transmitting with an input of half a kilowatt on a wavelength of 86 metres, the aerial current is 0·9 ampere. An aerial 80 feet high, situated on the top of a hill is employed. On the left of the illustration is the receiver, and on the right the transmitter. A feature of the station is its simplicity. No elaborate apparatus is employed.

SENSITIVE RADIO-FREQUENCY RELAY.

This article describes the theoretical properties, mechanical construction and possible application of a new electron relay, invented and developed by Samuel Ruben, a physicist of New York. This relay has been developed to control currents as great as five amperes by means of extremely small operating currents of any frequency.*

By GEORGE LEWIS.

THE operation of this relay is primarily based upon the employment of the kinetic energy of the thermionic discharges brought about by a suitable emission element, such as a filament, when directed upon a sensitively responsive anode. The impact of the electron stream upon the anode results in the expenditure of the kinetic energy of the bombarding stream, which is translated as:

1. A slight and negligible mechanical effect;

2. A negligible radiation of low wavelength and

3. A temperature rise of the anode.

Various valves have been constructed by Mr. Ruben, in which he has employed different anodes for the utilisation of the thermionic bombardment principle. As the temperature rise of the anode is the major effect in this type of valve, amounting to practically the entire translation of the kinetic energy of the electron stream, the anode adopted as the most serviceable is the thermo-sensitive type. (Figs. 1 and 2).

In the type of valve described below, the translated energy is employed as a means for operating the contacts of a relay situated within the valve.

The rapidity of the action of this device is dependent on the rate of heating and the rate of cooling of the anode, which, in turn, are dependent upon factors as follows:—

Rate of heating—dependent on:

(*a*) Power of bombarding electrons—this should be as great as possible.

(*b*) Heat capacity of anode—this should be as small as possible.

Rate of cooling—dependent on:

(*a*) Ability of anode to radiate power.

(*b*) Heat capacity of anode—this should be as small as possible.

Journal of the American Institution of Electrical Engineers, Nov. 1924.

In the device as now developed, the anode is composed of a blackened strip of nichrome which is initially maintained at a high temperature, in the neighbourhood of 600

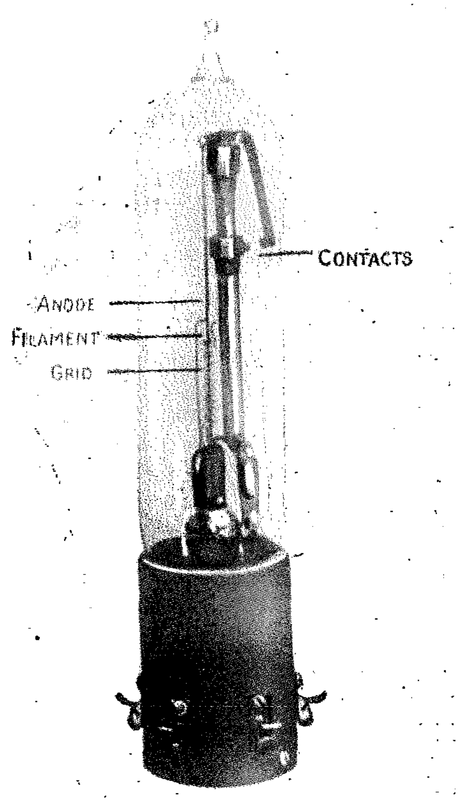


Fig. 1. A view of the Ruben relay which clearly shows the construction.

deg. Cent. The strip form gives a large radiating surface with a small mass and therefore small heat capacity. The high initial temperature gives the anode increased ability to radiate power, since this depends on the fourth power of the temperature.

This relay comprises four main elements:

1. A source of electron emission—a cathode;

2. A means for controlling the electron emission flow;

3. A sensitively responsive anode, and

4. A movable contact arm and a stationary contact for the control of a high-density external circuit.

The cathode element employed in this relay is a platinum-iridium strip having a newly-developed oxide coating which gives the cathode a high thermionic efficiency and a long life. The strip is suspended parallel to the sensitively responsive anode, which is composed of nichrome, attached at one end to the movable contact arm of the make-and-break device, controlled by the movement of the anode responding to the impact of the electron stream upon it. The electron discharge from the filament is electrostatically controlled by a grid element interposed between the filament and anode, so that in operation the grid controls the anode movement by virtue of its control of the electron stream.

The anode is maintained by a local circuit at a temperature at which the movable contact is normally at a point very minutely spaced from the stationary contact. Such close contact spacing, without any tendency to arc or spark, even when the external circuit carries a current of considerable potential, is made possible by the degree of evacuation to which the tube is subjected before the sealing-off process is completed.

As the necessary slight movement of the contact arm of the make-and-break device is controlled by the thermo-expansive anode of the described characteristics, the operating speed of the device is high compared with usual thermal devices.

To avoid any deformation of the elements of this device from the repeated application of high temperatures, especially in the process of evacuation, great care has been taken in their composition and design. The result is a notable stability of adjustment under operating conditions.

Nichrome was selected for the anode as it was found to possess the following desirable electrical and physical characteristics:

(*a*) Operating constancy over long and interrupted periods of use.

(*b*) High and constant values of electrical resistance at various operating temperatures;

(*c*) Suitable co-efficient of expansion and

(*d*) Adequate mechanical strength at operating temperatures.

The contacts of the circuit control device are composed of tungsten, one being affixed to a lever supported for the proper ratio of its arms. The lever and stationary contact support are composed of nickel-manganese, an alloy found suitable for vacuous devices. One end of the lever carries the tungsten contact, and the other is attached to the thermo-expansive anode.

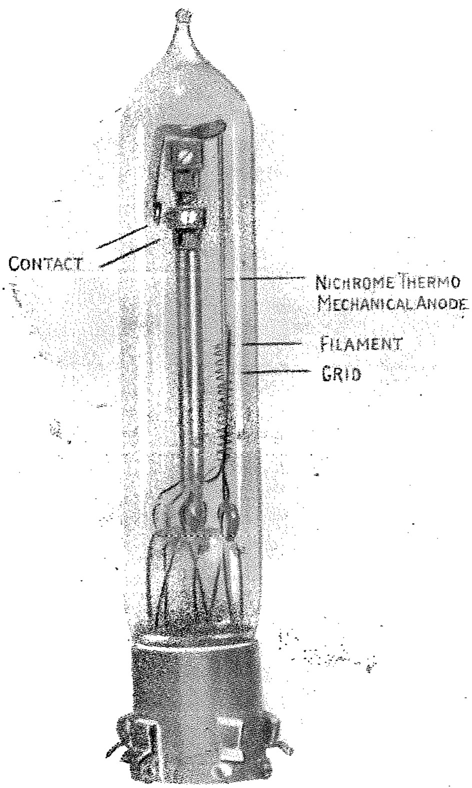


Fig. 2. Another view of the Ruben relay.

As the anode expands and contracts in response to the action of the controlling electron stream, the movable contact moves towards and away from the stationary contact, thus serving to close and open the external circuit.

The normal position of the lever can be made practically independent of the position of the apparatus itself, which can be mounted in a horizontal or vertical plane.

The actual energy necessary to control the external circuit of high density is of very small magnitude, being only that necessary to electrostatically charge the grid element sufficiently to modulate the impacting electron stream, as in the present thermionic devices. The time required for the actuation of the lever is controlled by the heating current normally discharged through the anode.

CONNECTION OF RELAY IN CIRCUITS.

Fig. 3 shows a typical connection of such a relay into a circuit. In the circuit as shown the relay is operated by incoming radio signals, and controls a signalling device indicated as a call bell. The anode is so connected that its energising circuit is partially short-circuited when the contact of the relay circuit is closed, thus causing the anode to cool by radiation, and causing the circuit to open. By this rapid heating and cooling of the anode element the relay contact opens and closes the external circuit at a rate of about 20 times per second.

The relay can be employed in this manner as a call device for radio or carrier-wave circuits for either telegraphy or telephony. When used in this manner, all of its circuits can be supplied with energy from a single transformer as indicated

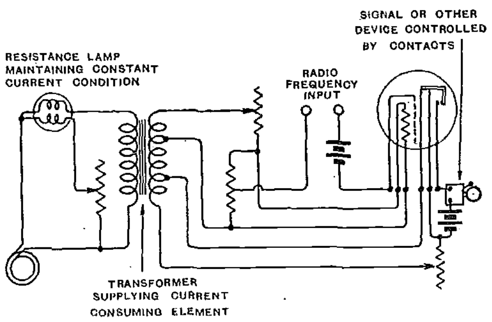


Fig. 3. Connections of a relay operated by wireless signals.

To keep the adjustment constant and independent of line variations, a ballast lamp specially developed for this relay has been supplied. The lamp comprises two resistance elements in a hydrogen filled tube, one element being iron, which controls a current flowing to the primary of the transformer, and operated at about 500 deg. Cent. at which temperature iron has an exceedingly large resistance temperature coefficient. The other element is nichrome wire which is directly connected across the line; its temperature is adjusted by means of an external resistance to bring the controlling iron resistance element to a proper temperature. When adjusted, large variations in the line potential are compensated and the relay adjustment is stable.

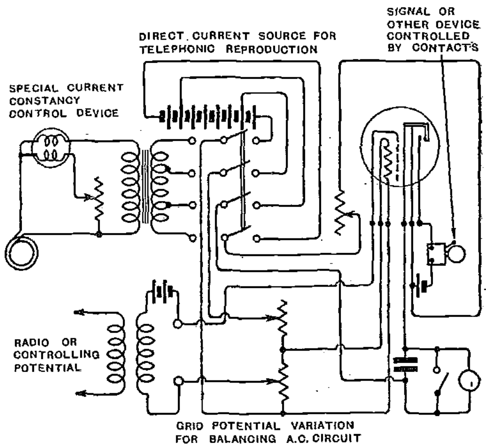


Fig. 4. Telephone receivers and a call bell may be operated by connecting the relay in this manner.

Fig. 4 shows the same circuit with a change-over switch to allow the use of telephone receivers in the plate circuit, by which a call-signal relay and an audio-frequency relay in one valve are obtained.

This relay can be connected in a circuit as a reflex, a regeneration or an amplification valve, or in any connection in which the usual three-element valve is applicable, with the added advantage of the local circuit control of current of high density or high potential.

In conclusion, it may be stated that the Ruben relay has been designed to obtain a relay which could be controlled by minute energies in the form of currents of any frequency, either radio or otherwise; could be operated at adequate speeds for certain telegraph applications, and could control circuits of considerable current and potential. Its application is suggested for any conditions where these requirements are to be fulfilled, such as radio and carrier calling and recording systems, as a telegraph recorder and repeater, either line or cable, and for similar purposes.

WOOD AS AN INSULATOR.

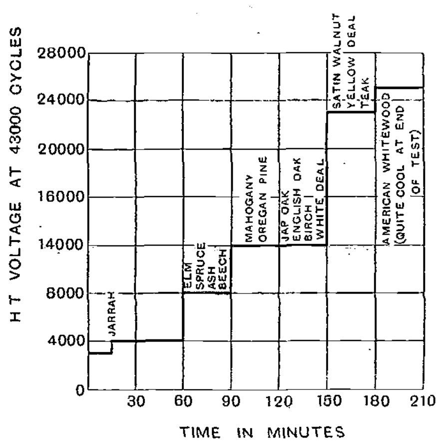
A number of tests have been made to find an insulating material suitable for supporting the turns of wire of the tuning coils employed in high power transmitters. The tests indicate that American white wood is superior to other woods.*

A MATTER of considerable importance in the design of inductance coils for high power stations is the selection of the material for supporting the cable. An exhaustive test of various materials under high frequency stresses has found that most of the insulating materials available tend to become hot, and in many cases end in smoke under the prolonged application of high frequency voltage. For instance, vitrified porcelain has been employed in the construction of these coils, but cracks, and molten porcelain has oozed out of the insulators.

On the ground of economy, and also of ease of make-up, wood offers distinct advantages over other insulators for the manufacture of large inductance coils for use at radio frequency.

In order to obtain information as to the properties of various kinds of woods, samples of a number of different varieties of wood were obtained and subjected to a number of tests. The samples were all cut to a standard size, namely, 1 in. by 1 in. by 4 ins. long, and were arranged in a symmetrical manner between two copper plates connected across the tuning inductance of an arc oscillating circuit tuned to approximately 6,800 metres. The voltage was applied and increased gradually until particular samples began to smoke and burn. These samples were then removed, and the voltage was further increased. The figure shows the steps in which the voltage was raised, and the length of time during which each particular voltage was applied to the samples. The point in the tests upon which each sample was removed upon showing signs of failure is indicated at the point at which the name of the wood appears.

It will be seen that the samples of American white wood were superior to those of any other wood tested. Subsequent tests carried out on large numbers of samples of this wood at a voltage of approximately 35,000 amply confirm the results of these tests, and in no case has any charring or undue heating been observed. In the case of one sample special arrangements were made to increase the voltage, and a flash-over occurred between the metal plates at 55,000 volts, the wood samples remaining undamaged.



The result of tests on specimens of wood.

Inductance coils have been made up using this kind of wood, and have given every satisfaction under working conditions. Such a coil at Northolt radio station has proved itself capable of carrying a current of 115 amperes, the voltage at the aerial end approximating to 60,000.

*Abstract of address delivered by Mr. E. H. Shaughnessy before the Wireless Section of the Institution of Electrical Engineers on November 5th, 1924.

A REINARTZ RECEIVER.

A DESCRIPTION OF A RECEIVER WHICH IS VERY EFFECTIVE FOR THE RECEPTION OF SHORT WAVELENGTH SIGNALS.

By E. J. MARTIN.

AFTER testing the various methods of tuning on short wavelengths, more especially below 100 metres, the author came to the conclusion that the Reinartz type of tuner was best for the following reasons:—(*a*) On these short wavelengths it is just as sensitive as any other tuner. (*b*) Reaction control is remarkably smooth, and has very little effect on tuning. (*c*) Hand capacity effects can readily be eliminated.

vernier are usually satisfactory. The inductances should be wound with a minimum of supporting material, and a fairly thick wire, such as enamelled No. 18, be used, with the turns spaced to reduce the self-capacity of the coil.

The following is a description of such a set tuning from about 60 to 180 metres, the circuit being as shown in Fig. 1.

Coil L_1 has 25 turns of No. 18 enamelled wire wound on six ebonite rods, set in a

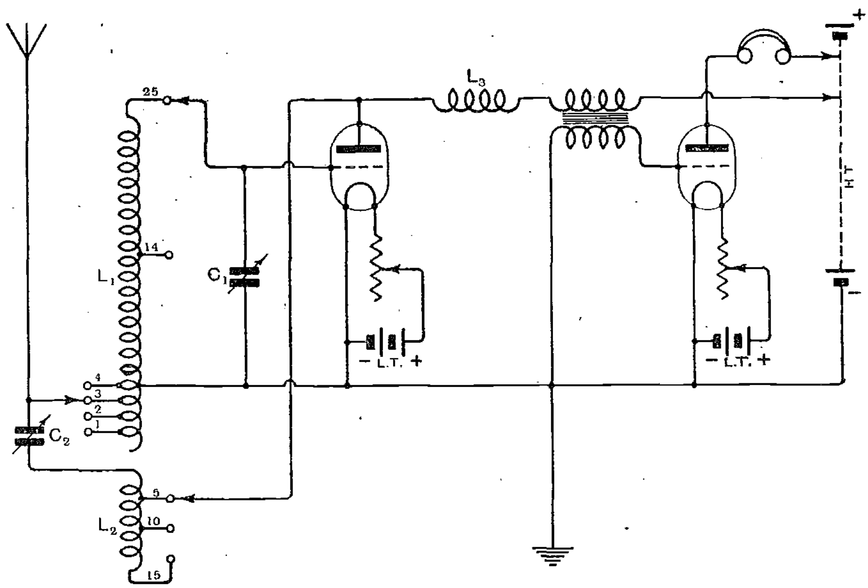


Fig. 1. *Connections of a Reinartz receiver with one stage of low frequency amplification. The construction of the coils marked L_1 and L_2 is indicated in Fig. 2.*

For tuning below 100 metres special care should be taken in the design of the inductances and condensers. The tuning condensers should be of the best construction, having low losses and a small minimum capacity. Square law condensers with a

circle $5\frac{1}{4}$ ins. in diameter, as indicated in Fig. 2. The rods are supported by wooden rings made of three-ply wood. Three supporting rings are employed. This is advisable, as otherwise the ebonite rods tend to warp and loosen the windings. The turns are spaced 1/10th of an inch, the wire being wound in slots cut in the rods with a hacksaw.

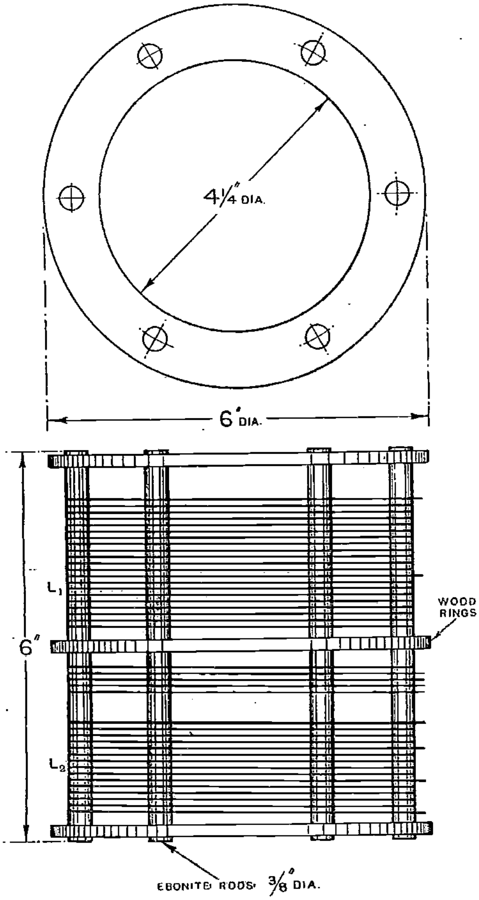


Fig. 2. The arrangement of the former and windings for coils L_1 and L_2.

Before winding, a suitable length of the wire should be unwound from the bobbin and stretched to remove the kinks. Tappings are taken at the first, second, third, fourth and fourteenth turns by scraping off the enamel insulation for a short distance and soldering on short lengths of tinned wire. Connection is made to these taps by spring clips.

Coil L_2 has 15 turns of No. 18 enamelled wire wound in a similar manner to coil L_1, a space of ¾ in. being left between the two windings. Both windings are wound in the same direction on the same former. Tappings are taken at the 5th and 10th turns.

A high frequency choke coil, L_3, having 200 turns of No. 36 D.C.C. wire wound on a cardboard former 2½ ins. in diameter, is employed between the anode of the first valve and the primary winding of the inter-valve transformer.

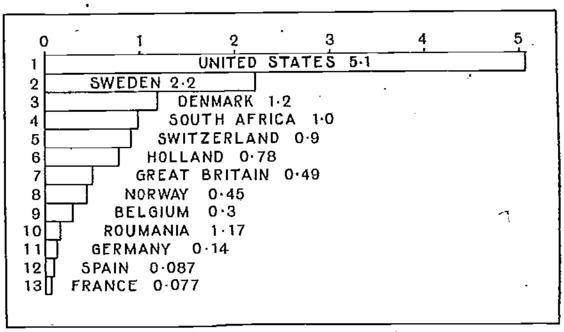
Condenser C_1 tunes the secondary circuit, and is of the square law type, having a maximum capacity of 0·0003 microfarads. The moving plates are connected to earth. Tinfoil is pasted on the back of the dial, and this is connected to the moving plates, thereby eliminating hand capacity effects.

The reaction condenser C_2 is an ordinary tuning condenser of 0·0003 microfarads maximum capacity.

The components should be well spaced, and the inductances especially should be well clear of surrounding objects. As in many receivers, the sensitivity of the set depends a great deal upon the efficiency of the valve as a detector. This depends upon the anode voltage, and upon the point where the earth tap is connected to the filament battery, that is to say, on the grid potential. In the set constructed by the writer a Wecovalve was used as a detector, which worked best when connected as indicated in the diagram. Ordinary hard valves require a grid condenser and leak.

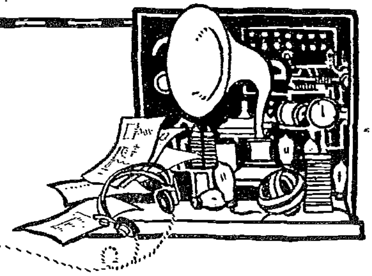
Trouble may be experienced in making the receiver oscillate when it is working on or near the fundamental wavelength of the aerial. This difficulty may be overcome by connecting a suitable loading coil in the aerial circuit, thereby raising the fundamental to a value above the highest wavelength of the set.

A number of American amateurs are now working on short wavelengths, and they are received very loudly on this receiver.



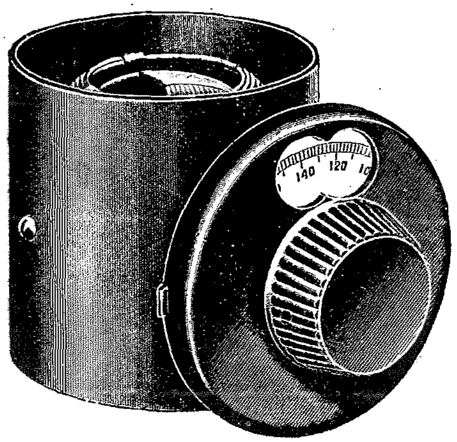
An interesting diagram, which recently appeared in "Radio-électricité" showing the number of broadcasting stations in proportion to millions of population in the principal countries of the world.

NEW APPLIANCES.



The Igranic Variometer.

An entirely new principle of variometer design has been introduced inasmuch as the windings are made self-supporting without the aid of solid moulding and to all intents and purposes the coils may be said to be



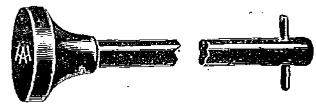
The new type Igranic variometer.

air supported. This form of construction is extremely efficient, and will no doubt be welcomed by those who are looking for something better in variometer design. The self-capacity of the winding is low, whilst a high value of mutual inductance is obtained between the two coils. A Paxolin tube surrounds the windings to give them mechanical protection, whilst the variometer is attached to the panel by one-hole fixing.

The instrument is supplied in two types, one covering a band 280 to 650 metres, and the other 700 to 2,400 metres, when connected to an aerial of the usual dimensions.

Anti-Capacity Extension Handle.

Designed ordinarily for use with the variable grid leak manufactured by Messrs. A. H. Hunt, Ltd., this extension handle can easily be adapted for use with almost any component instrument. It is only necessary to drill a hole in the centre of the knob and

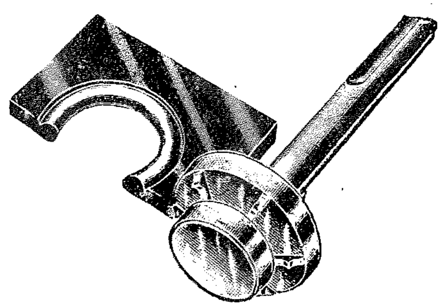


A useful extension handle.

make a saw-cut to carry the pin. A good positive drive is obtained and the hand is removed at a distance of several inches from the instrument panel.

The "Bezel" Beading Tool.

This useful tool enables the amateur to get a full true bead round a large-sized hole such as an inspection or valve window. Its end is fitted with a guide piece which keeps the tool centre in the hole. Six



The "Bezel" beading tool, a recent product of the Rockwood Co., Ltd.

steel cutters are suitably arranged to produce the bead and having surfaces so set that chattering is avoided and a good smooth cut obtained. The tool is obtainable in two sizes, suitable for use on holes of $\frac{3}{4}$ in. and 1 in. diameter. Extra sets of cutter blades are supplied.

VALVE TESTS.

MULLARD D 3 VALVES.

IN addition to the two valves of the D.06 type, recently reviewed in these pages, we at the same time received from the Mullard Radio Valve Co., Ltd., samples of another of their new productions known as the D.3.

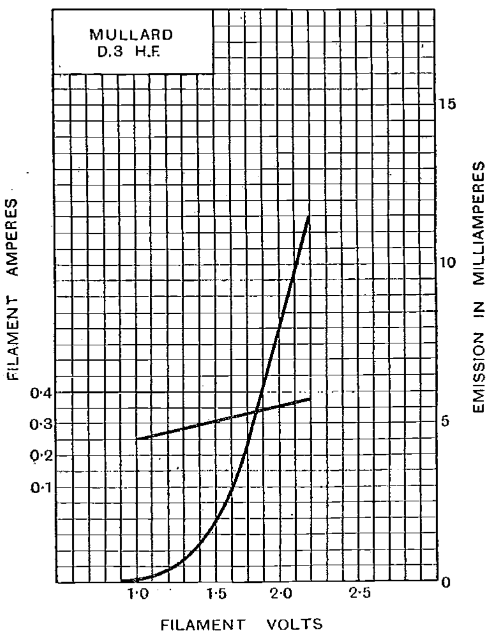


Fig. 1. Curves showing the filament current and emission for various filament voltages.

These valves are designed to work off one accumulator (1·8 to 2 volts), and consume about 0·35 ampere. As in the case of the D.06, two types are made, one having a moderately high impedance and suitable for H.F. amplification and detection, the other being designed for L.F. work and having a lower impedance.

The old cylindrical method of construction has been maintained in the D.3, but the electrodes are mounted on the slant, as was first done in the D.F. Ora, and more recently in the D.06.

Like all the newer Mullard valves, their appearance is very pleasing, the new ridged base adding to the effect, and we are glad to notice that the sealing device, already described in connection with the D.06, has been applied to this type, and, no doubt, will be extended to all this company's valves in due course.

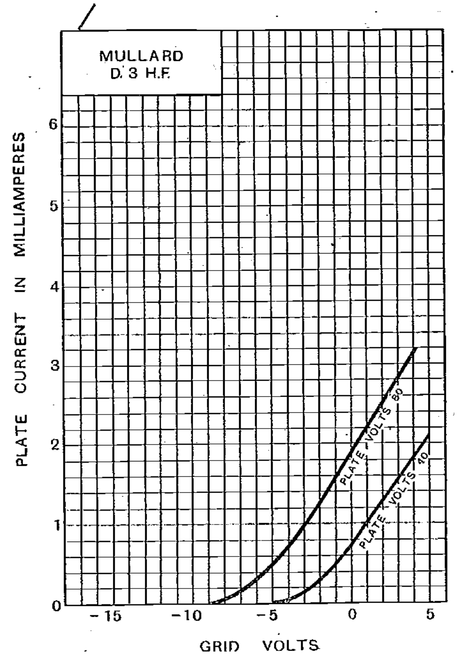


Fig. 2. Plate current-grid volts characteristic curves.

The results obtained from our usual bench tests are shown in Figs. 1 to 6. Figs. 1 to 3 refer to the H.F., and Figs. 4 to 6 to the L.F. valve. Figs. 1 and 4 show the filament characteristics of the two tested samples.

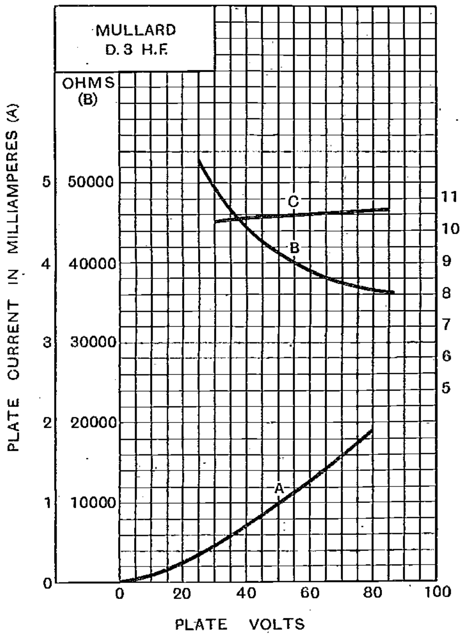


Fig. 3. Curves showing the variation of plate current (A), *impedance* (B), *and amplification factor* (C) *with plate volts.*

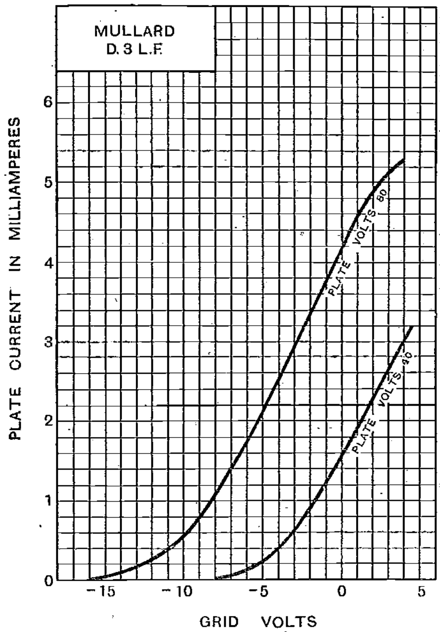


Fig. 5. Plate current-grid volts characteristic curves.

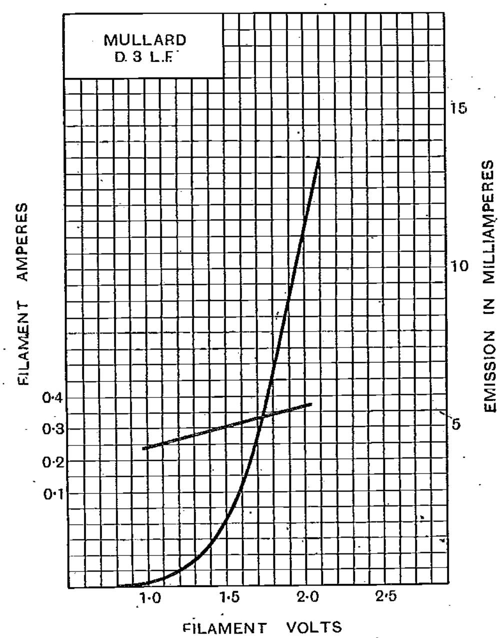


Fig. 4. The filament current and emission for various filament voltages.

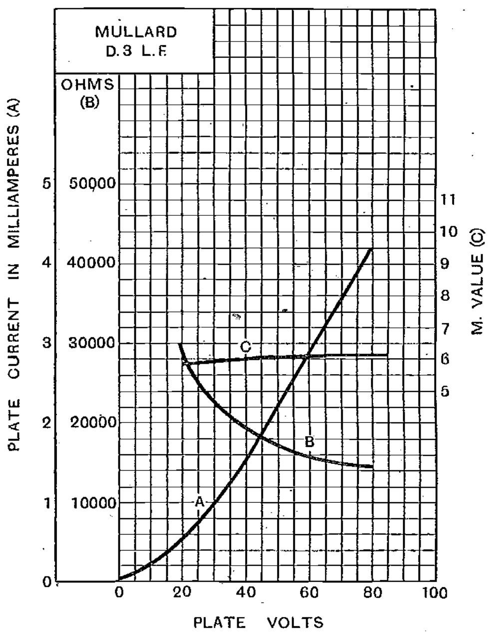


Fig. 6. Curves showing the dependance of the emission (A), *impedance* (B), *and amplification factor* (C) *on the plate volts.*

The emission, when the filament is connected straight across the 2-volt accumulator, is quite liberal, and the H.F. valve can usually be dimmed quite appreciably, for at 1·8 volts an emission of 6 milliamperes is obtained, which is ample for the purpose.

It is interesting to compare the two sets of plate-current grid-volt curves, Figs. 2 and 5, for as the plate voltages are 40 and 80 in both cases, the result of modifying the grid construction is very clearly shown. At a moderately low plate potential (80 volts) the L.F. valve shows a particularly good operating region, and should give excellent service. For maximum input a bias of, say, −4 volts should be applied to the grid. The L.F. valve has a magnification factor of about 6, with a plate impedance of approximately 20,000 ohms. The value of these factors for the H.F. type are substantially higher, being of the order of 10 and 35,000 ohms respectively. Once more the effect of modifying the grid can be appreciated by observing the differences in similar curves of Figs. 3 and 6.

These valves were submitted to a particularly long circuit test. For the D.3 H.F., operating either as a H.F. amplifier or detector, a plate potential of 40 volts was used with excellent results. The setting was by no means critical, however, and any H.T. voltage from 40 to 60 may be used.

For the L.F. valve, we used 80 volts on the plate, and a grid bias of negative 4. Good clear reception was obtained, quite free from distortion.

The D.3 type of valve may be recommended.

AN INTERESTING RECEIVER.

THE W.P. "EZI" WIRING SERIES No. 4.—THE FOUR VALVE COMBINATION RECEIVER.

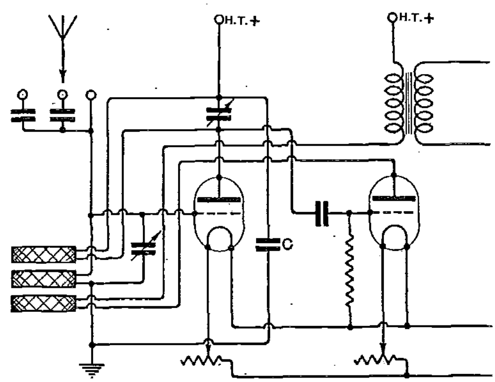
By W. JAMES.

This receiver was designed to give the maximum degree of amplification with selectivity and purity. A total of four valves are employed, the first giving high frequency amplification, the second detection, and the third and fourth power amplification. The first and last valves may be switched out when desired.

Among the special features of the receiver is the method of connecting the first valve. To bring it into use and so obtain H.F. amplification, it is only necessary to turn on the filament resistance. When H.F. amplification is not required, the filament resistance is simply turned off. The anode circuit then automatically becomes a secondary circuit between the aerial and the detector.

For the benefit of readers who would like to try this arrangement, a circuit of the H.F. portion is given in the accompanying figure, from which it will be seen that the aerial coil is mounted in the central holder, and the reaction and anode coils in the outer holders of a three-coil tuning stand.

The booklet contains four beautiful photographs of the receiver printed on art paper, four full-size drawings (20 ins. by 8 ins.), and a theoretical circuit and practical wiring diagrams printed in four colours, with full



The condenser C should have a fairly large capacity, such as 0·005μF.

instructions regarding the components, their assembly, and the operation of the receiver.

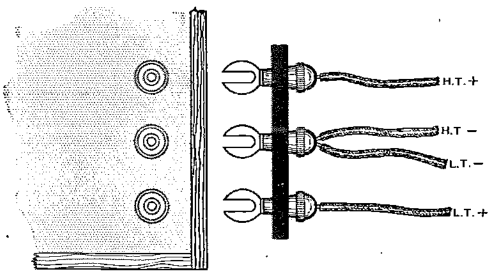
Published by the Wireless Press, Ltd., price 2s. net, or 2s. 2d. post free, and obtainable from all booksellers.

READERS' PRACTICAL IDEAS.

This section is devoted to the publication of ideas submitted by readers and includes many devices which the experimenter will welcome.

Foolproof Connections.

WHEN a number of connections such as positive and negative H.T. and positive and negative L.T. have to be made to a receiver each time it is used, trouble can be saved and the risk of wrong connections eliminated by using a terminal strip. Holes should be drilled in a strip of ebonite corresponding with the positions of the terminals of the receiver and spade terminals passed through the holes with the nuts screwed up from the reverse side. The appropriate wires are permanently connected to the spade connectors and thus by a single operation the battery connections may be removed from the set. By unevenly spacing the terminals the chance of completely reversing the strip is avoided.

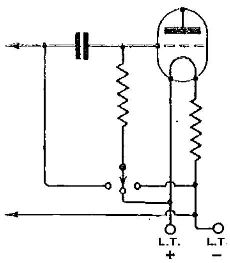


Spade connectors carried on a strip of ebonite simplify the connecting up of the battery leads.

A. R. G.

Regulating Grid Potential.

THERE are three usual methods of connecting up the grid leak in a detector valve circuit. It may be connected across the grid condenser, while the lower end of the inductance may be connected either to the positive or negative of the L.T. battery, depending upon the potential required. Under certain conditions a positive potential may be required, whilst in others the grid may need to be negative, the best adjustment depending upon the type of valve used and whether it is desirable to stimulate self-oscillation. By introducing a three-way switch the grid leak can be connected across the grid condenser or may be applied to either the positive or the negative of the battery.



The use of a three-way switch for regulating grid potential.

K.S.W.

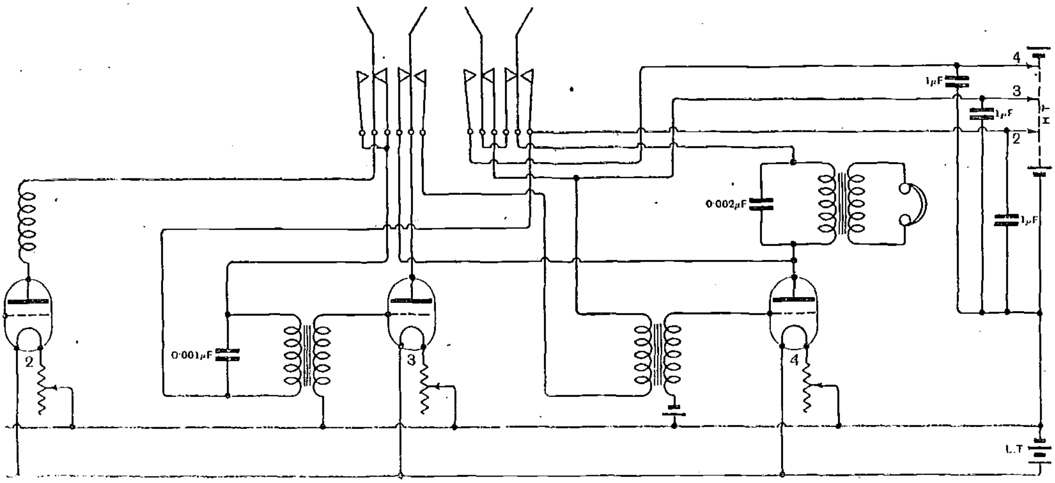
Setting Indicator for Rotating Dials.

TO make a setting point for the rotating dials of variable condensers, variometers, etc., drill a hole through the panel at the required spot and plug it with a peg made from a white Eronoid knitting needle, which should be driven in fairly tightly with a little seccotine or other adhesive. The projecting pieces can be trimmed off flush with a sharp chisel or file and rubbed down with the remainder of the panel. The edge of the rotating dial should slightly overlap the white spot; it is, then quite unnecessary to use a centre line across it as the division marks on the edge of the dial can be observed quite accurately with regard to the position of the dot.

J. H. S. F.

the varnish will distribute itself uniformly throughout the winding and only a minimum quantity will be retained.

C. A. J. B.



Dewar key switching of low frequency amplifying stages, in which provision is made to pick up suitable H.T. battery potentials.

An Improved Switching Circuit.

WHEN introducing a switch for changing the number of low frequency amplifying stages in circuit, care must be taken to see that changes are not made in the potentials applied to the plates of the valves. In the accompanying circuit this has been provided for, and it will be observed that the valves are correctly operated as regards H.T. potential, irrespective of the number of amplifying stages in operation.

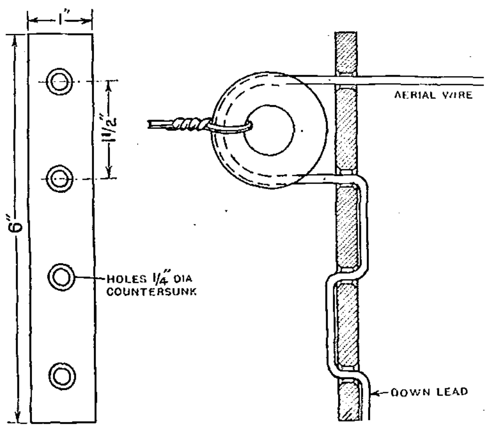
V. E. S.

Removing Excess of Varnish.

PILE wound coils are sometimes immersed in varnish in order to thoroughly impregnate them so that when dry they are quite hard and the turns held firmly together. Excess of varnish, however, is undesirable, and if the coils are hung up to drain it will be found that the surplus liquid does not run through but evaporates rapidly and collects on one side of the coil. A simple method of overcoming this is to mount the coil on a wooden former which has a centre hole, so that a metal screw can be passed through, and nuts clamped up on either side. Then by holding the stem of the screw in the chuck of a small hand brace the coil can be rotated at a high speed. When revolving,

Aerial Wire Terminations.

BY passing the aerial wire through holes in an ebonite strip a termination can be made on the insulator which will



Adjustable clamp for securing the aerial wire to the insulator.

provide for adjusting the length and tension on the aerial as may be required.

E. R. P.

THE EXPERIMENTER'S NOTE BOOK.

By W. JAMES.

The Super-Heterodyne Receiver for Telephony.

THE beginner sometimes experiences difficulty in understanding why an oscillator and two detectors are required in a super-heterodyne receiver employed for the reception of telephony. At first it seems that only one detector—as in ordinary receivers—is required. A super-heterodyne receiver, however, is an instrument which changes the wavelength of the incoming telephony and then amplifies it at the different wavelength. To change the wavelength an oscillator and a detector are employed, and it is customary to refer to this portion of the receiver as the "wave changer." When one valve is used in the oscillator and another in the detector, the arrangement is referred to as a two-valve "wave changer." Some super-heterodyne sets of the latest design have a single-valve wave changer, the one valve giving rectification and generating oscillations. Such sets are manufactured by the Radio Corporation of America and one was described recently in this journal.

The operation of the receiver may be explained with Figs. 1 and 2. In Fig. 1 we have diagrammatically the arrangement of a super-heterodyne receiver arranged for telephony and in Fig. 2 a series of curves, showing the currents flowing in the various parts of the receiver. First we have the currents flowing in the aerial and tuner due to the latter being tuned to a telephone transmitter sending

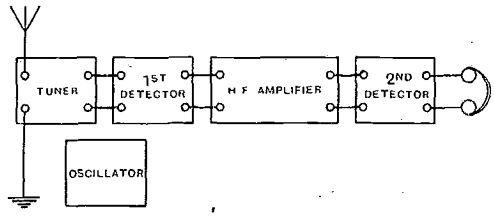


Fig. 1. The arrangement of a super-heterodyne receiver for telephony reception.

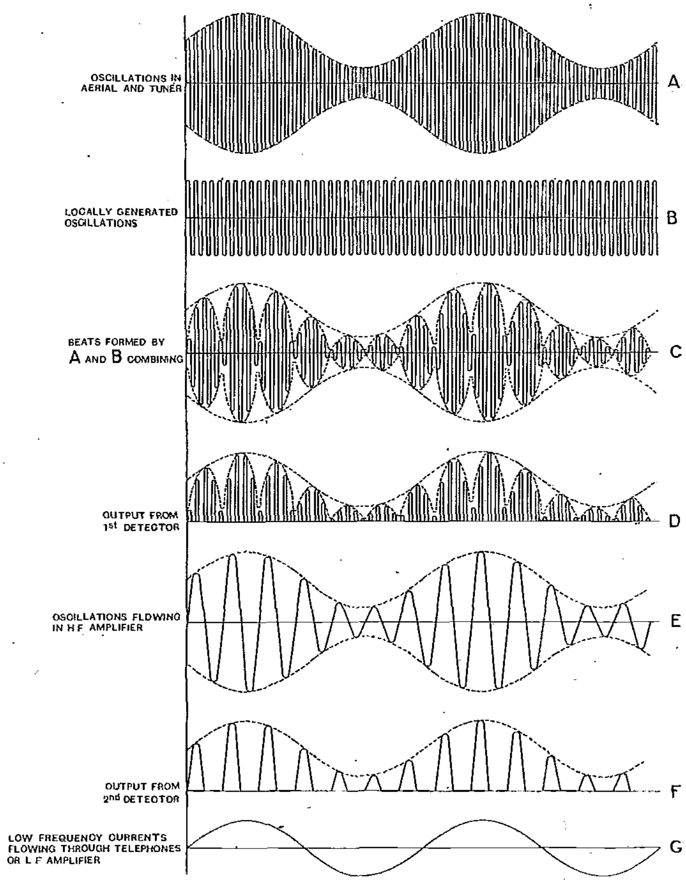


Fig. 2. A series of curves showing the operation of a super-hetero-dyne receiver. Unfortunately it is not possible in a diagram of this size to give a scale drawing.

out a single note. These are represented by curve A. Their wavelength may, for instance, be 300 metres, corresponding with a frequency of 1,000,000 cycles per second and a modulating frequency of say 1,000 cycles. If the oscillations were tuned in on an ordinary receiver a note of 1,000 cycles would be heard in the telephones. Coupled to the tuner is an oscillator that may be adjusted to produce oscillations having a frequency above or below that of the incoming signal. The oscillations set up in the tuner by the oscillator are represented by curve B, and may, in a practical case, have a frequency of 1,060,000 cycles.

Thus in the tuner, which is connected to the first detector, we have oscillating currents of two frequencies and they combine to form a beat frequency as indicated in curve C. Notice that the outline or envelope of the signal is unchanged, but that the amplitude of the oscillations is varying at a high frequency.

The frequency of the beats is the difference in the frequency of the incoming signal and of the local oscillations—in this instance 60,000 cycles. A current having a frequency of 60,000 cycles cannot, of course, be heard in telephone receivers, and in fact corresponds with oscillations having a wavelength of 5,000 metres.

Curve D represents the rectified currents flowing in the anode circuit of the detector. Now the anode of the detector is connected to a circuit tuned to 5,000 metres; the oscillating currents having a wavelength of 300 metres therefore pass through this circuit and return to the filament side of the detector, while the oscillations having a wavelength of 5,000 metres are passed to the high-frequency amplifier. The currents flowing in the amplifier are therefore modulated currents having a wavelength of 5,000 metres, as indicated in curve E. These are rectified by the second detector, producing currents as in curve F in the anode circuit of the detector. The high-frequency component of the signal passes to the filament through the condenser, which is usually provided in the circuit, leaving the signal as in curve I to operate the head telephones or be amplified in the low frequency amplifier.

A study of the curves should enable the reader to understand exactly the principles of the super-heterodyne receiver, and will certainly enable him to obtain better results from a receiver of this type which he may make up from a published description.

The Use of a H.F. Amplifying Valve Before the First Detector.

It is usual to employ a frame aerial with a super-heterodyne receiver and to couple the source of local oscillations to the grid circuit of the first detector, as illustrated in Fig. 1. The locally generated oscillations therefore flow in the frame aerial and cause oscillations to be radiated. However, the local oscillations are usually so we k that very little or no interference is experienced as a result of the locally generated oscillations flowing in the frame aerial. But if an outdoor aerial and earth are employed, as indicated in Fig. 3, a relatively considerable amount of energy may be radiated and cause interference to other listeners. This is quite

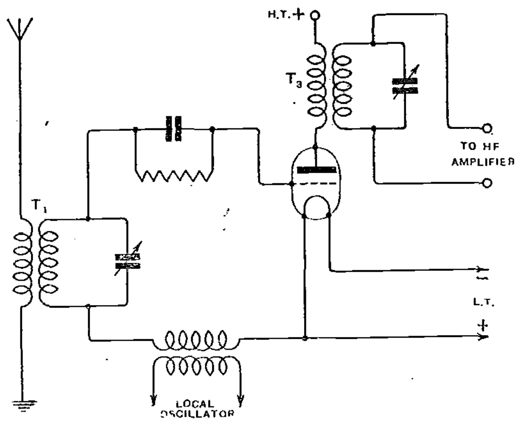


Fig. 3. Interference can be caused by employing an outdoor aerial in this manner.

undesirable, but yet there may be occasions when it is required to employ the outdoor aerial in place of the relatively inefficient frame aerial.

The radiation of energy due to the local generator of oscillations may, for practical purposes, be eliminated by employing a valve between the aerial and the first detector, as indicated in Fig. 4. Here we have the aerial coupled by a transformer T_1 to the grid of the first valve and an intervalve transformer T_2 between the anode of the first valve and the detector. The local oscillator is coupled to the grid circuit of the detector; hence only weak oscillations which pass through the capacity of the first valve reach the aerial. If the first valve and transformer are arranged on the neutrodyne principle, the amount of energy flowing from the first oscillator to the aerial is negligible.

In the figure we show an untuned transformer. If a tuned transformer is employed another adjustment is added to the set which is undesirable. The special merit of the super-heterodyne receiver is, of course, the selectivity and sensitivity which is secured with only two tuning adjustments. Tuning is rendered difficult if a third critical adjustment is added.

It should be remembered, however, that the selectivity of the set depends a good deal on the tuner—whether the latter comprises a frame aerial tuned with a condenser, or tuning coils and a condenser connected to an aerial as in Fig. 3. Therefore a good tuning condenser and good coils must be employed if reasonable selectivity is to be secured. However, even though the best components are employed, it is sometimes desirable to improve the selectivity. This can be done by using one stage of tuned high frequency amplification before the first detector, as indicated in Fig. 4. The selectivity of the set is then considerably better than without the stage of high frequency amplification.

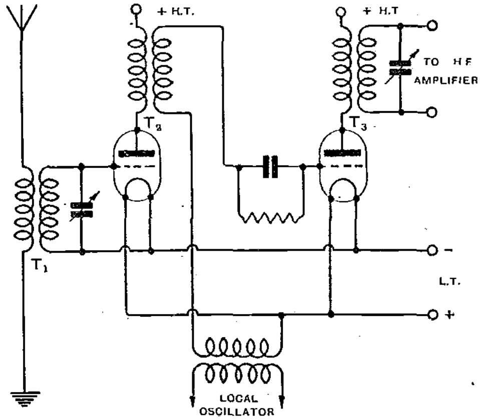


Fig. 4. Showing the connections of a high-frequency stage of amplification to prevent radiation, give sharper tuning and increase signal strength.

CORRESPONDENCE.

The Post Office and Receiving Licences.

To the Editor of THE WIRELESS WORLD AND RADIO REVIEW.

SIR,—Attention having been called to the concluding paragraph of your article entitled "The Post Office and Receiving Licences" in the current number of *The Wireless World and Radio Review*, I am directed by the Postmaster-General to state that you are right in assuming that no alteration is being made in the arrangement under which an experimenter who uses several wireless receiving sets in the same room or building in the course of his experimental work is not required to take out more than one wireless licence in respect of them.

F. J. BROWN.

General Post Office,
London, E.C.1.
January 2nd, 1925.

Chelmsford Reception in Poland.

To the Editor of THE WIRELESS WORLD AND RADIO REVIEW.

SIR,—I would like, through your excellent paper, to express my gratitude to the Chelmsford station (5 XX) which in spite of the distance of 1,600 kms. we can hear nearly every day, better than any other European station. This fact, combined with the excellence of the programmes, is most gratifying.

If I am not mistaken, the Chelmsford station has recently been working on rather lower than 1,600 metres. We are generally able to listen to Paris (1,500 kms.), Rome (1,400 kms.), Moscow (1,000 kms.), and German stations (700-800 kms.).

Our set is a six-valve French make and is installed in our local Club in Brzesc on Bug (Poland).

JADEUSZ FEDOROWICZ.
(*Chairman of the Radio Section*).

Calls Heard in Mosul.

The following letter is of special interest, the receptions referred to having been carried out by an operator in Mosul with whom several British amateurs have worked.

To the Editor of THE WIRELESS WORLD AND RADIO REVIEW.

SIR,—I attach a list of calls heard for insertion for interest to those concerned.

British—2 NC, 2 XA, 2 OD, 2 KF, 2 NM, 2 WJ, 6 NF, 5 NN, 5 RZ, 5 BV, 5 MO, 2 WJ, 2 SZ, 2 NO, 2 SH.

U.S.A. 1 ABS, 2 YT, 4 XE.

French—8 B, 8 QG, 8 SM, 8 S, 8 SSC, 8 YG, 8 DU, 8 AQ, 8 RO, 8 FC, 8 GM, 8 TG, 8 AP, 8 FQ, 8 UU.

Dutch—PC 1, 0 CTU, NSF.

Finnish—FN 1 B, FN 2.

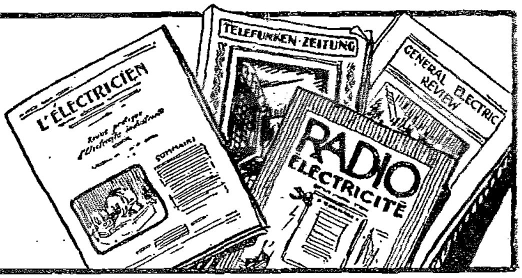
Danish—7 EC.

(o-v-o).

R. F. DURRANT.

Mosul, Iraq.

PATENTS AND ABSTRACTS



Variable Condensers.

An interesting variable condenser is sketched in Fig. 1. A containing shell is formed of two thin dished celluloid sheets, A_1 and A_2, joined at their edges, B. A wire, C, bent in the form of a semi-circle, lies inside the shell, and one end, D, is employed as a connection. The shell contains a conducting

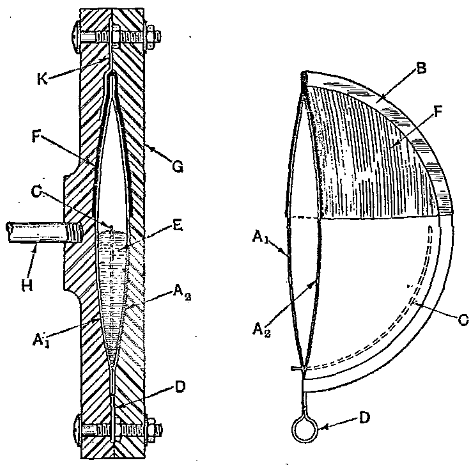


Fig. 1. *A novel variable condenser.*

liquid—for instance, mercury—filling preferably a little less than half the chamber of the shell. On the outer face of the wall of the shell is a conducting coating F, which may be of metal foil. In order to produce the largest possible capacity for a given size, it is preferable that the metal coating be as closely in contact as possible with the surface of the walls A_1 and A_2; for example, by chemically or electrolytically precipitating the metal thereon. Also these surfaces may be sprayed with powdered metal, or coated with metal-containing paint. The complete shell thus formed may be enclosed in an insulating housing G, having a spindle H by means of which the casing may be rotatably mounted. The condenser is mounted so that the central plane of the shell is vertical.

The capacity of the condenser is practically zero when the portion of the shell carrying the metal coating is in the upper position. The capacity of the condenser is greatest when the case G is turned so that the conducting liquid E is covered by the whole of the metal coating. This variable condenser is described in Patent No. 223,831.

A Variable Grid Leak.

The variable grid leak sketched in Fig. 2 is of the type in which the resistance is varied by adjusting the length of high resistance material between the terminals of the leak (Patent 224,295). Referring to the figure, 1 is a tube of ebonite bored as indicated, with a metal plug and terminal 2 at one end, and a threaded bush 3 at the other. A short length of screwed brass 4 passes through the

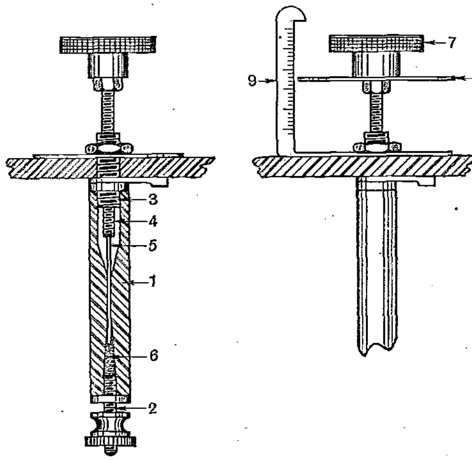


Fig. 2. *A grid leak.*

bush and carries at one end the knob 7, and at the other end a contact pin 5. In the tapering portion 6 of the container is a high resistance material such as powdered graphite, a paste of slate powder in oil or Indian ink. The resistance between the terminals of the leak is adjusted by turning the knob. When the contact pin is screwed down to touch the end of the plug 2, the resistance is zero, and as the pin is withdrawn from this position the resistance increases, until, when the pin is removed completely from the high resistance material, the resistance is very great.

The resistance may be calibrated with the aid of the dial 8 and the scale 9.

Duplex Wireless Telephony.

In duplex telephone systems using the same frequency for telephoning in both directions, it has hitherto been thought necessary accurately to tune each transmitting station to the frequency to be employed. It is well known, however, that it is extremely difficult to get two stations tuned to the same frequency. According to this invention (Patent No. 207,827), these difficulties are overcome by so arranging one of the stations that it is caused to radiate oscillations of the desired frequency by the oscillations received from the other station. This is effected by employing a valve, and by influencing the grid of that valve by the incoming oscillations.

Fig. 3 shows two intercommunicating stations A and B. Station A is provided with a valve generator, having connected to its anode and grid a circuit 1 tuned to the frequency to be employed. Speech currents may be applied to the grid in the well-known way through a transformer 2. Station B has a valve, the grid circuit of which contains a coil 3 coupled to the aerial, so that the oscillations from station A influence the grid of the valve at B; consequently the valve at B, by means of coils 4, 5, impresses upon its aerial oscillations of this frequency. Speech currents are applied to the grid through a transformer 6, and telephones are connected in the anode circuits of the valves.

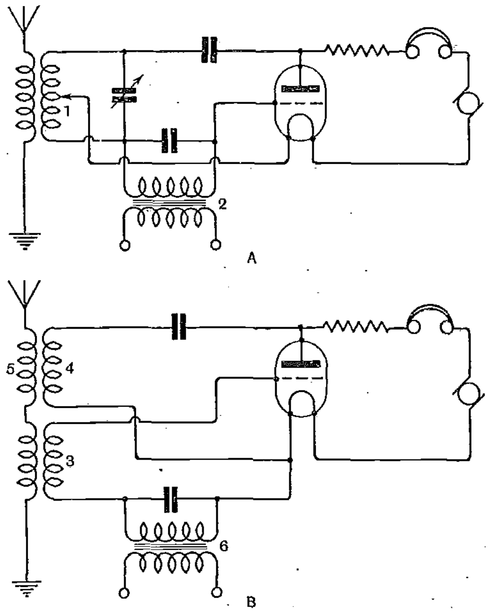
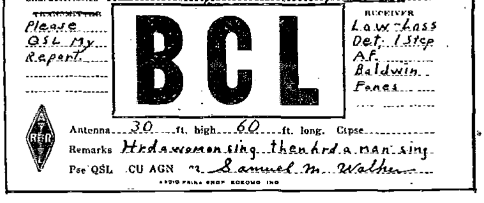


Fig. 3. Duplex wireless telephony.

The speech which sets up the currents in the primary of transformer 2 at station A will be reproduced in the telephones of station B, and, similarly, speech at station B will be heard in the telephones of station A.

In some instances, of course, it may be desirable to interpose an amplifier between the aerial and coil 3.

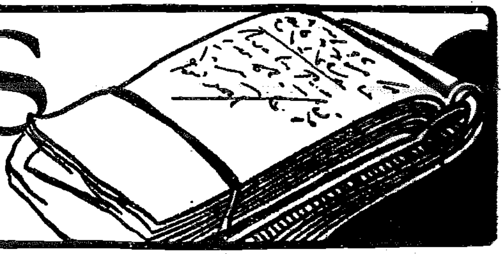


SAMUEL M. WALKER 8 E. Henrietta St. BALTIMORE, MD. U.S.A
Radio 2LO NOVEMBER 25, 1924
Ur. Fone SIGS RECD Here About 11.50 P.M. E.S.T.
Characteristics QRZ But good Modulation, QRM
Please QSL My Report.
BCL
RECEIVER Low-Loss Det. 1 Step A.F. Baldwin Fones
Antenna 30 ft. high 60 ft. long. Ctpse
Remarks Hrd a woman sing then hrd a man sing
Pse QSL CU AGN 73 Samuel M. Walker

NOT A TRANSMITTER.

From a first glance at the accompanying QSL card the impression is gained that Mr. Samuel M. Walker is a transmitter. The familiar "call letters" stand, however, for "broadcast listener" The use of such a card by holders of receiving licences has, we understand, been authorised by the American Amateur Relay League.

NOTES & NEWS



A course of lessons in English is to be given from the Vienna broadcasting station by Professor MacCaul Smith, President of the Vienna Progress English Club.

* * * *

Telegraphic and wireless communication has been established between France and Soviet Russia, states our Paris correspondent.

* * * *

Two-way communication was carried out between G 2 OD (Mr. E. J. Simmonds) and Mexican 1 B at 8 a.m. on January 1st.

* * * *

About 2,700 licences have been issued for wireless receivers in the Irish Free State.

* * * *

During the recent gales the head of the mast at the Cullercoats wireless station was blown down. Work was continued with a temporary aerial.

* * * *

Complaints are made that telephone lines used by the Bournemouth Fire Brigade are being employed to support wireless aerials. The Town Council has decided to take action against offenders.

* * * *

RECORD AMATEUR OVERLAND TRANSMISSION ?

Mr. J. A. Partridge (2 KF) of Merton Park, has received a communication from Mr. Richard Jamas, of Saigon, French Indo-China, confirming the reception of his signals on Saturday, December 6th, at a strength of R 1-2. Mr. Jamas, whose address is 21 rue Richard, Saigon, employed a three-valve (1—v—1) receiver.

This transmission of seven thousand miles, mostly overland, probably constitutes an amateur record.

STORM UPSETS DUNDEE PROGRAMME.

Dundee listeners on January 2nd experienced a new form of simultaneous broadcasting, states the *Dundee Courier*. Owing to the heavy storms which have been sweeping the country many telephone lines broke down and broadcasting stations were isolated. The engineers of the Dundee Relay Station got over the difficulty by tuning-in the Chelmsford station on a valve set and retransmitting the news bulletin and talks. The bad atmospherical conditions caused some disturbance, otherwise the transmission would have been perfect.

ARGENTINE DA 8.

An early Sunday morning vigil is being kept regularly by Mr. Carlos Braggio, DA 8 (ex CB 8) of Buenos Aires, in the hope of two-way communication with British amateurs. Mr. Braggio would be especially glad if amateurs would call him before sunrise in England. Although it is now summer in the Argentine and atmospherics are plentiful, it is hoped that short waves and a modicum of luck will "do the trick."

DA 8 operates on 80 metres, with a power of 200 watts.

AUSTRALIAN WORKS WITH MOSUL.

In a letter which we have received from Mr. A. Nixon, of Manchester, our correspondent states that on Tuesday, December 30th, he intercepted signals exchanged between A 3 BD and GHH 1 (Mosul, Iraq). The Australian was first readable at 7.25 p.m. and the two-way messages were readable until 7.45 p.m.

NORTHOLT CAUSING BROADCAST DISTURBANCE ?

General Post Office wireless experts are making a thorough inquiry into the allegations that the Government wireless station at Northolt is responsible for the numerous interruptions which have occurred of late in the reception of broadcasts from 2 LO and the other British home stations, says the *Morning Post*.

General Post Office experts have contended that Northolt is not the offending station, but both professionals and amateurs are stated to have convinced the Post Office that a further inquiry is justified.

It is understood that when the experts have completed their inquiry a report will be made to the general public, and remedial changes will be made, if necessary, in the wavelengths.

THE PARIS AMATEUR CONFERENCE.

In view of the International Conference of Radio Amateurs in Paris during Easter, Mr. Gerald Marcuse, British representative of the International Amateur Radio Union, would be glad to hear from British amateurs who wish to attend. Mr. Marcuse may then be able to arrange for a party to proceed to Paris under special travelling facilities, provided the numbers are sufficient. As accommodation in Paris is limited during the Easter week, the desirability of making early arrangements will be apparent. Enquiries should be addressed to Mr. Gerald Marcuse, c/o The Radio Society of Great Britain, 53 Victoria Street, London, S.W.1.

PORTO RICO REACHES EUROPE.

A special programme was recently broadcast for the benefit of Spanish radio enthusiasts by the Radio Corporation of Porto Rico, a subsidiary of the International Telephone and Telegraph Co. from its station, WKAQ. The transmission was very clearly heard in Spain and many letters of congratulation have been received from all parts of Europe. The station is equipped with a Western Electric 500 watt transmitting set employing the Heisling modulation circuit with five valves.

AUTHOR'S BROADCAST RIGHTS.

In consequence of complaints regarding the broadcasting of copyright works in Spain, the Society of Authors is to hold an international congress in Madrid from May 16th to 18th, with a view to secure author's rights.

BELGIAN TRANSATLANTIC SUCCESS.

Successful two-way communication with Canadian and American amateurs is reported by Belgian P 2, who worked on December 10th with 3 BP, on a power of 50 watts. On December 21st his signals were stated to be of "wonderful strength" by 1 AR, with whom he worked on that date. On the same morning he carried on two-way communication with U 1BSD, U 1SF and U 1AAC.

MORNING RECEPTION OF U.S.A.

Interesting details on the "early" and "late" reception of U.S. amateur stations are forwarded by Mr. W. R. Burne, of Sale, Cheshire.

On Saturday, December 20th, he states, American stations were coming in strongly at 9.15 p.m., while on the following morning the last U.S. station was heard as late as 10.25 a.m.

It remains to be seen whether other British amateurs have picked up American signals at still more extraordinary times.

N.P.L. REPORT ON VARIABLE GRID LEAKS.

A number of exhaustive tests were recently carried out on six "Bretwood" variable grid leaks submitted to the National Physical Laboratory, by Messrs. Radio Improvements. The outcome of these tests is an interesting report, in which tabulated results are given together with graphs.

In every case the observations were made after one minute's electrification at a pressure of 100 volts. The current carrying capacity can of course be estimated for any given resistance value. To test the variation of resistance with time, three grid leaks were submitted to a trial extending over fifteen weeks, and the results obtained indicated comparatively small changes of resistance over this period. The influence of temperature on the resistance of three specimens was also measured between 20° and 27° C, and it was found that the average change in resistance was 6 per cent. for 1° C, the resistance decreasing with increased temperature. The graphs serve to show that the resistance of the grid leaks increases in practically a straight line with each turn of the knob. We understand that copies of this interesting report are obtainable from Messrs. Radio Improvements, Ltd., of 12 to 18 London Mews, Maple Street, London, W.1.

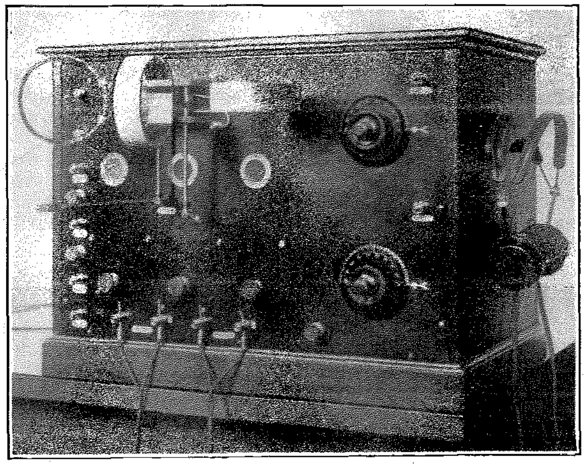
Simplifying the task of the broadcast actor. The method depicted above, in which the MS. of the play is projected on a screen, is now in use at 2 LO.

G 2NM RECEIVED IN INDIA.

Mr. Gerald Marcuse (2 NM) of Caterham, Surrey, has received a letter from India confirming that he is the first British amateur to be heard in that country. The writer is Mr. George Benzie, formerly an active amateur in Scotland, who now resides at Cachar, India. According to arrangement, Mr. Benzie listened for 2 NM's signals at 11.45 p.m (G.M.T.) on December 4th, and was rewarded by hearing strong and steady signals from the British station. Mr. Benzie is situated approximately 5,000 miles from London and 350 miles N.E. of Calcutta. His set is of the home-made variety, employing three valves, and his aerial, a four-wire cage, is 40 feet high and 80 feet long. Many U.S. and several Australian and New Zealand amateur stations have been heard, and the Europeans picked up include 8 BF, UFT 2, and SMZY.

CZECHO SLOVAKIAN AMATEUR ?

On the night of December 30th, states Mr. L. H. Thomas (6 QB), of West Norwood, he picked up a C.W. call at 10.45 G.M.T. on 84 metres, which ran as follows : " 5 MO 5 MO gcs OK 1 OK 1." It is possible that the prefix " CS " stands for Czecho - Slovakia, and Mr. Thomas would be glad to know if any other reader has heard this or any other Czecho - Slovakian station. OK 1 was pure C.W. and his signals were received at R5-6 on a two-valve set (0—v—1).



A neatly-designed receiver of home construction, built by Mr. A. M. Nimrod, of Edinburgh. The set comprises three valves (1—v—1).

MORE EUROPEAN RECEPTION IN IRAQ.

Following on the reports of two-way working between British amateur stations and an amateur at Mosul, we have received interesting details of the reception of European short wave signals at Basrah, Iraq. The information reaches us from Mr. J. E. Long, Officer-in-Charge of Basrah Radio.

On December 2nd, 2 YT, the Poldhu experimental station, was heard transmitting to Cape Town at R9 strength with a clear and steady note. On the following day, GHH 1 (Mosul) and 8 BO were both received, the former clear and steady at R4, and the latter with a " warbling A.C. note " at a strength of R6. The receiver consisted of a two-valve loose-coupled straight circuit with reaction on the secondary. In the reception of 8 BO, the aerial consisted of a 12-ft. length of single-strand wire fastened to nails in a brick wall !

SWANSEA READERS NOTE.

Messrs Fuller's United Electric Works, Ltd., inform us that their Swansea depot has been removed from Pier Street to more convenient premises at 51 Waterloo Street.

A SOCIAL EVENING.

Members of the staff of Messrs. Peto & Radford held an enjoyable social gathering at the Grosvenor Hotel, Victoria, S.W., on Wednesday, January 7th, when the proceedings took the form of a concert followed by a dance. During the interval appropriate speeches were made by the Chairman and directors.

AMERICAN AND BRITISH RECEPTION IN SYRIA.

A noteworthy attempt to pick up the American and British broadcast transmissions during International Broadcasting week was made at Saad-Nail, near Beyrout, Syria, by Mr. G. H. J. Horan, of the Saad-Nail Observatory. Situated on the slopes of the Lebanon Mountains, and heavily screened by surrounding hills, the observatory was not an ideal spot for the experiments, but the results were distinctly encouraging. On November 26th and 28th, a programme of American origin was heard on between 70 and 80 metres, and probably emanated from KDKA. Heavy atmospherics, however, prevented identification.

The most interesting portion of Mr. Horan's report deals with his reception of the British stations during the relaying of the American transmissions. Fading was very pronounced, but the interesting observation was made that (according to the English announcer) fading from the American station did not coincide with the fading of the British transmission.

A two-valve receiver was used (0—v—1) with a 4-wire cage aerial 114-ft. long, having an average height of 40 feet.

SWEDISH DX WITH AMERICA.

The first amateur two-way communication between Sweden and America was accomplished on December 29th by Swedish SMZS (Teknolog T. Elmquist), and the American 1 CI. The power used by the Swedish station was 150 watts, a wavelength of 80 metres being employed.

BOOK RECEIVED.

Wireless Working Hints for Beginners. By Archibald Williams. (London : Percival Marshall & Co., 66 Farringdon Street, E.C.4.) pp. 94. With 58 illustrations. Price 1s. 6d. net.

Calls Heard

West Derby, Liverpool.
2 II, 2 IK, 2 MM, 5 BH, 5 GJ, 5 KK, 5 OK, 5 OC, 6 FY, 6 LC, 6 OW, 7 FS, 8 AL, 8 BN, 8 CF, 8 CN, 8 ÉG, 8 ÉO, 8 ÉU, 8 FJ, 8 FK, 8 FM, 8 GJ, 8 JK, 8 OK, 8 QG, 8 SM, 8 SR, 8 SG, 8 WL, 8 WZ, 8 XH, 8 ZM, 8 ZUT, 4 ALS, 4 GP, o RW, o SK, o ZA, 10 KQ. Finnish: 1 NA. (o—v—o.) (John F. Cullen, 5 OL.)

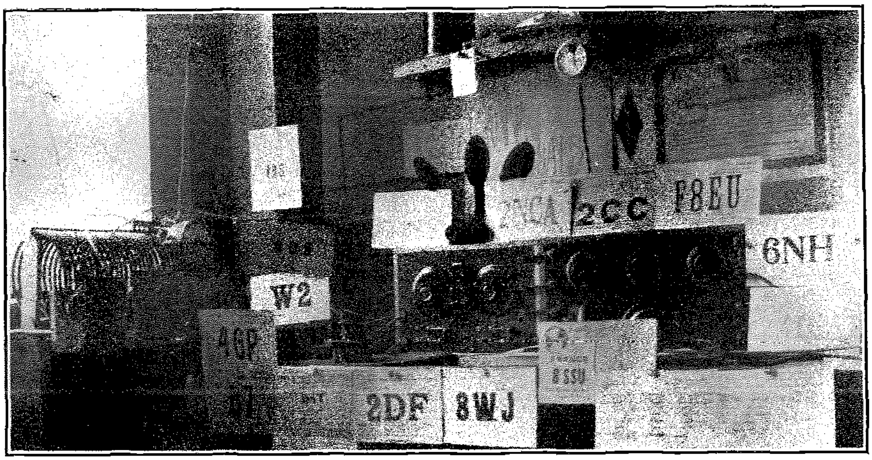
The Hague, Holland.
o AG, o BA, o CO, o GC, o II, o GR, o RS, o RW, o ZZ, 1 FP, 2 CC, 2 IN, 2 NM, 2 YT, 3 DAX, 4 RS, 4 UU, 5 TR, 5 UG, 6 AL, 7 ZM, 8 BRG, 8 CM, 8 CO, 8 FI, 8 FK, 8 HSM, 8 PA, 8 QG, 8 RG, 8 TM, 8 UU, 8 VV, 8 WL. (o—v—o.) (T. Zaalberg.)

Kirby Muxloe, near Leicester.
French: 8 AB, 8 AF, 8 DA, 8 DY, 8 FI, 8 FX, 8 GI, 8 GL, 8 GN, 8 SHF, 8 IP, 8 JB, 8 KD, 8 KK, 8 LLO, 8 NS, 8 PA, 8 QG, 8 RBR, 8 RO. Italian: 1 FP, 3 AF. Swedish: SMZY, SMXX. Canadian: 1 AR. American: 1 AAU, 1 AAY, 1 AUG, 1 BKR, 1 CG, 1 CMP, 1 CW, 1 KC, 1 OW, 1 XX, 2 BF, 2 CEI, 2 MU, 2 RK, 3 BG, 3 OGG, 4 OA, 4 TJ, 5 RU. Miscellaneous: 4 RS, 4 YZ, 1 OKZ. Finland: FN 2 NM, FN 2 MB. WGH. (F. H. Tyler.)

1 BDT, 1 BGQ, 1 AYI, 1 CKP, 1 CMP, 10 OP. Miscellaneous: AIN, YA 75, YA 77, 10 KZ, 7 BD, 9 AD, 3 XO, 3 ZP, 3 CM. (o—v—1.) (A. Simons.)

Macclesfield (during last week of November).
8 HSG, 8 AA, 8 DP, 8 EPS, 8 FNN, 8 GST, 9 AD, H 9 AD 13 AF, B 4 QS, A o AX (or A o AK) calling 8 GST. (Thomas Geeson, 2 SO.)

Stockton-on-Tees.
British: 2 GY, 2 NB, 5 HA, 5 MO, 5 RB, 5 RF, 5 UO, 6 GH, 6 LT, 6 TD, 6 US. French: 8 AB, 8 BRG, 8 BP, 8 CF, 8 CM, 8 DE, 8 DU, 8 ÉN, 8 ÉU, 8 FC, 8 FM, 8 GK, 8 GM, 8 GP, 8 HSM, 8 JV, 8 NK, 8 NS, 8 QG, 8 RV, 8 SG, 8 SR, 8 SSC, 8 UU, 8 WAL, 8 WL, 8 WV, 8 WZ, 8 XR, FL, UFT 2. Dutch: o BA, o GC, o II, o XF. Belgian: 4 ALS, 4 AU, 4 QS, 4 RS, 4 SS, 4 YZ. Luxembourg: L o AA. Germany: 1 CF. Switzerland: 9 AA. Italy: 1 ER. Sweden: SMYY, SMZZ. Finland: FN 1, FN 2 NB, FN 2 NM. American: 1 ANA, 1 BHM, 2 BGG, 2 BSC, 2 CVJ, 4 TJ. Unknown: 1 JXK, 10 KG, 9 BR. (J. W. Pallister, 2 AUH.)



A glimpse in the operating room at B 4ALS, owned and operated by Mr. A. L. Stainier, of Louvain, Belgium.

Braintree, Essex.
French: 8 AB, 8 AQ, 8 AU, 8 BD, 8 BM, 8 BRQ, 8 BV, 8 CN, 8 CZ, 8 DE, 8 DO, 8 DU, 8 ÉA, 8 ÉM, 8 ÉU, 8 FF, 8 FG, 8 FI, 8 FQ, 8 FS, 8 GI, 8 GK, 8 GM, 8 GO, 8 HIM, 8 HSG, 8 HSM, 8 II, 8 LL, 8 MN, 8 ON, 8 PP, 8 SG, 8 SM, 8 SSU, 8 TO, 8 UD, 8 UU, 8 WAL, 8 WV, 8 WZ, 8 XU, 8 ZU. American: 1 AN, 1 BGQ, 1 BX, 1 CA, 1 CMP, 1 II, 1 JXK, 1 KC, 1 PL, 1 XAV, 2 AWF, 2 BY, 2 CG, 2 RK, 3 AJ, 3 AJD, 3 BD, 3 CM, 3 LP, 3 OT. Canadian: 1 AR, 1 DQ. Australian: 3 JU. Danish: 7 EC, 7 ZM. Dutch: o AB, o BA, o GM, o IS, o ZZ, PA 9. Swedish: SMYY. Italian: 1 AM, 1 DO, 3 AF. Swiss: 9 AD. Belgian: 4 RS, 4 QS, 4 YZ, B 7, P 2. Finnish: FN 2 NM, FN 1 NA. Luxembourg: o AA, JXL. Unknown: 3 TO, 3 ZS, 4 AU, 3 EFEE, 4 TRA, 8 ARA, 8 PCA, 8 BGT, Q 8 TH, FZXH. (o—v—1 receiver.) (D. Woods.)

Smedsletten, Sweden.
British: 2 KF, 2 NM, 2 FN, 2 JF, 2 OD, 5 DN, 5 MO. French: 8 AB. Finnish: 2 NM, 3 CM. (B. Fredén.)

Mablethorpe, Lincs.
French: 8 AU, 8 BF, 8 BU, 8 CM, 8 CO, 8 DA, 8 ÉM, 8 ÉP, 8 ÉU, 8 FR, 8 GH, 8 GL, 8 IP, 8 LZ, 8 MR, 8 NS, 8 OK, 8 PA, 8 PP, 8 QA, 8 QC, 8 RG, 8 SM, 8 WL, 8 ZM, 8 LLO, 8 MAR, 8 MTZ, 8 RBR, 8 UMZ, 8 WAL, 8 ZUT. Swedish: SMXX, SMYY, SMZN, SMZQ, SMZY, SMZZ. Dutch: o BG, o KN, o RW, o ZA, o ZZ. Belgian: 4 GP, 4 RS, 4 QS, 4 UU, 4 YZ. Finnish: 2 NCA, 2 NM, 3 NB. American: 1 II, 1 SW, 1 YW,

UNKNOWN CALLS HEARD.

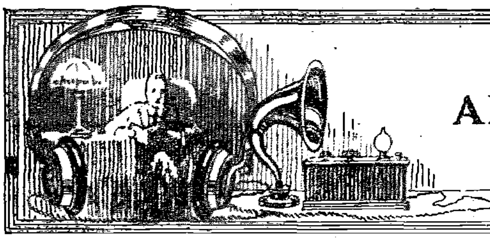
(Heard at Worksop, Notts.): 8 SSC, LOAA, 2 YT.
(Heard at Ipswich, 28.11.24): JAQ.
(Heard at Lymm, Cheshire, 6.12.24): S 7 BD.
(Heard at Brixton): 6 RM.
(Heard at Dingwall, N.B.): A 3 ZY.
(Heard at Wooler, Northumberland): 7 GQL 2, 7 GQL 3, O 8 LL.
(Heard at Queenstown, Ireland): UK 9 AB.
(Heard at Weybridge, Surrey), E 1 CM.

UNKNOWN CALLS.

The following information concerning unknown calls, recently published in this journal, is forwarded by Mr. R. E. Williams, of Holyhead.

"AIN is situated in Casablanca, Morocco, and belongs to the French Army Signal Corps, and works on a W/L. of approximately 50 metres. This information was supplied to me by F 8 BF last July, at which time he was conducting short wave experiments with AIN on 44 metres.

"I have also observed that a station with the prefix YA with different figures following, is published practically every week as received amongst the unknown calls by different amateurs, and this has been going on for some months now, and the figures following the YA are always different and has gone up from YA 1 to YA 77. I heard this station once give his position as "Penzance, South of England." So probably he is enjoying the fun of seeing reports published in your journal, and also finding just how far his signals can be heard, thus wasting the time of experimenters who would otherwise be doing real D.X. work."



AMONG THE SOCIETIES.

[Correspondence intended for Club Secretaries may be addressed c/o the Editor of this Journal.]

During the last two months junior members of the Wimbledon Radio Society have been able to profit from a series of elementary lectures on wireless by Mr. C. E. P. Jones. All lectures have been illustrated by specially prepared diagrams thrown on the screen by a reflecting lantern.

Mr. J. A. Partridge (2 KF) recently paid a surprise visit and provided an interesting account of his DX work with New Zealand amateurs.

Captain P. P. Eckersley is to lecture in the Compton Hall, Wimbledon, on Thursday, January 29th.

A nominal admission fee of 6d. will be made, the proceeds to be devoted to the Wimbledon Hospital.

* * * *

The Ilford and District Radio Society's recently constructed portable receiver is yielding excellent results on a short indoor aerial. Comprising four valves, the set is arranged to work on any combination of valves from one to four. For the construction of the receiver the Society is indebted to the Hon. Secretary, Mr. Gedge.

The Society is at present running an instructive competition in connection with which prizes are offered for various types of set built by members.

* * * *

The new session of the Holy Trinity (Barnsbury) Radio Club opens on January 16th. All radio enthusiasts over 16 years of age, residing in the Barnsbury district, are invited to attend the club meetings during the new session, which closes on May 22nd.

* * * *

The subject of "Aerial Tuning" was dealt with in an informative lecture given before the Beckenham and District Radio Society by Messrs. Igranic, Ltd., on January 1st.

An excellent programme of meetings has been arranged for the present session, and intending members should communicate with the Hon. Secretary without delay.

* * * *

At the last meeting of the Dorking and District Radio Society, Mr. L. F. Cooke gave the first of a series of elementary lectures on the underlying principles of wireless. These lectures, primarily intended for beginners, are held on the third Monday in each month. The next lecture will deal with wireless components.

* * * *

The Hackney and District Radio Society continues its useful series of "Vest Pocket" lectures. One of these recently given by Mr. Jones dealt with his interesting experiences in the nightly reception of KDKA. Mr. Van Colle gave an interesting talk on switching arrangements, and Mr. Phillips contributed with an explanation of how to determine the correct value of the filament resistance for any type of valve.

* * * *

A visit to 2 LO was paid by members of the Woking and District Radio Society on December 31st, an enjoyable and instructive afternoon being spent in the inspection of the apparatus and studios. The Society extends a warm welcome to new members.

FORTHCOMING EVENTS.

WEDNESDAY, JANUARY 14th.

Radio Society of Great Britain. Informal Meeting. At 6 p.m. At the Institution of Electrical Engineers, Savoy Place, W.C.2. "Some Notes on Short Wave Reception." By Mr. Stanley Ward.

Clapham Park Wireless and Scientific Society. At 7.45 p.m. At 67 Balham High Road. Lecture by representative of Alfred Graham & Co.

THURSDAY, JANUARY 15th.

Luton Wireless Society. At 8 p.m. At the Hitchin Road Boys' School. Experiment and Demonstration for Beginners.

Bournemouth and District Radio Society. Lecture: "Brown Apparatus: its Construction and Working." By Messrs. S. G. Brown, Ltd.

Woking and District Radio Society. At 7.30 p.m. "Valves." By Messrs. The Mullard Radio Valve Co., Ltd.

FRIDAY, JANUARY 16th.

Sheffield and District Wireless Society. At 7.30 p.m. At the Department of Applied Science, St. George's Square. Lecture: "A.C. Rectifiers." By Mr. C. H. Hainsworth.

Holy Trinity (Barnsbury) Radio Club. At 7.45 p.m. At Parish Hall, Richmond Road, Islington, N.1. Opening Meeting of Session.

MONDAY, JANUARY 16th.

Dorking and District Radio Society. At 7.45 p.m. At 65 South Street. Members' Evening with apparatus.

QSL CARDS WAITING.

The British amateurs 2 AWD, 2 GY and 2 XE are asked to communicate with the editor of the *Journal des 8* (Imprimerie Veuclin, Rugles, Eure, France), who is in possession of QSL cards intended for these amateurs.

MISUSE OF CALL SIGNS.

Mr. Norman Blackburne (2 AJB), of Hastings, has reason to suspect from reports received, that his call sign is being used illicitly in the Stockport (Manchester) district. As 2 AJB is licensed only for an artificial aerial, misunderstandings are likely to occur with the authorities, and he trusts that the publication of this note will have the desired effect.

A similar case is reported by Mr. William H. Neeld (2 ARB), of Wanstead, E.11, whose licence is for an artificial aerial. Signals from a station using his call sign are reported from the Bath district.

The unauthorised use of the call sign 2 AW, is reported by its owner, Lieut.-Commander Burbury (R.N., Ret.), of Crigglestone, Wakefield. 2 AW has not been in operation since March last.

READERS PROBLEMS

Readers desiring to consult the "Wireless World" Information Dept. should make use of the coupon to be found in the advertisement pages.

CHOKES FOR L.F. AMPLIFICATION.

MANY readers have written asking what is the most suitable value of choke to employ in choke-coupled amplifiers.

In order to secure pure reproduction with the choke method of amplification, the inductance of the choke must be sufficiently large to offer a high impedance to the lowest musical frequencies which the amplifier is required to deal with. A suitable value of choke is one having an inductance of 100 henries.

The windings of an ordinary intervalve transformer, when connected in series, are excellent for this purpose. If chokes of too low a value are used, distortion of the lower frequencies will occur.

In order to obtain a reasonable degree of amplification per stage a valve having a high amplification factor should be employed. Such a valve is the D.E.5 B. In cases where very great strength is expected to be delivered to the grid of the last valve of a choke-coupled, or, in fact, any type of amplifier, a valve of the L.S.5 type should be employed, as this valve has a long characteristic curve, and is capable of dealing with large power without distortion.

THE ELIMINATION OF NOISES DUE TO MAGNETIC INDUCTION.

SEVERAL correspondents have asked us whether we consider that the "bird-cage" type of aerial mounted on a single pole is suitable for the elimination of interference caused by the proximity of tramways.

This type of aerial is only effective for the purpose named when it can be definitely proved that the interference is caused by direct induction from the overhead trolley wires or the underground conduit such as is likely to be caused if the ordinary type of aerial running parallel to the roadway is used. This can be cured in many cases by running the aerial at as large an angle as possible to the roadway. In cases where this is impossible, however, the "bird-cage" type of aerial may be tried since no part of it will be parallel to the tramway conduits. It has, however, been our experience that most of the trouble which readers meet with from this cause is due to earth currents and not to magnetic induction. In these cases, of course, no advantage would be obtained by the use of this type of aerial and in order to eliminate this interference various expedients can be tried such as the connection of a condenser of large capacity, say 2 μF, in the earth lead. Failing this it will be necessary to employ a counterpoise in the manner suggested in the last issue.

A RELIABLE VARIABLE GRID LEAK.

A CORRESPONDENT has written asking us to suggest a suitable method for constructing a variable grid leak.

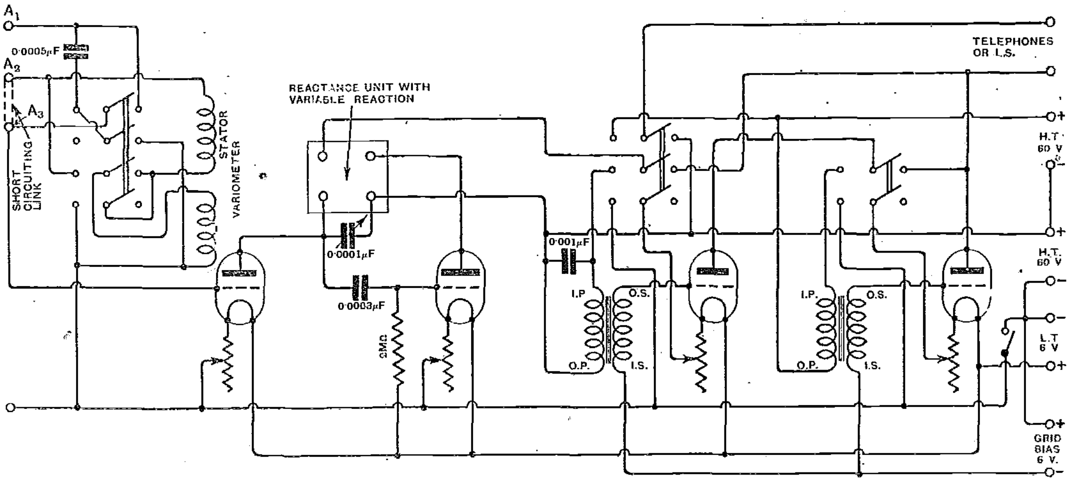
It is not to be recommended that home-made grid leaks of the ordinary type be employed in wireless circuits. Excellent results may of course be had when wiring up experimental circuits by using leaks of the pencil mark type, but these are naturally quite unsuitable for incorporating into finished receivers. It will usually be found that leaks of the carbon compression type will invariably give trouble in the long run due to "packing," and even in the commercial types it is seldom that the resistance value for a given setting of the adjusting knob remains constant for any given length of time.

The case is quite different when dealing with fixed leaks made by reputable firms as their value can usually be trusted to remain constant provided that they are not brought into contact with a hot soldering iron, or similarly ill-used. It is noteworthy in this respect that so far manufacturers of these highly reputable components have not attempted to produce a variable grid leak, they apparently realising the difficulties in accomplishing this end. Bearing in mind, however, the extreme reliability of the fixed type of grid leak it would seem that the most reliable form of "variable" leak which could be made by the home constructor would be of the kind where connections from a number of fixed leaks are brought to a series of studs on the panel and brought into circuit by means of the usual rotary switch. For instance, two grid leaks of ·5 megohms resistance value could be used singly or placed (by means of the stud switch) into series or parallel with each other, thus obtaining values of ·25, ·5 and 1 megohm. The simplest way of course, would be to employ nine studs with nine leaks attached thereto, increasing in value from ·5 megohm to 5 megohms by half-megohm stages. This would give sufficiently fine adjustment for all ordinary purposes and would be remarkably simple in construction. If finer adjustment is required, a switching arrangement containing two sets of studs may be employed in order to enable various combinations of leaks in series and parallel to be used for obtaining intermediate values. For instance, in order to obtain a value of ·25 megohms, two leaks of ·5 megohm each could be used in parallel, whilst if an additional leak of 1 megohm were placed in parallel with these the resultant value would be ·2 megohms. These leaks should preferably be mounted in clips at the back of the panel, partly owing to the harmful effects caused by the careless application of a hot soldering iron and partly because a defective specimen is easily replaceable. In some foreign countries it is possible to obtain a component of this description, the usual practice being to bring a number of leaks of different values into circuit by means of a simple stud switch and a variable leak having a range of only ·5 megohm can be brought into series with the fixed leaks when superfine adjustment is required. The variable element, by reason of its extremely small range, is usually reliable and very fine adjustment is obtainable by means of a worm gear.

grid bias and extra high tension for the L.F. amplifiers are included in order that two power valves may be used here if desired. The tripolar switch automatically adjusts the voltage applied to the anode of the detector valve when the telephones are brought into this circuit.

The extra H.T. and the grid terminals may be short-circuited if desired, and ordinary valves used for low frequency amplification, but, of course, at some sacrifice of purity of reproduction.

It will be noticed that three aerial terminals are provided. Normally the two lower ones should be connected together, and the aerial attached to the top one. Should it be desired to use a frame aerial the connection between the two lower aerial terminals should be removed, and the frame attached either to these two terminals or between the top two.



A four-valve receiver with switches to control the number of valves in circuit. A variometer is employed for tuning the aerial circuit and a tapped reactance unit couples the H.F. and detector valves.

A Four-Valve Receiver Suitable for Either Long or Short Wave Reception Without the Use of Plug-in Coils.

A READER has written asking us for a circuit suitable for covering the B.B.C. and main continental band of wavelengths, and also Chelmsford and the long-wave Paris stations. He asks if it is possible to accomplish this without resorting to plug-in coils by using a variometer and an anode reactance and variable reaction unit which he has in his possession.

We illustrate above a circuit suitable for accomplishing this. Switches are provided for cutting out either one or two L.F. valves as desired. No provision is made for cutting out the H.F. valve, since, in this particular circuit reaction cannot be employed unless this valve is in circuit, and the detector valve alone would give a range not greatly in excess of that given by a crystal. Terminals for

With the four-pole range switch in the short wave position the rotor and stator windings of the variometer are placed in parallel and a 0·0005 μF fixed condenser inserted in series. According to data given by the manufacturers of the components in question, this arrangement should cover from about 250 metres to well above the broadcast range. Upon changing over to the long wave position the variometer windings are placed in series and the 0·0005 μF fixed condenser is placed in parallel across the whole aerial circuit. It will then be possible to tune in the long wave Dutch stations, and also Chelmsford and Paris. The anode reactance, of course, easily covers both long and short waves.

This circuit will be found quite stable and productive of excellent results on either the local or more distant stations, and the tuning will be considerably easier than with the usual type of tuned anode circuit.

The WIRELESS WORLD AND RADIO REVIEW

RADIO TOPICS.

By THE EDITOR.

CAN THE OSCILLATION NUISANCE BE REMEDIED ?

ON turning over the pages of a daily newspaper which enjoys an extensive circulation, one's attention is drawn by a headline " Station Shooting." Headlines often convey very little and on reading down the column one learns exactly what this arresting title means.

A reader there describes his experiences in an attempt to receive the transmissions of as many broadcasting stations as possible, and one sees, not without surprise, that the aim of the writer is to encourage readers to search out the signals of distant stations, paying very little attention to the programme transmitted by the local station. If this suggestion is acted upon seriously, interference by oscillation will increase enormously, and the advice that we have frequently given to broadcast listeners that they should tune in a local station and then leave the dials alone will, as a result, be ignored. In view of this it is as well to draw attention to the urgent need to deal with the question of interference by oscillating receivers.

The " Don't do it " policy of the B.B.C. has served no purpose. We fail to see how a non-technical listener equipped with receiving apparatus built probably by a firm of manufacturers who are themselves members of the Broadcasting Co., and fitted with adjustable reaction, can be tuned without causing interference. Such a set will energise the aerial circuit whenever the reaction coil is brought into operation, and we do not know of any instructions that could be issued to a listener who has no technical knowledge, advising him as to the method to be adopted in tuning his receiver to avoid the setting up of self-oscillation.

The Post Office, on the other hand, went into the matter to the best of its ability, and as we all remember, undertook the testing and stamping of all receivers to be sold for broadcast reception. Although these sets made use of reaction in a variety of ways the Post Office liberally issued an authority stamp certifying that certain receivers would not cause serious interference. To attempt to do a thing of this sort does not reflect great credit on those technical men who were prepared to take upon themselves such a responsibility, and after being in operation for many months the Post Office now withdraws control and permits manufacturers to build self-oscillating receivers just as they please. In the case of the experimenter the Post Office shifted the responsibility and in awarding a permit the would-be experimenter was told that he must not use his apparatus in a manner that would energise the aerial circuit, though they did not go as far as to say that he was not to make use of reaction. They would have been fulfilling their duty if they had drawn up just one circuit that would meet this requirement. Personally we have not seen such a circuit published as yet. Members of the Radio Society will remember that shortly after the war the question of interference by oscillation was carefully debated and of all the circuit systems put forward none was found to be non-interfering.

Local radio societies have been faced with definite complaints, mainly because the Broadcasting Company, in their dilemma have shirked the job and recommended those experiencing trouble to get in touch with their local society. The societies have done their best to deal with complaints and to endeavour to find remedies, but operating in a small area and without advice their efforts have been without avail. Were it possible to locate an interfering station what steps should the investigators take to prevent continuance of the nuisance? They may inform the user that his set makes use of reaction, and therefore is certain on most of its adjustments to cause interference, and they may recommend him to abandon his expensive outfit. But why should the offender be so penalised and his signal strength reduced, while the law permits the sale and construction of oscillating receivers?

Almost every valve user unblushingly adjusts his reaction coil. The receiving set may whistle when it oscillates by becoming sensitive to the oscillations of a neighbouring set, or the user may adjust to that silent point where he tunes in KDKA at maximum strength. In either case the range of his set as a transmitter may be tens of miles.

The oscillation nuisance must be stopped, for we believe that even to the crystal user whose non-oscillating set does not respond to the continuous waves emitted by interfering sets, appreciable distortion must be produced in the quality of the broadcasting received. Some thousands of oscillating receivers in a congested area must create strains in the ether of infinitely greater intensity than even the broadcasting stations themselves, and the effect produced is probably a falling off in range, quality, and signal strength, apart from the annoying heterodyne squeals to which the oscillating set is so responsive when tuned to the wavelength of another oscillator.

As an immediate remedy we would suggest that the general public be discouraged from searching for distant stations on the British broadcasting wavelengths. There is little doubt, however, that the only real remedy lies in the prohibition of the use of reaction during broadcasting hours, and on broadcasting wavelengths, and it is here that the experimental licence would have been so useful inasmuch as the skilled worker would have enjoyed full facilities, making use of his knowledge in the manipulation of his set, and knowing whether or not interference is being caused. To forbid the use of reaction is rather a bold suggestion, we admit, but we believe that in this direction may lie a solution to the present chaos.

The columns of this journal are available for the expression of readers' views and we would welcome suggestions which may lead to a possible solution.

BROADCASTING AND THE THEATRES.

THE strong feeling of theatrical managers over the question of broadcasting plays is not likely to have been lessened by the recent transmission of part of the revue "Yoicks," from the Kingsway Theatre. The interest which the press took in the matter very naturally induced a larger public to listen in for that transmission than would have otherwise been the case, and it seems most unlikely that anything but benefit to the theatre and the play can come of this publicity. In fact the announcement of other similar events comprises this. The quarrel is no new one and has been in existence ever since broadcasting first started, when at that time there was also some risk of unfriendly feeling between broadcasting interests and the press. However, those difficulties were overcome early in the negotiations, which prepared the way for organised broadcast in this country. We would very much like to see a concise statement by the theatrical interests pointing out just in what way they consider that the broadcasting of plays can be detrimental to their interest. As near as we can recollect, an unfortunate circumstance in the early days of broadcasting may be in part responsible for the present antagonistic attitude. We refer to the exclusion, whether accidental or otherwise, of representatives of the theatrical profession from the earliest negotiations, in conjunction with the Post Office, which prepared the way for broadcasting. The press was strongly represented then and a good many other interests, so that it is possible that the seed of discontent was sown at that time. Now, it almost seems as if the Broadcasting Company is to get its own way simply by force of public opinion and one cannot blame the Company for taking whatever steps it can to bring about the addition to its programmes of whatever is demanded by the public, but at the same time it remains a matter of regret that it has not been possible up to the present for broadcasting and theatrical interests to come to a better understanding, and we wish all success to the pending discussions between the parties which we understand is about to take place.

TELEVISION.

A DESCRIPTION OF THE BAIRD SYSTEM BY ITS INVENTOR,

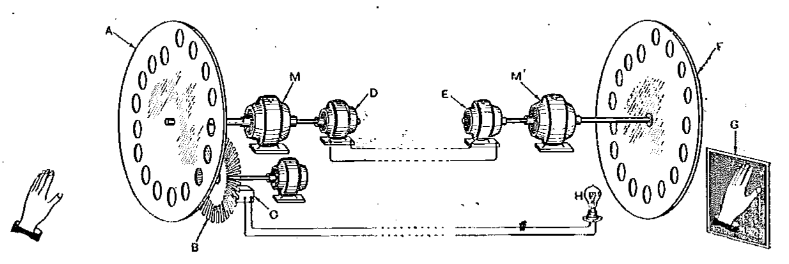
J. L. BAIRD.

IN the issue of *The Wireless World and Radio Review* for May 7th of this year, an account was published describing some of my early experiments in television when moving shadowgraphs were transmitted. A further account of developments which have since taken place may be of interest to wireless workers and enthusiasts, as television, although it can scarcely be described as a branch of wireless telegraphy, is closely allied to it.

For instance, one of the first problems to be faced in television is the amplification of the extremely minute current given by the light-sensitive cell. The thermionic valve has provided a solution to this problem by giving us a means of amplification to almost any extent ; this is only one of the many wireless devices used in television.

The distinction between the transmission of shadowgraphs and that of actual objects is much greater than is at first apparent. With shadowgraphs the light-sensitive cell is only called upon to distinguish between total darkness on the one hand and the full power of the source of light, possibly several thousand candle power, on the other.

In the transmission, however, of actual objects, even where only black and white are concerned, the cell has to distinguish between darkness and the very small light, usually, indeed, only a small fraction of a candle power, reflected from the white part of the object. The apparatus has therefore to be capable of detecting changes of light, probably at least a thousand times less in intensity than when shadowgraphs are being transmitted. There are other optical problems which render the transmission of the actual object much the more difficult of the two, but the above is sufficient indication of the difficulty of the step.

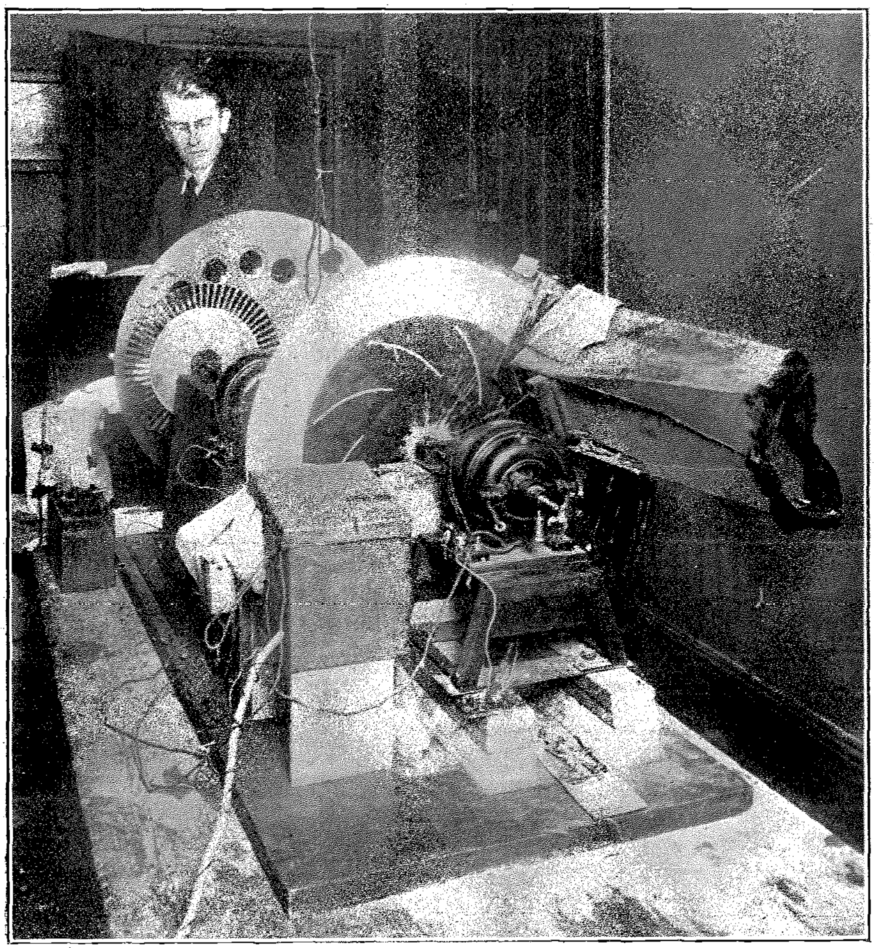


Diagramatic Plan.

For simplicity, two sets of line wires are shown. In sending by wireless the high frequency light signals are superimposed on the low frequency synchronising signals.
A and F = Lens Discs. B = Serrated Disc. C = Light Sensitive Cell.
D = A.C. Generator. H = Lamp. G = Receiving Screen.

In the earlier models shadowgraphs only were transmitted, the light having to be *behind* the object sent. The utility of a machine capable of transmitting only shadows is obviously restricted, and the next step to be attempted was the transmission of an actual object by *reflected* light.

The apparatus now used consists of a revolving disc containing a single spiral of lenses, and, behind this, a serrated shutter revolving at a very high speed. The object to be viewed is placed in front of the disc, which revolves at about 500 revolutions per minute. The arrangement will be better understood by referring to the accompanying drawing. The hand is the object being transmitted. As the disc revolves, light from every part of the hand falls in succession on consists of a disc containing a spiral of lenses exactly similar to the disc at the transmitting end, and revolving in synchronism with it. Behind this disc, in a position corresponding to that of the light-sensitive cell at the transmitting station, is a lamp which is fed by the received current. The varying light from this lamp traverses a ground glass



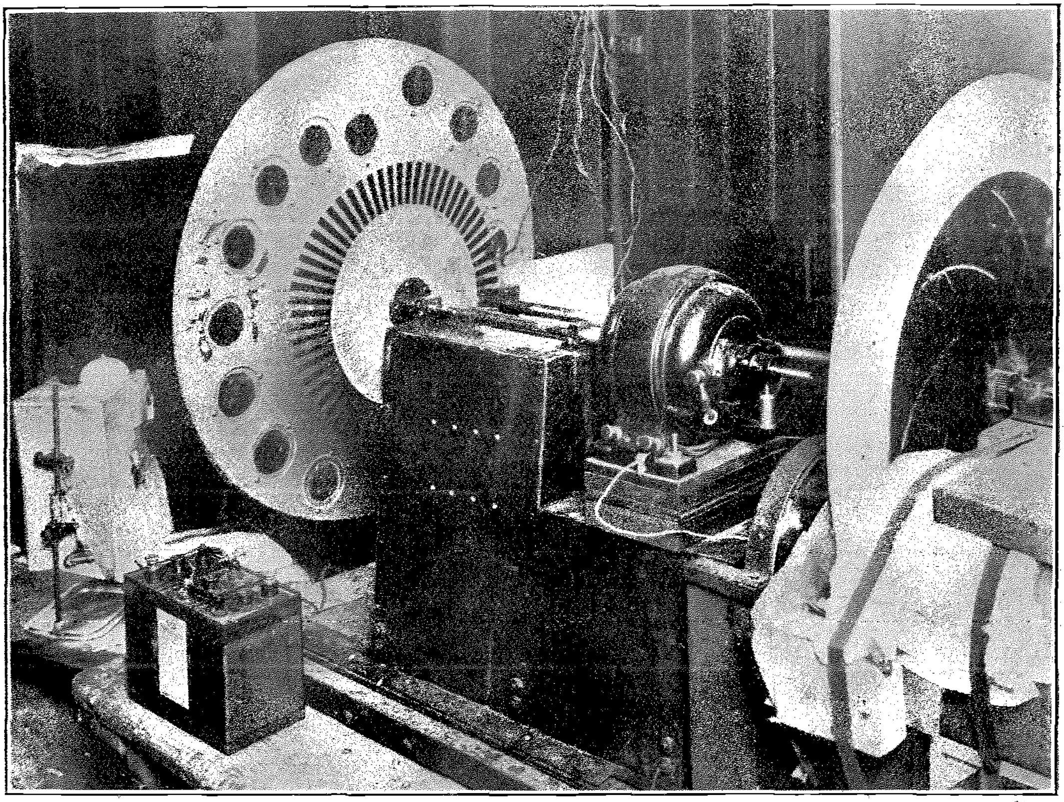
End view of transmitting machine. Mr. Baird in the background is holding his hand in position for transmission in front of the lens disc. Part of the old machine used for the transmission of shadowgraphs is seen in the foreground.

to the light-sensitive cell "C" after having been interrupted at very high frequency by the serrated disc "B." This interrupted light, as it falls upon the cell, gives rise to a pulsating current in its circuit. The pulsating current, after amplification, is transmitted to the receiving machine, which screen and reproduces there the hand which is being transmitted.

The method of synchronism, which was not described in my previous article, is simple. Isochronism is obtained by coupling a small A.C. generator to the transmitter shaft and the current from this being transmitted to the receiving station where it controls an A.C. synchronous motor. Only a very small current is required.

Synchronism is obtained by rotating the synchronous motor about its spindle or bodily rotating the driving mechanism until the picture comes into view.

The letter "H," for example, can be clearly transmitted, but the hand, moved in front of the transmitter, is reproduced only as a blurred outline. A face is exceptionally difficult to send with the experimental apparatus, but, with careful focussing, a white oval, with dark patches for the eyes



Side view of transmitter showing spiral arrangement of lenses and serrated disc. The light-sensitive cell is contained in the metal case behind the serrated disc.

and mouth, appears at the receiving end; and the mouth can be clearly seen opening and closing.

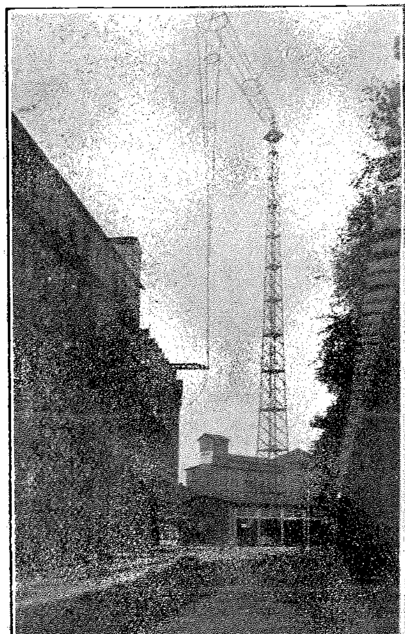
There have been many suggestions that television should be allied to the kinema. This opens up a wide vista for the future, but it is early yet to speculate upon the matter.

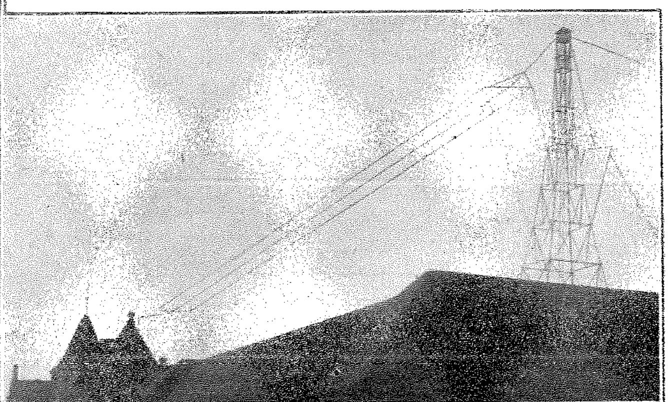
The cell which I have been using is neither a photo-electric nor a selenium cell, but a colloidal (fluid) cell of my own invention, of which I hope to give particulars at a later date.

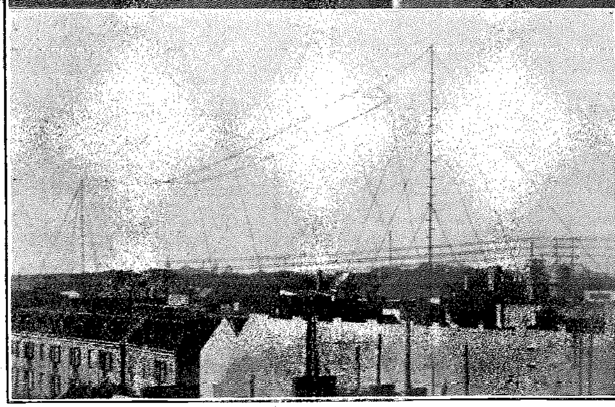
At present the apparatus is one constructed purely for experimental purposes, and is capable of transmitting only simple objects.

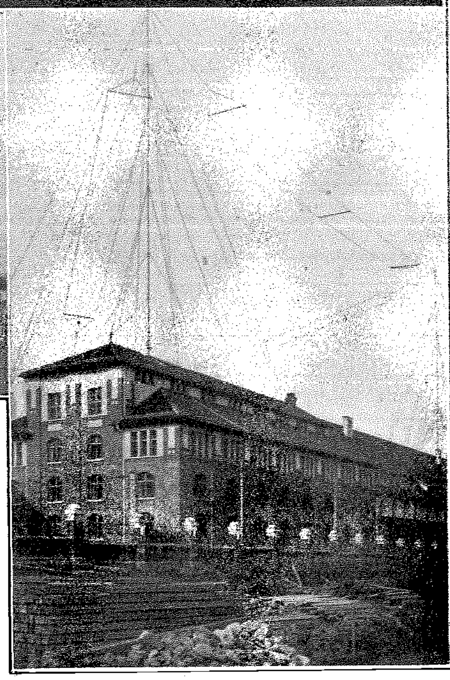
BROADCAST AERIALS IN GERMANY.

Left, the aerial and one of the towers of the Münster broadcasting station, which conducts daily transmissions on a wavelength of 410 metres; below, the aerial of the München station, operating on a 485 metre wave. Both these stations transmit afternoon and evening concerts every weekday, whilst a short afternoon concert is also given on Sundays. The Münster station is operated by the Westdeutsche Funkstunde A.G., whilst the München station belongs to the Deutsche Stunde in Bayern.





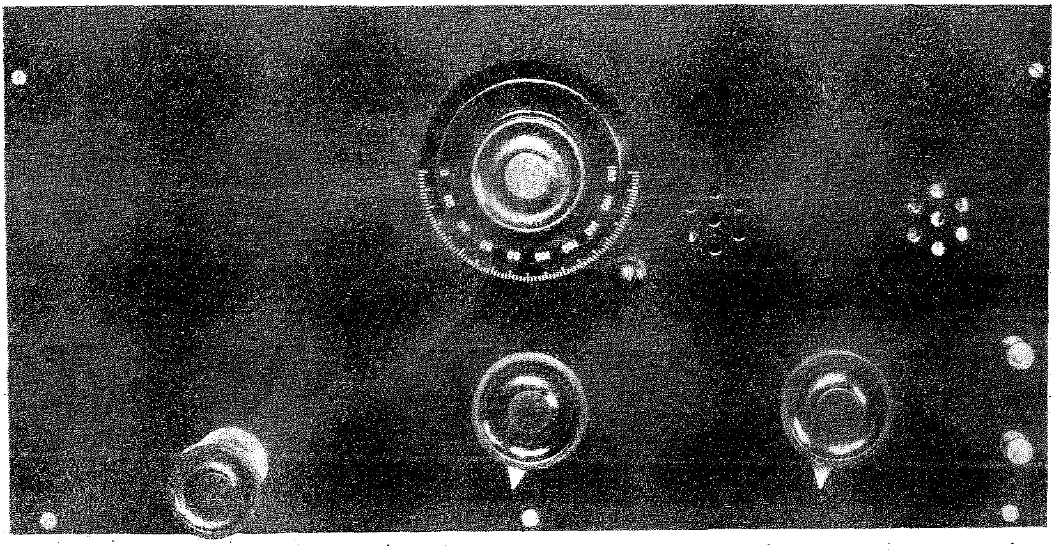




The site of the 505 metre station in Berlin is shown in the picture above, whilst the building which carries the Stuttgart masts and aerial is shown on the right. This building also houses the studio and the transmitter.
The wavelength of the Stuttgart station is 443 metres, and the station belongs to the Suddeutsche Rundfunk Aktiengesellschaft.

A TWO-VALVE RECEIVER

DETECTOR AND NOTE MAGNIFIER



Where plug-in coils are employed for tuning it is usual to fit the coil-holder to the outside of the set. Now that coil-holders of the type used in this receiver are available, it is convenient to accommodate the coils behind the panel. The following article describes a two-valve receiver making use of this feature.

By HUGH S. POCOCK.

IN spite of the multiplicity of designs for receivers and the almost inexhaustible variety of circuits which can be employed, there still remains a simple circuit which has not lost in popularity through the introduction of so many competitors. The combined detector and one stage low frequency amplifier (Fig. 1) still maintains its popularity amongst amateurs throughout the world. Such a receiver is used by nearly all amateurs as a general standby set, and daily records of long distance reception are sufficient to indicate that its efficiency leaves little to be desired in the hands of a careful operator. It has, moreover, the advantage that it is comparatively simple to operate, and therefore searching for long distance stations can be done without much difficulty. When skill has been acquired on a receiver of this type it is surprising how little is missed of any signal capable of reaching the aerial. It would be out of place here to enter into the controversy which is still going on amongst amateurs as to whether a circuit of this type can rival super heterodynes and other more elaborate receivers. No doubt the super heterodyne can give much better results when properly designed and handled, but it is often much more a matter of skill in the operation of a receiver than the type of circuit used which accounts for the extraordinary achievements in long distance reception which have been recorded in this journal during past months.

The purpose of describing the present receiver is to give a convenient and compact design for using plug-in coils with a two-valve circuit so that the receiver may be a standby for the use of the general amateur, whilst it is also a convenient arrangement for use for broadcasting, and at reasonable ranges will give good loud speaker strength without resorting to pushing reaction to the point of producing interference.

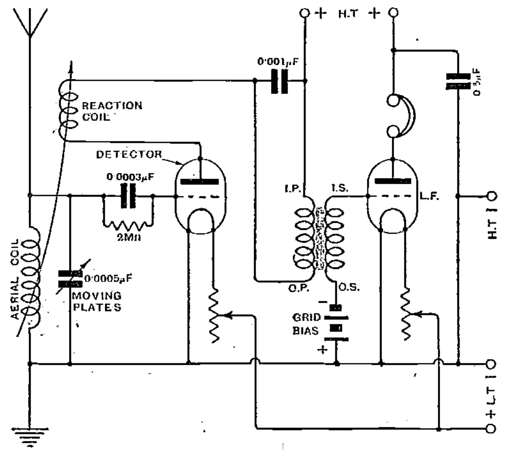


Fig. 1. The theoretical connections of the receiver.

Controls on Panel.

The controls for tuning as shown in the photograph of the front panel are two, one being the variable condenser across the aerial coil and the other the knob for adjusting reaction coupling. The two filament resistances are the only other controls to manipulate. A feature of the arrangement is the employment of a type of coilholder which is suitable for behind panel mounting, so that the plug-in coils can be accommodated behind the panel instead of being fitted, as is more usual, but rather clumsy in appearance, on the side of the box housing the set. This type of coilholder gives a neat appearance to the finished receiver, whilst in addition it gives particularly easy adjustment with one control. The type of variable condenser used is one giving a vernier adjustment, but without the employment of an aditional vernier condenser plate.

List of Parts Required.

The list of parts required for the receiver is a small one, and the cost is also proportionately small. No expensive components are made use of, and the wiring and general construction is of the simplest. The following components will be required :—

1 Ebonite panel, 7 ins. by 14 ins., which is a standard size for Radion panels if the constructor desires to make use of one of these.

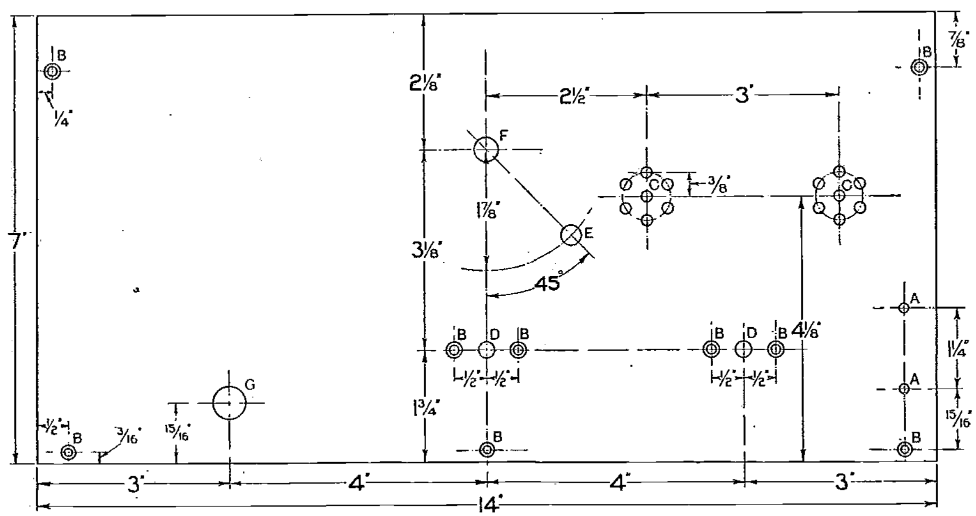


Fig. 2. A drawing of the ebonite panel showing the position of the components. The holes have the following sizes :—A, drill 5/32 in. hole for 4 B.A. terminals. B, drill 5/32 in. hole and countersink for No. 6 wood screws and 4 B.A. countersunk screws. C, drill 3/16 in. hole. D, drill ¼ in. hole. E, drill 5/16 in. hole. F, drill ⅜ in. hole. G, drill ½ in. hole.

1 Variable condenser, 0·0005, which in this particular instance is of the pattern supplied by Jackson Bros., and known as "J. B."
1 Two-coil holder for mounting behind the panel ("Ellanpee").
2 Valve holders.
2 Filament resistances (Ormond).
1 L.F. transformer.
1 Grid condenser, with clips for grid leak, having values of 0·0003μF and 2 megohms respectively.
1 Fixed condenser of capacity 0·001 μF.
1 Fixed condenser having a capacity of 0·5 μF for use across the terminals of the H.T. battery.
1 Three-cell dry battery for providing negative bias to the grid of the second valve.
9 Terminals, two for mounting on the front of the panel for the telephones, and seven at the back of the panel on a strip of ebonite, size 7 ins. by $1\frac{3}{8}$ in., as shown in the illustration.

in the drawing (Fig. 2), where all the dimensions of holes are given. It will be seen that both the variable condenser and the two-coil holder fitted to the panel are of a

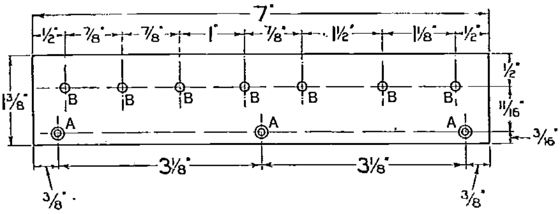


Fig. 4. Details of the ebonite connection strip. A, ⅛ in. dia., countersunk for No. 4 wood screws B, 5/32 in. dia.

type using one-hole fixing. For the filament resistances, of Ormond pattern, three holes will be drilled to the sizes shown in the drawing, two of the holes being used for the screws fixing the resistances to the panel. The remaining holes to be drilled in the panel are those for the telephone terminals, for fixing

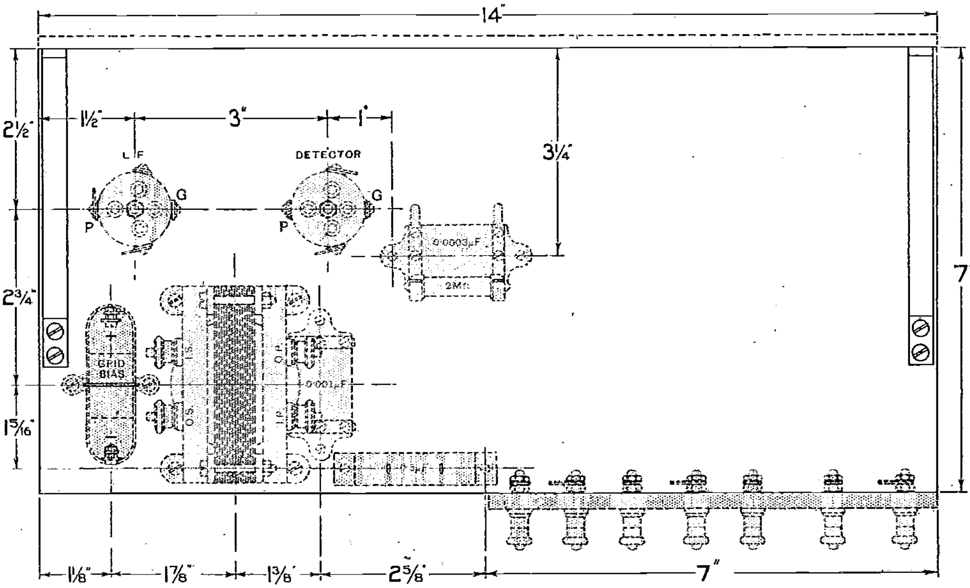


Fig. 3. The arrangement of the components on the baseboard.

1 Wooden baseboard, size 7 ins. by 14 ins., on which all components, except those which are actually fitted to the front panel, are attached.

Assuming that components of the type mentioned above are purchased, the drilling of the panel can be done precisely as indicated the panel to the wooden baseboard (Fig. 3) by means of wood screws, and the screw holes for fixing the brass brackets, which support the panel. In addition, if desired, holes may be drilled through as shown to provide peep holes through which to see when the valves are lit if the set is housed in a box.

The terminal strip (Fig. 4) is screwed to the back edge of the baseboard so that it will come flush with the outside of the box in which the receiver may be contained. Three terminals are provided for H.T. battery connections; one is the common negative, and the other two are provided in order that additional potential can be applied to the plate of the second valve. Although an "R" type valve would function satisfactorily in the L.F. stage, it is better if a valve of a type specially designed for low frequency stages is employed such as the B.T.H. B 4. The three-cell dry battery provides a negative bias of 4½ volts, and the H.T. potential may then be 120 volts. A fixed condenser of 0·001 μF capacity is employed across the primary of the low frequency transformer, which in this instrument is of the R.I. pattern.

After the components have all been placed and fixed, the wiring can be proceeded with, and for this Fig. 5 should be carefully followed. The wiring should be done with bare No. 16

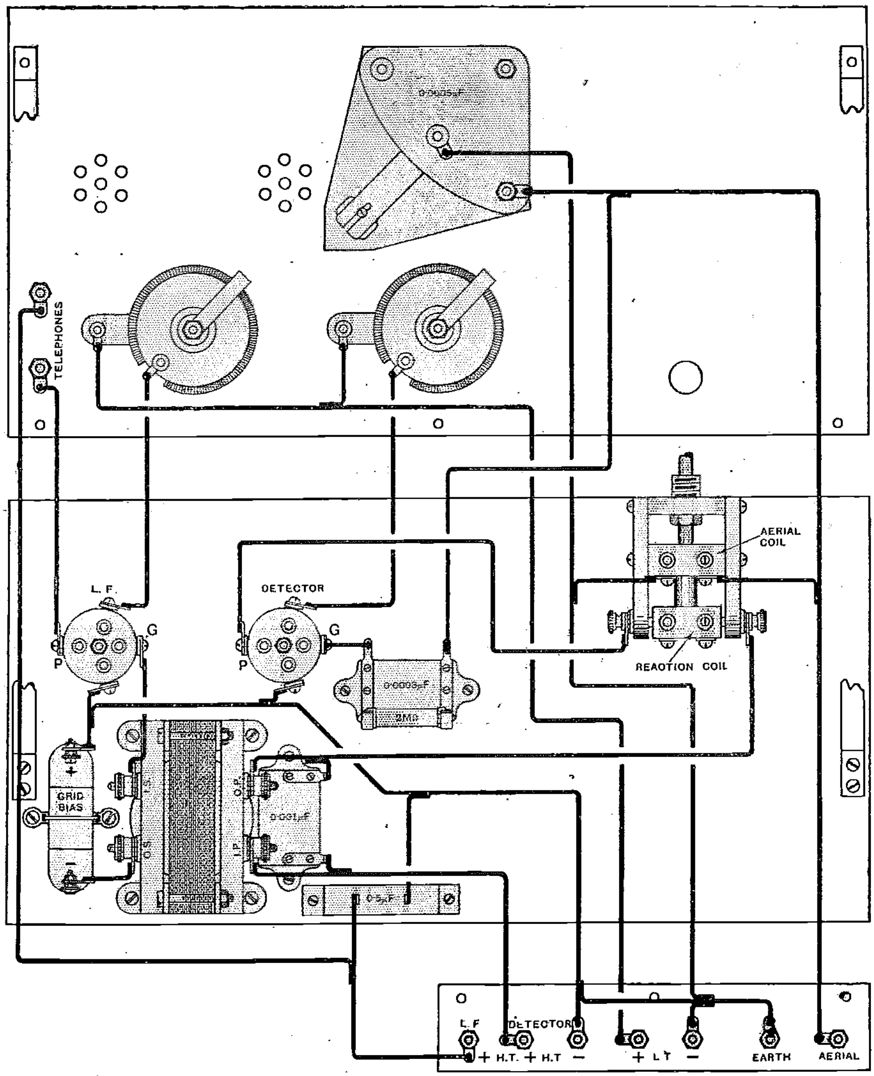
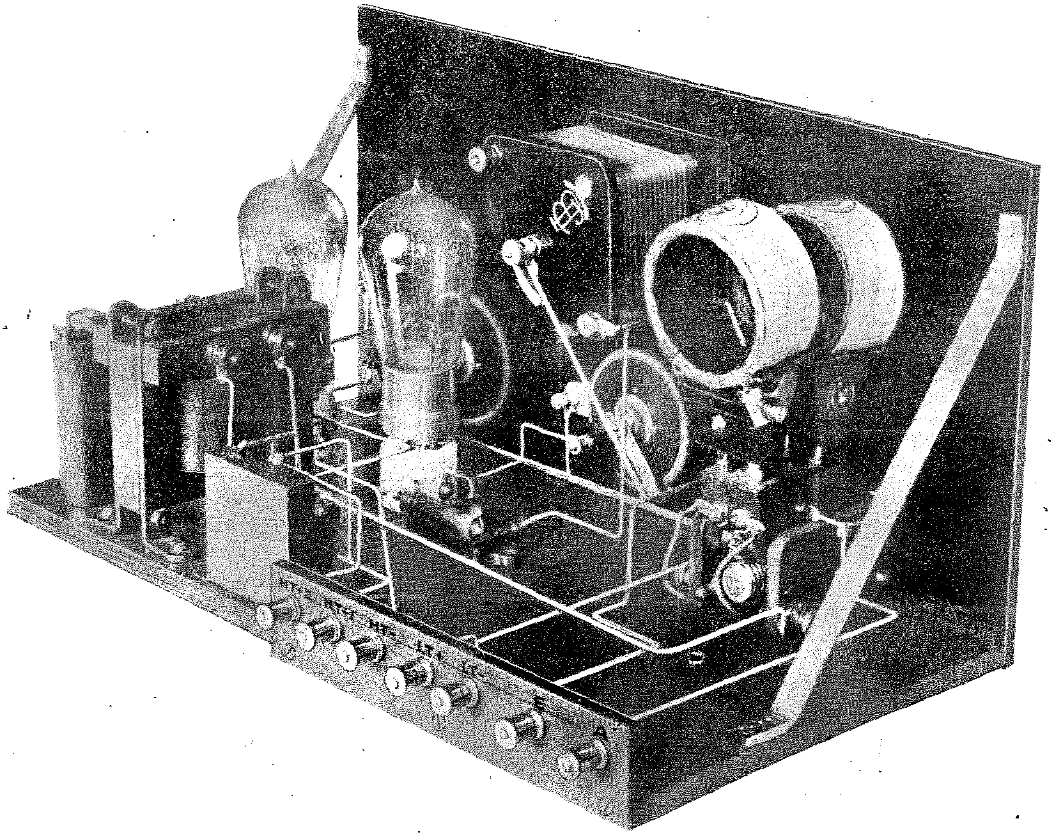


Fig. 5. Wiring diagram of the receiver.

tinned copper, suitable lengths being stretched to straighten them before the bends are made, and the wires can then be fitted to their respective connections. It is always convenient to use terminal tags wherever possible, and to solder the wires to these. This simplifies the soldering, and gives a much neater appearance than is obtained by soldering the wires direct to the terminals. In addition, if at any time it is desired to dissemble the receiver, this can be done without finding that terminals and other pieces of apparatus are spoilt by the adhesion of solder. It will be seen that no switch has been provided to enable the variable condenser to be placed in parallel or series with the aerial coil, and in this receiver the variable condenser is permanently in parallel. This has been done partly for the sake of simplicity and partly because, when one considers that in changing over from the parallel to series position or *vice versa*, a gap will occur in the wavelength range if the same coils are left in, there is not much to be gained by arranging to switch from the parallel to series position unless compensating fixed condensers are to be provided as described recently in this journal. Such an arrangement would add somewhat to the complication, and it is always possible to interchange the coils so as to cover additional wavelengths as required.



A view of the interior of the set. On the right are the aerial and reaction coils; in the centre, the aerial tuning condenser, and on the left the H.T. battery condenser, transformer and grid battery. The grid condenser and leak are to the right of the first valve holder.

It is preferable to fit a 0·001 μF condenser across the terminals for the telephones, but this is not absolutely necessary, and has not been shown in the set.

This receiver is primarily intended for reception on the broadcast wavelengths and upwards by the employment of different coils, but those who desire to receive on the short wavelengths can do so also by a slight addition to the arrangement shown. This will be described here in case the constructor may care to adopt the method.

A flat slab coil wound on a card should be obtained, having, say, 15 turns of insulated wire of a gauge not less than No. 22. One end of the coil is connected to the aerial, instead of connecting the aerial to the terminal provided on the set, and the other end of the flat slab coil is connected to the common earth terminal The slab coil can be coupled to the tuned coil of the receiver by slipping it between the panel and the plug-in coil of the receiver.

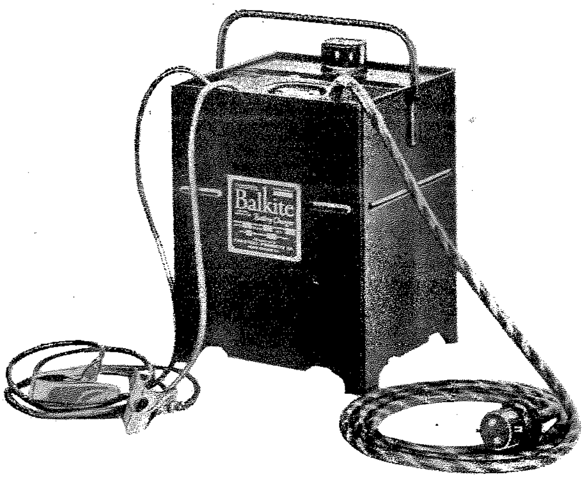
By varying its position the amount of coupling can also be varied, and it will be found that using short wave coils of plug-in type, it is easy to tune down to very short wavelengths.

Before concluding, it is desired to point out that the circuit is one which will energise the aerial and cause interference easily if the reaction coil is brought near to the aerial coil. Care should be taken to see that when receiving broadcasting, the reaction coil should be far away from the aerial coil and this precaution will also result in clearer reception of the transmissions.

No particulars are included of the construction of a cabinet to house the set. In preparing such a box the principal point which should be borne in mind is that the top should be hinged to provide access to the valves and for the purpose of changing coils.

THE BALKITE BATTERY CHARGER.

The Balkite Battery Charger is an appliance for charging accumulators from ordinary electric light alternating current (200-240 volts, 50-60 cycles). It consists of a small transformer and a special rectifying cell. The cell has three electrodes, giving full wave rectification. Such a cell converts both half-cycles of the alternating current into direct current for charging the accumulator. One of the electrodes is of lead, and the others of a material referred to as Balkite. We believe, however, that Balkite is the trade name for a preparation of tantalum. An electrolyte of sulphuric acid is employed, and a small quantity of oil is added to the cell to prevent creeping and reduce evaporation.



The complete battery charger.

The charger is therefore a simple, straightforward arrangement, with no parts likely to get out of order or wear out. It delivers a taper charge commencing at the rate of 2½-3 amperes, and cannot discharge, short-circuit, or damage a battery by over-charging. The charging rate being 2½-3 amperes, a 6 volt 50 ampere hour accumulator will be completely charged in about 20 hours at an average cost of ½d. an hour, based on a cost of 6d. per unit.

An adaptor is provided for plugging into any electric light socket, and two spring clips for connection to the battery. This appliance is marketed by Messrs. Burndept, Ltd.

THE EMISSION FROM A VALVE FILAMENT.

The author describes an interesting experiment, and shows that, probably due to the contact difference of potential, the plate current is not symmetrical with regard to the centre of the filament.

By G. S. P. HEYWOOD.

SUPPOSE that in a two-electrode valve, Fig. 1, the fall of potential across the filament is 2 volts. If the plate is now given a potential of $+\frac{1}{2}$ volts relative to the negative end of the filament, only the first quarter of the length of the filament is at a lower potential than the plate. Electrons can only flow therefore from this portion of the filament (neglecting for the present such disturbing factors as velocity of emission, space charge, etc.). So by measuring the current from the plate for different values of the plate potential from 0 to +2 volts, the current from successive fractions of the length of the filament may be determined.

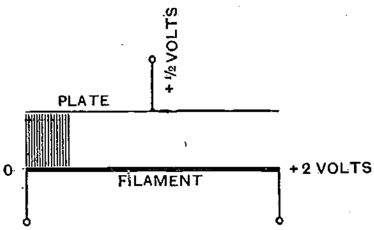


Fig. 1.

The two-electrode valve is connected as shown in Fig. 2. V is a voltmeter reading up to 8 volts; G is a micro-ammeter. Across the filament leads is connected a sliding potentiometer having 50 divisions, each of 20 ohms resistance. By this means the plate can be set at the potential of any given point on the filament, and the position of this point may be read directly off the potentiometer scale. The voltage across the filament is kept constant, and the micro-ammeter is read for various settings of the potentiometer slider. These readings give the currents from successive fractions of the length of the filament. By subtracting a given reading from the next one, the current from any part of the filament is

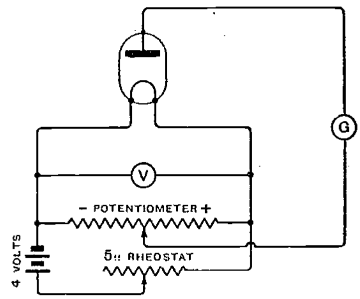


Fig. 2. *Arrangement of apparatus for finding the plate current from different parts of a filament.*

obtained. In order to verify the results, the connections of the filament are then reversed, and a fresh set of readings taken.

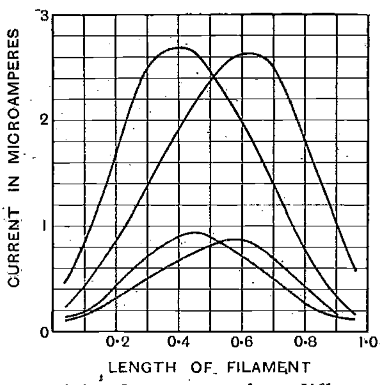


Fig. 3. *The plate current from different parts of a filament.*

The results of Fig. 3 were obtained with a 4-volt Mullard valve, R.D.93. The grid was connected to the plate, so that the valve acted as a diode, and readings were taken for the currents from successive tenths of the filament. The upper two curves give the currents when the fall of potential across the filament was 2 volts, the lower two when it was 1·8 volts. The curves show that the emission rises to a well-defined maximum near the centre of the filament; this is to be expected, for the centre of the filament is hotter than the ends.

It is found that the maximum is always displaced a short distance from the centre of the filament; this displacement is towards the positive end of the filament, whichever way round the latter is connected. Since each pair of curves is approximately symmetrical about the central line, this displacement cannot be due to lack of uniformity in the filament. It is probably caused by the contact potential between the tungsten filament and the nickel plate. Suppose the filament is positive to the plate, with a contact P.D. of $\frac{1}{2}$-volt; and let the fall of potential across the filament be 2 volts, say. Then it is evident that $1\frac{1}{2}$ volts must be applied to the plate in order to draw electrons off half the filament. In the experiment, this would cause a displacement of the apparent maximum of the curve towards the positive end, Fig. 4. The amount of displacement gives an indication of the value of the contact potential. By reversing the filament connections and taking the mean of the two curves, the true currents from every part of the filament are obtained.

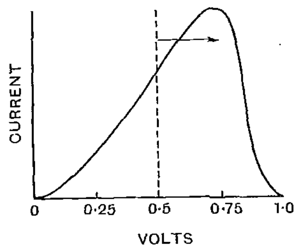
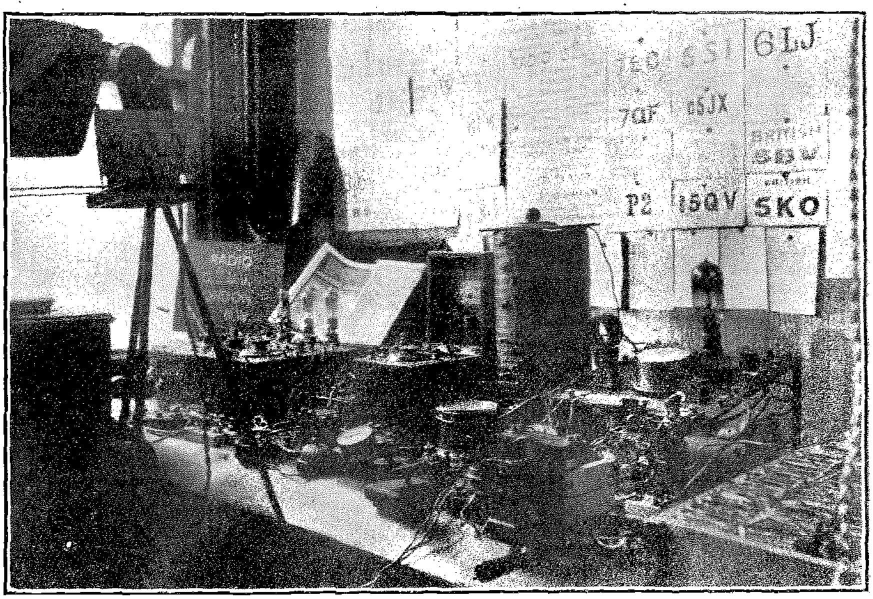


Fig. 4. The actual plate current from different parts of a filament.

This simple experiment not only gives us some information of the conditions inside a valve, but also seems to point the way to a more elaborate method of determining contact potentials. I am indebted to Mr. E. W. B. Gill, B.Sc. for the idea of the experiment.

A HAND GENERATOR STATION.



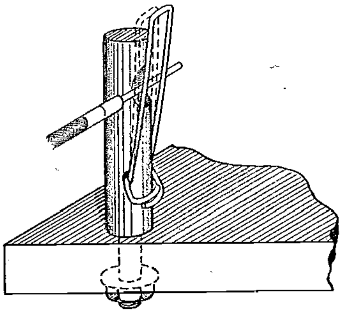
A view of the transmitting bench at G 2 U V, the property of Mr. W. E. F. Corsham. 2 U V may be numbered among the pioneers of British amateur transmitters; he secured the third prize in the first successful amateur Transatlantic Tests, and was the first Britisher to issue QSL cards. Mr. Corsham works principally with a hand generator, and many of his long distance records have been performed with dry cells

READERS' PRACTICAL IDEAS.

This section is devoted to the publication of ideas submitted by readers and includes many devices which the experimenter will welcome.

An Easily Made Terminal.

OF simple construction, this terminal will be found to make a reliable contact. The construction can be seen quite clearly from the diagram. Hard springy brass



Spring terminal of easy construction.

wire should be used for making the loop pieces. Wires can be quickly inserted under the clip and a number of connections easily made to one terminal.

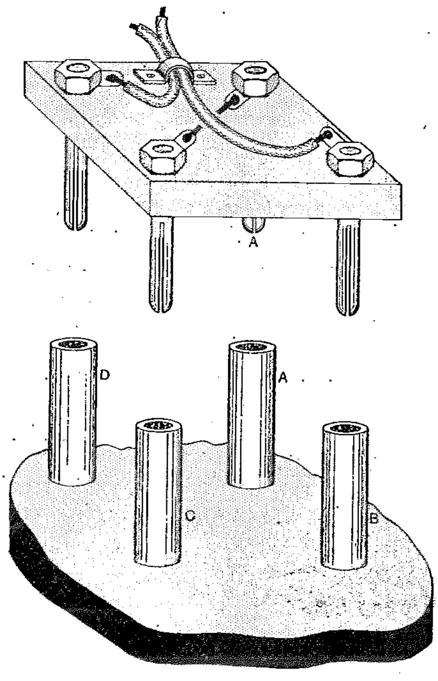
J. B.

Reaction Reversing and Short-circuiting Switch.

ALTHOUGH the reaction coil may be used with its leads permanently connected in circuit and no provision made for reversing the direction of reaction coupling, it will be found that the introduction of a change-over switch to reverse the connections to the reaction coil has many advantages.

A suitable switch is shown here, and is easily made up from four valve pins. A piece of ¼ in. ebonite measuring about 1¼ ins. by 1¼ ins., is squared up and tapped holes made at the corners. Into these holes the valve pins are inserted and lock nuts are fitted to hold the pins securely, and at the same time carry the tag connectors. These pins are made to engage into four valve sockets, A, B, C and D. The leads to the coil are connected either to A and C, or B and D, and it will be seen that by inserting the valve pins in the various sockets that the connections of the coil may be reversed or short circuited.

The addition of this simple switch to a receiving set will be found particularly useful at the present time when manufacturers of



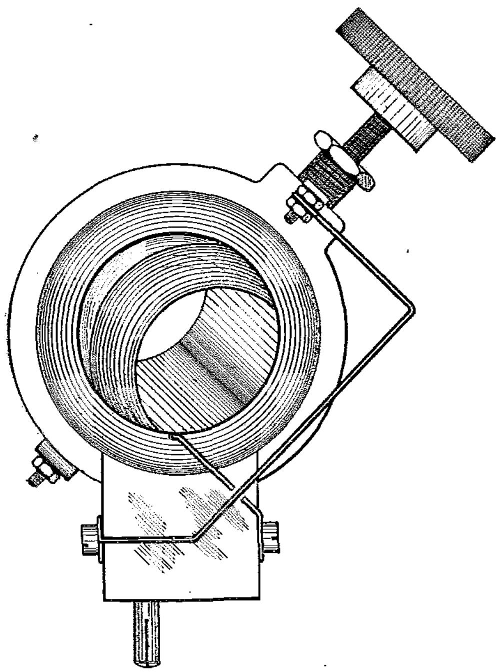
Useful reaction reversing switch.

coils do not arrange the socket connections to produce a uniform direction of inductive coupling.

S. W. S.

A Plug-in Variometer.

THE anode plug-in coil is usually tuned by means of a parallel condenser, but there are many experimenters who still prefer to employ variometer tuning, particularly when working on the shorter wavelengths.



A variometer mounted on a plug-in socket has many useful applications.

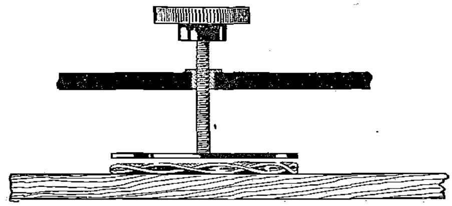
A set designed to use condenser tuning can be readily converted by mounting a variometer on the pin and socket of a coil holder. Only a few patterns of variometer are suitable and the accompanying drawing shows a simple method for mounting the Acme type.

A. T. C.

Spade Tuning.

THERE are many broadcast receivers in which the method of tuning consists of varying the position of a metal plate with regard to an inductance of the flat type. The inductance of a coil is altered as the position of the metal plate changes, thus providing the necessary tuning range.

A method of mounting the tuning plate is shown in the accompanying figure. Care must be taken to attach the disc quite squarely on the 2 B.A. spindle. The bush is tapped 2 B.A. and should fit tightly in the ebonite panel.



Coil tuned by the damping plate method.

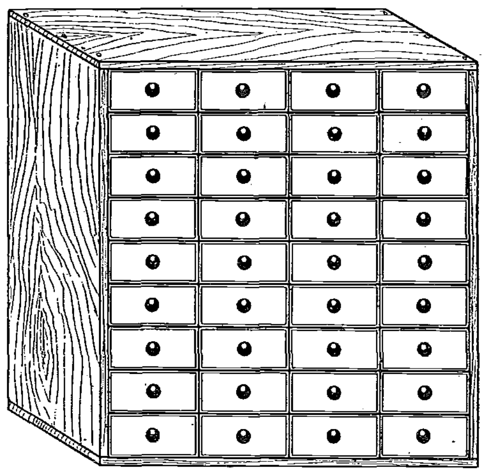
This method of tuning can be applied to both aerial and tuned anode circuits, and the greatest wavelength change will be produced as the disc makes contact with the face of the coil. The damping plate may measure about 3 ins. in diameter and can be constructed of brass or copper and soldered on to the end of the threaded rod.

H. D.

Cabinet for Screws, Washers, Nuts, etc.

ALTHOUGH somewhat crude in its construction, a cabinet made up as shown will prove exceedingly useful.

It consists merely of a number of matchboxes secured together by means of interleaving with cardboard and Seccotine, and protected on the outside with pieces of thin mahogany or cigar-box wood. The knobs for withdrawing the boxes are brass paper fasteners.



Cabinet for small screws, washers and nuts.

A. W. R.

SHORT WAVELENGTH RECEPTION.

The author tried three receivers and compared them by observing the strength of the signals received and the relative ease of adjustment. He concludes that the best receiver is the one having a regenerative valve detector with one stage of note magnification.

By E. J. MARTIN.

THE following experiences in reception on a wavelength of 220 metres and below may be of interest.

Receivers in general can be divided into three main groups: (1) reflex circuits; (2) circuits employing high frequency amplification. (3) circuits employing low frequency amplification. Experiments were made to determine which type was best suited for long distance short wave reception.

REFLEX CIRCUITS.

The efficiency of the valve as a high frequency amplifier is usually very much reduced when the valve is made to function as a low frequency as well as a high frequency amplifier. It was decided, therefore, to make good this loss in effectiveness by using one stage of ordinary high frequency amplification before the reflex stage. The circuit shown in Fig. 1 was employed.

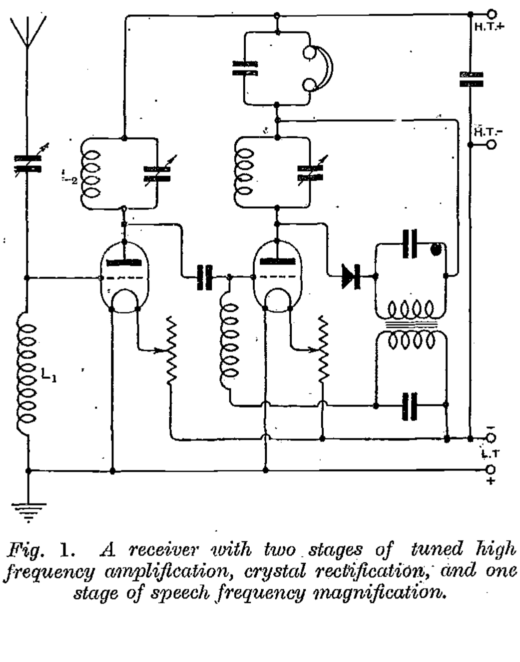


Fig. 1. A receiver with two stages of tuned high frequency amplification, crystal rectification, and one stage of speech frequency magnification.

Good results were obtained from broadcasting stations, but complications soon began to arise when it was used on the shorter wavelengths. When efficient inductances were used, the set oscillated continuously with no reaction coupling, in spite of special efforts to avoid capacity effects in wiring, etc. This difficulty was got over by employing reversed reaction between coils L_1 and L_2. This arrangement of the circuit was used when listening for American stations. Several stations were heard at good readable strength on 200 metres, but the set was not a practicable one for many reasons. It had too many controls, which made searching difficult, and its efficiency fell off as the wavelength was reduced.

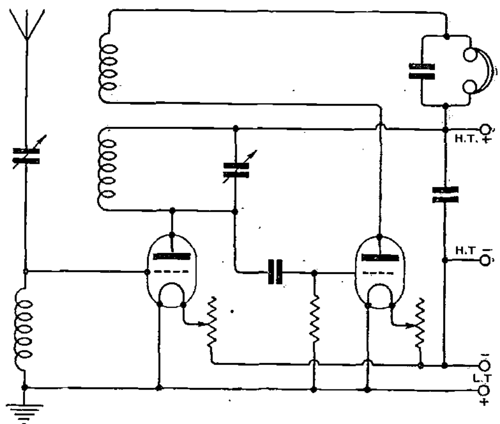


Fig. 2. A receiver giving one stage of high frequency amplification, with valve detector. The reaction coil is coupled to the anode coil.

Circuits Employing High Frequency Amplification Only.

Bearing in mind the difficulties due to self-oscillation in the previous receiver, another receiver was wired, using one stage of high frequency amplification and valve detector, as in Fig. 2. This was a much more practicable circuit. Considerable magnetic reaction had to be used to make the set oscillate, provided that the aerial tuning condenser was not set at too small a value. The number of controls was reduced to three, which was better, but still rather too many. This did not give the same signal strength as when the circuit of Fig. 1 was employed. Only one or two American signals were faintly heard; also, although fairly good high frequency amplification was obtained on 200 metres, the amplification fell off for shorter wavelengths, until at about 120 metres the amplification was negligible. An ordinary "R" valve was used in the high frequency stage.

A Circuit Employing Low Frequency Amplification.

Finally, to reduce the number of controls to two, a valve detector and one note magnifier were employed, the detector valve being a peanut valve with 26 volts on the anode, as in Fig. 3. The reaction coil is coupled to the aerial coil, and if the circuit is handled carefully, no more interference will be caused by radiation than when the reaction coil is coupled to a circuit connected to the anode of a high frequency stage. This proved to be just the circuit required. Searching from 120 to 220 metres was an easy matter. Greater signal strength than that obtained from the circuit of Fig. 2 was obtained, with easier tuning. The degree of amplification was fairly constant, and did not fall off on the lower wavelengths. Many American stations were logged without difficulty.

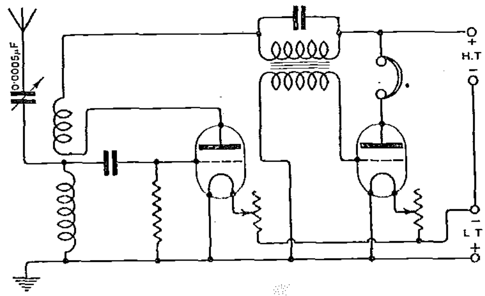


Fig. 3. This receiver has a valve detector and one stage of note magnification, with the reaction coil coupled to the aerial coil.

These experiences seem to show that the ordinary regenerative valve detector and note magnifier is the best simple set to employ. It may be found difficult to make the set oscillate on the lower wavelengths, but no difficulty should be experienced if the following points are borne in mind.

The aerial tuning inductance must be wound with a thick gauge of copper wire, such as No. 18 or 20, on a damp-proof former; preferably the wire itself should not be waxed or shellaced. If the coils are likely to get damp, enamelled wire may be employed. Preferably space the turns slightly. The reaction coil may be wound with fairly fine wire, on a former which is small compared to the diameter of the former employed in the construction of the aerial coil.

BROADCAST STAMP ALBUMS.

The latest broadcasting craze in America centres round the radio stamp. A Chicago company gave the idea to the world.

The broadcast listener first sends for a copy of the stamp album. He receives it, together with a map, a broadcasting station call list and a batch of Proof of Reception cards. Space is provided on these for a list of broadcast items heard, the time of reception and other marks of proof. Having completed the particulars, the listener posts the card, together with a ten cent piece, to the station heard.

If the numbers and time tally with the station log the listener immediately receives a stamp bearing the station's call letters and design. This is pasted in the album and remains an eternal proof of the diligence, patience and skill of its owner.

OBTAINING ANODE CURRENT FROM D.C. MAINS.

The H.T. supply for a valve receiver is usually obtained from a dry cell battery or a bank of low capacity accumulators. Both methods are expensive and troublesome. It is therefore of interest to learn that perfectly satisfactory results may be obtained at low cost from D.C. mains.

By G. G. BLAKE, M.I.E.E., A.Inst.P.

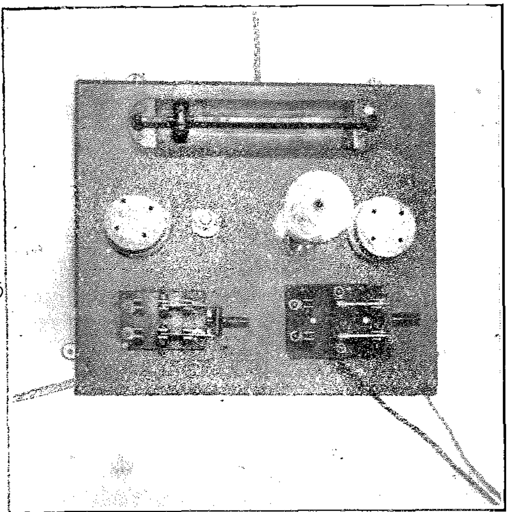


Fig. 3. The apparatus is easily constructed, and the components may be attached on a back board such as is used for mounting electrical fittings.

THE method usually employed to smooth out the hum from the D.C. supply is indicated in Fig. 1. L and L_1 are two 50-volt lamps in series across the mains (the positive is the live main, and negative earth). The lamps act as a potentiometer, and the H.T. supply to the wireless set *via* chokes I and I_1 can be varied by altering the relation between the resistances of the lamps. With this well-known arrangement, the ripple can be smoothed out until it is only heard as a very low hum, and when using a loud speaker and receiving strong telephony, this is not noticeable.

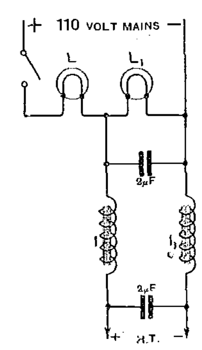


Fig. 1. A usual arrangement for obtaining smoothed H.T. from the mains for valve reception.

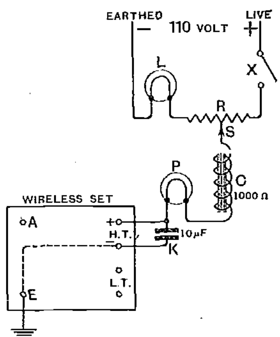


Fig. 2. An improved method.

When using headphones to receive distant stations, however, the writer found it impossible to entirely eliminate the hum in this way.

The best results were obtained when employing iron core chokes wound to a resistance of 1,000 ohms, and condensers of 10 microfarads capacity; but even then the hum was quite audible when no signals or telephony were being received. This form of H.T. supply was not comparable to the use of H.T. batteries.

Fig. 2 shows the arrangement finally adopted by means of which the ripples are entirely eliminated and an absolutely silent H.T. supply obtained. L is a 110 volt 16 candle power carbon filament lamp in series with a resistance R (440 ohms) connected across the mains as shown, through a switch X. (A suitable resistance for this purpose is supplied by the Zenith Manufacturing Company.)

The H.T. is increased or decreased by moving slider S nearer to, or further from, the positive end of the resistance R. An iron-cored choke, C, wound to a resistance of about 1,000 ohms, is connected in series with the supply to smooth it. The secondary of a small motor ignition coil or even an intervalve transformer will answer the purpose. On its way to the positive terminal of the set, the current is passed through a small 4-volt lamp, the function of which is that of a fuse, and protects the wireless set in case of accident. Needless to say, as the maximum current which passes through this circuit is only 5 or 6 milliamperes, the lamp does not light up under normal working conditions. K is a condenser having a capacity of 10 microfarads. This can be built up with five 2 μF Dubilier condensers connected in parallel.

It is of interest to note, that when employing such a large capacity, it holds a sufficient charge to maintain the H.T. supply to the set for a couple of seconds after the switch X has been turned off. The signals gradually fade away.

A photograph of the apparatus in use appears as Fig. 3. The choke is mounted behind the board and in this instance a two-way switch, shown on the left-hand side, is employed to entirely insulate the board from both mains when not in use, and a second two-way switch is provided which is employed as a change-over switch when charging the L.T. accumulator or when connecting it to the set. The matter of accumulator charging is not dealt with in this article, so that no diagram of the connections to this switch need be given.

The same arrangement is found to work quite satisfactorily from a 220-volt main, on the 3-wire system; but in this case a 60-watt metal filament 220-volt lamp should be employed, and as both mains are live, a double pole switch must be used as shown in the photograph.

When the valves in the receiver require different anode voltages, the arrangement of Fig. 4 may be employed. The circuit shows two separate anode supplies obtained from two shunt circuits connected across the

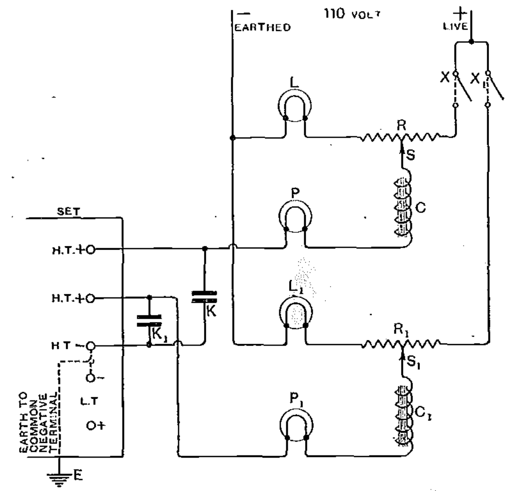
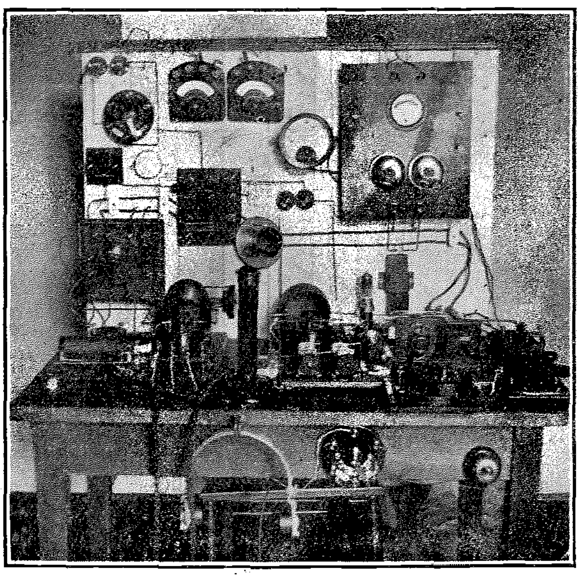


Fig. 4. Circuit arrangement for producing two values of H.T. potential.

mains. Adjustable resistances R and R_1 and lamps L and L_1 are employed with smoothing chokes C and C_1 and condensers K and K_1. Several such circuits may be connected to meet the requirements of the receiver.



STATION 5 CV.

In designing this station, the owner, Mr. Ronald J. Harrison, of Brondesbury, has aimed at neat and systematic arrangement of components to facilitate experimental work. Every component is easily accessible and the method of surface wiring allows for quick modification of circuits. The grid control transmitter is seen on the left of the table. The power valve and its panel are at the back, and to the front is the remainder of the grid circuit and tuning arrangements. With a plate potential of 240 volts, a current of 0·24 ampere is registered on the aerial ammeter when working on the shorter wavelengths. The microphone is of the standard Post Office type and gives very good results.

A SIMPLE SHORT WAVE SET.

The author outlines the construction of a receiver which he has found very satisfactory for the reception of short wavelength signals.

By C. D. ABBOTT.

TO a great many amateurs the receiving of signals on 100 metres presents considerable difficulty. This is due to two main causes: (1) An unsuitable aerial-earth system, and (2) an unsuitable circuit.

(1) My experiments seem to show that the aerial should be as high as possible and consist of a single copper wire or strip about 50 feet long, and carefully insulated. Insulators of glass are satisfactory and I prefer them to the ordinary insulators of porcelain. The insulators should be of the long thin type which have a portion protected from the rain and thus have a long surface leakage path.

A counterpoise can with advantage be employed in place of the usual earth connection and may consist of about six wires placed eighteen inches or two feet apart and about six feet above the ground. The wires of the counterpoise should be carefully insulated, using as insulators, for instance, the ordinary egg or shell type. Arrange the counterpoise below the aerial, and of a length a little above that of the aerial.

(2) I have tried many circuits but find it difficult to make them oscillate at wavelengths of the order of 100 metres. Finally the circuit shown in Fig. 1 was adopted. It consists of a valve detector and one stage of low-frequency amplification, the reaction coil being connected to the anode of the detector and through a 0·0002 microfarad tuning condenser to the filament. A valve of the V.24 type is used as the detector, and an ordinary four-pin valve in the L.F. stage.

Special attention was given to the construction of the tuning coils. The coil in the aerial circuit consists of six turns of No. 12 bare copper wire with the turns spaced $\frac{1}{8}$ in. apart on a former consisting of four pieces of ebonite rod secured at the corners of two end pieces of wood or ebonite 4 ins. square. The secondary winding has fifteen turns and the winding is commenced two inches from the end of the primary winding. Both coils are put on in the same direction and are wound with No. 12 copper wire. For the reaction coil a winding of ten turns of No. 28 wire with the turns spaced $\frac{1}{8}$ in. on a former $3\frac{1}{2}$ ins. in diameter is fitted at the end of the secondary winding. This coil is not adjustable. The best position for it is found by experiment, and experience

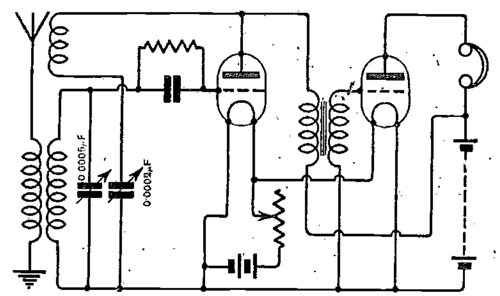


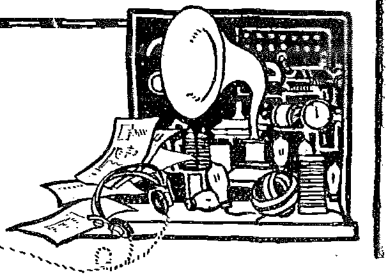
Fig. 1. The circuit of the receiver recommended for short wavelength reception.

shows that the desired smooth reaction effects may be obtained by adjusting the 0·0002 microfarad tuning condenser in series with it.

It is essential to employ good quality variable condensers, and as fine tuning is necessary for good results verniers should be fitted.

Special attention should be given to the wiring and the layout of the components. Allow ample room in order that the parts and wiring may be well spaced.

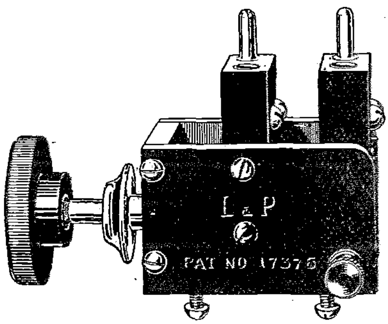
NEW APPLIANCES.



The L. & P. Two-Coil Holder.

The more usual patterns of coil holder suffer from the defect that they cannot be conveniently mounted behind the instrument panel and in consequence the coils project and either obscure apparatus on the front of the panel or occupy considerable panel space. This new coil holder is of the geared variety operating through a well-made worm and pinion.

The holder is not only designed for behind-the-panel mounting with a one-hole fixing, but can also be attached to the baseboard of the set or externally to the side or top of the cabinet. The metal parts are nickel plated to conform with other recently introduced components, for there is a tendency at the present time to give all the component parts appearing on the instrument face a nickelled finish.

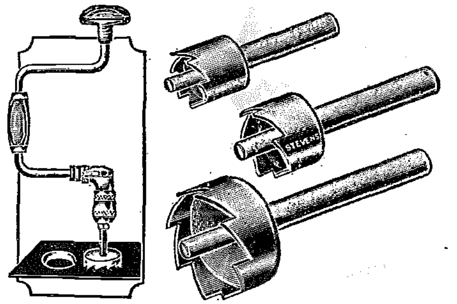


A geared two-coil holder which is suitable for mounting behind the panel.

Panel Cutters.

Cutting large holes in ebonite panels is usually a laborious job for the amateur, as he does not possess a suitably large drill or the means for rotating it and usually has to resort to using his biggest drill and then filing out to the required size.

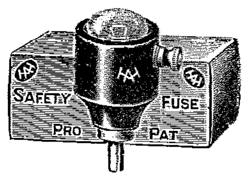
The panel cutters shown here provide an easy means for making holes of various sizes suitable for giving clearance to condenser spindles, etc., or large enough for valve windows. These cutters are made in three sizes, $\frac{3}{4}$ in., 1 in. and $1\frac{1}{2}$ ins., and are manufactured by Messrs. The Rockwood Co., Ltd.



Cutters which may be employed for making holes in ebonite panels.

A Wander Plug Safety Fuse.

A small fuse in the H.T. supply is always effective in protecting the battery from damage and at the same time preventing heavy currents being delivered such as if applied to valve filaments would immediately burn them out. The H.T. supply lead is the one part in a wireless receiver circuit where a fuse can be effectively employed, and if mounted on the wander plug will burn out should a short circuit occur anywhere in the instrument, as it is fitted at the actual point of distribution.



A fuse fitted to an H.T. wander plug.

This device is a product of Messrs. A. H. Hunt, Ltd., the well-known manufacturers of motor accessories.

THE EXPERIMENTER'S NOTE BOOK.

By W. James.

The Selectivity of a Super-Heterodyne Receiver.

ALTHOUGH a super-heterodyne receiver usually has but two tuning controls—one for tuning the incoming signal and the second for adjusting the frequency of the oscillator—plus sometimes an adjustment for controlling the degree of regeneration, the selectivity is remarkable. The reasons for this extraordinary selectivity will be best understood by considering a practical example. Thus, let us suppose that we are receiving a signal having a wavelength of 300 metres and that the high frequency amplifier is adjusted to 3,000 metres.

Converting the values of wavelength to values of frequency, we find the corresponding frequencies are 1,000,000 and 100,000 cycles per second. Hence the oscillator is adjusted to a frequency of 1,100,000 cycles or 900,000 cycles—that is, 100,000 cycles above or below the frequency of the incoming signal.

Now imagine there is an interfering signal of 305 metres flowing in the tuner. This signal has a frequency of 983,600 cycles and will therefore set up a beat frequency of 116,400 cycles if the oscillator is set at 1,100,000 cycles or a beat frequency of 83,600 cycles when the oscillator is adjusted to 900,000 cycles. Converting the frequencies to wavelengths we find that while the 300 metre signal which we wish to amplify has a supersonic wavelength of 3,000 metres, the interfering signal of 305 metres has a supersonic wavelength of 2,580 or 3,590 metres, according to whether the oscillator is set at a wavelength below or above that of the incoming signal. Thus an interfering signal having a wavelength of only 5 metres greater than the desired signal produces a supersonic wavelength differing from 3,000 metres—the wavelength to which the high frequency amplifier is adjusted—by 420 or 590 metres respectively.

Under normal conditions, that is when a frame aerial is employed without reaction, a signal of 305 metres coming for instance from a station having a power about the same as that sending the signals desired and situated a similar distance away, would set up oscillations in the frame of relatively considerable magnitude, and would, of course, be heard with the desired signal. If somewhere in the high frequency amplifier portion of the super-heterodyne receiver, however, we provide a circuit which is sharply tuned to a given wavelength, say to 3,000 metres, as in the above example, the interfering signal which has a supersonic wavelength of 2,580 or 3,590 metres will not be amplified. A sharply tuned circuit, which is sometimes referred to as a filter, is always employed in the H.F. amplifier. Usually it is connected between the first detector and the first amplifying valve, but may almost equally well be connected between the last stage of the H.F. amplifier and the input circuit of the second detector. The filter may consist of a tuned transformer or a tuned anode coil employing carefully wound coils and condensers.

A Super-Heterodyne Receiver Having Three Stages of Resistance Coupled H.F. Amplification.

Perhaps the simplest super-heterodyne receiver is that which employs a resistance coupled H.F. amplifier. The circuit for such a receiver is given in Fig. 1 and is recommended to beginners. This is the circuit of the first super-heterodyne receiver which I built when studying the subject, and it gave very good results indeed when one considers the ease with which it is put together and the relative low cost of the components. We have first the frame aerial and tuning condenser C_1. For 250 to 550 metres the frame had 15 turns of No. 18 D.C.C. wire wound on a skeleton framework 15 inches square, and C_1 had a capacity of 0·0005 microfarads. Connected to the frame circuit on one side is the grid condenser and leak C_2, R_1, of

0·00025 microfarad and 2 megohms respectively, and on the other side a coupling coil L_3 consisting of 15 turns of No. 22 D.C.C., 1½ ins. diameter. In the anode circuit of the first detector is the primary winding L_1 of a high frequency transformer shunted by a fixed condenser C_3 having a capacity of 0·001 microfarad. The transformer actually employed was an Igranic (size 4), which consists of two duolateral coils suitably placed together, with a four-pin plug. The three valves of the high frequency amplifier are resistance coupled, having anode resistances R_4 of the grid leak type, with a resistance of 100,000 ohms each, coupling condensers C_4, C_5 and C_6, and grid leaks R_2 and R_3. The coupling condensers had a value of 0.005 microfarad, the grid leaks R_2 a resistance of 0.5 megohm and R_3 a value of 2 megohms. It will be noticed that the grid leaks R_2 are connected to the negative side of the filaments, while R_3 is connected to the positive side for rectification.

A separate oscillator having its own filament and anode batteries was employed. The grid and anode coils were ordinary basket coils, the grid coil L_5 having 55 turns of No. 22 D.C.C. and the anode coil L_4 40 turns of No. 22 D.C.C. Both were wound on a basket coil former 1½ ins. in diameter, with 15 spokes. These were tied together, and the coupling coil mounted near them in order that variable coupling could be obtained. Condenser C_8 of 0.0005 microfarad capacity tunes the grid circuit, and condenser C_9 of 1 microfarad completes the anode circuit for H.F. currents.

To tune-in a signal the frame aerial condenser is set at a value and the oscillator tuning condenser slowly turned. This process is repeated until a signal is heard and then both condensers are accurately set to the best values.

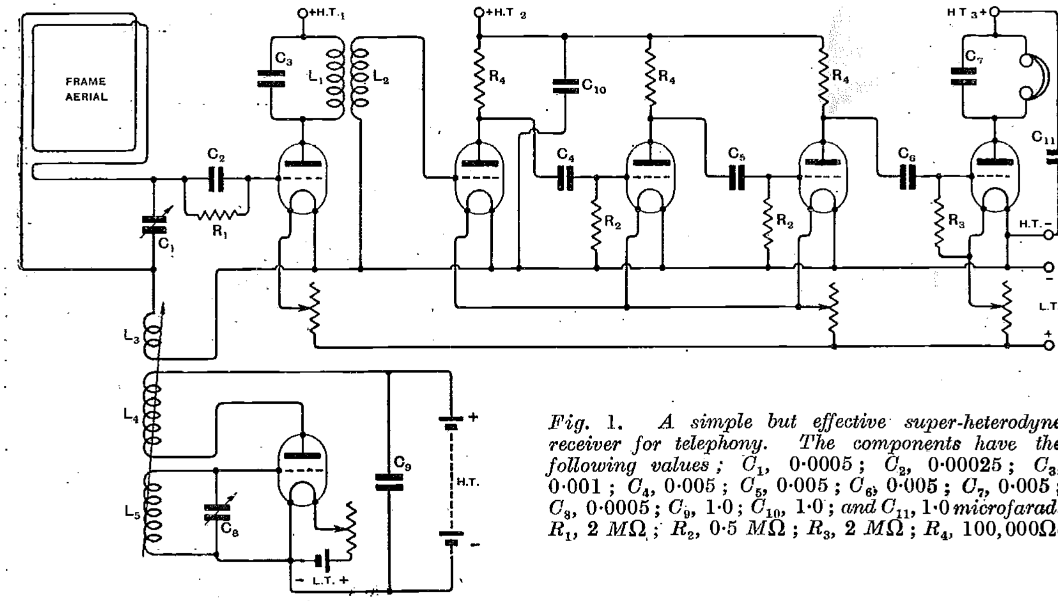


Fig. 1. A simple but effective super-heterodyne receiver for telephony. The components have the following values; C_1, 0·0005; C_2, 0·00025; C_3, 0·001; C_4, 0·005; C_5, 0·005; C_6, 0·005; C_7, 0·005; C_8, 0·0005; C_9, 1·0; C_{10}, 1·0; *and* C_{11}, 1·0 *microfarad.* R_1, 2 $M\Omega$; R_2, 0·5 $M\Omega$; R_3, 2 $M\Omega$; R_4, 100,000Ω.

With this simple set no difficulty at all should be experienced in receiving many stations situated a long distance away. I heard many continental and several American stations with this elementary arrangement and learned many of the tricks of super-heterodyne receivers as well. At the moment I am testing a set which I have built after a good deal of experimenting which is altogether superior to the simple set mentioned above, and hope to describe its theory and design in an early issue of this journal.

PATENTS AND ABSTRACTS.

A Reflex Receiver.

In ordinary reflex receivers it is usual to connect the frame aerial or the tuner direct to the first valve by connecting one side of the tuned circuit to the grid and the other side to the filament. The latter connection determines and fixes the average voltage of the grid and is set in accordance with the characteristic curve of the particular valve in use. It is claimed, however (British Patent No. 223,648) that better results may be obtained by connecting a fixed condenser of small capacity in the circuit, as in Fig. 1, to prevent the grid taking up the normal voltage of the filament. Referring to the figure we see that the frame aerial F, tuned by condenser C, has one of its ends connected to the grid and the other end joined to the fixed condenser C_1, and that the secondary winding of the L.F. transformer is connected between the filament and the other side of C_1. Incoming signals are therefore applied to the first valve and amplified, being passed to the valve detector by the H.F. transformer T_1. The rectified currents then pass through the primary winding P of the L.F. transformer, setting up voltages in the secondary winding S which influence the grid of the first valve. These L.F. voltages pass through the fixed condenser C_1 in the grid circuit; hence the capacity of this condenser must be such that it does not offer a high impedance to the L.F. voltages. According to the patent specification, a capacity of 0·005 microfarads is suitable—although, of course, it may be larger. As the grid is influenced by the L.F. voltages magnified L.F. currents flow in the anode circuit and actuate the telephones T.

With this circuit we therefore obtain one stage of H.F. amplification followed by valve detection and then one stage of L.F. magnification. The effect of condenser C_1 is to break the grid circuit to direct currents, and leaves the grid of the valve free to assume a voltage determined by the operating conditions. When the grid is made positive, a small grid current flows and charges the condenser C_1, giving the grid a slight negative potential. Consequently the average working potential of the grid is automatically adjusted to that degree of negative potential which just prevents self-oscillation of the valve. With this potential on the grid the valve is in its most sensitive and responsive

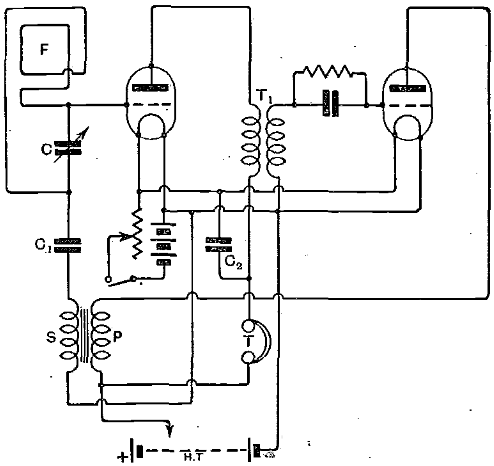
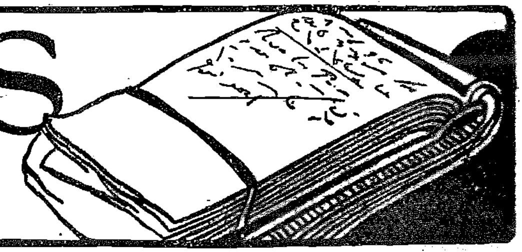


Fig. 1. A reflex receiver giving one stage of H.F. amplification, valve detection, and one stage of L.F. magnification.

condition. The explanation of the action and the theory of condenser C_1 in circuits of this type is complex, but it is said that in practice a considerable increase in the signal strength is obtained by including this condenser in the circuit.

The values of the components employed in this circuit are usual ones, and depend on the wavelength of the signals to be received. For instance, the tuning condenser C may have a capacity of 0·0005 microfarads, C_2, 0·002 microfarads and the grid condenser and leak 0·0003 microfarads and 2 megohms respectively. The H.F. transformer T_1 may comprise two basket coils tuned with a 0·0002 microfarad condenser, or a pin-type transformer may be employed. If the windings are of fine wire having a fairly high resistance, there is no need to tune the transformer with a variable condenser.

NOTES & NEWS



Additions to the Marconi station at Carnarvon have facilitated the opening of a second direct wireless telegraph service between London and New York.

* * * *

The Admiralty have closed the wireless station at Goswick, Berwick. It was built during the war, and has been used as a direction-finding station for naval and navigation purposes.

* * * *

For the benefit of the American Colony in Paris, a special "American Night" was held at the *Petit Parisien* broadcasting station on January 12th.

* * * *

A broadcast receiver has been installed in the reading room of the House of Parliament in Vienna for the benefit of members.

* * * *

BRIGHTER PROSPECTS FOR DUTCH TRANSMITTERS.

Signs are not wanting that the heavy restrictions upon amateur transmitters in Holland are being relaxed by the authorities. According to an English correspondent now in Utrecht, ten amateur transmitting stations have now been licensed, with the call signs PB 1 to PB 10, and good DX work is being carried on with America.

WIRELESS AND SOLAR ECLIPSE.

Special arrangements have been made in America to observe whether the solar eclipse of January 24th will influence the transmission and reception of wireless signals. Although the eclipse will be partial as viewed from this country, it will be total over a belt covering Western New York, Connecticut, Northern Pennsylvania, and New Jersey. On previous occasions American listeners have noticed an improvement in signals during the progress of an eclipse.

SHORT WAVE RECEPTION IN SHEFFIELD.

With reference to the newly-opened service between Nauen and Buenos Aires on 30 metres, a Sheffield reader, Mr. Lawrence Manning, reports regular reception of these signals on a two-valve (0—v—1) receiver. The call sign used by the German station is apparently POX, not POZ, and has probably been allocated for this special service.

WIRELESS SERVICE AT SEA.

Sir Bertram Hayes, upon his retirement from the command of the "Majestic," received a congratulatory wireless message from the Chatham Multiplex Marine Station, Massachusetts, recalling that his ship holds the world's high-speed record in radio transmission for working at 150 words per minute.

In reply to this message Sir Bertram Hayes expressed his gratitude to the wireless stations for their kind assistance in establishing the position of the ship when required. He added that the "Majestic's" high-speed record is due to the extraordinary efficiency of the Marconi operators.

BELGIAN AMATEURS BUSY.

Further Belgian successes in transatlantic amateur working are reported.

On December 28th, B 4 RS communicated at 6.20 a.m. with U 1 KC, of Northampton, Mass., with a plate input of 20 watts. The transmitter employed was illustrated in our issue of December 3rd last.

Belgian 4 QS, on the morning of December 6th, was successful in working with two U.S. amateurs, viz., 1 SF and 3 AB. 4 QS used less than 20 watts.

WIRELESS PHOTOGRAPHS ON VIEW.

In view of the recent successful experiments in the wireless transmission of photographs between New York and London, special interest attaches to the latest exhibit at the Science Museum, South Kensington. The exhibit shows a photographic film of the Prince of Wales which was actually used for the purpose of transmission, a photograph of the portrait as received in New York, and a copy of one of the American newspapers in which it appeared. The exhibit is to be found in the Western Hall at the Science Museum, Imperial Institute Road.

GOOD WORK WITH A SUPER-HETERODYNE.

A more than usually interesting log of the reception of American broadcasting stations has been forwarded by Mr. E. A. Devine, of Wooler, Northumberland, who, in less than four hours on the night of December 27-28th, listened to eight American transmissions. At 12.15 a.m. children's stories were heard at WBZ, and following the closing down of this station, WHAR was logged through serious morse jamming. Strong band items were received from KDKA at 1.30, and half an hour later the Montreal station was heard with great clearness. PWX, of the Cuban Telephone Co., Havana, was next tuned in and solos and announcements in Spanish were heard at comfortable strength. WOR and WGY were then picked up in succession, and finally, at 3.45, WIP, of Philadelphia, Pa., was heard clearly and strongly on telephones.

These very satisfactory results were obtained on a seven-valve super-heterodyne receiver. The night in question appears to have been extremely favourable for long distance reception, as we have received interesting reports from a number of listeners.

MORE ABOUT WGH.

Apropos our recent note on the identity of WGH, we are indebted to Mr. A. N. C. Horne, of Queenstown, Ireland, for supplying official information which revises the details already given.

The following particulars are taken from the International List of Radio Telegraph Stations. The name of the station is Tuckerton, New Jersey, WGH, and its normal range is given as 4,000 nautical miles. A General Electric valve transmitter is employed and work is carried out on wavelengths of 90, 93, 97, 100 and 103 metres.

I.E.E. ANNUAL DINNER.

The Annual Dinner and Reunion of the Institution of Electrical Engineers will be held at the Hotel Cecil, Strand, W.C., on Thursday, February 12th, under the Presidency of Mr. W. B. Woodhouse, supported by the Council. Tickets should be applied for as early as possible, and application forms may be obtained from Mr. P. F. Rowell, Secretary, at the Institution, Savoy Place, W.C.2.

MORE DX WITH MOSUL.

"We had no difficulty in working with each other," states Mr. R. L. Royle (2 WJ), of Palmers Green, London, in a report of successful DX with GHH 1 (Mosul) on December 29th. The communication took place on 90 metres between 3.20 and 4.20 a.m. (G.M.T.) and signals from Mosul were of excellent strength. The power input at 2 WJ was 130 watts, and at Mosul, 100 watts.

NEW WIRELESS EXPORT JOURNAL.

The Wireless Export Trader, published by The Trader Publishing Co., Ltd., 139-140 Fleet Street, London, E.C.4, is a new monthly journal designed to keep overseas importers and dealers in touch with the development of Radio Industry in Great Britain, and also supplies of British goods for resale in all the world's markets.

The publishers, who have had experience in the production of trade journals extending over 30 years, are confident that this journal will meet a real need. The world demand is all for reliable productions of up-to-date design, and the British industry is doing more than any other to supply this, and is keeping well in the forefront of radio research and progress.

The worldwide subscription rate is 10s. per annum, post free.

An imposing display of amateur apparatus was a feature of a Wireless Exhibition recently held under the auspices of the Maidstone and District Radio Society. Our photograph shows a portion of the exhibition.

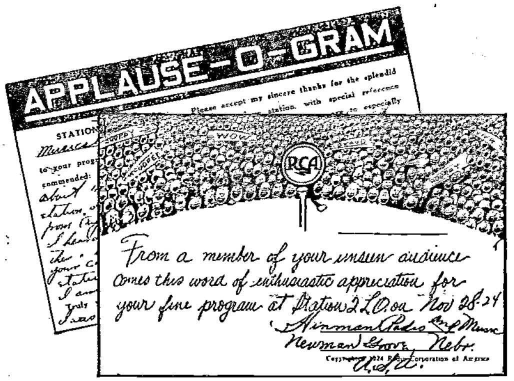
ATMOSPHERICS OVERCOME ?

Bold claims are made for a new invention, by a young Frenchman named Verdan, designed to overcome atmospheric and other interruptions in the transmission of wireless telegraph messages. According to reports the apparatus transmits messages by a system of printed letters. Practical experiments are soon to be made with the new appliance between Nice and Ajaccio, Corsica, and it is hoped that, as a result, the cable between France and that island may be dispensed with.

BEAM WIRELESS IN CANADA.

A group of new stations is being erected near Montreal by Marconi's Wireless Telegraph Company of Canada for direct communication with England and Australia by means of the beam system.

Each station is to be capable of communication at a speed of 105 letters per minute each way during a daily average of 18 hours.



Two typical applause cards at present in vogue in America.

BOOKS RECEIVED.

Some Methods of Testing Radio Receiving Sets. By J. L. Preston and L. C. F. Horle (Washington : Department of Commerce, Bureau of Standards. Price, 10 cents.)

Chronicle Wireless Guide for the Amateur Constructor. (Manchester : Allied Newspapers, Ltd., Withy Grove. Illustrated with Circuit and Wiring Diagrams and Photographs. Pp. 104. Price, 6d. net).

TRADE NOTES.

Messrs. Radio Instruments, Ltd., inform us that Mr. A. J. B. Harris, until recently testing officer in charge of wireless receiving instruments and valves at the Signal School, Royal Naval Barracks, Portsmouth, has joined the technical staff of the company as superintendent of their test room.

* * * *

A move to larger and more commodious premises has been made by Messrs. The Dubilier Condenser Co. (1921), Ltd., the company's new address being Ducon Works, Victoria Road, North Acton, London, W.3.

RADIOTELEPHONY AND AFRICAN FLIGHT.

Wireless telephony is playing a considerable part in the flight from Paris to Lake Chad, which the French aviators—D'Oisy, Goys, Vuillemin and Dagneau—began on January 16th. During the flight the airmen have been in constant touch with the wireless stations at Le Bourget, Marseilles and Toulouse. The principal wireless telephony stations at Algiers, Dijon, Lyons and Perpignan, are also maintaining a listening watch. This aerial voyage in Africa, which is attracting considerable attention in France, will cover a distance of 4,293 miles on the outward journey alone.

CORRESPONDENCE.

A.C. on the Short Wavelengths.

To the Editor of THE WIRELESS WORLD AND RADIO REVIEW.

SIR,—I wish to draw your attention to the rapid increase in the use of unrectified, or very badly rectified A.C. telegraphy on the shorter wavelengths.

During the recent month or so many British stations and a far greater number of Continental experimenters have reduced their wavelengths to somewhere between 60 and 100 metres. It is well known that experimental stations in the Antipodes and those in the American Continent work for the most part on waves between 70 and 90 metres, which range is badly crowded at the present time.

The introduction of this badly tuned type of A.C. signal to the most interesting of all wave bands is causing considerable interference to long distance communication; for example, Australian 3 BQ is invariably blotted out on Sunday evenings (which is the only time the English amateur may hope to effect contact) by some inconsiderate experimenter using a signal spreading over some 5 metres or more, thus effectively and completely spoiling every chance of copying the usually feeble Australian signal.

I am certain that I am voicing the opinion of most amateurs of long standing in lodging this complaint against the unrectified signal expert.

The position is steadily becoming worse each week and the obvious way to clear the trouble is to urge, wherever possible, all European amateurs to refrain from transmitting below 90 metres during the very brief periods the A and Z stations are audible on this side.

Many experimenters are under the impression that to transmit between 60 and 85 metres is a sure way to successful working with the U.S.A., and it is with this object in view that they have decreased their wavelengths. I would like to point out that the hope of being received in America between 65 and 85 metres is a very small one indeed owing to the terrific QRM at all times.

The U.S.A., Australian and New Zealand enthusiasts are listening for European amateurs around 100 metres, and occasionally on 50 metres, but never between 65 and 90.

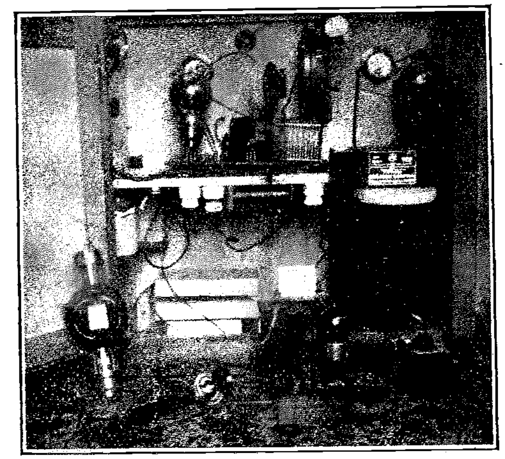
I shall be glad if you will be good enough to publish this letter at your earliest convenience.

J. A. PARTRIDGE, G 2 KF.

Calls Heard

St. Helier, Jersey.
British : 2 AS, 2 AV, 2 CC, 2 DR, 2 FN, 2 FQ, 2 FU, 2 GY, 2 IL, 2 KW, 2NM, 2 RB, 2 RX, 2 TR, 2 ZN, 2 CC, 5 CX, 5 GS, 5 HA, 5 IG, 5 IK, 5 LH, 5 LS, 5 MO, 5 MT, 5 OX, 5 RZ, 5 SU, 5 TZ, 5 UL, 5 UO, 6 AH, 6 AL, 6 FA, 6 GH, 6 GM, 6 KK, 6 LJ, 6 LO, 6 WI, 6 ME, 6 NF, 6 QB, 6 TD, 6 US. French : 8 AB, 8 BO, 8 BP, 8 BRG, 8 CH, 8 CT, 8 DY, 8 EM, 8 EP, 8 EU, 8 EV, 8 FV, 8 GJ, 8 GK, 8 GO, 8 HSF, 8 HSM, 8 IF, 8 II, 8 KC, 8 KK, 8 LPR, 8 JBL, 8 PA, 8 PP, 8 RBR, 8 RG, 8 RGT, 8 SG, 8 SR, 8 SSC, 8 SSU, 8 SSV, 8 UD, 8 WK, 8 WZ, 8 XR, 8 ZM, 8 ZZ, 8 ZZX. Dutch : 0 AX, 0 BQ, 0 GC, 0 MS, 0 RE. Danish : 7 EC, 7 ZM. Italian : 1 AM, 1 MT, 3 RM. Luxembourg : 0 AA. Swedish : SMZN, SMZV, SMZY. Belgian : 4 ALS, 4 C 2, 4 QS, 4 SS, 4 YZ, B 7, IO 2. Swiss : 9 AA, 9 AD, 9 BR. Finland : 2 NCA, 2 NM, 3 NB. Canadian : 4 KU. New Zealand : 2 AC. Argentine : CB 8. Mexican : 1 B. U.S.A. : 1 AJA, 1 ARJ, 1 AVR, 1 BIE, 1 BSD, 1 CKJ, 1 CMP, 1 DHT, 1 IEF, 1 JBL, 1 KC, 1 ML, 1 OW, 1 PL, 1 SW, 1 XC, 1 XP, 1 XW, 2 ABO, 2 ANA, 2 BCO, 2 BCW, 2 BGG, 2 BRC, 2 BF, 2 CTY, 2 CVU, 2 CH, 2 CY, 2 EQ, 2 KU, 2 MC, 3 BCK, 3 ADB, 3 BGP, 3 BTU, 3 BU, 3 BWP, 3 CBL, 3 CH, 3 CHC, 3 CHG, 3 CKJ, 3 GC, 3 QV, 3 SD, 3 VW, 3 ZW, 4 AU, 4 KU, 4 RR, 4 TJ, 4 UA, 4 XE, 5 CPM, 5 HL, 5 RU, 5 SN, 6 BUR, 6 CSR, 7 AKK, 8 AVL, 8 AP, 8 ADD, 8 ADG, 8 BF, 8 CC, 8 CE, 8 CKO, 8 SP, 8 KC, 8 ZG, 9 CA, NFV, NKF. Various : AGN, AIN, IHU, OCDJ, POZ, WGH, 1 OKZ, YA 79. (0--v—1.)
(D. Grove-White, 2 AWO.)

Wandsworth Common, S.W.17. (60 to 200 metres).
Telephony : 2 FM, 2 KF, 2 JU, 2 PY, 2 SX, 2 TI, 2 TK, 2 UC, 5 BT, 5 DT, 5 IO, 5 IS, 5 KS, 5 LP, 6 BBC, 6 RM. Dutch (Telegraphy) : OAB, OAZ, OGC, ONI, ONN, ORE. Finnish : 2 NM. British : 2 AWO, 2 BSC, 2 CC, 2 CV, 2 DR, 2 DX, 2 FM, 2 FU, 2 IT, 2 KF, 2 LZ, 2 MK, 2 NB, 2 NM, 2 NY, 2 OD, 2 PY, 2 RQ, 2 TA, 2 TF, 2 TQ, 2 WJ, 2 WP, 5 AM, 5 AR, 5 BH, 5 CB, 5 CC, 5 CX, 5 HA, 5 IM, 5 LU, 5 MO, 5 OX, 5 PD, 5 RH, 5 RZ, 5 TZ, 5 UQ, 5 WI, 6 AL, 6 AN, 6 FG, 6 FQ, 6 GD, 6 GH, 6 GM, 6 ME, (? working 6 GM), 6 NF, 6 QA, 6 TM, 6 WO, 6 YB. Danish : 7 EC. French : 8 AB, 8 AP, 8 BV, 8 CA, 8 CU, 8 DM, 8 DU, 8 EN, 8 EU, 8 FI, 8 FK, 8 FQ, 8 FR, 8 FU, 8 GI, 8 GK, 8 GO, 8 HS, 8 HSM, 8 II, 8 LL, 8 LP, 8 UD, 8 UU, 8 WAL, 8 ZZ. Swiss : 9 BR. Belgian : 4 AL, 4 SS, 4 YS, 4 YZ, Q 1. American : 4 EQ, 4 IO, 8 CCR. Various : UG 5, WGH, ABC. (0—v—1)
(F. R. Wells and C. E. P. Jones, 2 CA.)



Some of the apparatus at 8 AP, the French telephony transmitter. 8 AP employs a power of 100 watts.

Worksop.
British : 2 BF, 2 CC, 2 DD, 2 DX, 2 EX, 2 FN, 2 FU, 2 GM, 2 JF, 2 JK, 2 KW, 2 MX, 2 NB, 2 NF, 2 NM, 2 OD, 2 RB, 2 SH, 2 SZ, 2 TF, 2 UD, 2 UJ, 2 UX, 2 XI, 5 BS, 5 BV, 5 CC, 5 CX, 5 DA, 5 DN, 5 IK, 5 KQ, 5 KZ, 5 MA, 5 MO, 5 MX, 5 NN, 5 OX, 5 RQ, 5 RZ, 5 SK, 5 SU, 5 UQ, 5 WG, 5 XN, 6 AL, 6 GH, 6 GM, 6 GS, 6 JL, 6 KK, 6 LJ, 6 NF, 6 NN, 6 NL, 6 QB, 6 TD, 6 TM, 6 RY, 6 XJ. Belgian : 4 AU, 4 CA, 4 CZ, 4 CL, 4 GP, 4 II, 4 QL, 4 QO, 4 QS, 4 QY, 4 QZ, 4 UF, 4 UU, B4 YZ, P1, P 2, W 2, B 5. Dutch : OAL, 0 BA, 0 BQ, 0 DA, 0 GA, 0 GG, 0 GK, 0 GL, 0 HM, 0 II, 0 ML, 0 MS, 0 NN, 0 OD, 0 PG, 0 QW, 0 RE, 0 RF, 0 RM, 0 RW, 0 SK. 0 ZZ. Finnish : INA, FN 2NM, FN2NCA. Danish : 7 EC, 7 MP, 7 QM, 7 ZM, 7 GQ ? Rhineland : 3 CA, 1 CF, 8 SSU. Italian : 1 ER, I MT, I NN, I HT. Swedish : SM YM, SMYY. American : 1 BGQ, 8 BQ, 2 NG, 2 CB, 2 BUD, 2 XR, 3 OT, 3 HG. Various : 9 AD, 9 BU, 9 PA, POZ, ACX, ICS, IST, WGH, IOKZ, 1 KH, 1 YS, ICCM de 2 YT, NSF, 14 J. French : 8 AB, 8 AD, 8 AI, 8 AL, 8 AQ, 8 ARA, 8 AS, 8 AU, 8 BA, 8 BF, 8 BN, 8 BP, 8 BR, 8 BU, 8 BV, 8 BZ, 8 CA, 8 CK, 8 CM, 8 CN, 8 CT, 8 CZ, 8 DA, 8 DB, 8 DD, 8 DI, 8 DM, 8 DN, 8 DO, 8 DP, 8 DU, 8 ÉÉ, 8 ÉK, 8 ÉM, 8 ÉO, 8 EU, 8 ÉV, 8 FC, 8 FI, 8 FK, 8 FM, 8 FP, 8 FR, 8 FU, 8 GF, 8 GG, 8 GH, 8 GK, 8 GL, 8 GM, 8 GO, 8 GP, 8 GS, 8 GU, 8 HSD, 8 HSF, 8 HSM, 8 IG, 8 IP, 8 JH, 8 JHK, 8 JHL, 8 JM, 8 JU, 8 LA, 8 LI, 8 LM, 8 LP, 8 LPK, 8 LR, 8 MA, 8 MAR, 8 MK, 8 MN, 8 MU, 8 MZ, 8 NB, 8 NE, 8 NS, 8 OK, 8 PA, 8 PD, 8 PHO, 8 PP, 8 PS, 8 PU, 8 QD, 8 QG, 8 QM, 8 QR, 8 QT, 8 QU, 8 RG, 8 SBN, 8 SD, 8 SK, 8 SM, 8 SSC, 8 SU, 8 UA, 8 UD, 8 UF, 8 UK, 8 UU, 8 UZ, 8 VV, 8 WK, 8 WV, 8 WZ, 8 XH, 8 XM, 8 XR, 8 XS, 8 XX, 8 XZ, 8 YA, 8 ZM, 8 ZP, 8 ZU, 8 ZUT, 8 ZZ. (0—v—0)
(No aerial or earth used.) (E. R. Martin.)

Northampton.
Telephony : 2 YR, 5 FZ, 5 OD, 5 KW, 8 FC. British (Morse) : 2 AV, 2 AWO, 2 BN, 2 LQ, 2 FN, 2 GN, 2 JF, 2 JU, 2 KT, 2 KW, 2 LZ, 2 NB, 2 SH, 2 TU, 2 VJ, 2 WJ, 2 WY, 2 XY, 2 YT, 5 GS, 5 HA, 5 LF, 5 LS, 6 AH, 6 FA, 6 LJ, 6 ME, 6 QB, 6 UV, 6 XG, 6 YF. American : 1 AE, 1 AEA, 1 AJG, 1 ANR, 1 ARE, 1 BDT, 1 BHM, 1 BOA, 1 CKP, 1 DA, C1DQ, 1 ER, 1 XAV, 1 XZ, 1 ZAB, 2 AAY, 2 AFP, 2 AG, 2 AWF, 2 AZY, 2 BE, 2 BGG, 2 BIG, 2 BM, 2 BRC, 2 BSC, 2 BY, 2 CBG, 2 CC, 3 ADQ, 3 BCO, 3 BG, 3 BSS, 3 BTA, 3 BWT, 3 CBL, 3 CC, 3 CHG, 3 MUE, 3 OT, 4 FG. French: 8 AQ, 8 BO, 8 BV, 8 CT, 8 DE, 8 DU, 8 ÉÉ, 8 GG, 8 GK, 8 GO, 8 HSG, 8 JV, 8 LLO, 8 LMT, 8 LPR, 8 LR, 8 MG, 8 UD, 8 UK, 8 UU, 8 WV, 8 XR, 8 XU. Dutch : 0 GC, 0 GG, 0 RE, 0 RW, 0 XF, 0 XQ. Belgian : 4 ALS, 4 CD, 4 SA, P 2. Swiss : 9 AB, 9 BR. Swedish : SMYY. Italian : 3 RM, ACD. Rhineland : I CF. Luxembourg : LOAA. Unknown : I OKZ, S 7BD. (0—v—0 and 0—v—1, frame aerial.) (P. H. Brigstock Trasler.)

Cambridge.
American : 1 CF, 1 CQ, 1 OW, 1 PL, 9 AA, 9 AB, WGH. Canadian : 1 AR. Danish : 7 EC. Belgian : 4 AU, 4 C 2, 4 EAV, 4 KV, 4 MB, 4 OS, 4 RS, 4 YZ. Dutch : 0 RE, 0 RA. Finnish : 1 NA, 2 NM. Italian : 1 MT. French : 8 AP, 8 BR, 8 BV, 8 DGP, 8 DU, 8 ÉU, 8 FI, 8 GI, 8 GIP, 8 GM, 8 GO, 8 GZO, 8 HS, 8 II, 8 LL, 8 MG, 8 MK, 8 MO, 8 NS, 8 SB, 8 SO, 8 SR. 8 SSU, 8 TM, 8 UU, 8 ZZ, 8 ZZF. Unknown : GIL. (0—v—0.)
(L. M. T. Balfour and C. C. Birkinshaw.)

Walthamstow, London, E.
French : 8 AG, 8 AY, 8 AB, 8 BU, 8 BV, 8 BP, 8 BG, 8 DE, 8 FA, 8 FF, 8 FM, 8 FP, 8 GS, 8 GL, 8 GI, 8 GP, 8 GM, 8 HS, 8 LP, 8 LM, 8 PS, 8 PA, 8 RG, 8 SM, 8 TM, 8 TO, 8 UK, 8 YG. Belgian : 9 NR, 9 QS, 9 AU. Dutch : 0 BA, 0 RE, 0 GA, 0 NK. Miscellaneous : 3 AF, 3 SS, 1 CF, SMYY, SRK.
(H. W. Webb, 6 OV.)

REPORTS, PLEASE.

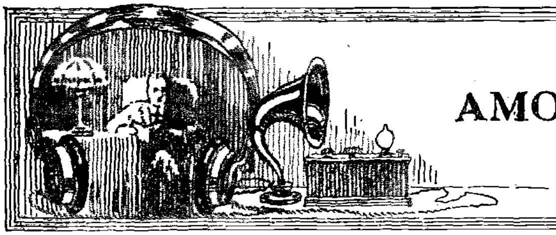
Reports on his transmissions are welcomed by Mr. A. E. MacFarlane (6 RM), of 30 Vincent Road, E. Croydon, Surrey. Transmissions are C.W. and telephony.

2 APR.

We should be glad if the Secretary of the "Waveley" Radio Club, owning the call sign 2 APR, would advise us of the locality in which the station is situated.

5 WR.

If all transmitters who have worked with 5 WR would please refrain from calling up that station or addressing correspondence to the late Mr. C. S. Morriss, his parents would be grateful.



AMONG THE SOCIETIES.

The Dublin Wireless Club, which was founded in 1913, is doing active work for the Free State amateur.

An instructive lecture on "Inductance and Capacity" was provided on January 8th by Mr. W. A. Beatty, who dealt with the practical side of the subject by comparing various types of coils and condensers. The use and abuse of reaction was also explained and the lecturer gave an interesting demonstration with a wireless receiver.

* * * *

"Surprise Nights" have become a frequent feature on the programme of the Hackney and District Radio Society. Such an evening was held on December 29th, when members were asked to write questions on slips of paper. These were then handed round and answered by other members, a very useful discussion resulting.

At the Annual General Meeting of the Society, held on January 5th, Mr. E. Cunningham was elected chairman, Mr. H. A. Epton being appointed as Vice-Chairman. The remainder of the evening was devoted to the sale of the Society's spare apparatus.

* * * *

The use of single layer coils, wound edgewise, to keep self-capacity at a minimum was strongly advocated by Mr. T. P. Allen, B.Sc. lecturing before the Belfast Y.M.C.A. Radio Club on January 2nd. Mr. Allen's lecture covered the problems of inductance, capacity and resistance, and much useful information was given on the calculation of coil values with a view to getting the best results.

* * * *

A highly successful and well-attended "Gadget Night" was held by the Ilford and District Radio Society on January 6th. Members had been asked to bring along any novel or ingenious idea or component which they had evolved, and thanks are due to all those who so ably responded.

Mr. H. L. Vizard described a method of obtaining H.T. current from the supply mains using a potentiometer and filter circuit, while Mr. Dennis exhibited a portable set containing many novel features. Other novelties included a grid leak on a piece of gramophone record and a low capacity valve holder for use in short wave reception.

* * * *

The first Annual General Meeting of the Golders Green and Hendon Radio Society was held on January 7th, when Mr. Maurice Child, the retiring President, gave a brief résumé of the year's work. In addition to an excellent programme of lectures, the Society during 1924 held three field days and a carnival dance.

The new President of the Society is Mr. Leslie McMichael, M.Inst.R.E.

* * * *

In response to many requests from local enthusiasts, the Beckenham and District Radio Society has decided to hold an Exhibition and Competition on or about April 1st next. It is hoped that a number of prominent manufacturers will take stands. Public appreciation of such an exhibition is likely to be very marked and a large attendance is expected.

* * * *

"Transmitting" formed the title of an instructive lecture recently given by Mr. W. Gravett before the Dorking and District Radio Society. Mr. Gravett's transmitting set, constructed by himself, aroused considerable interest.

* * * *

An excellent lecture on short wave reception was given by Mr. J. E. Nickless (2 KT) before the Streatham Radio Society on January 14th. A good discussion followed the lecture, and much useful information was gained. The audience particularly enjoyed Mr. Nickless's accounts of humorous incidents in the early days of transmission.

FORTHCOMING EVENTS.

WEDNESDAY, JANUARY 21st.

Radio Society of Great Britain. Ordinary Meeting. At 6 p.m. (refreshments at 5.30). At the Institution of Electrical Engineers, Savoy Place, W.C.2. Presidential address: "Matter and Radiation," by Sir Oliver Lodge, D.Sc., LL.D., F.R.S.

Clapham Park Wireless and Scientific Society. At 7.45 p.m. At 67 Balham High Road. Testing Night.

Radio Research Society, Peckham. Lecture: "External Heterodyne Reception." Discussion: "Single Circuit and Double Circuit Receivers."

THURSDAY, JANUARY 22nd.

Bournemouth and District Radio Society. At 7 p.m. In the Canford Hall, St. Peter's Road, Southern Railway Company Film: "The Electrification of the S.W. Section of the Southern Railway."

Luton Wireless Society. At 8 p.m. At the Hitchin Road Boys' School. Discussion of Difficulties.

Beckenham and District Radio Society. At 8.15 p.m. Lecture: "Extra Short Wave Transmission." By Lt. Walker (2 OM).

Dublin Wireless Club. Loud Speaker Demonstration.

FRIDAY, JANUARY 23rd.

Sheffield and District Wireless Society. At 7.30 p.m. At Department of Applied Science, St. George's Square. Competition.

TUESDAY, JANUARY 27th.

Institution of Electrical Engineers (North Midland Centre). At 7.30 p.m. At the University, Leeds. Faraday Lecture on "World-Wide Radio Telegraphy," by Professor G. W. O. Howe, D.Sc.

Manchester and District Radio Transmitters' Society. Lecture: "Condensers." By Mr. P. R. Coursey, B.Sc.

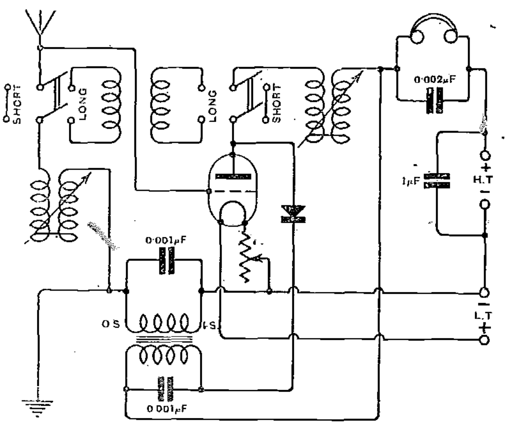
READERS PROBLEMS

Readers desiring to consult the "Wireless World" Information Dept. should make use of the coupon to be found in the advertisement pages.

A One-Valve Reflex Circuit for High and Low Wavelengths.

A READER has asked for a diagram of a reliable one-valve reflex circuit suitable for receiving the B.B.C. stations and also Chelmsford and Paris without using either plug-in coils or condensers.

We illustrate below a circuit suitable for this purpose. Variometer tuning is employed and reception of the long wave stations is accomplished by bringing into circuit loading coils by means of D.P.D.T. switches. These switches may be of the anti-capacity type and a single four-pole switch may be used if desired in place of the two switches. The loading coils may be basket or slab wound and as they are cut completely out of the circuit on the lower wavelengths undesirable "dead end" effects are eliminated. It is, however, desirable that they should be placed as far away from the variometers as possible and they should be placed at an angle to each other.



A single valve reflex set suitable for the reception of B.B.C. stations, Chelmsford and Paris.

No attempt is made in this circuit to deliberately introduce magnetic reaction and the absence of this considerably simplifies tuning and prevents the set "buzzing," a very annoying feature in dual circuits containing both magnetic reaction and one or more L.F. transformers. The correct connections of the I.P. and O.P. terminals of the transformer must be determined by experiment and it is also advisable to experiment with the values of the fixed condensers across the windings of the transformers and telephones. This circuit will be found extremely stable and productive of good results.

Prevention of Amplitude Distortion in a Choke Coupled Amplifier.

ON page 302 of the December 3rd issue of this journal a method was described for preventing overloading of the last valve of a choke coupled amplifier due to strong local signals by means of altering the value of the grid leak of the final valve by means of clix sockets. It will be appreciated that if incoming signals are of considerable amplitude, distortion will occur due to the voltage swing applied to the grid of the final valve being of sufficient amplitude to pass beyond the limits of the straight line portion of the grid volts anode current characteristics. This can be prevented by lowering the value of the grid leak associated with the last valve.

Suggestions for Increasing Efficiency on Low Wavelengths.

WE receive many queries from readers for three and four valve circuits suitable for reception on all wavelengths, that is of course, from about 150 metres upwards, since the ordinary standard types of circuit using commercial plug-in coils are quite unsuitable for dealing with the wavelengths below this limit.

The losses due to small stray capacities which are relatively unimportant on the broadcast wavelengths and quite negligible on long wavelengths are absolutely fatal to efficiency when dealing with wavelengths below 150 metres; in fact it will be found that even on the 200 metres wavelength the efficiency of the ordinary receiver is markedly less than on the broadcasting band of wavelengths. This is partly due to the fact that condensers of fairly large maximum and minimum capacity are usually employed in these receivers.

It is therefore advisable when working below about 250 metres that the capacities of the variable condensers employed should be kept as low as possible and should not exceed 0·0002 μF maximum value under ordinary circumstances. Unfortunately, however, a condenser having such a low maximum is not very useful on long waves inasmuch as the variation of wavelength obtainable with such a small capacity range will be extremely limited and a very large number of coils will be required. It is of course quite impracticable for the variable condenser to be changed for different bands of wavelengths, but an excellent plan to overcome this difficulty, which is but little employed among amateurs, is to mount small clips in parallel with the variable condensers into which "clip-in" condensers of varying values can be inserted when desiring to receive on the longer wavelengths. It is obviously more convenient and less costly to have a large range of fixed condensers of this type than to have a large number of expensive and bulky coils.

RESISTANCES FOR H.F. AMPLIFICATION.

A CORRESPONDENT has written to ask whether the remarks made on page 379 of the December 17th issue of this journal concerning anode resistances for L.F. amplification are equally applicable in the case of H.F. amplifiers designed for use on long wavelengths.

The anode current of valves employed for H.F. amplification is usually not so great as that of valves for L.F. amplification. Hence anode resistances of the grid leak type are not so noisy as they would be when connected in an L.F. amplifier. However, if several stages of resistance coupled H.F. amplification are employed, a noise that is sufficient to be undesirable may be heard unless the resistances are carefully chosen. Wire-wound resistances may, of course, be employed, provided they are wound to have a negligible value of self-capacity and inductance.

CAUSES OF LOW FREQUENCY HOWLING.

FROM time to time we receive complaints from readers troubled with low frequency buzzing or whistling in their receivers. This trouble cannot, of course, be cured by adjusting reaction, and the note will not change its pitch when tuning controls are moved as in the case of high frequency oscillation. The tone varies from a low growl to a high-pitched whistle according to the constants of the L.F. portion of the receiver. It is, of course, caused by the low frequency valves oscillating at audible frequency. This is due usually to either a magnetic or capacity coupling between the input and output sides of the amplifier. This can best be avoided by carefully spacing all the L.F. components of the circuit, taking care that transformers are not adjacent to each other and placing their cores at an angle to each other if possible. Care must also be exercised in spacing the wiring carefully so that grid and anode wires do not run parallel to each other for any great distance. Provided this is done very little trouble will be experienced from the causes we have mentioned. It is far better to exercise care in this respect when the set is being constructed than to resort to the placing of condensers and resistances in various portions of the circuit in order to eliminate the trouble.

There is, however, another source of trouble, which is often productive of instability in the L.F. amplifier. This is due to having a high resistance in the circuit, such as the H.T. battery, which is common to the anode circuits of all the valves. Varying potentials are set up across this high resistance which are, of course, communicated to all the valves in the common anode circuit, with the result that low frequency oscillation is set up. The use of a condenser of large capacity (such as 2 μF) across the H.T. battery will do much to remedy this, besides acting as a filter for any crackling noises set up by a defective battery. In one case which was recently brought to our notice, the trouble was eventually traced to the use of a wander plug containing a high resistance designed for the protection of the filaments should the H.T. wiring accidentally come into contact with the L.T. wiring of the receiver. This plug was used as the H.T. + connection for all valves, no separate tappings being provided, and its resistance was sufficient to cause the trouble we have mentioned. The use of a grid battery common to all L.F. valves is also another possible source of trouble if it should happen to be of high resistance, and a 2 μF shunting condenser can be used with advantage in this portion of the circuit.

METHODS OF CONTROLLING THE GRID POTENTIAL OF POWER VALVES.

A CORRESPONDENT proposes to add an L.F. amplifier, using a valve of the D.E.5 type, to his valve receiving set, and desires to know if he can use a potentiometer in conjunction with dry cells of the bell-ringing type in order to get a fine adjustment of grid bias for this valve.

It is certainly possible to obtain a far finer adjustment of grid bias by this method than by the more usual method of using a small H.T. battery and wander plugs, and the only point which necessitates consideration is the probable life of the cells concerned. The usual resistance value of the ordinary potentiometer used in wireless receiving sets is approximately 300 ohms, and as it is desirable that five dry cells be used the value of the current flowing in the potentiometer windings will be 0·025 amps. A switch should be included in the circuit in order to prevent the cells dissipating their energy through the potentiometer windings when the set is not in use. It is then probable that, using the set three or four hours daily, the cells would last four or five months.

The importance of providing a suitable grid bias for valves working as high or low frequency amplifiers cannot be over-estimated. Without grid bias there is certain to be distortion, regardless of the type of intervalve coupling employed.

There appears to be a misunderstanding regarding resistance coupled amplifiers. Correct grid bias is just as essential when this method of coupling is employed as when intervalve transformers are used—in fact a resistance coupled amplifier will usually give signals of poor quality when no bias is employed compared with those obtained from a suitably adjusted transformer coupled amplifier.

The WIRELESS WORLD AND RADIO REVIEW

RADIO TOPICS.

By The Editor.

BROADCASTING AND EDUCATION

THE British Broadcasting Company has taken up energetically the question of utilising broadcasting as a means of education in schools. The Company announces that they are in touch with every local educational authority in the country, school inspectors and members of educational advisory committees, with reference to their new programme of talks, lectures and school transmissions which are to be broadcast from all the B.B.C. stations simultaneously between now and the Easter vacation. The B.B.C. has been encouraged in its efforts in this direction by the keen interest which has been shown by a very large proportion of those responsible for school education. It is pointed out that, quite apart from the material which is broadcast for educational purposes in the ordinary way, there is the very distinct advantage that ordinary studies can be supplemented by lectures on special topics, by eminent authorities who whilst they can devote the time to broadcast single lectures could not possibly visit individual schools to lecture under the same arrangement. Broadcasting therefore provides the only means for students to attend authoritative lectures of this character.

The Schools Radio Society, which is a section of the Radio Society of Great Britain, was formed for the purpose of encouraging the use of wireless in schools for this purpose and also for the actual instruction of students during school hours in the elementary theory and practice of wireless. The Society has done a good deal to stimulate interest but still seeks more support from schools and colleges throughout the country.

It is unfortunate that just at the present time when such a big effort is being made by the British Broadcasting Company and other interests to encourage the adoption of wireless as a means of education that an important educational body in this country should recently have announced that it does not propose to give any active support to the movement nor to authorise any grants to assist schools to acquire the necessary receiving apparatus.

The reason given for this decision is that in their opinion the degree of intelligibility obtained from loud speaker reproduction has not yet reached a stage of development when lectures can be followed easily by young students. It would be well if in coming to such a decision this educational body had stated on what evidence this decision had been based. It is easy to understand that persons who have had no experience of good reception might be capable of denouncing wireless reception in this fashion, but in our opinion, before a responsible body came to such a decision, a thorough investigation of the matter should have been undertaken. We are confident that on the score of intelligibility it would have been possible to demonstrate that, properly handled, a suitable wireless receiver leaves very little, if anything, to be desired. It is true, of course, that to produce speech at loud speaker strength so that it is a perfect reproduction of the original is not an easy matter, but when it comes to a question of intelligibility it has long been recognised that it is possible not only to reproduce the same degree of intelligibility but even to improve upon the original in this direction.

We note that part of the scheme of the British Broadcasting Company in their educational programme is to instruct a local representative at each of their broadcasting stations who will give, on request, free advice to teachers and educational officials on the equipment of their schools with apparatus specially suitable for the purpose and economical in initial cost and upkeep. In view of these special facilities and the enterprise of the B.B.C. in starting these programmes, we feel that it should be regarded as incumbent upon educational authorities who have so far disregarded the value of wireless to reconsider the whole question in the light of these new circumstances.

almost an impossible one. The experiment was no doubt suggested as a result of the success of recent demonstrations of what has come to be known as the "speaking film" and described recently in this journal. The great advantage which the latter system has over one where broadcasting is done independently is that the difficulty of synchronising the two is completely overcome. We believe that the future of the speaking film is assured but it is doubtful if it is worth while to continue experiments where broadcasting is done independently

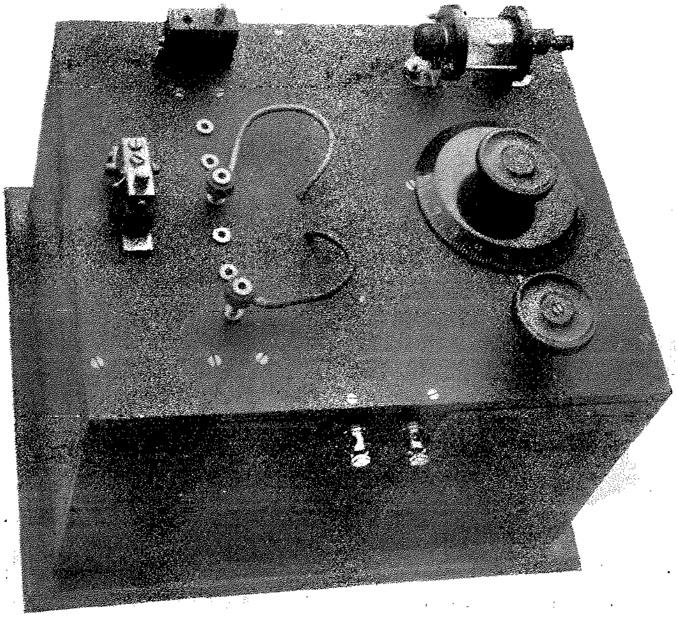
Filming the scene which was simultaneously screened and broadcast. The experiment is referred to below.

BROADCAST FILM EXPERIMENT.

THE pioneer attempt made the other day to synchronise the music of a play being broadcast with a cinematograph picture of the same performance was distinctly interesting even though the results may not have been entirely successful from a practical point of view. The fact however, that the cinematograph picture was taken at a different performance from that when the music was broadcast, made the problem of synchronising the two

of the film as attempted the other day, unless some new system is first devised to give a greater assurance of success in the matter of synchronising the two operations.

The possible solution to the difficulty which naturally presents itself is for a film or other form of record of the music to be made at the same time as the cinematograph picture is taken, and for this record to be used afterwards to control the broadcast transmitter. If this were carried out the difficulty of synchronising the two would be reduced to merely the necessity of bringing the two into step.



IDEAL RECEIVERS —III.

A COMBINED CRYSTAL RECEIVER AND BUZZER WAVEMETER FOR ALL WAVELENGTHS.

By W. JAMES.

The finished instrument. On the left is the buzzer, the loading coil holder and the Clix plugs and sockets tapping the coil. On the right is seen the switch, tuning condenser, and crystal detector. The telephone terminals are in front.

DESIGN OF THE INSTRUMENT.

THIS instrument is primarily a crystal receiver; to it has been added a switch, a buzzer and a battery, in order that it may also be employed as a buzzer wavemeter.

It has been shown by careful measurements that for best results

(*a*) A good coil must be employed.

(*b*) When a tuning condenser is used in the aerial circuit, and the set is to receive signals over the broadcast band of wavelengths, the condenser must be connected in series with the aerial, and further, it must not be set at a value lower than about 0·00025 microfarads. When tuning to longer wavelengths, however, such as 5 XX (1,600 metres), it is permissible to employ a tuning condenser connected in parallel with the tuning coil, provided only a small value of capacity is employed.

(*c*) The design should be such that the crystal detector can be tapped across a portion of the tuning coil, and not the whole coil, as is usually done. The best adjustment of the crystal detector circuit depends on the high frequency resistance of the crystal detector—which may, in the case of the wire contact type, be between 1,000 and 5,000 ohms, according to the particular crystal employed—and the resistance of the aerial-earth system. Obviously the best adjustment for a detector having a resistance of 1,000 ohms is not the best when a different crystal which may have a resistance as high as 5,000 ohms is employed.

It is, of course, essential so to arrange the components that tuning may be effected easily—for instance, the detector should be placed where it may be critically set and not liable to be accidentally moved when adjusting the condenser or arranging the tapping plugs.

(*a*) In most instances the crystal receiver will be required to tune over the broadcast band of wavelengths (say 300-500 metres) and also to 5 XX (1,600 metres). We may therefore employ one coil for the lower band of wavelengths, and add a loading coil when tuning to 1,600 metres or higher wavelengths The loading coil may be removed from the set and the connections for this coil short-circuited when receiving the lower wavelength signals. There will then be no losses through dead end effects such as would be produced if the loading coil were mounted permanently in the set and simply disconnected when not required. The connections of the coils may be seen from Fig. 1, where LC is the socket for the loading coil.

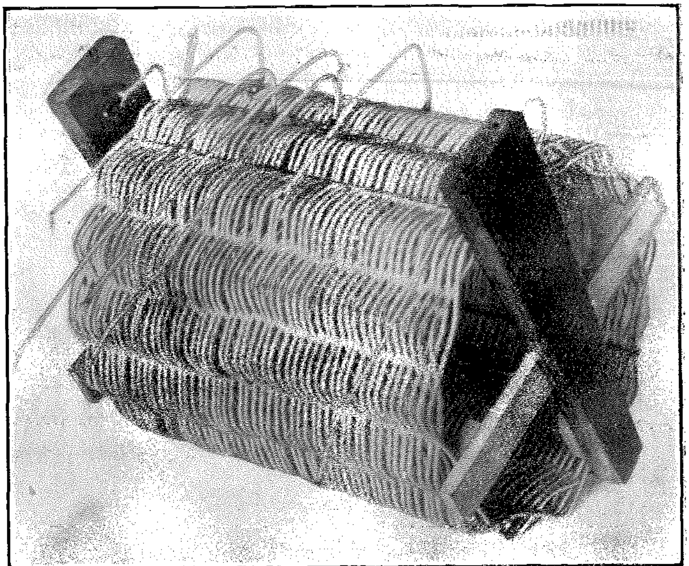


Fig. 2. A tapped basket-weave coil is employed in the set. The photograph shows the tapped coil, and the supporting end pieces of wood.

As to the coil used to tune over the lower band of wavelengths, and which is permanently secured in the set, it is well known that this coil should have the lowest possible high-frequency resistance. It should therefore be wound with a fairly thick wire, have its turns spaced, and be as nearly self-supporting as is consistent with mechanical strength.

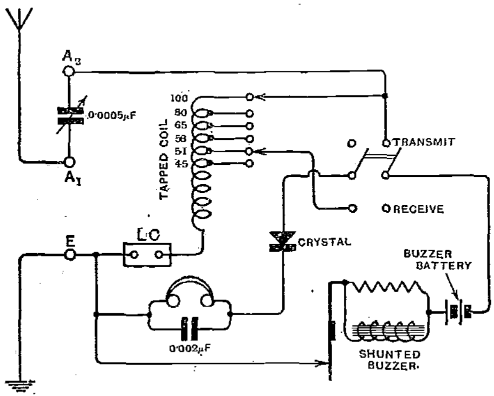


Fig. 1. The theoretical diagram of the set. When the aerial is connected to A_1 and the earth to E, and the switch is put in the position marked "Receive," the variable condenser is in series with the aerial and the coil, and the crystal detector and telephones are connected to the coil for reception. By putting the switch to "Transmit," and connecting terminals A_1 and E with a piece of wire, or a small coil, the set may be used as a buzzer wavemeter.

The effect of employing a solid former, such as a cardboard or ebonite tube upon which the turns are wound is to add considerably to the resistance of the coil and so to reduce the signal strength. The coil used in this receiver is of the basket-weave type, and is illustrated in Fig. 2. This type of coil is practically self-supporting, has spaced turns and is easily wound, and, of course, is much more efficient than an ordinary single-layer coil of similar inductance wound on a solid former. For a coil of the basket-weave type tuning over 300-500 metres, the best size of wire from the point of view of maximum efficiency is about No. 18 copper. Ideally, of course, bare wire would be employed, but practically it is difficult to construct a coil for a receiver of this type of bare wire. Further, the method of winding is such that the turns touch where they cross between the pegs of the former which is used for winding; therefore a double cotton covered wire is employed to give the conductor itself a reasonable spacing.

It was pointed out above that it is essential to tap the detector circuit across a portion of the coil or alternatively so to arrange the ratio of capacity to inductance that the required conditions are met. The best position for the detector tapping depends partly on the aerial-earth system, but mainly on the H.F. resistance of the crystal detector, which naturally will be different for every specimen of crystal. It is therefore necessary to find the best position for this tap by experiment. If the detector is connected across the whole of the coil, it is usually found that tuning is *flat* and signals weak. By adjusting the circuit the signal strength may be brought up and the selectivity of the set considerably improved.

We must therefore take taps from our coil, and do it in such a way that the losses of the coil are not increased. The losses would be increased, for instance, if we took a number of taps, ran the tapping wires together, and connected them to studs mounted close together in the ebonite panel. In this set we connect the taps at suitable points, mount the coil in such a manner that the tapping wires are short and well spaced, and provide contacts in the form of Clix sockets, which are mounted ¾ in. apart in the panel.

(*b*) A tuning condenser of 0·0005 microfarads capacity is employed. It is connected as indicated in Fig. 1. When the aerial is connected to terminal A_1 and the earth to terminal E, this condenser is in series with the aerial. To put the condenser in parallel with the tuning coil for the reception of long wavelength signals it is only necessary to connect terminals A_1 and E by a wire, and to connect the aerial to A_2 and the earth to E. When the instrument is to be used as a wavemeter, terminals A_1 and E may be short-circuited, when we have an ordinary tuned circuit comprising a condenser connected across a coil. Alternatively, we may connect between A_1 and E a small coil having long leads, and say 5 turns about 2 ins. in diameter, and use this coil to induce the oscillations set up in the wavemeter into the circuit to be excited.

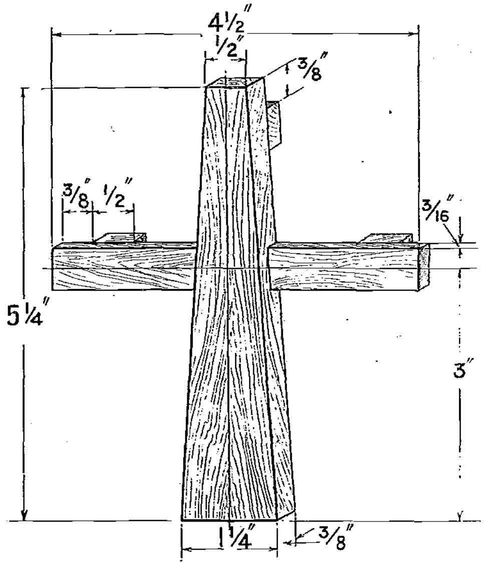


Fig. 4. The coil is fixed to the ebonite panel of the instrument by two supports of wood arranged as indicated here.

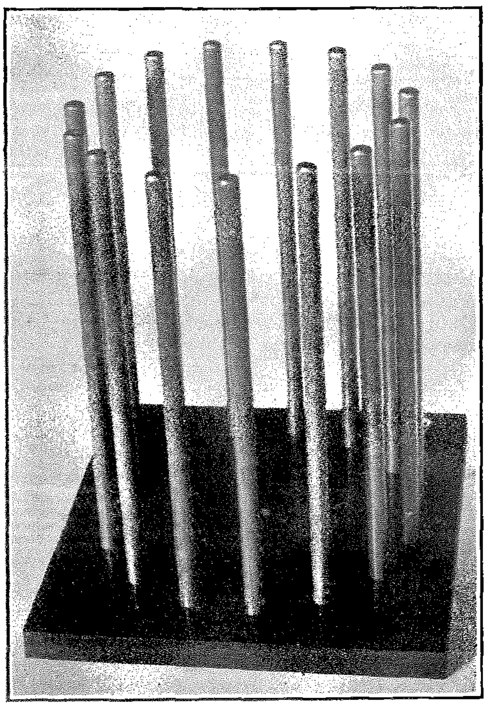


Fig. 3. The former on which the coil illustrated in Fig. 2 was wound. It consists of 15 lengths of brass rod let in a piece of ebonite or wood.

When receiving signals it will be found that signals are weakened if the tuning condenser is set at a value below about 0·00025 microfarads. With ordinary aerials which have a capacity of the order of 0·00025 microfarads not much is gained by employing a tuning condenser having a capacity over 0·0005 microfarads in series with the aerial.

(*c*) We have taken care of requirement (*c*) by providing a tapped coil as in (*a*) above. The best position for the detector tap for maximum signal strength and best selectivity will depend on the crystal, different specimens having widely different characteristics.

Experiment, however, will soon indicate the best adjustments.

THE TAPPED COIL.

A photograph of the tapped coil and the former upon which the coil is wound appears as Figs. 2 and 3. The former consists of a piece of ebonite or wood measuring about 6 ins. square with 15 lengths of $\frac{1}{4}$ in. brass rod fitted uniformly on the circumference of a circle 4 ins. diameter. The lengths of rod are 6 ins. long, and are a tight fit in the holes provided in the base of the former. There is no need to screw the holes in the base and the ends of the rods. It is advisable to drill the holes through the base, for then it is an easy matter to punch the rods out of the base when required.

To wind the coil it is only necessary to secure the end of wire, and to wind the wire on the outside of the first peg, on the inside of the next peg, then on the outside of the next peg, and so on. It will be found that the pegs will bend inwards if the wire is pulled. Therefore do not pull the wire, but rather bend it round the pegs with the fingers, allowing the base of the former to rest flat on the table.

The coil is complete when 100 turns are wound. Pass a length of thread at intervals through the spaces of the turns to secure them. Then at the tapping points, which are clearly marked in Fig. 1, bare the wire for about $\frac{1}{4}$ in., place a piece of empire cloth beneath the points, and solder short lengths of wire. Finally remove the lengths of rod from the former and so release the coil.

Next prepare the supports for the coil. These are sketched in Fig. 3, and are constructed of wood. The wide ends of the supports are screwed to the panel as will be shown in the next number.

(To be concluded.)

A WORD FOR THE TRANSMITTER.

A timely statement on the position of the amateur transmitter in relation to the broadcast listener was made by Mr. H. Bevan Swift, the recently elected Chairman of the Transmitter and Relay Section of the R.S.G.B., in a speech from 2 LO on January 22nd.

"The holder of a transmitting licence," said Mr. Bevan Swift, "enjoys privileges granted by the Postmaster-General to carry out experimental work upon a fixed wavelength of 440 metres, a band from 150 to 200, and in a few cases, extremely low wavelengths. The first, being within the broadcast band, is prohibited during broadcast hours. No such restriction exists regarding the lower wavelengths, and the experimenter is free, according to the terms of his licence, to work during any hours. The majority of experimenters have, however, made it a strict rule with themselves never to work during the hours of broadcasting simply because they know that the unselective receiving sets surrounding them would pick up the emitted waves. They have no wish to incur the wrath of the broadcast listener, or to jeopardise their privileges, so that they wisely refrain from exercising their legal rights until the last strokes of Big Ben have tolled the close of the broadcast day.

"The extension of broadcast hours have more and more curtailed the available working time, so that the experimenter has become a man of extremely late, or rather early, hours. His patience in this respect is not appreciated, for few broadcast listeners know the real circumstances. On the other hand the experimenter is frequently blamed by inconsiderate listeners for every Morse message or other interference heard. Such judgment is very unfair, although the idea appears to be prevalent, and very few experimenters have escaped the impeachment. The interference is generally due in the case of Morse messages to ships or high power coastal stations, coupled with the fact that the average receiving set is hopelessly unselective.

"The trouble would be obviated if the receiving sets used for broadcast made more use of the coupled circuit advocated in the technical press, and recently by Captain Eckersley. This would cut out all interference and sharpen the tuning of the set to the desired station. It is so simple and easy to apply that every receiving set should have it. In most cases it would consist of an extra coil to which the aerial and earth would be connected, instead of their usual terminals. Any radio dealer could easily fit this at a small charge. It further would give the user the advantage of being able to receive other stations than the one he usually receives. If every set had this the great bulk of complaints would disappear, and we should hear less of the interfering transmitter.

"The experimenter has already performed wonders in radio research work, of which he is justly proud. Although limited by the small powers permitted he has shown the radio world the value of ultra short waves for long distance work. Intercommunication with American experimenters is now a customary nightly occurrence, while two-way working with Australia and New Zealand has also been established.

"Nobody wishes to see the British experimenter hampered in his research work so that other countries would have an unfair advantage, and upon this ground the Transmitter and Relay Section of the Radio Society of Great Britain makes an appeal for more considerate dealing from the great body of broadcast listeners."

THE IMPORTANCE OF FILAMENT CONTROL.

In this short article the author shows how careful control of the filament current is an aid to fine tuning.

By R. J. BANN, B.Sc.Tech.

IT is often very surprising, in these days of comparative enlightenment on the theory of thermionic valves, to note how very many well-informed wireless enthusiasts quite fail to realise the great importance of filament control in valve receiving circuits. This question is rarely dealt with with the thoroughness which I submit is its just due. Most people realise that the operation of the thermionic valve depends entirely upon electron emission and the terms "saturation current," "backlash current" and the like, are, I believe, quite familiar to most students of this extremely fascinating branch of wireless reception. In the following study of these points an attempt is made to show the great possibilities of some kind of fine control—

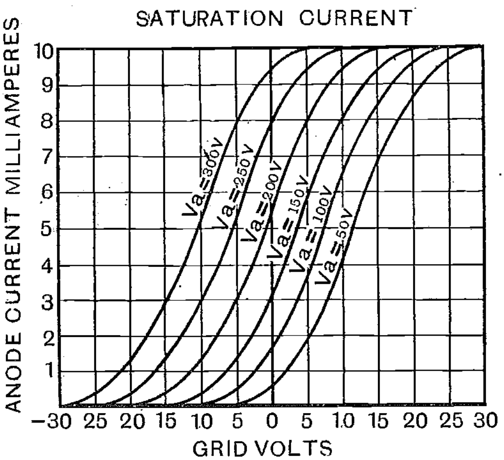


Fig. 1. Ordinary characteristic curves showing the relationship of anode current to grid volts for various anode voltages.

let us call it "vernier" control—on the electron emission from a valve filament. First it should be noted that this control is most effective when used in a circuit employing regenerative amplification or reaction, dual amplification or circuits employing combinations or variants of these

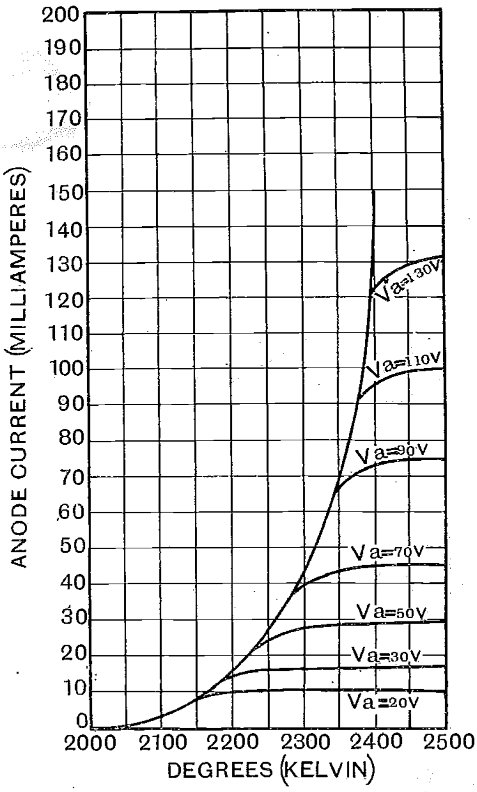


Fig. 2. Curves showing the variation of anode current with filament temperature.

features. At the same time too much importance cannot be attached to fine filament control with straight circuits.

CASE I.

In Fig. I we have the familiar anode current—grid volts characteristic for a simple valve. The features of the curves are :—

(*a*) The reverse grid potential required to stop all electron flow (anode current zero).

(*b*) Saturation current, when further increase in plate voltage produces no appreciable increase in anode current.

From the nature of the various curves it will be clear that increasing the anode current does not affect the nature of the characteristic but pushes the curve to the left. It is, of course, assumed that the filament temperature is constant in the above argument.

CASE 2.

In Fig. 2 we have the order of things reversed, the anode voltage being constant for any one curve and the filament emission variable. It will be seen that the effect of increasing the filament emission is to push the curve upwards. The curves shown are emission curves for an ordinary hard valve with a tungsten filament.

CASE 3.

In Fig. 3 we have a sketch of an arrangement whereby the normal grid potential may be controlled by a potentiometer of about 300 ohms resistance. This method results in moving the curve (see Fig. 1) to the left or right at will. Experiment has shown that the saturation current of any valve is the same whether the grid is there or not when the grid is neutral with respect to the filament. That is to say, saturation current is the same for a given two-electrode or three-electrode valve, other things being equal. Referring to Fig. 1, we see that the anode current increases with increasing grid potential. Therefore for greatest amplification the grid potential apparently must be raised. Actually, as is well-known, such increase has serious drawbacks, since a portion of the electron stream will be "absorbed" by the grid, resulting in a decrease in anode current and often some rectification and distortion due to grid current. For best results the valve should therefore be worked on the straight line portion of its characteristic on the negative side of the point of grid volts. Simply, this may be effected by careful control of filament emission and plate potential since any electrons striking the neutral grid will tend to make its potential negative with respect to the filament. The above follows from previous observations that increase in plate volts moves the characteristic to the *left* or negative side and increase in emission raises the limit of saturation and thus increases magnification.

CASE 4.

There is still another aspect of our study and that is the effect of anode current on the interchange of electro-magnetic energy from the plate circuit to the grid external circuit, or what we know as "reaction." For the purpose of our present study it will suffice if we consider the reaction introduced by means of a coil in the plate circuit coupled to the aerial coil or the secondary coil of a loose-coupled tuner. Everybody knows that

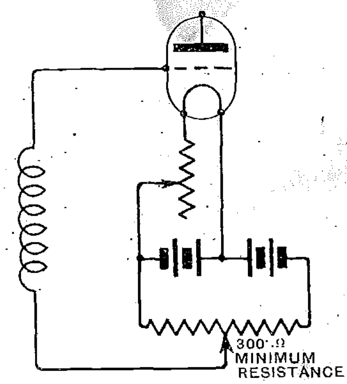
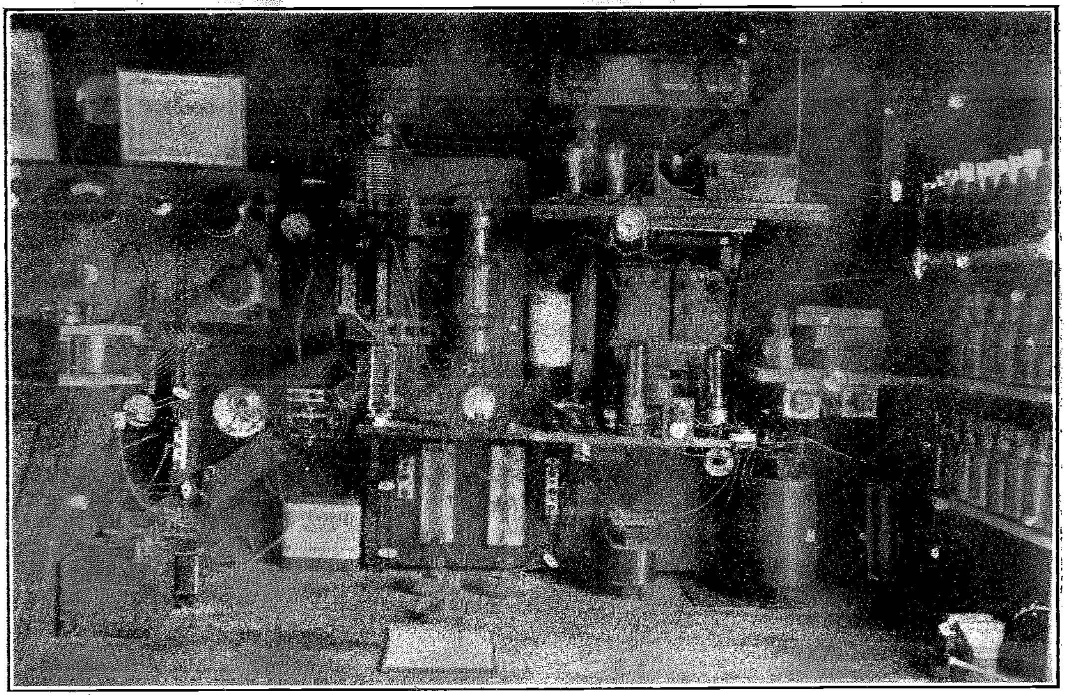


Fig. 3. A potentiometer is included in the grid circuit of the valve to give control of the grid potential.

between two coils so coupled in circuits which are in resonance with the same frequency, there is an interchange of electro-magnetic energy producing a feed back effect from the coil in the anode circuit to that in the grid circuit. This extra energy input to the grid circuit tends to neutralise the damping losses and ohmic losses in the latter and an increase in signal strength results. Now the amount of regeneration thus produced is proportional to the *mutual* inductance between the two coils, which is again proportional to the tightness of the coupling (*i.e.*, to the distance of one coil from the other).

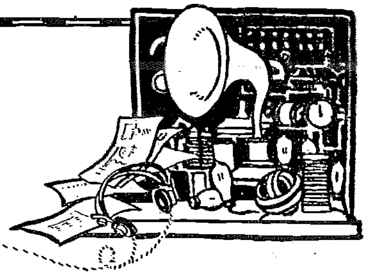
The magnetic flux being proportional to the current passing through the coil, teh regenerative effect will depend on the current flowing in the anode circuit. In other words, reaction in any receiver may be controlled by varying the electron emission from the filament. The same arguments will clearly hold good in a different and more direct sense with a receiver employing dual amplification, since the rectified current which is a measure of the filament emission is fed back for reamplification to the grid of the valve. It is often remarkable how patient and careful filament control is successful in reducing distortion without having to " detune " the set slightly. On a single-valve crystal reflex circuit I have tuned in Birmingham, Aberdeen and London on the filament rheostat alone, without touching the tuning condensers. With a single note magnifier added, Hamburg, Berlin and London have again come in on filament control alone. So that from the theoretical aspect, coupled with results in actual practice, I think there is a clear case for successful reception by controlling the output of the valve at its primary source—the filament. In conclusion I may add that many of my friends are now converted and have become enthusiastic filament controllers.

AN AUSTRALIAN AMATEUR TRANSMITTING STATION.



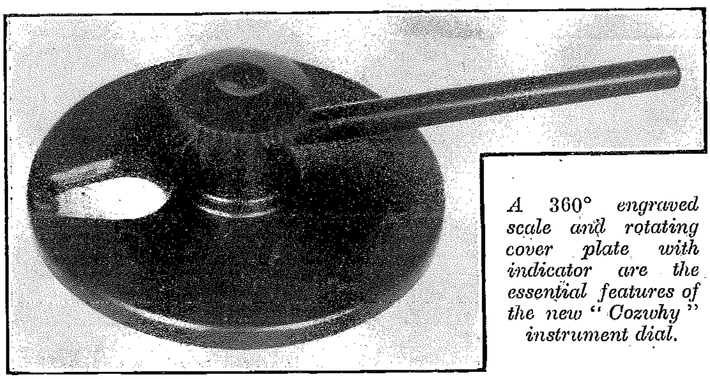
This photograph depicts the transmitting apparatus at A 2 CM, which is owned and operated by Mr. Charles Maclurcan, of Sydney, N.S.W. It may be mentioned that A 2 CM was in two-way communication with G 2 OD (Mr. E. J. Simmonds, of Gerrard's Cross, Bucks) on November 24th, when the Australian station sent a message for H.M. the King. 2 CM's signals have been received by a number of British amateurs.

NEW APPLIANCES.



The "Cozwhy" Dial.

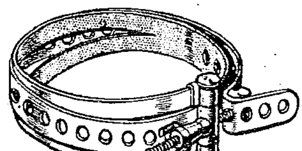
The need for an accurately divided instrument dial marked with degree divisions and with its markings so displayed that they can be easily read, has been met by the appearance on the market of the "Cozwhy" instrument dial. It consists of a cover which rotates with the instrument spindle while the scale remains stationary.



A 360° engraved scale and rotating cover plate with indicator are the essential features of the new "Cozwhy" instrument dial.

The "A.A." Earthing Clip.

Earthing is usually obtained by connection to the water main, making use of a clip to provide reliable connection. The "A.A." clip consists of a double loop of soft brass

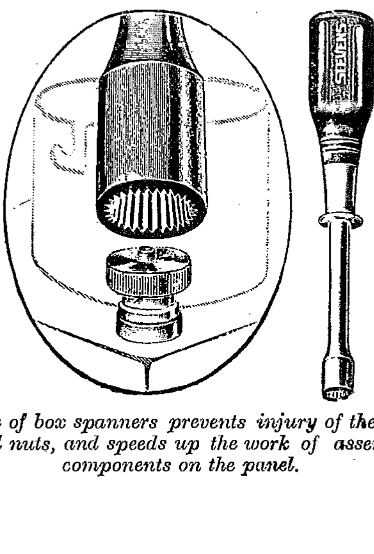


An earthing clip made in brass and designed to provide a good grip round the cleaned surface of a water pipe.

and is adjustable through a wide range to fit pipes of various sizes. A firm grip is obtained, and the earth lead is best connected to a small tag clamped down under the tightening screw. The clip is a nicely finished piece of work, the machined parts being clean and accurately set up.

"Spintite" Wrenches and Box Spanners.

The use of box spanners for tightening up small nuts on the back of instrument panels has already been referred to in the pages of this journal. In instrument construction back-nuts often appear in rather inaccessible positions and if an attempt is made to tighten up with pliers the head of the nut may become damaged, whilst it is sometimes exceedingly difficult to screw up tightly. The "Spintite" wrenches are made in all B.A. sizes, whilst another type is supplied to give a good grip on knurled terminal heads. The use of these tools saves time, whilst a much more positive and effective grip upon nuts is obtained.



The use of box spanners prevents injury of the faces of small nuts, and speeds up the work of assembling components on the panel.

RESISTANCE COUPLED AMPLIFIERS.

In this paper the author discusses resistance-capacity coupled low frequency amplifiers, and gives the results of measurements taken when an R valve, a D.E.5 valve and a D.E. 5B. valve is employed.

THE advantages of this method of amplification have of late been generally recognised. The principal advantage is that the amplification is almost independent of frequency over the whole range of speech frequencies, and that by the simple expedient of using large coupling condensers the even amplification may be maintained down to the lowest audible notes, such as the base notes of an organ.

A second, though by no means negligible, advantage is the very small H.T. current taken.

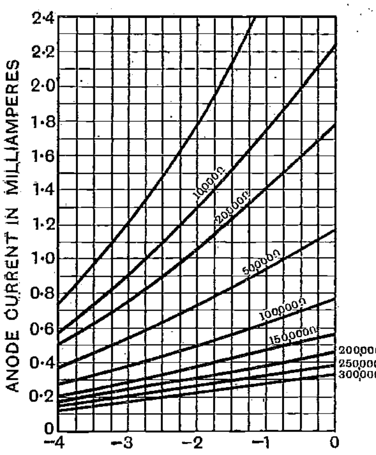


Fig. 1. *Anode current grid volts curves with anode resistances connected to a D.E.5 B. valve. H.T. voltage* 150.

The chief disadvantage up to the present has been the comparatively small degree of amplification obtainable; for example, with an R or similar type of valve an amplification of about 7 is the maximum; whereas with transformer coupling amplification of from 18 to 35 can be obtained.

However, by the use of specially designed valves having high amplification factors, such as the M.O. D.E.5 B, this can be largely overcome. With such a valve an amplification of about 15 can be obtained.

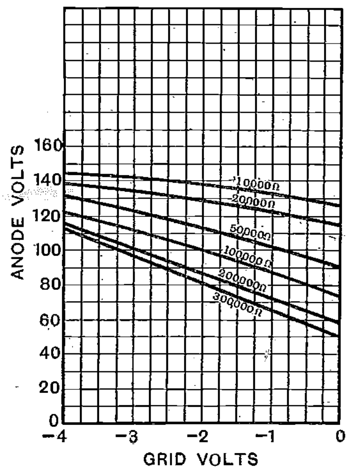


Fig. 2. *Anode volts grid volts curves with anode resistances connected to a D.E.5 B. valve. H.T. voltage* 150.

The theory of resistance amplification has been often treated; in many cases, however, it is assumed that, having decided on a suitable anode voltage and anode resistance, the H.T. supply is provided accordingly. The more practical problem is: given a definite H.T. supply, what is the best valve and what is the best anode resistance to use with it? Generally speaking, the higher the amplification factor of the valve the better.

It is possible to determine whether a valve is suitable and the best value of anode resistance by taking a series of anode-current grid-volt curves with various resistances in the anode circuit at constant H.T. supply volts.

Such a series of curves for a M.O. D.E.5 B valve are shown in Fig. 1. The H.T. supply was 150 volts, and curves were taken with anode resistances varying from 10,000 to

300,000 ohms. It will be seen that the insertion of the resistance has not only diminished the anode current, but has at the same time considerably straightened the curves, almost entirely eliminating distortion due to curvature of the valve characteristic.

Suppose the anode resistance is *r* ohms and the anode current is *i* amperes, then there will be a voltage drop of *ri* volts across the resistance. Hence a series of derived curves can be plotted that represent the anode-volts grid-volts relation for each value of anode resistance. Fig. 2 gives the set of curves corresponding to Fig. 1.

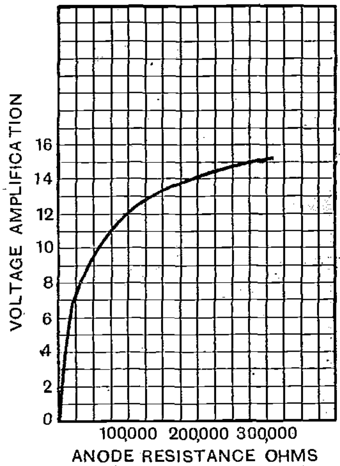


Fig. 3. The voltage amplification with a D.E.5B. and a H.T. voltage of 150.

These curves may also be readily observed by connecting a low reading electrostatic voltmeter either across the anode resistance or between anode and filament negative.

From these curves can be derived another shown in Fig. 3, where the ratio

$$\frac{\text{change of anode volts}}{\text{change of grid volts}}$$

for the change of grid volts from 0 to —4 is plotted against anode resistance. This ratio is the voltage amplification of the combination of valve and resistance. It will be seen that an amplification of 15 is obtained with an anode resistance of 250,000 ohms and a grid bias of —2 volt, and that an input grid swing of at least 4 volts and an output swing of 60 volts can be dealt with with negligible distortion.

There is little point in increasing the resistance beyond 250,000 ohms.

Fig. 4, which gives the corresponding curves for an R valve, shows that it is possible to use too high an anode resistance.

Fig. 5 gives the corresponding curve for the D.E.5 valve.

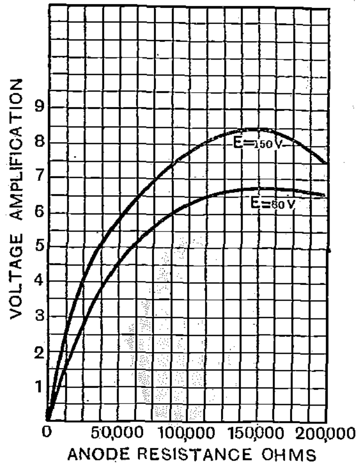


Fig. 4. The voltage amplification with an R valve and an H.T. voltage of 80 *and* 150.

Owing to the shunting effect of the coupling condenser and grid leak, amplifications of from 5 per cent. to 10 per cent. less than the values derived in the above way will be obtained in practice. It is interesting here to refer to the question of H.T. current economy.

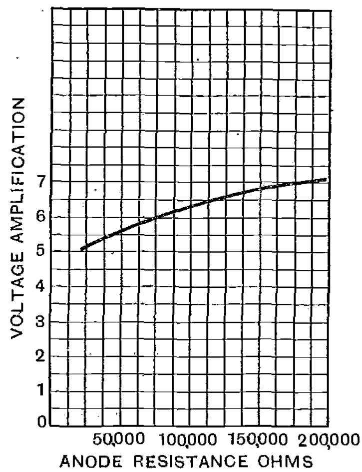


Fig. 5. The voltage amplification with a D.E.5 valve and an H.T. voltage of 150.

Two stages of distortionless amplification, giving a voltage amplification of about $14^2=196$ can be used with an increase of only about 0·6 mA. to the H.T. current.

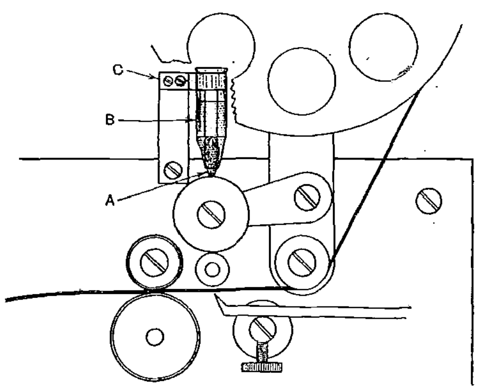
READERS' PRACTICAL IDEAS.

This section is devoted to the publication of ideas submitted by readers and includes many devices which the experimenter will welcome.

An Inker Improvement.

Many readers must have experienced the difficulty of obtaining a satisfactory ink supply on the inking wheel of a Morse recorder. The essential difficulty lies in obtaining a suitable quality of ink, but matters can be very much improved by fitting a small bracket which gives support to a glass tube into which the ink is introduced and is fed to the wheel by means of a small wick or brush.

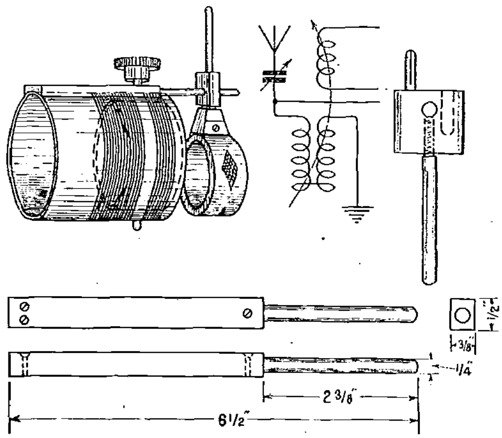
A. C. C.



Providing a continuous supply of ink on to the inking wheel of a Morse recorder. A = wick; B = glass tube; C = bracket.

Adding Reaction Coupling to a Variometer.

It is not always easy to obtain reaction coupling when the aerial circuit is tuned by means of a variometer. A suggested method is shown which consists of fitting to the outer coil of the variometer an ebonite extension piece which passes through a hole made in a coil-holder. The coil-holder may be locked in position on the ebonite rod by screwing down the handle which is threaded into a tapped hole. Thus when a plug-in coil is carried in the coil-holder it can not only be moved so that the



Constructional details for fitting reaction coupling to a variometer.

distance from the aerial inductance increases but it can also be rotated to provide a very small degree of coupling, and at the same time critically controllable.

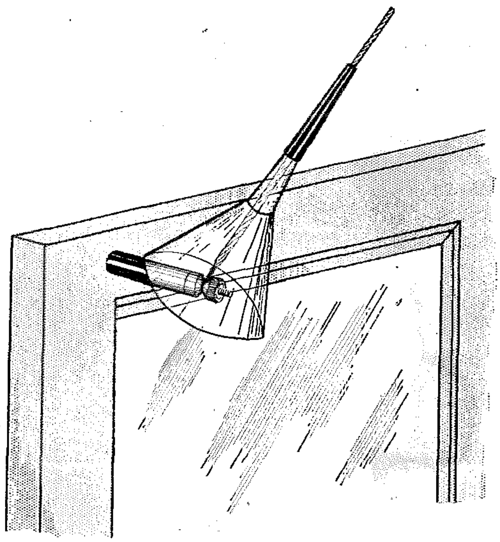
G. W. R.

Improving the Lead-in.

When the aerial down lead drops vertically on to the leading-in insulator a path is provided for rain during wet weather, and a considerable quantity of water may be brought down on to the insulator, spoiling its insulating properties and rendering it dirty and corroded.

The insulator may be kept dry and the water run off by fitting a glass funnel as shown. A water-tight joint is made with the down lead by means of a short piece of indiarubber tubing, while the rim of the funnel rests on the stem of the insulator.

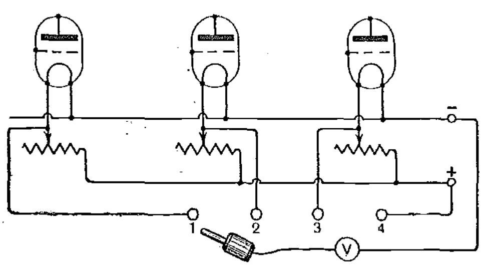
W. A. S.



Shielding the leading-in insulator.

Correct Filament Voltage.

USERS of multivalve receivers frequently find difficulty in obtaining the correct potentials across the filaments of all of the valves. By means of a wander plug and



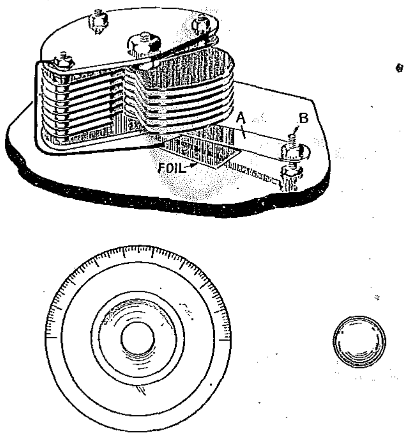
sockets or a switch of the rotary type a voltmeter can be applied across each of the filaments in turn and the best working potentials obtained.

A. C.

An Easily Fitted Vernier.

THE use of condensers fitted with a separately controlled plate to give vernier adjustment is not favoured by many experimenters, on account of the added space taken by a condenser so fitted and also in view of the increased cost.

A useful vernier can easily be added to the standard type by securing a small piece of metal foil to the face of the panel, and causing a strip of springy brass to approach it. The position of the brass strip is controlled by means of a 4 B.A. screw and is shown at B. A nut is soldered to the face



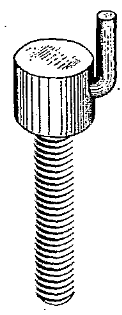
A fine adjustment can be obtained by employing this scheme.

of the plate so that as the screw is rotated the position of A changes with regard to the metal foil lying on the panel face. It will be found that a very critical control can be obtained in this way.

F. A. F.

Limiting Switch Arm Movement.

ONE of the easiest methods for preventing a switch arm from travelling over the end contact studs consists of drilling a small hole in the side of a stud and inserting a piece of hard brass wire. A contact stud fitted up in this manner is shown in the figure.



A stud fitted with a stop.

E. G. D.

THE EXPERIMENTER'S NOTE BOOK.

By W. JAMES.

A Super-Heterodyne Receiver with Three Stages of Transformer Coupled H.F. Amplification.

THE most popular coupling for the high frequency amplifier of a super-heterodyne receiver is the transformer. Transformers are favoured because it is thought that this form of intervalve coupling is cheaper than others. When tuned anode or resistance couplings are used, for instance, it is necessary to employ fixed condensers and grid leaks. These components add considerably to the cost of the amplifier. It is also usually thought easier to secure effective amplification when transformers are employed, and it is possible that in a poorly designed amplifier rectification may occur when grid condensers and leaks are used. However, with transformer couplings we have at least four variables—the number of turns in the primary, the number in the secondary, the gauge of wire employed and the distance between the windings. Each of these is important. If the ratio of the transformers is wrong; if too fine a wire is employed, or if the spacing of the windings is incorrect, amplification and selectivity suffer. But still, it *is* possible to make these values right and so to secure reasonably effective amplification and good selectivity.

The connections of a six-valve receiver having three stages of transformer coupled high frequency amplification are given in Fig. 1. Here we have a frame aerial tuned to the frequency of the incoming signal by condenser C_1 (0·0005 microfarads), which is connected to the first detector, V_2. A grid condenser and leak C_3 R_1 (0·00025 microfarad and 2 megohms) are employed for rectification and the grid return wire is joined to the positive side of the filament. In series with the frame aerial is the coupling coil L_1, which consists of a few turns of No. 20 D.C.C. coupled to the oscillator, V_1. The oscillator has a coil L_2 and tuning condenser C_2, which

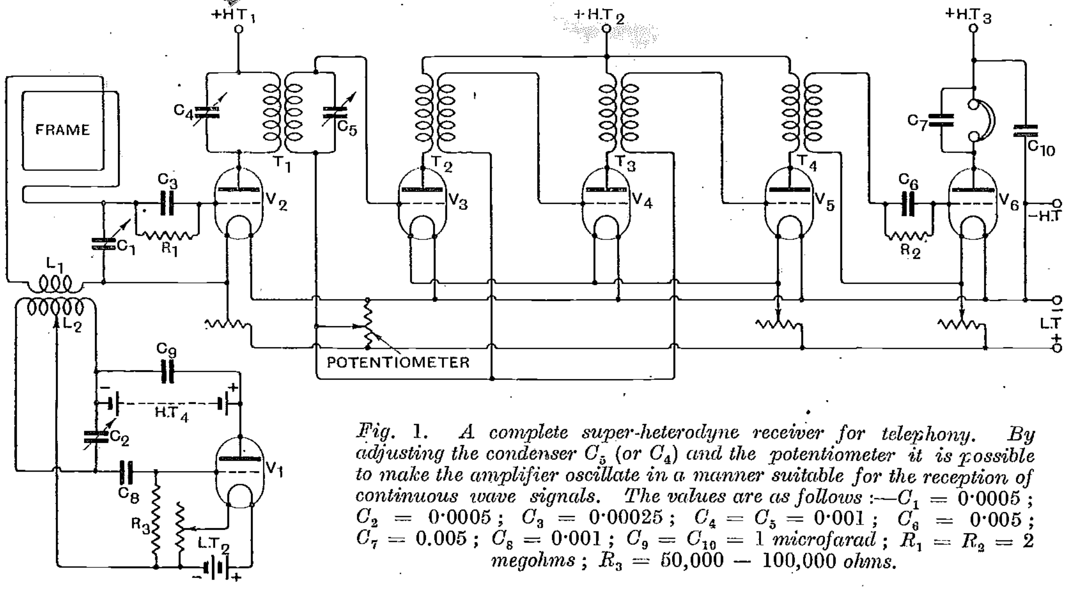


Fig. 1. A complete super-heterodyne receiver for telephony. By adjusting the condenser C_5 (or C_4) and the potentiometer it is possible to make the amplifier oscillate in a manner suitable for the reception of continuous wave signals. The values are as follows :—C_1 = 0·0005 ; C_2 = 0·0005 ; C_3 = 0·00025 ; C_4 = C_5 = 0·001 ; C_6 = 0·005 ; C_7 = 0.005 ; C_8 = 0·001 ; C_9 = C_{10} = 1 microfarad ; R_1 = R_2 = 2 megohms ; R_3 = 50,000 — 100,000 ohms.

is tuned to a frequency differing from that of the incoming signal by the frequency of the high · frequency amplifier. It should be noticed that one end of this circuit is connected through an H.T. battery to the anode of the valve, while the other end is connected to the grid through a grid condenser and leak C_8 R_3. The filament is connected to a tap on the coil. Usual values are C_2, 0·0005, C_8, 0·001, and C_9, 1·0 microfarad, and R_3, 50,000 to 100,000 ohms.

Between the first detector and the first valve of the H.F. amplifier is a tuned transformer T_1, having condensers C_4 and C_5, connected to the primary and secondary windings. These are drawn as though they are variable condensers in order to emphasise the fact that both windings of this transformer should be tuned. The desired result could, of course, be obtained by employing ordinary variable condensers, but this is not usually done—neither is it necessary. One must, however, adjust the values of these condensers, and the number of turns of the windings of this transformer in order to secure good selectivity. Usual values for the condensers are 0·001 microfarads when the transformer has similar windings. When the transformer has a turn ratio differing rom unity, however, the values of the condensers must be adjusted accordingly. It will be remembered from the explanation given in earlier articles that the wavelength of the H.F. amplifier in the majority of instances lies between 3,000 and 10,000 metres. The coils of the first transformer T_1 may therefore have values corresponding to Nos. 300-750 Igranic coils.

Transformers T_2, T_3 and T_4 should be designed to have a natural wavelength equal to the wavelength of the first transformer. Sometimes tuning is effected by employing adjustable condensers across the secondary windings, but it is more usual to adjust the wavelength by removing turns from the coils. Whichever method is employed, it is quite essential to make the wavelength of each circuit as nearly alike as possible. The tuning of these transformers will, of course, depend a good deal on the capacity of the circuit—the capacity of the connecting wires and that of the valves. Hence it is important to make the adjustments with the transformer connected in the circuit and under operating conditions. It is by no means an easy job, and should not be undertaken too lightly, as the success or failure of the set depends in a large measure on this work being properly carried out.

The last valve, V_6, is the second detector,

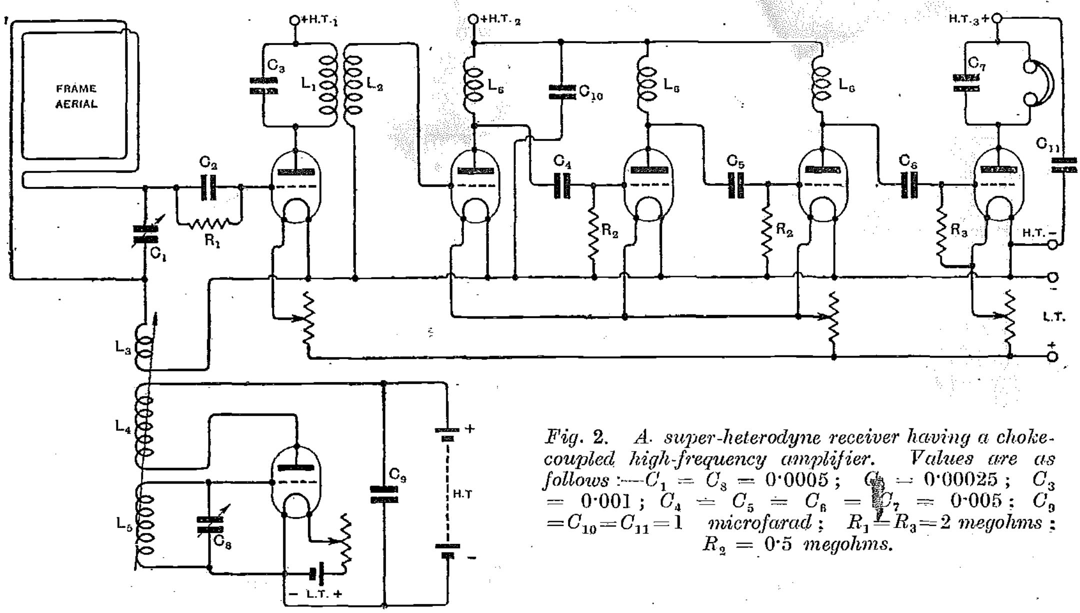


Fig. 2. A super-heterodyne receiver having a choke-coupled high-frequency amplifier. Values are as follows:—$C_1 = C_8 = 0{\cdot}0005$; C[illegible] = 0·00025; $C_3 = 0{\cdot}001$; $C_4 = C_5 = C_6 = C_7 = 0{\cdot}005$; $C_9 = C_{10} = C_{11} = 1$ microfarad; $R_1 = R_3 = 2$ megohms; $R_2 = 0{\cdot}5$ megohms.

having a grid condenser and leak C_6 R_2 (0·005 microfarads and 2 megohms) connected in the grid circuit with the grid return wire connected to the positive side of the filament. Transformers T_1, T_2 and T_3 have their grid return wires connected to a potentiometer, the function of which is to give one some control over the amount of amplification. Its use is neither recommended or condemned, because while I think it is perhaps the easiest method of controlling the amplifier, there are other more scientific and better methods of accomplishing this.

Adjusting the High-Frequency Amplifier.

The transformers employed in the high frequency amplifier may be adjusted to have a suitable wavelength by testing with a buzzer wavemeter. A suitable instrument is described elsewhere in these pages. It will be necessary to place the wavemeter some distance from the receiver when making adjustments if good results are to be obtained.

A Super-Heterodyne Receiver having Tuned-Anode Intervalve High Frequency Couplings.

A receiver having three stages of choke-coupled high frequency amplification is given in Fig. 2. The connections are similar to those of the resistance coupled set given on page 554 of January 21st issue, but chokes are employed in place of the resistances. Values of the components are given in the caption to the figure.

LOW-FREQUENCY REACTION.

The author found that when a loud speaker is placed in certain positions relative to the amplifier, howling is caused. He discusses this phenomenon and gives a remedy.

By G. H. WATSON.

WHEN testing an amplifier connected as in Fig. 1 for use with a microphone, reaction difficulties were encountered, which produced a howl whenever the loud speaker was used.

It was evident that the feed back was from the loud speaker to the microphone. With the loud speaker in some positions no feed back was noticed even though the loud speaker was directed towards the microphone.

A variation in distance between the two gave positions where no reaction was obtained, and positions where it was maximum; this is roughly shown in Fig. 2.

The note was far from pure, but had a pitch of about 900, and on measuring the distance between successive maxima it was found that

$$\frac{\text{Velocity of sound waves}}{\text{Frequency of sound waves}} = \frac{1{,}100}{900} = 1{\cdot}22 \text{ ft.}$$

Several types of loud speaker were tried and very little difference was noticed, but

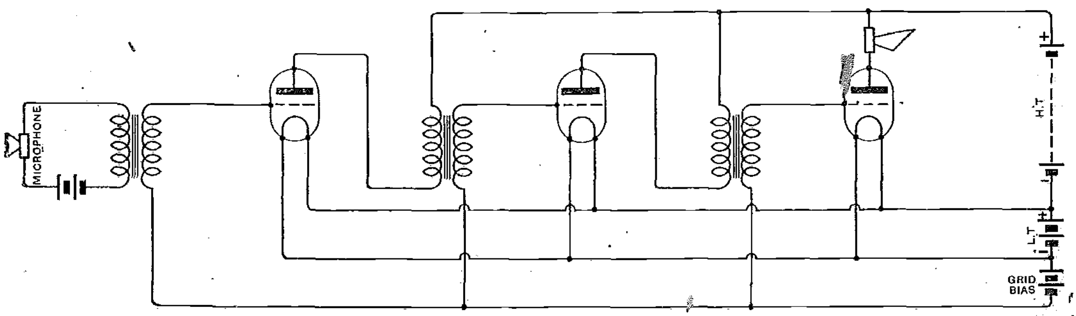


Fig. 1. An amplifier for strengthening the microphone currents.

by altering the tension on the microphone diaphragm, the note altered and also the distance between successive maxima on the strength-distance curve.

The foregoing combination affords a fairly convenient means of measuring the frequency of sound waves, providing the natural frequency of the microphone can be accurately adjusted to the frequency of the sound it is desired to measure.

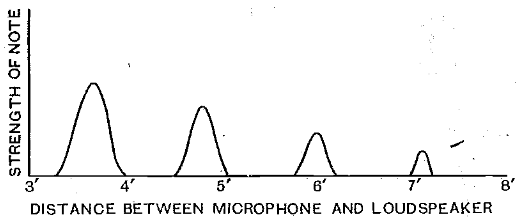


Fig. 2. Showing approximately the strength of the note set up with various distances between the microphone and loud speaker.

The spaces when near the microphone are due to the air waves swinging from 90 degs. to 270 degs. in opposite phase to the microphone diaphragm vibrations, as the loud speaker is moved back; when further from the microphone, reaction only becomes possible when absolutely in phase.

Dull emitting valves, when used with a loud speaker, often give trouble from mechanical resonance, which is a similar phenomenon to that mentioned above; the air vibrations produce vibrations of the valve, causing the electrodes to vary their distance relative to each other, which in turn alters the plate current at a frequency dependent upon the natural period of vibration of the electrodes.

As the note produced is usually of the order of 1500-2,000 cycles, giving an air wave of 8 to 6 inches, and the size of the valve is about 4 ins., it does not allow the placing of the loud speaker to produce anti-reaction as it does with the small microphone. Also, if several valves are used there might be anti-reaction on one valve and reaction on the others.

For this reason dull emitting valves for use with loud speakers should be enclosed in a case, and the lid closed whilst the set is in operation. This provision has been a satisfactory remedy for "mechanical resonance" in several sets which the writer has tested.

CALLS HEARD.

Walton-on-Thames, Surrey.

American: 1 AR, 1 BG, 1 BQ, 1 CG, 1 DA, 1 ER, 1 FP, 1 FG, 1 GV, 1 II, 1 KC, 1 ML, 1 MY, 1 PL, 1 RT, 1 SF, 1 SW, 1 XW, 1 XZ, 1 YO, 1 ZZ, 1 MX, 1 AW, 1 AAC, 1 AAU, 1 AHI, 1 AAL, 1 ABT, 1 AQW, 1 AOM, 1 AOU, 1 AUN, 1 ANA, 1 AJG, 1 BDT, 1 BDP, 1 BMT, 1 BQI, 1 BSI, 1 BSD, 1 BFN, 1 BGQ, 1 BVS, 1 BVS, 1 BKQ, 1 BIP, 1 BSD, 1 BIE, 1 BGO, 1 BKQ, 1 BSM, 1 BLB, 1 BGQ, 1 CAK, 1 CMP, 1 CKP, 1 CCQ, 1 XAM, 1 XAO, 2 BO, 2 BE, 2 BY, 2 CQ, 2 CV, 2 EM, 2 GK, 2 QH, 2 KU, 2 QW, 2 PD, 2 MU, 2 AFP, 2 ANA, 2 AWF, 2 ADJ, 2 APY, 2 BRC, 2 BGG, 2 BLM, 2 BRB, 2 BRD, 2 CVS, 2 CTV, 2 CYW, 2 CNK, 2 CPK, 3 HH, 3 GC, 3 BG, 3 WB, 3 HQ, 3 ZG, 3 HG, 3 OG, 3 KD, 3 ZD, 3 GK, 3 WR, 3 AU, 3 VW, 3 MB, 3 ADG, 3 ARI, 3 AJD 3 AUV, 3 BFE, 3 BCO, 3 BWT ,3 BOF, 3 BSS, 3 BTA, 3 BDO, 3 BFI, 3 CDN, 3 CDG, 4 EV, 4 OA, 4 XX, 4 FS, 4 ZD, 4 SA, 4 IO, 4 TJ, 4 RR, 4 XE, 5 UK, 5 RH, 5 KQ, 5 ZAS, 7 FR, 8 BF, 8 PL, 8 JQ, 8 KL, 8 SP, 8 UP, 8 XC, 8 BFE, 8 AMR, 8 CLN, 8 CYI, 8 CMI, 8 GHW, 8 DFW, 8 ALY, 8 CLN, 9 EM, 9 LD, 9 DXN, NKF NFU, LPX. French: 8 AQ, 8 CN, 8 EV, 8 EU, 8 FK, 8 FM, 8 FY, 8 GI, 8 GH, 8 LL, 8 LR, 8 MG, 8 PD, 8 UU, 8 WW, 8 WL, 8 ZP, 8 BRB, 8 LLM, 8 HSF, 8 HSM, 8 SSU, 8 SM, 8 AW, AIN. Australian: 2 ME, 2 CM, 3 BQ. Danish: 7 EC, 7 QF, 7 FR, 7 GQ. Italian: 1 AM 1, 3 AF. Finnish: 2 NM, 2 NCA, 3 NB. Swedish: SMYY, SMZS, SMZV, SMZZ. Luxembourg: 0 AA, 1 LW. Dutch: 0 II, 0 KN, 0 MS, 0 KW, 0 ZA. Others: P 2, 10 KZ, H 9 AB, POZ, 2 YT. (0—v—1.)

(F. Walker.)

Glasgow.

British: 2 DR, 2 DX, 2 CC, 2 FN, 2 FM, 2 KW, 2 YQ, 5 BH, 5 CX, 5 HC, 5 IK, 5 KT, 5 MA, 5 MO, 5 NN, 5 OX, 5 PD, 5 QV, 5 RZ, 5 SI, 5 SZ, 5 TZ, 5 UL, 5 XN, 6 FG, 6 GH, 6 GM, 6 LJ, 6 TM, 6 TD, 6 XJ, 6 YB. French: 8 AL, 8 BU, 8 BV, 8 CA, 8 CN, 8 CZ, 8 ÉN, 8 FI, 8 GH, 8 GI, 8 GM, 8 HSM, 8 LU, 8 PA, 8 QG, 8 QY, 8 SM, 8 UM, 8 UU, 8 UMZ, 8 ZI, 8 ZZ. Netherlands: 0 AX, 0 BA, 0 RA, 0 RE, 0 SK, 0 ZZ. Belgian: 4 CA, 4 UU, 4 YZ, B 7. Finnish: 1 FN, 2 NCA. Danish: 7 EC. American: 1 KC, 1 BCC, 1 XI, WGH. (0—v—0.)

(Geo. Spears.)

Tynemouth, Northumberland.

British: 2 AV, 2 CC, 2 DR, 2 DX, 2 FN, 2 GH, 2 GR, 2 GW, 2 HS, 2 IK, 2 IN, 2 IS, 2 KF, 2 KW, 2 KX, 2 NM, 2 OD, 2 PY, 2 SH, 2 TF, 2 TI, 2 UV, 2 VJ, 2 WD, 2 XD, 2 XY, 2 ZG, 5 AX, 5 BG, 5 BH, 5 BN, 5 BV, 5 CC, 5 CG, 5 CX, 5 DW, 5 IX, 5 FL, 5 GF, 5 HA, 5 ID, 5 IG, 5 IK, 5 JX, 5 KM, 5 LF, 5 LS, 5 MO, 5 NI, 5 NN, 5 OC, 5 OX, 5 RH, 5 RZ, 5 SZ, 5 TC, 6 AA, 6 AH, 6 AL, 6 BCD, 6 BY, 6 FG, 6 GH, 6 GM, 6 GS, 6 LJ, 6 ME, 6 NF, 6 SO, 6 TD, 6 TM, 6 XG. French: 8 AB, 8 ATC, 8 AU, 8 BA, 8 BF, 8 BP, 8 BV, 8 CA, 8 CK, 8 CN, 8 CT, 8 DA, 8 DI, 8 DP, 8 EN, 8 EU, 8 FK, 8 FM, 8 GER, 8 GI, 8 GO, 8 GP, 8 HAG, 8 LLO, 8 LO, 8 PA, 8 PP, 8 QG, 8 RBR, 8 RG, 8 RR, 8 SR, 8 SSU, 8 UL, 8 UU, 8 VV, 8 WZ, 8 XP, 8 XS, 8 ZUT, 8 ZZ. Belgian: P 1, P 2, 4 RS, 4 UU, 4 YZ, B 7. Swiss: 9 AD. Dutch: 0 BA, 0 RE, 0 ZZ. Luxembourg: 0 AA. Swedish: SMYY, SMZP, SMZV, SMZY. Italian: 1 FP, 1 DO. Danish: 7 EC. Finnish: FN 2 NCA, FN 2 NM. American: 1 SW. Unknown: FN 1, 1 JW, 1 NA, 3 CA, 3 CM, 3 ZV, 4 VV, 4 XA, 10 KZ, Y 20, YA 31, YA 35, UPA, WGH. (0—v—1.)

(H. F. M. Baker.)

Bolton, Lancs.

Australian: 3 BQ. American: 1 KC, 1 BHM, 9 BH, 1 ARE. French: 8 TM, 8 RM, 8 AB, 8 AQ, 8 DA, 8 BF, 8 DP, 8 ÉM. Belgian: 4 AA. Miscellaneous: 1 AM, 10 KZ, DJAGA (?). British: 5 UQ, 2 OD, 5 KC, 2 NM, 6 KB.

(Gilbert N. Haslam.)

UNKNOWN CALLS.

LPX (heard at S. Farnborough, Hants).
QF8 (heard at Braintree, Essex).
"CQ Europe de DC" (heard at Cambridge).
GBZI (heard at Blackheath, London, S.E.3).

CALLS IDENTIFIED.

S 7 BD. Mr. F. Balsells, Cervantes 20-20-2a, Reus (Varragona), Spain.

10 KZ.

Reports intended for 10 KZ may be forwarded c/o Monsieur R. Martin (F 8 DI), 63 Boulevard de la Republique, Nimes, France.

SMALL ARC TELEPHONY APPARATUS.

It is surprising how few people realise that it is quite possible to use commercially systems of wireless telephony which do not employ valves. Yet, long before valves were introduced inventors had attempted to produce satisfactory apparatus. An example of a simple and satisfactory equipment is described below.

OWING to the development of the valve transmitter, very little interest is now taken in arc systems, especially on the part of amateurs. This is to be regretted, as the arc transmitter, with some slight disadvantages, has at least a few advantages as compared with the valve transmitter. The most important of these, at least so far as amateur work is concerned, is that he can if necessary make his own arc generator, without requiring any great skill to do so, whereas he cannot possibly make his own transmitter valves. The cost of maintenance or the cost of purchase of the accumulator and high tension battery is, moreover, not inconsiderable, while, with an arc transmitter these do not come into the question, as it is hardly any trouble, when a continuous current supply is available, to connect up the arc generator. A small choke coil suffices for the equalisation of the current supply variations, and it is quite unnecessary to use any complicated system of condensers, chokes, etc., as is the case when connecting up thermionic valves.

How simply and practically an arc telephony transmitter can be made is shown by a new design by the firm of C. Lorenz, of Berlin.

The apparatus, which is constructed for fixed wavelengths of between 600 and 800 metres, is of small dimensions and light weight, in consequence of which it can be used as a portable station. The adjustment of the apparatus is made by two knobs (one for transmitting and one for receiving), which affords the great advantage that any novice can operate it.

Fig. 1 shows a front view of the apparatus, which is contained in a wooden case 35 cms. high, 27 cms. wide and 18 cms. deep. To

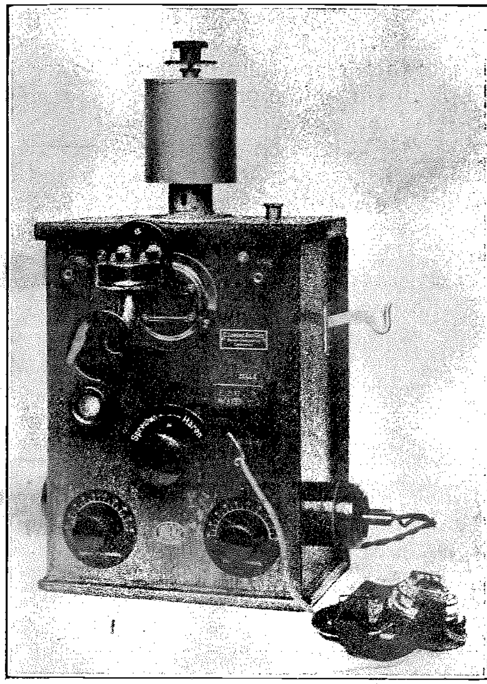


Fig. 1. A view of the Arc Telephony Transmitter and Receiver. Notice how few tuning controls are employed.

produce the high frequency oscillations a Poulsen generator with auxiliary circuit is used, which is situated on the top of the case in a brass cylinder. For receiving, a crystal detector is used. The tuning devices of the transmitter, in order to avoid multiplication of coils, are also used partly for receiving, the change from transmission to reception being effected by means of a special switch.

On the front panel of the apparatus, at the top left-hand side, is the connecting terminal for the aerial, on the right the terminal for earth, and in the middle the microphone. Under the aerial connection is placed the radiation indicator, in the form of a small glow-lamp bulb under a glass disc, as used in pocket lamps. On the other side, under the earth connection, can be seen the plug-in type crystal detector, and below this is the telephone socket. Under the microphone is the main switch, which is turned to the left for speaking and to the right for listening, and on the lower edge of the panel are the tuning adjustments for transmitting and receiving.

Sockets are provided on either side; that on the left is for direct circuit supply and that on the right is for connecting a regulating resistance.

The interior of the apparatus is shown in Fig. 2. Under the arc generator is seen the aerial tuning inductance, subdivided into six parts; beneath it is the microphone transformer, and under this again the coil across which the radiation indicating lamp is connected. The apparatus on the right-hand side of the case are the coils and condensers for the closed oscillatory circuit. In the lower part of the apparatus on the right is the aerial transmitting variometer and on the left, at the bottom, the receiving variometer, above which is a fixed value tuning condenser. The large instrument attached to the base is the iron-core reactance for the feed current. The main switch, which puts the antenna circuit into either the transmitting or the receiving circuit, is seen in the centre of the apparatus.

The operation of the apparatus is most simple. In transmitting, the main switch is put to "speaking" and the arc adjusted by turning the knob at the top of the set to a given setting. The aerial circuit is then tuned to the wavelength of the closed circuit as indicated by the lamp connected to the aerial circuit. When messages are to be received the main switch is put over to "listening," and the receiver tuned to

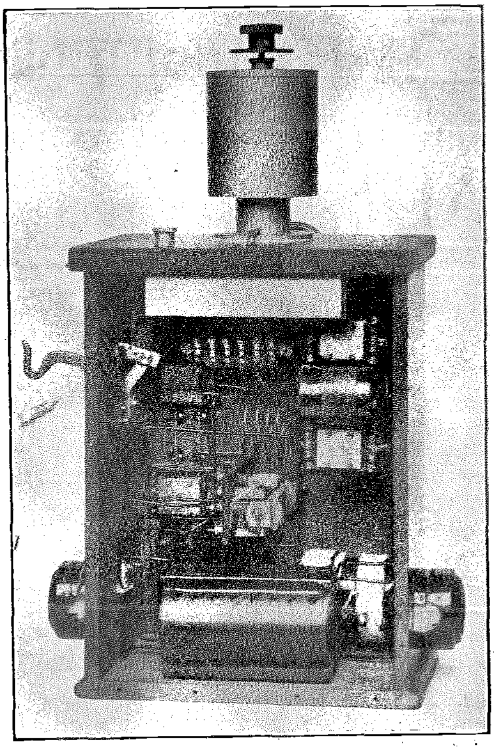


Fig. 2. A rear view of the set showing the arrangement of the apparatus.

the incoming telephony. Once the apparatus has been adjusted it is only necessary to put the switch to "speaking" or "listening" in accordance with the conversation.

ITALIAN NAVY'S SHORT WAVE TESTS.

A special series of tests on short wavelengths recently conducted between Italy and the South American coast, forms the subject of an interesting report we have received from the *Italian amateur*, Sgr. Adriano Ducati.

Sgr. Ducati was placed in charge of the wireless arrangements on board the "San Marco," the vessel which conveyed the Crown Prince of Italy on his tour to South America. An experimental wireless set was carried on the "San Marco," a similar set being installed at Rome, and a definite working schedule was arranged. Both sets employed A.C. at a potential of 250 volts.

On the outward journey the Rome Station, working on 108 metres, was heard distinctly as far as Buenos Aires in all weather conditions. This was in July, when the prevalence of atmospherics would have rendered signals on higher wavelengths unreadable. In spite of atmospherics, Rome continued to be heard until Bahia Blanca was reached.

Meanwhile, continued improvements were made in the transmitting equipment on the "San Marco," and Sgr. Ducati was able to communicate with the home station with equal facility. The antenna system was similar to that employed at ACD, Sgr. Ducati's station at Bologna, and an aerial ammeter reading of 18 amperes was obtained with an input of 1,000 watts, a wavelength of 99 metres being used. Signals were reported as very strong by a number of South American amateurs, and two-way communication was established with more than fifty American amateurs. The record transmission was achieved when a high speed message was copied by New Zealand 4 AA, using only two valves, and with neither aerial nor earth.

PATENTS AND ABSTRACTS

The Use of Alternating Currents for Supplying Filament and Anode Current.

In ordinary methods of employing alternating currents for heating the filaments and supplying the anode circuit of a valve receiver, it is usual to rectify and smooth the alternating current applied to the anode circuit and to connect the filaments through a suitable transformer. In an arrangement of this kind the anode current varies if precautions are not taken. These variations have the same frequency as the alternating current and are due to the variation of the temperature of the filaments, and of the anode current. They constitute a disturbance which seriously interferes with reception.

In order to eliminate this disturbance, an auxiliary alternating current of suitable magnitude and phase may be included in the anode-filament circuit. The diagram of Fig. 1 shows one method of securing the desired results.

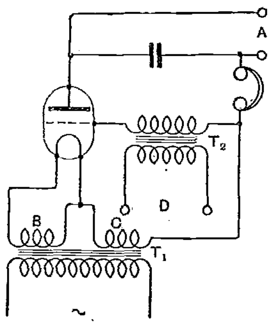


Fig. 1. Showing the connections of a compensating winding C to reduce noise.

The valve is heated from the winding B of a step-down transformer T_1 and the anode circuit is supplied with a rectified and smoothed current at the terminals A. In the grid circuit is connected an ordinary intervalve transformer T_2 which has its terminals D connected to the output terminals of a receiver, and telephones are connected in the usual manner in the anode circuit. According to the invention for

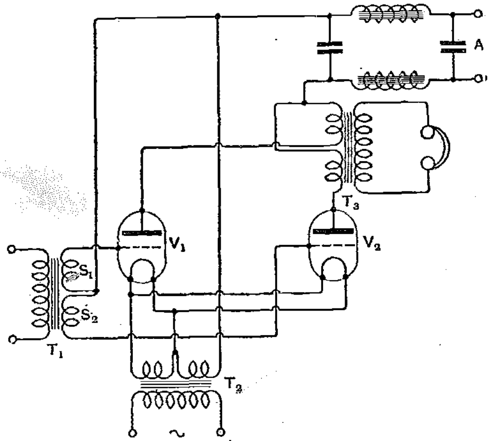
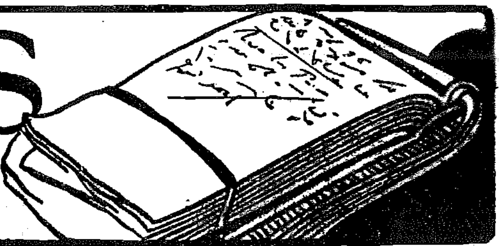


Fig. 2. The connections of a push-pull receiver for working off A.C.

eliminating noise (described in British Patent No. 205,472), the transformer T_1 has a third winding C. This winding is mounted between one side of the filament and the intervalve transformer in the grid circuit, and provides a compensating current which reduces the noise. The buzz produced by the variations of filament temperature due to the use of alternating current is, however, not entirely prevented, but an arrangement of valves as in Fig. 2 may be employed which has the desired effect of practically eliminating all noise. The currents to be amplified are passed through the primary winding T_1 and influence the grids of valves V_1 and V_2 through the secondaries S_1 S_2, and a transformer T_3 having a split primary winding is connected between the anodes of the valves and the telephones as in push-pull receivers.

NOTES & NEWS



An amateur wireless boom is reported to have started in Egypt.

* * * *

Nearly 31,000 receiving licences are stated to have been issued in Sweden up to the end of 1924.

* * * *

More than fifty firms are represented at the *Leeds Mercury* Wireless Exhibition, which remains open until the end of this week.

* * * *

Norway has suffered badly in the recent gales. Most of the telegraph and telephone wires to the North have broken down, and wireless is being used almost exclusively.

* * * *

In Sheffield 22 per thousand of the population are reported to have taken out wireless reception licences. In Bournemouth the proportion is 120 per thousand.

* * * *

Senatore Marconi has been elected an honorary member of the Institution of Civil Engineers.

* * * *

DAYLIGHT TRANSMISSION ON TWENTY-ONE METRES.

An indication that daylight conditions do not affect short wave signals to the same extent as those on the higher wavelengths is afforded by the experience of Mr. J. H. Reinartz, the American amateur and circuit designer, who has succeeded in transmitting signals across the American continent in broad daylight on a wavelength of only twenty-one metres. Transmitting from South Manchester, Conn., Mr. Reinartz received reports of his signals from amateurs at Berkeley, California; Hartley, Iowa; and Winter Park, Florida.

RADIO PARIS RELAYS 5 XX.

On several recent occasions the Radio Paris broadcasting station has relayed the programmes from the Chelmsford station for the benefit of French listeners. Radio Paris operates on 1,780 metres and relay transmissions are carried out after 10 p.m., at the conclusion of the station's ordinary programme.

SPANISH DX RESTRICTION.

Amateur radio transmitters in Spain are suffering under a severe handicap in their relations with experimenters of other countries, it having been decreed, states a correspondent, that no Spanish amateur may use the wave band between 120 metres and zero. This legislation has had no effect, however, on the number of amateurs applying for transmitting licences, which are being issued in many of the towns. Spanish amateur transmitters, who pay an annual licence fee of 200 pesetas, are allowed a maximum power of 100 watts.

A CZECHO-SLOVAKIAN AMATEUR.

It is now definitely ascertained that the call sign CS OK1, reception of which has been reported by a number of readers, is that of an amateur at Prague, Czecho-Slovakia, who transmits on 95 metres.

Two-way communication has been established with CS OK1 by Mr. J. W. Riddiough (G 5 SZ), of Morecambe.

SUNSHINE RECEPTION OF AMERICAN AMATEURS.

The extent to which American amateurs can be heard in this country, even in bright sunshine, within the period of a few minutes, is shown by the experience of Mr. E. J. Simmonds (2 OD) on a recent Sunday, between 9.45 and 10.7 a.m. (G.M.T.). In the space of 22 minutes the following were picked up:—1 CI, 1 ER, 1 SN, 1 ZT, 1 PL, 1 ML, 2 BRB, 2 MU, 2 AAR, 3 OT, 4 KL, 8 APL, 8 BSI, 8 DHW, 8 MC.

All the above stations were received well. Many more could have been logged, states Mr. Simmonds, but American Morse is very indifferent, and much time is lost by long CQ calls!

ABERDEEN ENTERTAINS BOMBAY.

Astonishing reception of the B.B.C. programmes is reported by a Bombay reader, who states that his neighbours, on the other side of the street, enjoy listening to Aberdeen on his loud speaker, clapping and joining in with the singing.

Chelmsford and London are received almost nightly on a six-valve set (3—v—2).

A PROFITABLE ANNOUNCEMENT.

There are enterprises less profitable than running a "one man" broadcasting station. According to a message from Mattapoisett, Massachusetts, Mr. Irving Vermilya, operator of the "one man" broadcasting station WBBG, recently announced that he was a pipe smoker and enjoyed a particular brand of tobacco. Up to the present the number of cans of tobacco received is 137.

Mr. Vermilya is the New England Division Manager of the American Radio Relay League.

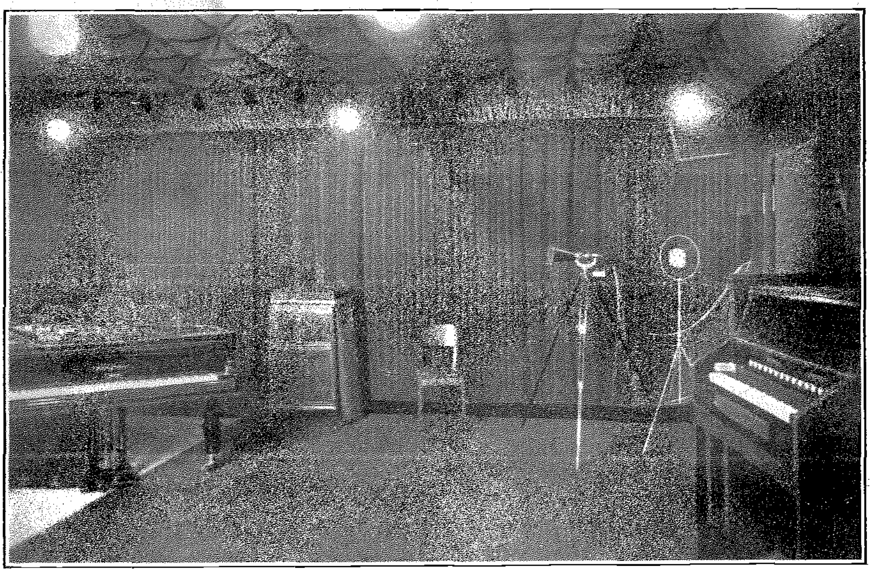
GERMAN PUBLIC AND WIRELESS TECHNIQUE.

There is no sign of any falling off in the public interest in broadcasting in Germany, says a Berlin message. The number of new listeners-in registered with the postal authorities has recently averaged 80,000 daily. One Berlin paper remarks that the number of home-built sets is not so great as in certain other countries, since "the technical knowledge of the general public in Germany does not compare well with that of the general public in England and America."

Arts, to be held in Paris this year. The organisers of the exhibition, realising that wireless has a claim to be considered along with arts and handicrafts, have conceded space to the Syndicat Professionel des Industries Radioélectrique. The selection of radio exhibits, which will be confined to the finest products of the designers' and cabinet makers' art, will have to meet the approval of a special jury before they may be displayed.

CHILI SIGNALS RECEIVED IN DAYLIGHT.

Probably the first British amateur to pick up Chilian signals in daylight is Mr. T. A. Studley, of Harrow, who has received written confirmation of his log from Mr. R. Raven-Hart (9 TC) of Los Andes, Chili. 9 TC's signals were received by Mr. Studley at 7.30 a.m., on November 23rd last, on a single valve receiver, when the Chilian was working on 90 metres with a power of 500 watts. Mr. Raven-Hart is continuing transmissions under these conditions and would be glad to receive reports addressed to him at 9 TC, Los Andes, Chili.



Many of our readers will be interested in the above picture of the studio of the Leipzig Broadcasting station. This station can easily be heard in this country and operates on a wavelength of 454 metres.

JOURNAL DES 8.

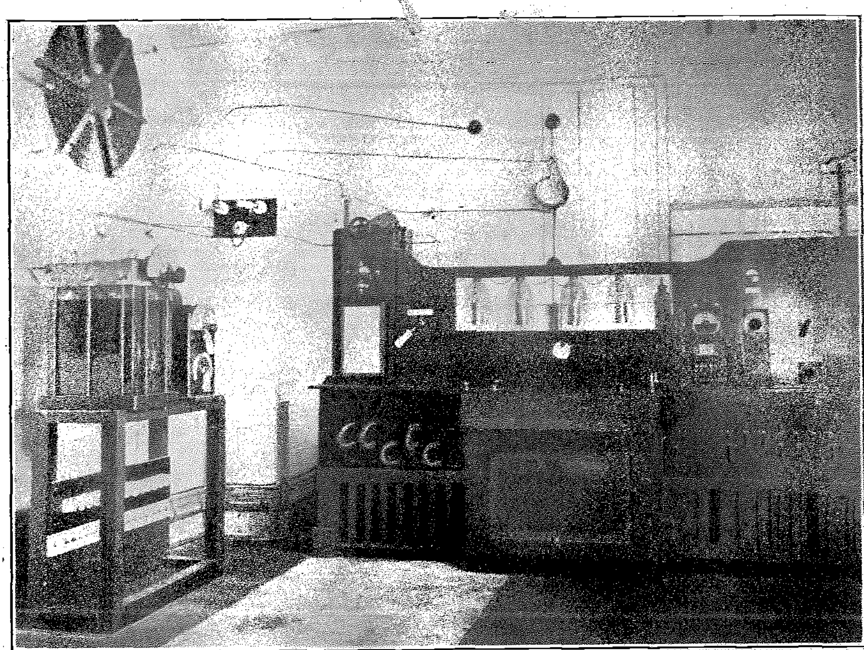
Among the many amateurs who take an interest in the "Calls Heard" section of this journal, there may be some who are unacquainted with the *Journal des* 8, an enterprising little weekly published in France, with the object of linking up the activities of French transmitters and their *confrères* in other countries. The *Journal des* 8 contains, in addition to notes on amateur installations, specially prepared lists of "Calls Heard," in which a number of British calls are to be found. It is published at the Imprimerie Veuclin, Rugles, Eure, France, the annual subscription rate being 35 francs.

WIRELESS AND ART.

The artistic side of wireless instrument design is to have a place at the Exposition of Decorative

BROADCAST PLAY DIFFICULTIES.

It would appear that there is little demand for the broadcasting of long plays. Following the performance of "The Tempest," at 2 LO on Friday, January 16th, the B.B.C. received reports from all parts of the country showing that difficulty was experienced in identifying the numerous characters. General opinion is in favour of plays not exceeding the twenty minute mark, and with fewer characters than are usually to be found in Shakespearian drama.



A view in the Control Room at the Koenigswusterhausen broadcasting station.

LONG AND SHORT WAVE CALIBRATION TESTS.

During February an important series of calibrated signals will be transmitted from WWV, the station of the U.S. Bureau of Standards at Washington, D.C., and from 6 XBM, the Stamford University, California. We are indebted to Mr. J. Gordon Ritchie, of Glasgow, for the following schedule of these transmissions. The times given are Eastern Standard Time for WWV, and Pacific Standard Time for 6 XBM, the former being 5 hours and the latter 8 hours slow on Greenwich time.

	Feb. 5th. Metres.	*Feb. 20th.* Metres.
10.00 to 10.8 p.m. ..	100	2,400
10.12 to 10.20 p.m. ..	91	2,254
10.24 to 10.32 p.m. ..	83	2,097
10.36 to 10.44 p.m. ..	75	1,934
10.48 to 10.56 p.m. ..	68	1,800
11.0 to 11.8 p.m. ..	61	1,463
11.12 to 11.20 p.m. ..	55	1,153
11.24 to 11.32 p.m. ..	50	952

The signals will be transmitted by unmodulated C.W. Each transmission will consist of a "general call" (2 minutes), a "standard frequency signal" (a series of very long dashes with the call sign intervening, lasting about 4 minutes) and "announcements" giving the measured frequency and particulars of the next frequency to be transmitted.

These signals are intended to be heard 1,000 miles from each station, but it is quite probable that they may be picked up in this country.

CORRESPONDENCE.

Regulations and the Experimenter.

To the Editor of THE WIRELESS WORLD AND RADIO REVIEW.

SIR,—Might an old and enthusiastic reader venture to join issue for a few words with the somewhat retrograde tendency in to-day's Editorial. One gathers that *Wireless World and Radio Review* views with regret the disappearance of the experimenter as a privileged class and holding a privileged licence. Who were these people ? Was their knowledge so terrific that the rest of us gasped with amazement. ? I believe they could read twenty words of Morse per minute but most of us know cases where even this qualification would prove wobbly on test.

To prohibit the use of reaction is surely secondary to prohibiting the outdoor aerial. The latter remedy has been rarely suggested but is surely more on the lines of progress. The writer has logged several American stations on a short indoor aerial in his flat, and is prepared to venture that no interference to others was caused during the process. The crystal user could still have his outside wire under any such scheme. Above all else, sir, do not let us traffic with monopoly or privilege in wireless.

Regulations are, of course, a necessity and a right of the citizen, but let such regulations stimulate research and not destroy it. The vast majority of your readers are probably more interested in research than inferior concerts and probably the vast majority would lack those mysterious qualifications necessary in order to obtain the "Experimental licence." It is time the rights of these people were pretty forcibly expressed.

West Kensington. G. C. P. BRAUN.

Radio Society of Great Britain.

The Society's ordinary general meeting, held on Wednesday, January 21st, was marked by the retirement of Dr. W. H. Eccles, M.I.E.E., from the Presidency of the Society, and the accession to that post of Sir Oliver Lodge, F.R.S.

In his final speech as President, Dr. Eccles said there was no need to spend much time in introducing Sir Oliver Lodge to any wireless audience in the world, and particularly in the case of an audience of British experimenters. If we traced wireless back to the discovery of electric waves in 1887 we should find from the records that Lodge was actually demonstrating their existence at the moment when Hertz announced the results of his own famous researches.

Having spoken of the early work of Sir Oliver Lodge, Dr. Eccles remarked that he considered it of special interest to the members of the Society that Dr. Lodge, as he then was, was not a professional inventor. He was, in the true sense of the word, an amateur.

"We may say," said Dr. Eccles, "that Lodge was the first wireless amateur, just as we may say that our only other honorary member, Marconi, was the first wireless engineer. Therefore, at this present time, when the amateur has attracted universal attention by his contributions to wireless science, it is especially appropriate that we should have as our President the earliest and the greatest of all radio experimenters."

Sir Oliver Lodge, replying, said that it was not only an honour, but a great pleasure and privilege to succeed in the Chair a man like Dr. Eccles, and in the penultimate chair a man like Sir Henry Jackson.

"You see before you," he said, "what may be called 'hymns' ancient and modern. (loud laughter). I and Sir Henry Jackson are the ancients. Eccles and a good many others here are the moderns and you will not expect me to give my view or to give any notion of the most recent advances and the constant inventions which are flowing from the amateurs of this country as well as from the professionals; the amateurs are doing a great work and the amount of experimenting that goes on is something tremendous, so that really ten years hence the science will have again advanced as it has advanced up to now. I must say that I am grateful for what Eccles has said. He knows a lot about it because he has been engaged in patent cases where these things really crop up and he has gone into it very thoroughly. I was in at the beginning, because I go back to the time of Clerk Maxwell, whose great treatise was published in 1873, and in 1875 I spent the whole of the summer studying it. His theory of electromagnetic waves excited my wild enthusiasm at the time. It was all mathematics in those days. Nobody knew how to produce electromagnetic waves or how to detect them. It is wonderful now to look back at those times of darkness; we knew nothing but mathematics. Then about the same time as Dr. Eccles has said, Hertz and I found them together; but Hertz found them much more thoroughly and more satisfactorily and they are truly Hertzian waves based upon Clerk Maxwell's researches a quarter of a century before. We found how to produce them and how to detect them in an infantile manner and so it went on until Marconi came and put the matter on a substantial commercial, financial and Governmental and telegraphic basis. Then things began to hum and here we are. (Laughter). Of course, Fleming and other workers have chipped in with the valve and it is astonishing now what can be done. We used to deal with only Morse signals; I did not think that wireless telephony would be possible. Now it is easy. I knew that short waves were more powerful in many respects than long ones but I did not think that any waves could go round the earth. I am told now that amateurs can get to New Zealand by wireless waves of short wavelength, the only wavelength they are allowed.

Conductors are full of loose electrons. A copper wire is a crowd of loose electrons in elongated form. When you want to reflect waves, you use a copper sheet, a good conducting sheet; the loose electrons do it. Eccles and Heaviside have shown that in the atmosphere under the rays of the sun, there is a crowd of loose electrons—ions—which arrange themselves nicely at night and form a sort of copper dome over the earth; and thus you get the waves to go round. It is amazing, a kind of thing we could not have expected but which enables the waves to go to these enormous distances without much loss instead of going off into space and doing nothing, or at least very little."

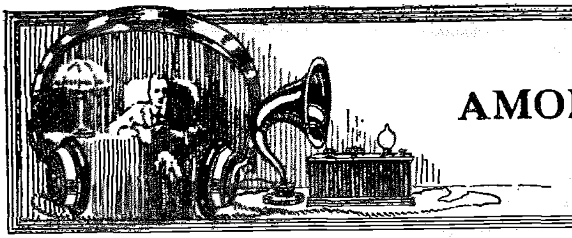
Sir Oliver Lodge then proceeded to deliver his Presidential address on "Matter and Radiation," a full report of which will appear in a subsequent issue of this journal.

T. & R. NOTES.

The principal item of interest during the past fortnight has been G 2 NM's two-way working with SA WJS, the 100-watt wireless station at the base camp of the Rice expedition, which is exploring the Amazon River Hinterland of Brazil. The signals from this remote outpost came in at extraordinary strength on two valves, the more remarkable when it is considered that the power plant could only have been local, such as a petrol-driven alternator. SA WJS reported that he had also been in communication with NZ 2 AP, in addition to all the American districts, except the 7th.

Another commendable performance is the reception, by Mr. Galpin (5 NF), of American 8 XG on 45 metres. This interesting feat took place at 10.30 p.m. (G.M.T.) on January 17th.

Members are again reminded of the International Conference of Radio Amateurs in Paris, from Thursday, April 16th, until Monday, April 20th, in connection with which Mr. Gerald Marcuse (2 NM) is prepared to arrange for special accommodation and travelling facilities. Enquiries should be addressed without delay to Mr. Marcuse, c/o The Radio Society of Great Britain, 53 Victoria Street, London, S.W.I.



AMONG THE SOCIETIES.

Radio Society of Great Britain.

Many of the difficulties encountered in short wave work were elucidated by Mr. Stanley Ward in the course of his informal talk before the Radio Society of Great Britain on January 14th.

One of the pressing needs of to-day, said Mr. Ward, is a condenser of sufficient mechanical soundness for the delicate adjustments necessary in short wave work. The speaker produced an interesting model of his own design, embodying a cone bearing which entirely eliminated side play, and at the same time ensured equidistant spacing of the plates.

Mr. Ward's "straight" circuit with which he had been able to tune down to 40 metres, aroused considerable interest. The circuit employed an aperiodic aerial, tuning being accomplished on the closed circuit. The use of a low capacity H.F. valve was strongly recommended, together with a potentiometer in preference to the condenser and grid leak method. A useful feature was the inclusion of an inductive resistance in the anode circuit; this permitted the insertion of telephones in such a way that they could be handled without upsetting tuning.

In the ensuing discussion Mr. G. G. Blake referred to noises in grid leaks, and outlined a method evolved several years ago, of constructing a grid leak of moist cotton, an arrangement which satisfactorily overcame the trouble. Mr. Alford, whilst preferring the superheterodyne for short wave work, admitted that excellent results could be secured with a "straight" circuit provided that meticulous care was taken in the construction and handling of the receiver. Captain Ainslie (occupying the chair), described an interesting single valve "straight" circuit, which enabled him to listen to KDKA on the 60-metre wavelength, while Mr. Robinson contributed a warning regarding the disadvantages of placing the short-wave receiver in the vicinity of metal objects which might easily be in resonance with the set. With high frequency circuits, a metal object 6 feet away might conceivably be "tightly coupled."

A demonstration of how to work a wireless set under difficulties was given by Mr. B. A. Matthews at the Birmingham Experimental Wireless Club on January 9th, and aroused considerable interest. Following the demonstration, the Club's nearly completed set was examined and formed the basis of a profitable discussion.

A five-valve set embodying a number of nove features was exhibited by its constructor, Mr. Toye, before the Hackney and District Radio Society on January 12th. All connections in the set are made with small plugs and jacks, and although any combination of valves can be used, no switches are employed. Mr. Toye demonstrated the ease with which changes could be made by this unusual method.

* * * *

For reasons of ill health, Mr. J. W. Pallett, Hon. Secretary of the Leicestershire Radio and Scientific Society, has been obliged to relinquish his post. All correspondence should therefore, be addressed to the new Hon. Secretary, Mr. A. E. Walker, Glen Burn, Ashleigh Road, Leicester.

FORTHCOMING EVENTS.

WEDNESDAY, JANUARY 28th.

Clapham Park Wireless and Scientific Society. At 7.45 p.m. At 67 Balham High Road. Lecture by representative of the Gramophone Co., Ltd.

Radio Research Society of Peckham. Lecture: "Condensers—Their Action and Importance." Demonstration: "Stunts."

Streatham Radio Society. Lecture: "Infra Red Rays." By Mr. Roddis

THURSDAY, JANUARY 29th.

Bournemouth and District Radio and Electrical Society. At the Y.M.C.A., St. Peter's Road. Lecture: "Esperanto and its Relationship to Radio Work."

Luton Wireless Society. At 8 p.m. At the Hitchin Road Boys' School. Experiment and Demonstration for Beginners.

FRIDAY, JANUARY 30th.

Sheffield and District Wireless Society. At 7.30 p.m. At the Department of Applied Science, St. George's Square. Lecture: "Esperanto as a Radio Language." By Mr. John Merchant.

Radio Experimental Society of Manchester. Illustrated Lecture: "My Wireless Life in West Africa." By Dr. L. S. Palmer, Ph.D.

MONDAY, FEBRUARY 2nd.

Dorking and District Radio Society. At 65 South Street. Members' Evening with Apparatus.

CATALOGUES, ETC., RECEIVED.

Falk, Stadelmann & Co., Ltd. (83, 85 and 87 Farringdon Road, London, E.C.1). Catalogue No. 522, containing full particulars of Efescaphone Wireless Receiving Sets and Components. Copies on receipt of postage.

Morch Bros. (35 Tresham Avenue, London, E.9). Illustrated catalogue of Rex Products, including Valve Receivers and Amplifiers.

M-L Magneto Syndicate, Ltd. (Victoria Works, Coventry). Particulars of the M-L Anode Converter with price list.

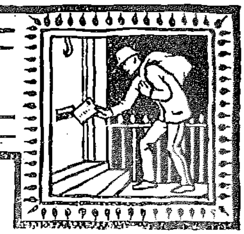
Leslie Dixon & Co. (9 Colonial Avenue, Minories, E.1). Electradix Catalogue of everything Electrical.

A. F. Bulgin & Co. (9, 10 and 11 Cursitor Street, London, E.C.4). Catalogue of Aermonic Radio Requisites.

Fuller's United Electric Works (Woodland Works, Chadwell Heath, Essex). List No. 325, describing the "Little Sparta" Loud Speaker.

Watmel Wireless Co. (332A Goswell Road, E.C.1). New "Watmel" Show Card, available to traders.

READERS PROBLEMS



Readers desiring to consult the "Wireless World" Information Dept. should make use of the coupon to be found in the advertisement pages.

A Selective Three-Valve Circuit.

A correspondent has written asking if we can recommend a reliable three-valve circuit capable of receiving most of the main B.B.C. and continental stations under favourable conditions. As the set is to be used within 20 miles of one of the main stations selectivity is an essential point. Our correspondent also desires to dispense with low frequency amplification.

As great sensitivity is demanded of the set it is essential that one or more stages of high frequency amplification be employed. With regard to selectivity, probably the best method of accomplishing this is by the use of loose coupling, but, unfortunately, this is productive of instability when used in conjunction with high frequency amplification. It is necessary, therefore, to find some means of stabilising the circuit. The use of a potentiometer or similar means of introducing losses by damping into the high frequency circuits is not altogether to be recommended from the point of view of efficiency. We have therefore incorporated the neutrodyne method of compensating for the capacities between the elements of the valve and the wiring of the circuit. Once these capacities have been successfully neutralised by means of the small condensers provided, this adjustment can remain untouched provided that valves or coils remain unchanged. For the band of wavelengths occupied by the B.B.C. and the majority of the continental stations the primaries of the H.F. transformers can consist of about 24 turns of No. 24 D.C.C. wire wound in the form of a basket coil on a former 1½ ins. in diameter. The secondaries can consist of 66 turns of the same wire on a former of the same dimensions. The tapping for the neutralising condenser should be made in the centre of the secondary coil. It is important that the coils be wound in the same direction. The primary, secondary and reaction coils can, of course, be plug-in coils of the usual values for these wavelengths. For operating a loud speaker any two-valve L.F. amplifier of good design may be used.

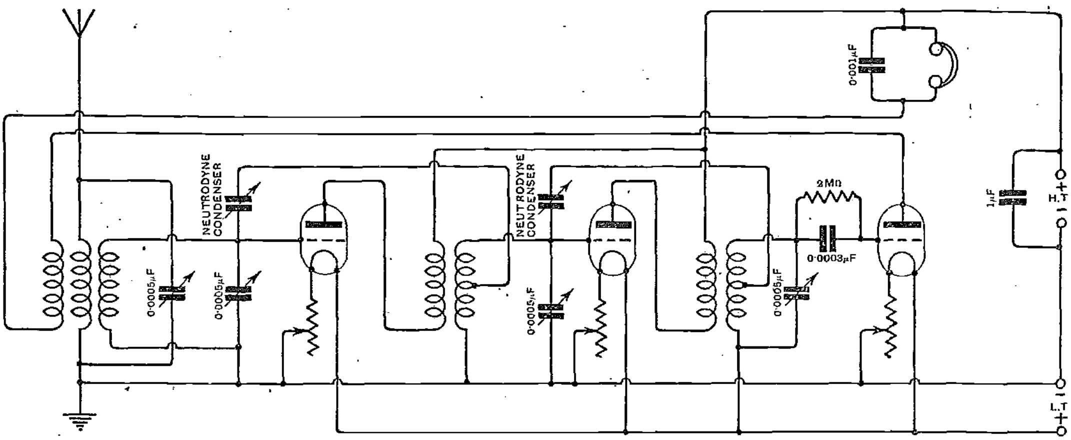


Fig. 1. A sensitive and selective receiver with two stages of transformer-coupled H.F. and valve detector with reaction coupled to the aerial.

Instability in a Four-Valve Receiver.

A reader has submitted a diagram of his four-valve receiver, and asks us to suggest a possible cause of the extreme instability of the instrument, it being prone to burst into oscillation at the slightest provocation, even when the potentiometer controlling the grid of the H.F. valve is over to the positive side.

The receiver is of the conventional type employing one H.F. valve, detector, and two L.F. valves. In a receiver of this type it is unusual to find instability, the set being perfectly stable without a potentiometer provided the set is carefully operated. In this particular receiver, however, we notice that although only one H.F. stage is employed, it contains no less than five D.P.D.T. switches in the high frequency portions of the circuit. These are for placing the A.T.C. in series or parallel, cutting out the H.F. valve, and reversing the reaction coil, but in addition to these there are two switches for the purpose of using tuned anode, tuned transformer or resistance coupling for the H.F. stage. Our correspondent informs us that all these switches are of the miniature nickel plated type.

From this information it is not difficult to perceive the cause of the instability concerning which our correspondent complains. It is quite a common mistake among home constructors to think that a large number of switches can be placed in the H.F. circuits with impunity. This applies specially to those of the miniature type which necessitate the connecting wires running in close proximity. It would be well to eliminate as many switches as possible, and to replace the remaining ones by those of the anti-capacity type. The two intervalve coupling switches can be eliminated by bringing the requisite connections to four valve sockets of the anti-capacity type, and constructing plug-in units for the various forms of coupling. For obtaining the utmost efficiency from a set employing H.F. amplification in any form, no switches whatsoever should be incorporated with the high frequency portions of the set.

An L.F. Amplifier with Alternative Choke or Resistance Coupling.

In response to requests from readers we illustrate below a circuit for a two-valve L.F. amplifier with alternative choke or resistance coupling. The H.T. voltages suitable for both methods of coupling are adjusted to the correct value, and when changing over from one method of coupling to the other the correct H.T. voltage is simultaneously adjusted according to the needs of the particular method of coupling employed. A switch is also provided for cutting out one stage if desired. The usual adjustable grid biasing battery is also included in the diagram.

This circuit is very suitable for making a rapid change over from one system of coupling to the other in order to compare the quality of reproduction and volume peculiar to each system. The values for anode resistances, grid condensers and leaks which we give are good average values for obtaining high quality reproduction. The chokes may have a value of 100 henries, and can consist of the primary and secondary of an intervalve transformer connected in series. A valve having a high amplification factor may be used in the first stage if desired, but it is recommended that the final valve be of the power type.

It is important to connect the input terminals of the amplifier in the correct manner to the telephone terminals of the valve receiver. The same L.T. battery can be used for the receiver and amplifier, but a separate H.T. battery is advisable.

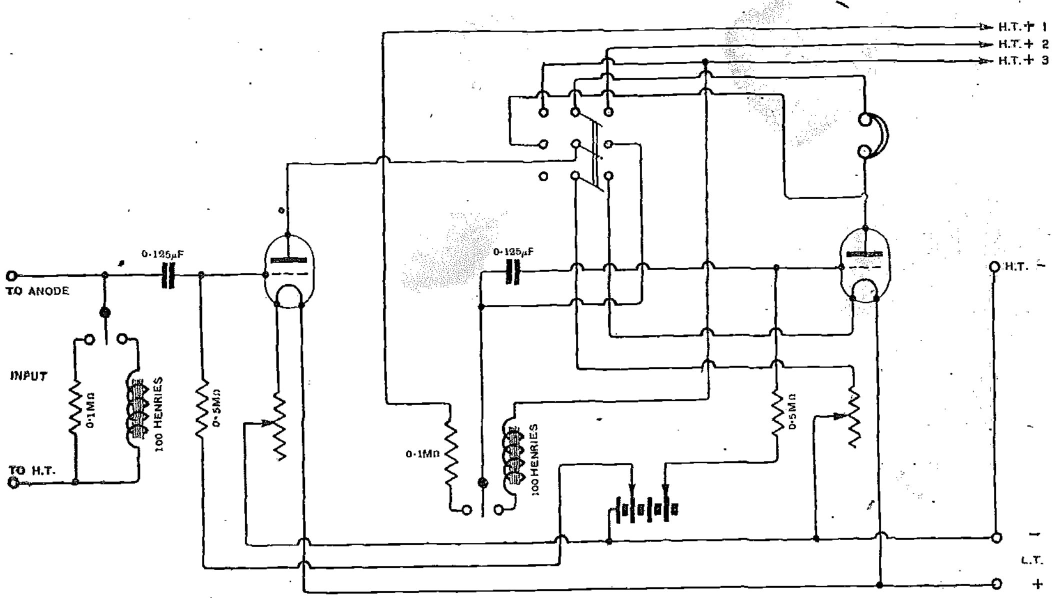


Fig. 2. An L.F. amplifier arranged for resistance or choke coupling.