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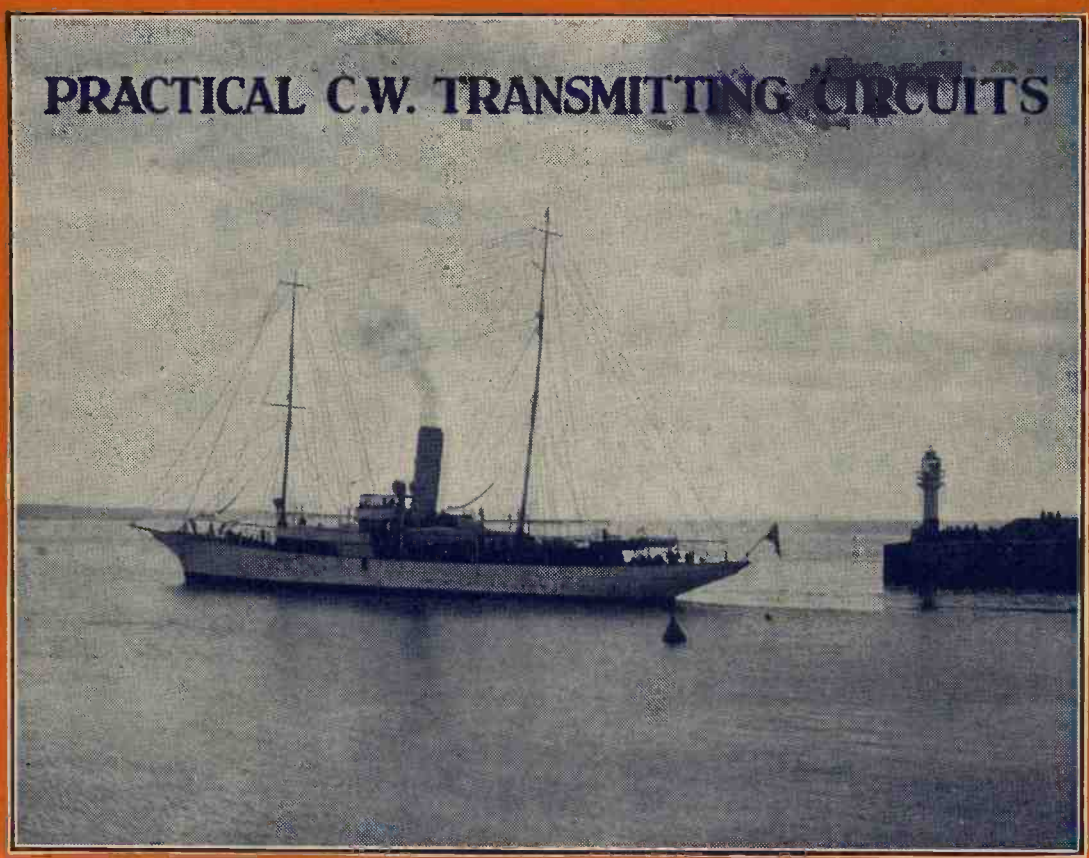
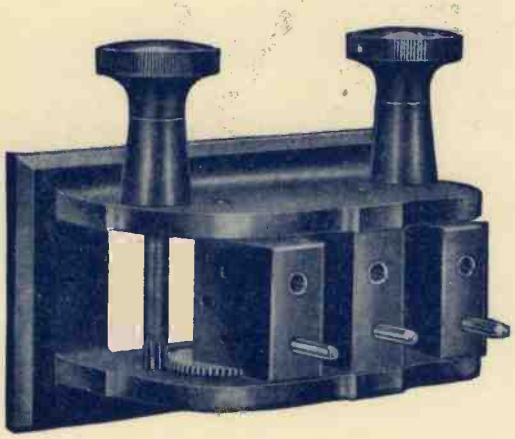
Wireless Weekly

Vol. 6. No. 5.

PRACTICAL C.W. TRANSMITTING CIRCUITS



REDUCED PRICES



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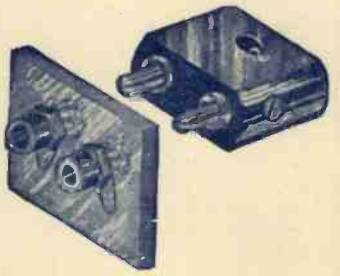

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EDITED BY JOHN SCOTT-TAGGART, F.Inst.P., A.M.I.E.E.

Some Geneva Problems

A FORTNIGHT ago we referred to the formation of the new Bureau at Geneva and indicated that there were many difficulties to be faced and overcome. The matter of interference between broadcasting stations is one of such importance and urgency that it is well to consider the matter in more detail than we were able to do at the time. As Capt. Eckersley pointed out in a recent technical talk broadcast from 2LO, a pair of low-power broadcasting stations situated at the extremes of the British Isles and working on wavelengths within a metre or so of one another, can set up a " beat-note " which will interfere with the reception of either of these stations, not only throughout the British Isles, but over large areas of the Continent. Whereas in this country the opening of a new broadcasting station only takes place after the question of interference between British wavelengths has been carefully considered, on the Continent new stations spring up with mushroom rapidity, and with very little regard to the mutual interference they may cause.

It might at first appear that all these matters could be simply adjusted by friendly agreement between the various administrations controlling the broadcasting stations. Actually, however, there is a bigger problem than this. We shall understand it better by considering what is happening in the United States. At the present time there are 564 broadcasting stations in operation. To these are allotted all wavelengths between limits, much in the way that in this country wavelengths between 300 and 500 metres are given up to broadcasting. If two stations are operated on wavelengths too close to one another, then interference will be set up which cannot be tuned out on any receiver. There must, therefore, be sufficient separation between any two stations to prevent such interference, and within the band allotted to broadcasting in the United States there are but one hundred different wavelengths possible if this freedom from interference is to be maintained. Of course, if the broadcasting stations are of low power and very widely separated from one another in distance, as is the case, for example, with a station in New York and another at San Francisco then we can increase the number of stations working without ill effect. In Europe, however, the various broadcasting stations are practically all within hearing of one another, and we have a severe limitation of number, which is going to prove the main difficulty of the future.

In America it has already been suggested that the broadcast band shall be extended below the present limit to 150 metres or so. It is possible that such suggestions will be put forward in Europe when, as a result of the conferences between the various administrations, the crowding to which we have referred and the wavelength limitations become more apparent. We earnestly hope that if such proposals are put forward and there is the slightest possibility of their coming into operation, the trade and the public generally will be advised in ample time, in view of the drastic changes which would be necessary in commercial broadcasting apparatus.

Another important aspect of the case relates to how close it is practicable to arrange wavelengths, apart from the question of the interference between two waves due to the beat-note effect referred to. At the present time it is generally considered that a minimum separation of 10 kilocycles is necessary to avoid beat-note interference. To be able to separate stations with only this difference between them, requires a receiver far more selective than the average one in use to-day. Here again a readjustment of wavelengths, even so as to avoid beat-note interference, should only be made after the most careful consideration of the many factors concerned.

CONTENTS.

	Page
C. W. Transmission for 200 Metres	134
Reception Conditions Week by Week	139
A New Use for Filament Control Jacks	140
A Short Wave Coil Mounting	141
Jottings By The Way	142
Radio Notes and News	144
A New Receiver for Modern Conditions	145
Random Technicalities	146
A General Purpose Two-Valve Receiver	148
Our American Visitors	153
Long Leads for Loud-Speakers	154
Correspondence	155
Apparatus We Have Tested	160
Information Department	161

Practical C.W. Transmitting Circuits for 200 Metres.

By DALLAS G. BOWER.

The Mullard 0/10 valve.

THE amateur designer of a continuous wave transmitting station has at his disposal two fundamental circuital arrangements which he may use, assuming that a valve or valves are to be his radio-frequency generator. Valve oscillators may be classed under two distinct headings:—Self-excited oscillators and "independent drive" oscillators. The first class of oscillator may be connected up in a variety of ways, using various circuital arrangements allowing greater ease of operation, flexibility, etc., but the fundamental principle of all the systems is the same.

Essentials

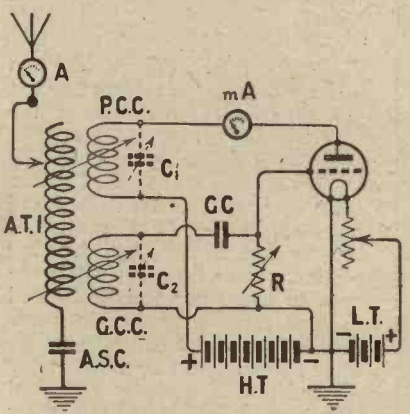
The basic essentials of a self-excited valve oscillator may be considered as a valve with a load in its output circuit with some means of coupling back a small portion of the power in the load circuit to the input circuit. As before mentioned, there are various methods of doing this, and the following information treats each circuit arrangement individually and the merits of each particular circuit are discussed.

Throughout the following information it is assumed that an auto-coupled output to aerial circuit is being used. A loose-coupled system may be used, and in many cases will be found a great asset in so far as ease of operation and steadiness of note are concerned. In order to operate a transmitter with a loose-coupled circuit, the closed or "tank" circuit should be adjusted first for correct wave-length setting and maximum H.F. current reading. The aerial circuit is then brought into operation, and as it is brought closer to resonance the aerial current will increase. When it is in resonance with the closed circuit the aerial current will be at a maximum for the particular degree of coupling employed.

Master Oscillator

It must be borne in mind that a good condenser should be used in the closed circuit, because it has to stand the full power generated by the valve without the load of the aerial while making preliminary adjustments.

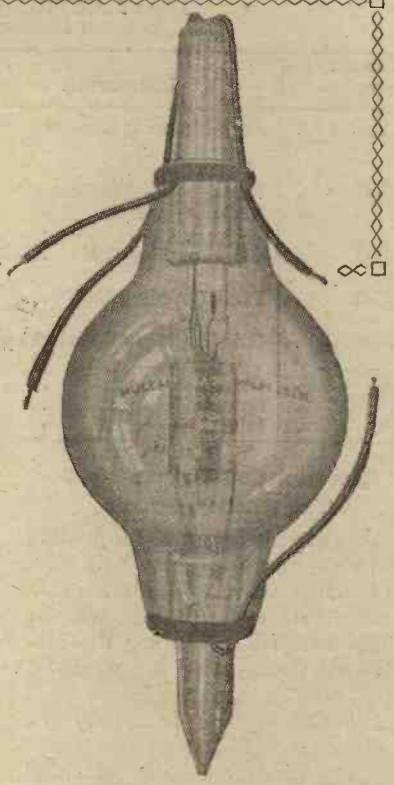
Before passing on to the various self-excited oscillators we must remember the "independent drive" or master-oscillator system. If perfect steadiness of note and ease of operation to the highest degree are required, this, if properly designed, is the ideal circuit. It has, without doubt, one distinct disadvantage from



Circuit No. 1.—The Meissner system.

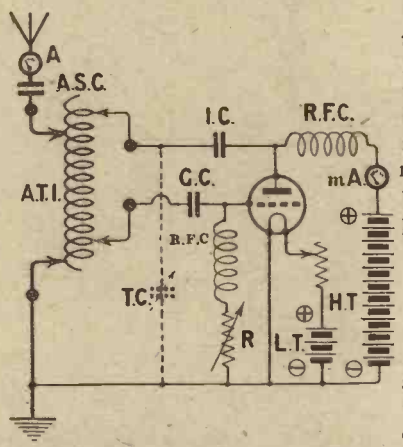
Mr. R. W. H. Bloxam, who, among others, has received signals from IXAM (John L. Reinartz, Connecticut) on a 20-metres wave-length during daylight.

The data given in this article will provide the transmitting amateur with material for a whole series of interesting experiments.



The Mullard 0/150 valve.

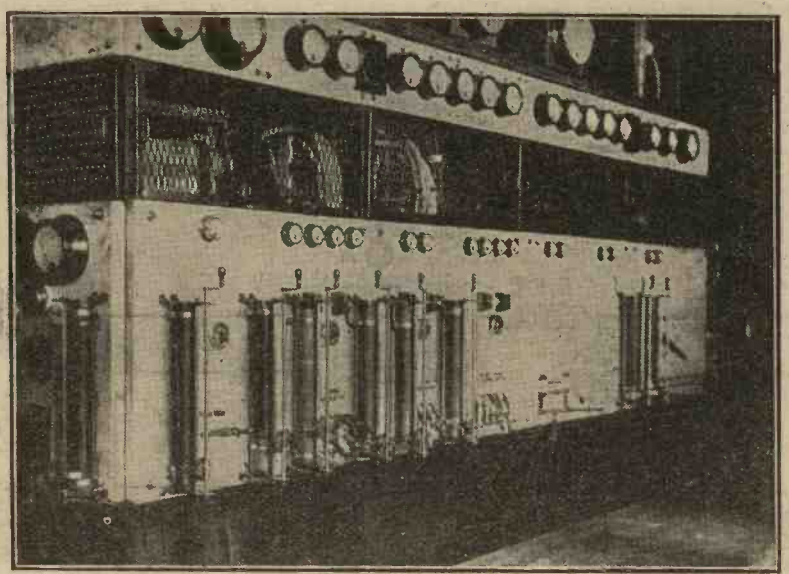
an amateur point of view, in so much as it requires an extra valve. To the wireless engineer this extra valve constitutes no objection, but to the amateur it may mean increased cost in his transmitter. The main power valve only acts as an amplifier and should be switched in after the oscillator has been adjusted to maximum efficiency. The tuning of such a transmitter is almost entirely dependent upon the oscillator circuit, and the aerial circuit adjustment will not appreciably affect the frequency of the transmission. It should simply be adjusted until maximum current is shown by the ammeter in the aerial circuit. As a last minor piece of information before passing on to the various circuits, remember that maximum aerial current does not necessarily mean maximum radiation in watts. This has been explained by Mr. Percy W. Harris in *Wireless Weekly*.



Circuit No. 2.—The Hartley Circuit.

Transmitting Circuit No. 1 Meissner System

This circuit is easy to handle and very flexible. It may be used with either a direct earth connection or a counterpoise. The effect of the aerial series condenser is to counteract the effect of the A.T.I. in raising the wavelength above the fundamental. Providing it is of proper capacity, a counterpoise may be used instead of this condenser. It must be remembered that some portion of the A.T.I. is at a high potential with respect to earth, and there will be a capacity current through the condenser formed by the winding of the aerial tuning inductance and grid and plate coupling coils. The windings of the respective coils, therefore, should not be too close, and every possible precaution taken to reduce dielectric losses.



The switchboard and controls at the Eiffel Tower station.

Condensers

This capacity should be as small as possible. The variable condensers across the grid and plate coils are not essential to operation but are a great help in tuning. It is important to note that the grid and plate coils should be coupled through the aerial coil and not to themselves, otherwise short-wave oscillations may be set up between them.

Disadvantages

The most serious disadvantage of this circuit is that the transmission frequency is entirely determined by the aerial circuit constants, hence any alteration in aerial capacity due to swinging in the wind will cause a very unsteady note to be transmitted.

TRANSMITTING CIRCUIT No. 1.
Meissner System (Series Feed).

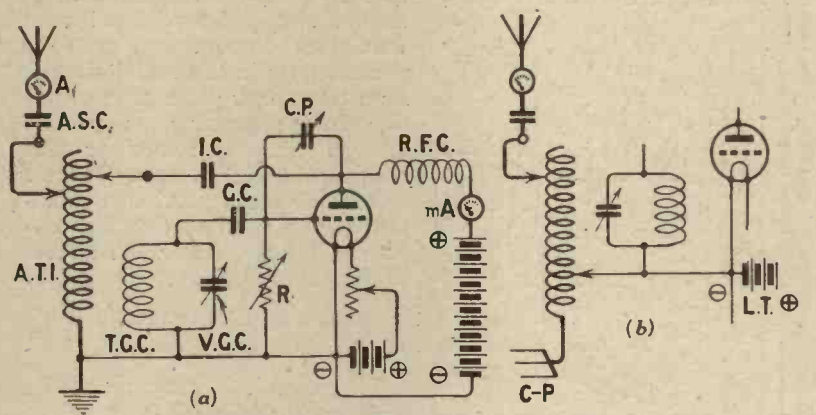
Circuit Symbol.	Instrument.	Description.
A.T.I. ..	Aerial Tuning Inductance ..	60 μH, 30 turns 6 in. dia. former. Copper strip or No. 16 s.w.g.
A.S.C. ..	Aerial Series Condenser ..	0.0003 μF to 0.003 μF.
A.	Aerial Ammeter	0–2 amperes. Hot-wire or thermo-couple.
G.C.C. ..	Grid Coupling Coil	4 in. dia., No. 22 d.c.c., 20 to 25 turns.
P.C.C. ..	Plate Coupling Coil	4 in. dia., No. 22 d.c.c., 20 to 25 turns.
C_2 and C_1 ..	Grid Tuning and Plate Tuning Condensers	Maximum capacity 0.0005 μF.
G.C. ..	Grid Condenser	0.002 μF.
R. ..	Grid Resistance	5,000 to 10,000 ohms.
mA. ..	Milliammeter	0–100 ma.

Transmitting Circuit No. 2
The Hartley Circuit

This circuit is not at all flexible and does not appear to suit high impedance valves. Unless extra precautions are taken it will be found that when heating the filament off A.C., using a step-down transformer, serious losses will occur due to the fact that the large capacity between the transformer windings is in parallel with the counterpoise (if one is used). The variable condenser across the plate tap and earth is not essential, but is a great asset in tuning the circuit and renders it more flexible. It greatly reduces the number of turns between the plate tap and earth, which may be quite considerable. The correct inductance between the plate tap and earth should be about 60 microhenries. The isolating condenser and radio-frequency chokes serve their usual purpose.

TRANSMITTING CIRCUIT No. 2.
The Hartley Circuit.

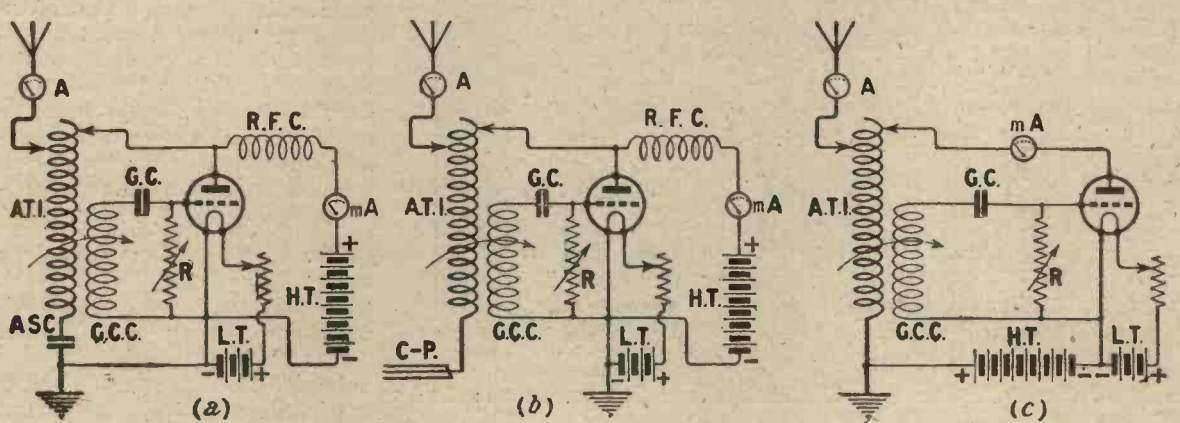
Circuit Symbol.	Instrument.	Description.
A.T.I. ..	Aerial Tuning Inductance ..	60 μH, 30 turns, 6 in. dia. former, 16 s.w.g.
A.S.C. ..	Aerial Series Condenser ..	0.0003 μF to 0.003 μF.
A. ..	Aerial Ammeter	Hot-wire or thermo-couple, 0–2 amperes.
T.C. ..	Tuning Condenser	Maximum capacity 0.0005 μF.
R. ..	Grid Resistance	5,000 to 10,000 ohms. Variable.
G.C. ..	Grid Condenser	0.002 μF.
I.C.	Isolating Condenser	0.001 μF.
R.F.C. ..	Radio-Frequency Chokes ..	2 in. dia., 8⅜ in. long, 500 turns, 26 to 28 d.s.c.
mA. ..	Milliammeter	0–100 ma.



Circuit No. 4.—The tuned grid system.

Transmitting Circuit No. 3
Magnetic Reaction

This is one of the best-known systems, and is used very extensively on account of its great flexibility. Three arrangements are shown—(*a*) when the valve is in shunt with the H.T. supply; (*b*) the arrangement suitable for use with a counterpoise; (*c*) when the valve is in series with the H.T. supply. In arrangement (b) the counterpoise capacity takes the place of the aerial series condenser in (*a*), the negative pole of the filament supply being earthed to complete the circuit for the anode alternating current. The aerial series condenser in circuit (*a*) also serves as an isolating



Circuit No. 3.—The magnetic reaction system.

condenser which the shunt oscillator must possess to prevent short-circuiting the H.T. supply. In (*a*) and (*b*) circuits the A.T.I. and aerial are at the D.C. potential of the H.T. supply, and care must be exercised in not touching any part of these circuits when the H.T. is on. Notice that in arrangement (*a*) the radio-frequency choke is in parallel with the aerial series condenser. With the values given in the data table, this circuit will resonate on wavelengths between 2,000-3,000 metres, the inductance value of the choke being about 3 millihenries. No troublesome resonant effects will be noticed unless in arrangement (*b*) the counterpoise is of unusually low capacity.

Series Feed

In the series feed circuit (*c*) the A.T.I. and aerial are at earth potential, but the filament circuit is at the D.C. potential of the H.T. supply, hence precautions must be taken not to touch this part of the circuit.

Transmitting Circuit No. 4
Tuned Grid System

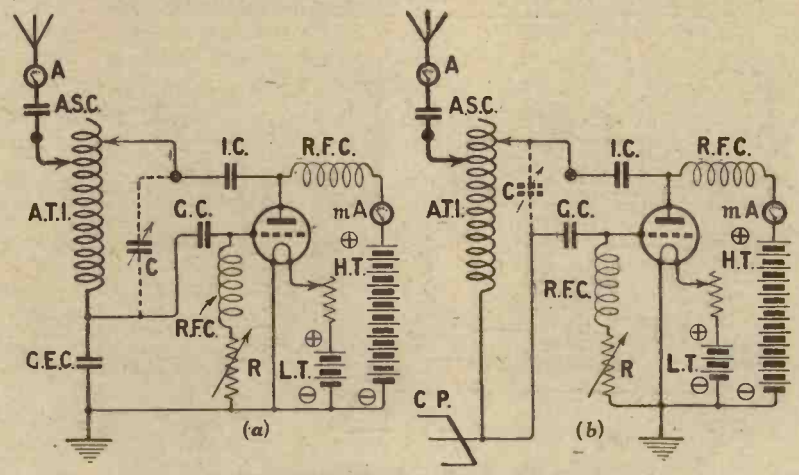
This arrangement uses a tuned input circuit to the valve. The coupling between the aerial and the tuned grid circuits is provided by the capacity between the plate and grid of the valve augmented by the small variable condenser. It will probably be found that this condenser will be unnecessary when using the circuit with a high-powered valve possessing a high amplification constant. In (*b*) a counterpoise is used. The earth tap should be variable in order to let it rest on the voltage node. The frequency of the oscillations is determined mainly by the constants of the tuned grid circuit, hence a fairly steady note is given.

Transmitting Circuit No. 5
The Colpitts Circuit

This circuit is different from all other types of self-excited valve transmitters. The output is capacitively coupled to the input and the grid obtains its excitation voltage from the condenser G.E.C. As the input power is increased and the size of the valve this condenser may decrease in value as indicated in the table. If a counterpoise is used, as in (*b*), this will act as the condenser G.E.C. in (*a*), providing the negative pole of the L.T. supply is earthed. The capacity of the average counterpoise will be lower than the values given, and the grid may be over-excited.

The Grid Tap

This may be overcome by tapping the grid on to a portion of the aerial tuning inductance nearer the plate tap. As the grid tap is moved towards the plate tap the voltage excitation to the grid is decreased. In the Colpitts circuit it is only possible to work *above* the fundamental frequency unless a series condenser (A.S.C.) is used. When the circuit contains the aerial series condenser it is possible to operate *at* the fundamental with great advantage. The condenser between



Circuit No. 5.—The Colpitts circuit.

TRANSMITTING CIRCUIT No. 3.
Magnetic Reaction System.
Data.

Circuit Symbol.	Instrument.	Description.
A.T.I. ..	Aerial Tuning Inductance ..	60 μH, 30 turns 6 in. dia. former, 16 s.w.g.
A.S.C. ..	Aerial Series Condenser ..	0.003 microfarads.
A. ..	Aerial Ammeter ..	Hot-wire or thermo-couple, 0–2 amperes.
G.C.C. ..	Grid Coupling Coil	4 in. dia. former No. 22 d.c.c., about 15 turns.
G.C. ..	Grid Condenser	0.002 microfarads.
R. ..	Grid Resistance	5,000 to 10,000 ohms. Variable.
R.F.C. ..	Radio-Frequency Choke ..	2 in. dia., 8¾ in. long, 500 turns, No. 26 to 28 d.s.c.
m.A. ..	Milliammeter	0–100 ma.

TRANSMITTING CIRCUIT No. 4.
Tuned Grid System.

Circuit Symbol.	Instrument.	Description.
A.T.I. ..	Aerial Tuning Inductance ..	60 μH, 30 turns, 6 in. dia. former. Copper strip.
A.S.C. ..	Aerial Series Condenser ..	0.0003 μF to 0.003 μF.
A. ..	Aerial Ammeter	Hot wire or thermo-couple, 0–2 amperes.
T.G.C. ..	Tuned Grid Coil	4 in. dia. former, No. 18 d.c.c. copper, 30 turns.
V.G.C. ..	Variable Grid Tuning Condenser	Maximum capacity 0.0005 μF.
G.C. ..	Grid Condenser	0.002 μF.
R. ..	Grid Resistance	5,000 to 10,000 ohms. Variable.
I.C. ..	Isolating Condenser	0.002 μF.
CP. ..	Plate Condenser	Maximum capacity .0001 μF.
R.F.C. ..	Radio-Frequency Choke ..	2 in. dia., 8¾ in. long, 500 turns, No. 26 to 28 d.s.c.
mA.	Milliammeter	0–100 ma.

TRANSMITTING CIRCUIT No. 5.
The Colpitts Circuit.

Circuit Symbol.	Instrument.	Description.
A.T.I. ..	Aerial Tuning Inductance ..	60 μH, 30 turns, 6 in. dia. former. Copper strip.
A.S.C. ..	Aerial Series Condenser ..	0.001 μF.
A.	Aerial Ammeter	Hot-wire or thermo-couple, 0–2 amperes.
G.E.C. ..	Grid Excitation Condenser ..	0.003 μF to 0.001 μF (see text).
C.	Tuning Condenser	0.0005 μF.
G.C. ..	Grid Condenser	0.002 μF.
R.	Grid Resistance	5,000 to 10,000 ohms. Variable.
R.F.C. ..	Radio-Frequency Choke ..	2 in. dia., 8⅛ in. long, 500 turns, No. 26 to 28 d.s.c.
mA. ..	Milliammeter	0–100 ma.

much as 20 watts can be lost without the choke. When the choke is used the loss is reduced to approximately 0.5 watts. As a comparison of the tuned grid system with the tuned plate, the latter will work better with low capacity counterpoises.

(In our next issue will be given some details concerning the "master oscillator," together with constructional data similar to that included this week.)

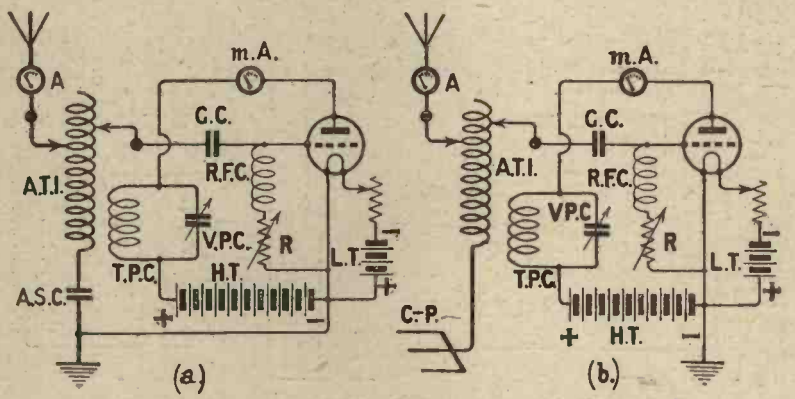
plate tap and grid tap is not a necessity, but simplifies tuning and reduces the number of turns between the two taps.

Transmitting Circuit No. 6
Tuned Plate System

This circuit differs only slightly from the tuned grid system, the output circuit of the valve being tuned instead of the input. A counterpoise may be substituted as in (*b*), the positive of the filament supply being earthed.

The R.F. Choke

The object of the radio-frequency choke is to keep the radio-frequency current from leaking through the grid resistance. In the case of a 5,000 ohm resistance used with a 250-watt valve, as



Circuit No. 6.—The tuned plate system.

TRANSMITTING CIRCUIT No. 6.
Tuned Plate System.

Circuit Symbol.	Instrument.	Description.
A.T.I. ..	Aerial Tuning Inductance ..	60 μH, 30 turns, 6 in. dia. former. Copper strip.
A.S.C. ..	Aerial Series Condenser ..	0.0003 μF to 0.003 μF.
A. ..	Aerial Ammeter	Hot-wire or thermo-couple 0–2 amperes.
T.P.C. ..	Tuned Plate Coil	4 in. dia., No. 22 d.c.c., 30 turns.
V.P.C. ..	Variable Plate Condenser ..	Maximum capacity 0.0005 μF.
R. ..	Grid Resistance	5,000 to 10,000 ohms. Variable.
G.C. ..	Grid Condenser	0.002 μF.
R.F.C. ..	Radio-Frequency Choke ..	2 in. dia., 8⅛ in. long, 500 turns, No. 26 to 28 d.s.c.
mA. ..	Milliammeter	0–100 ma.

Sir Arthur Steel-Maitland, Minister of Labour, broadcasting from the London Station upon the subject of Juvenile Unemployment.

Reception Conditions Week by Week

By W. K. ALFORD.

Review of reception for week ended April 26.

THE general conditions affecting reception continue to become more and more erratic, and will finally settle down to the more or less clearly defined summer conditions.

During the present week it has been noticed that there have been quite sharply defined periods exceptionally favourable for long range reception when the intensity of "atmospherics" was very greatly diminished only to reappear after about five minutes at general intensity existing at the time. It was particularly interesting to note that the phenomenon of fading, which was not very marked at the time, did not seem to bear any relation to these favourable periods which leads one to suppose that atmospheric conditions cannot always be associated with discontinuity or irregularity of the Heaviside layer.

Map showing approximate area of uniform reception from 2LO's old station. Blind spots are not shown.

A good deal of discussion is still going on regarding the effectiveness of the new London station, though the general inference is that of considerable improvement throughout the country as regards strength, compared with the old station, but there is no doubt that the quality of the transmission has not yet reached the very high standard of the old station.

A view of the assembly department of the wireless section of the C.A.V. works, showing loud speakers ready for packing.

The Old 2LO

Some considerable time ago I made an attempt to plot out on a map what might be termed curves of "iso-audibility," in other words, determine the places where London was received at good strength using a single regenerative valve.

Of course, very much greater ranges than the curves show are obtained by many people using a similar receiver, and one had to decide whether abnormally favourable conditions existed.

However rough and inaccurate the diagram is, it is quite certain that the old London station radiated very much more in a north-south direction than in an east-west direction, which seems to be exactly reversed in the case of the new station, although the effect is very much less noticeable in this case.

It is not possible in a map of this sort to delineate clearly all the so-called "blind spots," but only indicate in a general way the more effective areas for good reception.

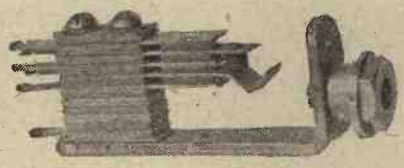
The broadcasting band of wavelengths seems to be rapidly extending, whether officially or not one cannot say, but one hears two Continental stations frequently, one on about 170 metres, and the other right down in the region of 70 metres, near KDKA's wave, and both much too strong to allow of them being harmonics from a higher wavelength, and who never give call signs. There is much speculation as to the effectiveness of the new high-power station of the B.B.C. at Daventry. The advocates of a single high-power station supplying the whole country are particularly interested, and in the light of present experience there is much to commend it.

A New P.O. Station

One is given to understand that the Post Office are erecting a receiving station in the vicinity of Daventry for the Leafield traffic, and what with the new B.B.C. station and the Post Office "aether shaker" at Rugby, one imagines that it would have an extremely hectic career. However, the ways of the Post Office are mysterious in the extreme, and they cannot very well fall out with the B.B.C. for some time to come.

A New Use for Filament Control Jacks

A useful tip for those who wish to incorporate switching in circuits employing resistance-coupled low-frequency valves.



A "double-filament" jack.

The plug within its shield.

MANY constructors, though favouring the use of plugs and jacks, do not care to use double filament control jacks on account of the extra complications introduced in the wiring, or else they feel that the sudden make-and-break action of the contacts is not good for the filaments of the valves, and they therefore prefer to use variable resistances for turning the valves off as well as controlling them.

A Further Use

There is, however, another use to which these extra contacts can be put in the case of a resistance-coupled amplifier. The chief disadvantage attending the use of jacks in a resistance-coupled low-frequency amplifier is due to the fact that when the 'phones are placed in circuit instead of the anode resistance the effective voltage applied to the plate of the valve in the circuit of which the 'phones are placed is immediately raised. In the case of a detector-valve this may cause the set to burst into violent self-oscillation, or if the case is that of an amplifier the grid-bias

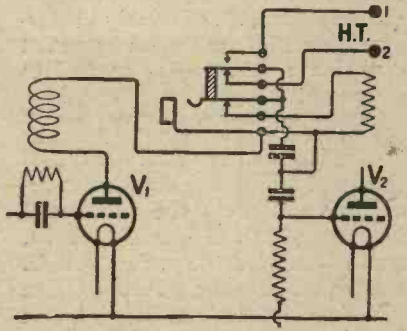


Fig. 1.—With this arrangement for switching in or out the resistance-coupled L.F. valve V2, a constant H.T. voltage may be maintained on the plate of V1.

being applied to the grid of the valve will now be insufficient to give pure reproduction or economy in plate current. A glance at Figs. 1 and 2 will help to make this clear.

Switching

A simple way of doing this automatically is to use the filament control contacts on the jack as a two-way switch by means of which a different plate voltage is applied according as to whether the 'phones or resistance are in circuit. Fig. 1 shows the circuit diagram, and it should be noted that H.T.1 will be the lower voltage required and H.T.2 the higher. If this arrangement

The plug removed from its shield showing how connection is made.

is used with a detector valve the best way to adjust your H.T. is first to use your stage of resistance-coupled L.F. with H.T.2 plugged into the value you intend using, adjusting the reaction of your receiver till your set is just off the oscillating point. Now plug H.T.1 into a much lower value and plug the 'phones in.

H.T. Adjustments

If the set goes into oscillation reduce the plate voltage going to H.T.1 until the set is again just off the oscillating point. Then when you are trying for distant stations it is possible to switch the L.F. stage in or out without upsetting the reaction setting of your receiver. In the same way this use of the filament contacts can be applied to the L.F. stages, so that when the 'phones are inserted after any one valve the plate voltage is reduced so as to bring it down to the correct value for pure reproduction without any alteration of grid-bias being necessary.

An Alternative Use

A further method which is suitable only for use with resistance-coupled L.F. amplifying valves is to use the filament contacts to vary the grid-bias being applied, so that when the 'phones are inserted in any plate circuit a larger negative potential is applied to the grid of that valve. The method is shown in the theoretical circuit diagram in Fig. 2, but, of course, is not suited for use with a detector valve.

Convenience

Either of these schemes will therefore remove what has always been, in the writer's opinion, the sole disadvantage of jacks, namely, their unsuitability for L.F. switching when resistance-coupled L.F. amplification is employed. Let the constructor give jacks a trial, he will find them a great convenience. Not only do they simplify the wiring of the receiver, eliminating many leads going back and forth from switch to component, but they also simplify the layout, enabling a logical scheme to be employed

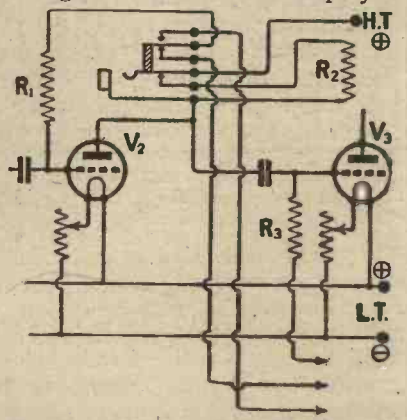


Fig. 2.—Using a jack to change grid-bias with H.T. voltage.

that is sure to result in increased efficiency.

C. P. A.

A SHORT-WAVE COIL MOUNTING.

By R. W. HALLOWS, M.A., Staff Editor.

FOR some time now experimenters have been giving a great deal of attention to the question of increased efficiency in tuning inductances. Some very successful coils for use on the broadcast waveband and upon shorter wavelengths have been turned out, but there is one point to which sufficient attention has not been paid; this is the design of the plug-and-socket coil-mounting which has now become the standard. In the early days of

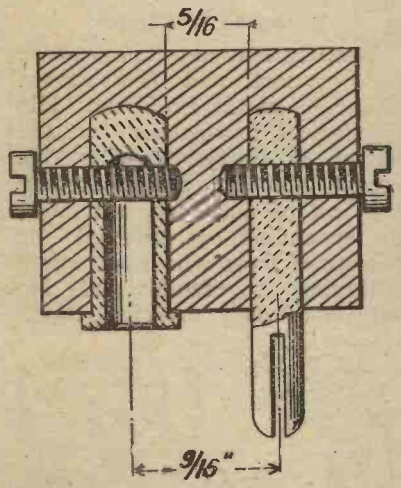


Fig. 1.—A section of a coil socket showing the construction.

wireless few people thought very much about the question of inductance efficiency. The plug-and-socket mounting was designed then, and it is most unfortunate that its use should have become practically universal, since now that the majority of sets are fitted with coil stands suitable for this mounting it is unlikely that a change will be made, for some time at any rate. It seems as though wireless might be saddled with the coil mounting referred to, and its progress hampered by it just as our railways are saddled with the 4 ft. 8½ in. gauge (laid down originally to accommodate the wheels of horse-drawn carts) and the small tunnels made in early days, which gave ample clearance for the locomotives and rolling stock then in use, but now prevent desirable increases in size from being made.

The Coil Holder

In Fig. 1 is seen a section of the standard coil holder which will serve to show the undesirable capacities that it introduces. The plug and socket are spaced $\frac{9}{16}$ in. apart from centre to centre. As they are usually $\frac{1}{4}$ in. in diameter this means that the portions of them embedded in the ebonite are only $\frac{5}{16}$ in. apart Further, since the fixing screws frequently go right through both plug and socket there may be a point within the holder at which portions of metal in electrical contact with the high or low potential ends of the coils are separated by only $\frac{1}{4}$ in. of ebonite.

Capacities

It must be remembered that the capacities referred to are doubled in the case of each coil since they exist between the plug and socket of the coil mounting as well as between those of the stand into which it is fitted. It is obviously of little use to take great pains in the construction of a low-loss coil for short-wave work and then to mount it upon a holder which, to a considerable extent, neutralises the good effects of one's labours. The standard coil holder can be slightly improved by drilling two or three $\frac{3}{16}$ in. holes through the ebonite between

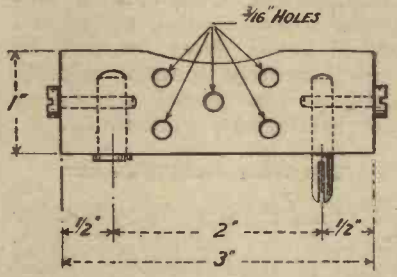


Fig. 2.—The dimensions of a coil-holder which is used by the author.

the plug and the socket, but we want something better even than this for short-wave work.

A Suggestion

In Fig. 2 is seen a mounting which the writer has found a great improvement over the standard one. It is quite simple to make in the home workshop, and those who go in for reception on 150 metres and below will find that it is well worth attention. The parts needed are a piece of $\frac{1}{2}$ in. ebonite 3 in. in length and 1 in. wide, an ordinary plug and socket, and a couple of 4B.A. screws. In what is to be the lower edge of the mounting drill two $\frac{1}{4}$-in. holes spaced 2 in. apart from centre to centre. They should be deep enough to take the plain portion of the plug and socket. From the edges drill and tap two 4B.A. holes running into the plug and socket and insert 4B.A. screws long enough to make good contact with the brass when wire and a washer are placed under their heads. With a round file hollow out slightly the upper edge of the former, as shown in the drawing. It is as well to drill through between the plug and socket a number of $\frac{3}{16}$ in. holes in order to reduce capacity.

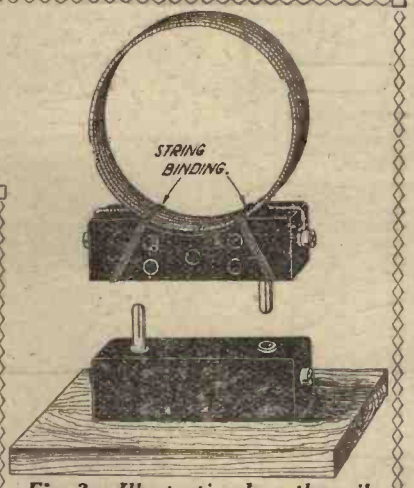


Fig. 3.—Illustrating how the coil may be mounted.

Fixing the Coil

Fig. 3 shows one method of fixing a coil to a mounting so made. Others will suggest themselves to the constructor.

Existing coil stands may be adapted to fit these mountings, but the writer has found it preferable to make up special little stands of a very simple kind. One of these is seen in Fig. 3. It consists simply of a small block of hard wood provided with a coil mounting made on the lines described. With a pair of coupled coils mounted in this way extremely fine variations in the coupling are possible, the stands being moved about on the table with the help of a stick or ruler.

Jottings by the way

Wonders Upon Wonders

WHENEVER I read in my paper an account of an interview with Professor A. M. Blow I am filled forthwith with conflicting emotions. In the first place, I thrill all over in sheer admiration for such wondrous projects as that of broadcasting coolness from the North Pole to help the fur trade in the summer time, or that other one of bringing sand in aeroplanes from the Sahara to those of our seaside resorts that have temporarily lost their beaches. You and I, you know, would simply never think of things like that. That is the

. . . During recruit days . . .

first emotion. The second is a feeling of sadness which steals over me when I reflect that there is another fertile brain whose activities, owing to its owner's shrinking modesty, are but little known to the public at large. I am speaking of my friend Professor Goop. What do you know of his inventions beyond what I have told you from time to time in these notes? Nothing.

The Taste of Stamps

Yet though you wot not of it, Professor Goop's brains are helping you at almost every moment of your life. When, for example, you stick a postage stamp upon a letter, do you not enjoy its subtle flavour? It was Professor Goop who, after years of research work, performed the impossible by discovering a flavour that would please *all* palates. Again, have you ever laid a pair of braces before you and pondered over their perfection? If you have, it will doubtless have occurred to you that the whole secret lies in the fact that the two things which come over your shoulders are stuck together at the back. Professor Goop did that for you. Why is it again that bootlaces are always of precisely the right length? If it were not for the Goop Bootlace Gauge, now used in the best factories throughout the world, they might easily be a fraction of an inch too short or possibly a multiple of a yard too long.

A Few More

If you served in the Great War did you never find yourself during recruit days filled with wonder at the strength of the voice that directed your movements? It is not, I think, too much to say that the War was won by the Goop Pocket Voice Amplifier for weak-chested sergeant-majors. But for it you would never have learned to spring smartly to attention or to cultivate the correct waggle of the right hand when saluting.

The Goop Baby Silencer

Has not the Goop Baby Silencer brought rest and sleep to thousands of tired fathers? Would life be worth living if the holes for the fixing screws in low-frequency transformers were always spaced in the same way? Would not wireless lose half its zest if every maker drilled and tapped components for the prosaic 4B.A. screw? Can you imagine anything duller than high-frequency transformers with their connections made in one monotonous standard way? All of these things are due to the secret propaganda conducted in the early days of wireless by Professor Goop, who has incessantly preached the doctrine that variety is the spice of life.

Ducks on Wet Days

Yes, we may say that we owe our comfort and contentment ultimately to the Professor. His mechanical spot-dabber for the horses of merry-go-rounds, his patent goloshes for protecting the feet of ducks on wet days, his expanding hat designed for the use of those who contemplate springing to fame, and his system of daily exercises which

. . . One eye peering through . . .

has enabled many a would-be alderman to bring up his once puny girth to the proportions necessary for success in civic life—all these have done not a little to increase the amenities of life. Even the Oxford trouser was introduced ten years ago by the Professor, who designed a pair with legs forty-eight inches in circumference. He used to stick both feet down one of them, leaving the other trailing behind him like a train.

Sheer Luck

It is curious to reflect at times upon the part that chance has played in some of the greatest inventions. The fellow who discovered gunpowder was, I believe, really engaged in endeavouring to make a new boot

blacking, or a love philtre, or something of that kind. To this end he mixed together sulphur and saltpetre and charcoal, and, finding the mixture unsuccessful, flung it, just as we fling our receiving sets at times, into the fireplace. Later on his one remaining useful eye, peering through a swathing of sticking plaster and bandages, lighted upon the shattered hearth, and he realised that his compound, even if it did not fulfil its original purpose, would provide the world with a new and noble means of promoting the brotherhood of man. Why go in for the messy and exhausting business of hacking your enemy to pieces with a billhook or a halberd when you could blow him neatly and expeditiously into smithereens with a pint or two of this handy compound?

A Tuning Device

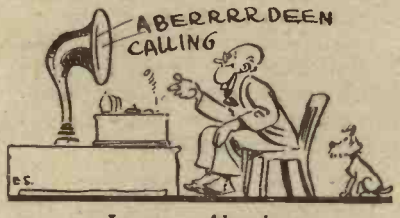
Chance again had a great deal to do with the conception and the development of Professor Goop's new all-stations tuner. He first got the idea in this way. For a long time, even with his most powerful receiving set, he had been unable to pick up Aberdeen. The desire to hear transmissions from the rugged north became a perfect passion with him. Set after set, circuit after circuit, he designed to capture them, but all failed. Then one day he asked to stay with him a friend who had recently been visiting the granite city. To this friend he opened his heart, telling him of his difficulty. The man smiled and got to work. With the help of the wavemeter he tuned to 495 metres. Except for an occasional wail, due probably to Poddleby, the loud-speaker was dumb. From his pocket the friend produced a shilling, which he rang loudly upon the panel of the receiving set. In came Aberdeen.

Inner History

This was the real beginning of the all-station tuner. The subsequent inner history of this wonderful invention reads like a romance. Some people might misunderstand that last remark, but I am quite sure that you, reader, will not. For days the Professor went on ringing his shilling and getting Aberdeen whenever he wanted him. Then quite by accident he chanced upon a discovery of the kind that can be described only as epoch-making. His set was tuned to London, which was coming through at remarkable strength. In taking his handkerchief from his pocket the Professor accidentally pulled out a shilling that bounced upon the panel. Instantly Aberdeen came through at almost equal strength. This set the Professor thinking. He

. . . Frankfort responded readily . . .

added another shilling. 2BD now rose to R6, whilst 2LO became C3. Professor Goop continued his experiment, and when the entire contents of his pockets, consisting of 5s. 9d. in silver and 4¾d. in copper, had been brought into service London was so faintly audible as to cause but little interference with the northern signal. By adding his watch and chain he was enabled to eliminate London altogether and to revel for the rest of the evening in a wonderful programme of dance music relayed by the northern station from the Savoy Hotel. As he told me next day, it did him a power of good to hear a real Scottish programme.



. . . In came Aberdeen. . . .

Further experiments were put in hand at once, and before many days the tuner was practically perfect. It takes the form of an ebonite panel shaped like a tea-tray, and mounted upon insulators of the largest size. This is placed between the A.T.I. and the loud-speaker. Wishing to hear something of the Swiss stations the Professor drilled a number of holes in a piece of cheddar cheese and placed it upon the tuner. This merely showed how extraordinarily selective the tuner is, for though Switzerland refused to respond to the artificial Gruyère, many American stations were heard simultaneously. The German stations are particularly easy on the all-station tuner, Frankfort responding readily to the correct sausage, Munich to a few drops of beer, and Stuttgart to a grand piano.

Warning

A little care is required in using the tuner in order to obtain the best results. One must always bear in mind how exceedingly delicate it is. The other day, for example, when the Professor had picked up Rome with the aid of a plateful of macaroni Mrs. Goop entered the room and reproached him for burning a hole with his soldering-iron in her new sofa. The ensuing exchange of winged words sounded so exactly like a meeting of the League of Nations that Rome was promptly swamped by Lausanne. By careful attention to detail, interference of all kinds can be eliminated with ease. The other night, for example, Moscow, enticed into the loud-speaker by means of a red rag, was rather badly jammed by another station which was eventually identified as Madrid. The reason, of course, was that red rags are an integral part of the national pastime of Spain. Here is a problem which would seem at first a little difficult to solve. Rising to the occasion the Professor seized the "Do It Now" card which hung over his desk and placed it upon the tuner. This finished Madrid at once, for in Spain, as you know, Mañana holds sway.

WIRELESS WAYFARER.

An informal meeting of the R.S.G.B. will be held at the Institution of Electrical Engineers, Savoy Place, W.C.2, at 6 p.m. on Wednesday, the 13th May, when Mr. R. H. Kidd, B.A., will open a discussion entitled "An Attempt at Quantitative Experiments on Modulation." These meetings are open to members of Affiliated Societies, who are heartily invited to attend. A certain number of tickets are also available to the general public. These may be obtained from the Secretary, The Radio Society of Great Britain, 53, Victoria Street, S.W.1.

RADIO NOTES AND NEWS

AT a meeting held recently in the laboratories of the Zenith Radio Corporation, Chicago, where radio scientists met with Commander Donald B. MacMillan, the Arctic explorer, to finally determine on the type of new short-wave radio transmitting and receiving apparatus with which the expedition is to be equipped this year, the scientists present were startled by the statements made by Mr. John L. Reinartz, of South Manchester, Connecticut, when he described the phenomena encountered by him in reaching down to extremely low wavelengths. Normal American broadcasting wavelengths are between 200 and 600 metres, yet phenomenal day-time code work has been accomplished on wavelengths as low as 10 metres. Mr. Reinartz made some remarkable observations on the conditions obtaining when working on very high frequencies, corresponding to wavelengths below one metre.

* * *

It was definitely decided between Commander MacMillan and the engineers present at the meeting that the expedition will be equipped with transmitters capable of four wavelength ranges, the lowest being approximately 20 metres, then 40, then 80, and then 180. The section of the world in which the expedition will be this year is one of the most difficult from the standpoint of radio transmission and reception, namely, that between 50 deg. and 75 deg. north latitude, in Davis Straits. The 20 metres wave band will be used during the period just preceding and succeeding noon. The 40 metres wavelength will, in all probability, be used during the hours around midnight, which will still be daylight in the Arctic, but dark in the lower degrees of latitude. The 80 metres wavelength is provided as an emergency compromise wavelength to cope with unanticipated conditions. The 180 metres wavelength transmitter is provided only for the purpose of ascertaining whether the 180 metres wave will be satisfactory over this great distance under the conditions existing.

The transmitting panels at Rome, a description of which station was given in our last issue.

On the last MacMillan Arctic Expedition a wavelength of 180 metres was used with good results after the Arctic night set in, and no appreciable interference from the Aurora Borealis was noticed. What the interference of the aurora will be on the low wavelengths no one knows.

The members of the American Radio Relay League will again be called upon to establish and maintain communication with the expedition, if possible.

* * *

We understand that on the afternoon of Saturday, April 25, at 5 p.m., Greenwich time, Mr. R. W. H. Bloxam was successful in intercepting at his experimental station, 5LS, at Blackheath, S.E., signals transmitted by Mr. John L. Reinartz on a wavelength of 20 metres, from his station 1XAM, at South Manchester, Connecticut, U.S.A.

The time at South Manchester would then be midday, so that these very short wave signals traversed the entire distance in broad daylight.

The Royal Geographical Society state the distance to be 3,334 miles, and the reception probably constitutes a daylight record for the low power used. 1XAM's power input is 1 kw.

* * *

On Saturday, May 9, a programme of "Old Masters," which is composed chiefly of works by Schubert and Schumann, is being broadcast from Manchester and relayed to 5XX. The artists taking part are Mr. Edward Isaacs, the distinguished Manchester pianist, and Mr. Harry Hopewell, a popular local baritone, and the 2ZY Augmented Orchestra.

* * *

Striking evidence of the popularity of the plays broadcast from the Manchester Station was given on the occasion of the 2ZY Dramatic Company's presentation of "The Chinese Puzzle." It was decided beforehand to issue a synopsis of the play to listeners in order that they might experience no difficulty in following the course of the play. Nearly three thousand requests for copies came in from districts as far apart as Staffordshire and North Wales.

A New Receiver for Modern Conditions

By D. J. S. HARTT, B.Sc.

Some further hints and a Test Report.

The orchestra at KDKA, which many readers will have heard during the winter months.

IN the article in the previous issue of *Wireless Weekly* the construction of special air-spaced coils for the short-wave plug-in unit was described, but for an alternative coil unit the same type of skeleton former may be used and the coils wound with No. 16 d.c.c.

An Alternative Coil

Although the air-spaced coils demand no special skill in construction, this alternative coil unit is, if anything, more easily made.

With 5½ turns of No. 16 d.c.c. wound on one end of the skeleton former for the aerial coil and 15½ turns on the other end for the secondary coil (the half turns being to enable the ends of the coils to be taken from opposite sides of the former), the minimum wavelength will be about 50 metres when the unit is used in conjunction with the receiver as described. The coils may be mounted in the manner previously indicated, and the unit made identical as far as the remainder is concerned.

With regard to the coil values for the reception of 5XX and Radio-Paris, a No. 150 or its equivalent will in most cases be suitable when using direct coupling, and a No. 100 or its equivalent for reaction. In some cases, where the aerial/earth system is of high resistance, a larger size reaction coil may be found necessary. For the Eiffel Tower wavelength a No. 200 or 250, with a No. 150 or 200 for reaction, should be tried.

If " semi-aperiodic " coupling is used for 5XX and Radio-Paris, suggested coil values are Nos. 150, 200, and 100, and for Eiffel Tower, Nos. 200, 300 and 150, for aerial, secondary, and reaction respectively.

Test Report

The receiver has been tested recently on the short wavelengths, and the Pittsburg station KDKA has been received on this lower wavelength without any difficulty at good strength in the 'phones. Only on one transmission out of five was the fading and the peculiar distortion which is sometimes apparent on these short-wave telephony transmissions sufficient to mar the reception. Although on the last night on which tests were made KDKA came in at unusual strength for the present conditions, the tendency seems, on the whole, to be for signals from this station to become weaker as general reception conditions approach those we are accustomed to in the summer months. A French station working telephony on 60 metres was also heard at excellent strength one night, while many amateurs' transmissions have been received on the short waves.

When the set was tried out on the broadcast and higher wavelengths, Brussels on 265 metres was received at fair strength on the loud-speaker, while several German stations, Birmingham, Bournemouth, Newcastle, Ecole Superieure, and Madrid were all heard at good strength in the 'phones, Bournemouth and Birmingham being particularly good. London (8 miles) and Chelmsford (about 35 miles) both come in excellently on the loud-speaker. Using the " semi-aperiodic " coupling, it was possible, by critical adjustment, to receive intelligible speech and music from a foreign station which was working on a wavelength between those of London and Bournemouth, while both the latter stations were working, but London could not be entirely eliminated on this wavelength. On the longer wavelengths the Eiffel Tower and Radio Paris were both received very well. Eiffel Tower, in particular, was very loud in the 'phones and quite enjoyable on the loud-speaker in a small room.

Random Technicalities

By PERCY W. HARRIS, M.I.R.E.
Assistant Editor.

IT is high time something was done about the naming of valves in a sensible way. If the nomenclature is puzzling to the expert, what must it be to the beginner?

Let us take a few examples. There is on the British market a type of valve consuming .25 of an ampere of filament current and working with about 40 to 100 volts on the anode. It is generally called a " small power valve," and richly deserves the popularity it has attained. It is made by all the valve manufacturers, and (with apologies to all of them) there seems very little difference between the different makes. Are they similarly named? Not a bit of it! The British Thomson-Houston Co. call theirs the B.4. The Marconi-Osram people call theirs the D.E.5, while Mullards call theirs the D.F.A.3. As all of them are modelled upon the American U.V.201a, there might at least be an agreement between makers (seeing that they are bonded together as the Valve Manufacturers' Association) as to the title.

* * *

The confusion is not due merely to differences in letters, which, as the valves are made by different manufacturers, is, perhaps, pardonable. The real trouble comes from the numerals attached to the letters. There is, as I have mentioned, the B.4 and the D.E.5. These are similar valves. Then we have the B.5 and the D.E.4; these are not similar valves. The B.5 and the D.E.5 are as different as chalk from cheese, for one is a dull emitter of the .06 ampere type and the other takes .25 of an ampere—to indicate but one difference between them. What is Mr. Mullards' D.F.A.4? Is it like the B.4 or the D.E.4? Certainly not! The D.F.A.4 closely resembles the D.E.5B.

Can we get a clue to the mystery by examining the voltage? No hope in this direction! The D.E.4 is a 3.8 valve, the B.5 is a 3-volt valve. The D.E.5 is a 5.6-volt valve. Just to help matters the B.4 which requires a 6-volt accumulator can be thought of in conjunction with the B.6, which requires a 4-volt accumulator.

* * *

Ediswans also have a good line of valves, but their names are just as confusing. The P.V.2 is a 6-volt valve and the P.V.6 is a 1.8- to 2-volt valve.

About the only matter on which the valve makers agree (other than price) is in a colour scheme. Red, apparently, means high frequency and green low frequency. For high frequency Cossors have a red top, Mullards have a red ring, and Ediswans a red stripe. In addition to these decorations they are hereby awarded a medal for their naming!

* * *

By the way, I have found recently that a number of com-

Dr. James Harris Rogers, the inventor of a printing telegraph system, whose efforts to cross the American continent with an underground transmitting aerial have been successful. Dr. Rogers is here seen pointing to the aerial.

ponents on the market are made to fit ¼-in. panels, and cannot be used on anything thinner. The manufacturers of such components are apparently under the impression that, as most people use ¼-in. ebonite panels, there is no need to trouble about anything smaller. As a matter of fact, we do not use 3/16-in. ebonite so much as we might well do, for on sets with small panels (up to, say, 8 in. x 6 in.) 3/16 in. ebonite is quite thick enough. The advantages of using it are that it is cheaper (seeing that ebonite is generally sold, or at any rate charged up, on the pound basis), and if two components are mounted, say, 1 in. from another on a 3/16-in. panel. the insulation between them is just as great as if they were mounted upon a 1-in. thick panel. Indeed, for very short wave work the thin panel is preferable. In such work great care is taken by some manufacturers to remove as much solid dielectric as possible from the field of variable condensers, and it seems rather absurd for us to screw the top plate of such a condenser close up against a thick ebonite panel.

* * *

On broadcast wavelengths I think it will be impossible to detect the difference in efficiency between a set using a ¼-in. panel and one using a 3/16 in., but when we come down to the 40- and 20-metre ranges such matters are of greater importance. In any case, experimenters might well consider whether they have not fallen into the habit of using a ¼-in. panel for everything where in many cases they would save money by using the thinner material. At the same time, manufacturers who make components which only fit ¼-in. panels may find themselves left behind should the popularity of the thinner material increase. Fortunately there are already plenty of excellent components which fit 3/16-in. panels.

GERMAN RADIO

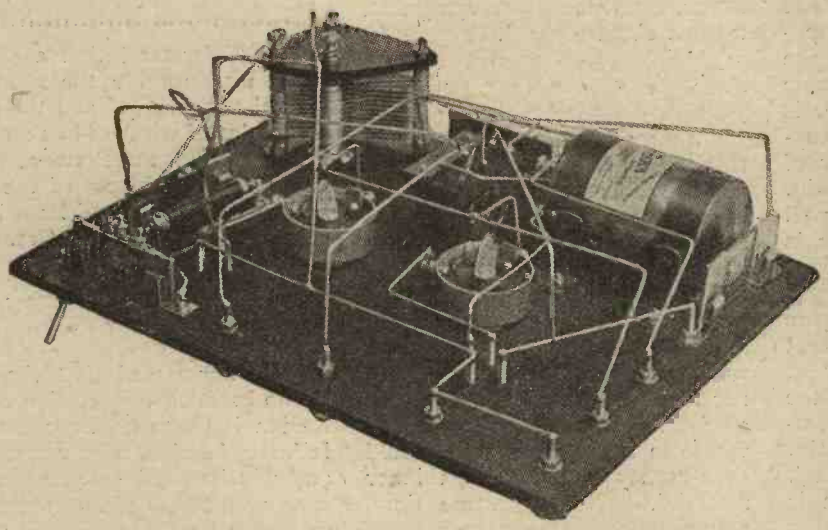
We understand that a special radio institute for the study of both the theoretical and the practical sides of wireless has recently been founded at Bremen, Germany. The objects of the new institute are to spread knowledge of radio throughout Germany, and to encourage work for the advancement of the science.

* * *

It is announced that the new Berlin broadcasting station of the National German Broadcasting Industry has just been completed, and will be put into operation as soon as a series of test transmissions can be accomplished. It is situated on the Kaiserdamm Strasse in the Charlottenburg district of the city.

This new station is able to supply an aerial power of 2 kw., ten times more than the station now in use.

In this photograph we see Dr. Rogers working his apparatus. The call letters of his station are 3XR.



The layout of the receiver permits easy access to the components for wiring up.

The receiver presents a very con be seen in the

A General P Valve R

By JOHN U

Special switching is inco that separate H.T. value valves, without disturbin detector when the secon ci

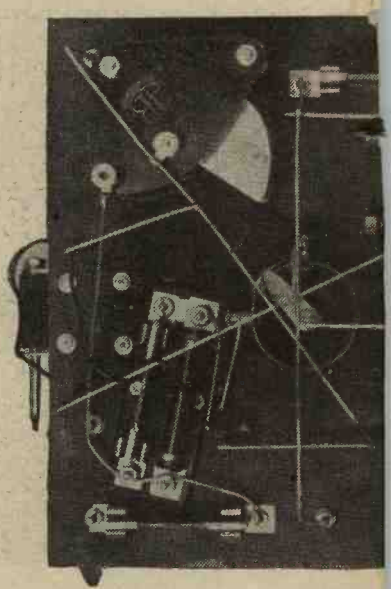
THE receiver about to be described consists of a detector valve with reaction, followed by one stage of low-frequency amplification. Special switching arrangements are incorporated so that separate values of high-tension may be used on the two valves, despite the fact that the switch cuts the last valve out of circuit, but still leaves the telephones connected to the normal H.T. positive terminal.

Switching

This particular arrangement allows of the use of one of the small types of power valve now on the market, so that the maximum amount of amplification may be obtained from this stage, and hence the receiver is suitable for use with a loud-speaker up to several miles from a main station, whilst beyond this distance it constitutes an admirable arrangement for using telephones. Although no high-frequency valve is incorporated in the receiver, given a reasonably good aerial and earth system and a little skill in tuning, a number of the distant stations may be received at excellent strength. The type of circuit used is, in fact, that favoured by a number of amateurs whose feats of long-distance reception during the winter constitute some highly praiseworthy achievements.

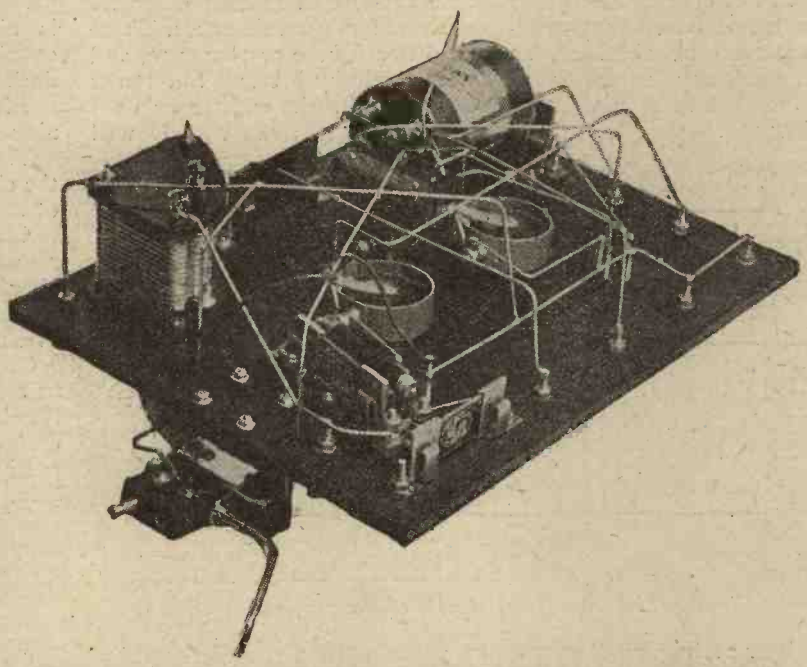
H.T. Connections

Transformer coupling is used to couple the detector to the amplifying valve, and the only part of the circuit which calls for comment is the somewhat unusual arrangement of switching which allows of the telephones being inserted between the terminals marked "Tel" when either one or two valves are in use, but at the same time allows of each valve receiving its appropriate value of high tension. A double-pole two-way switch is used, and on referring to the circuit it will be seen that with the switch in the position marked 1 connection is from the reaction coil L2, through the telephones to H.T. + 1, which is the high-tension supply to the detector valve. With the switch in the position marked 2, the circuit is now through the primary of the L.F. transformer, but still goes to H.T. + 1. The telephones are now in the anode circuit of V2, and the appropriate high-tension value of H.T. + 2 is applied to the plate of this valve. Two by-pass condensers, C4 and C5, each of 0.001 μF, are used across the primary of the L.F. transformer and across the telephones. Since a power valve, or, in fact, any valve with an appropriate value of high-tension for



A plan view of the back of the p the practical

npact appearance. The switch may entre of the panel.

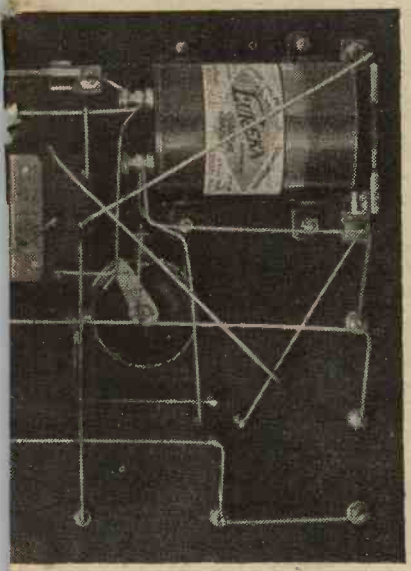


The connections to the coil holder and the grid leak unit may be clearly seen from this photograph.

Purpose Two-Receiver

INDERDOWN

rporated in this receiver so s may be used for the two g the voltage applied to the d valve is switched out of cuit.



anel, which may be compared with wiring diagram.

low-frequency amplifying purposes, may be used, provision is made for grid-bias, as shown in the circuit diagram.

General Arrangement

The set is conveniently arranged with all the components mounted on one panel, so that little difficulty is experienced in building, and the whole is incorporated in a sloping type of cabinet so that the coils are arranged with their axes vertical, thus obviating any tendency to flop when heavy coils are used.

The Layout

From the photographs the general neatness of the layout will be appreciated, as will the convenient positions of the tuning controls. To the left hand of the panel will be seen the two-coil holder, which takes the aerial coil in the fixed block and the reaction coil in the moving, and also the 0.0005 μF variable tuning condenser. In the top left-hand corner is the constant aerial tuning terminal, whilst directly below it is the terminal A1, giving plain parallel tuning. The earth terminal is seen in the left hand bottom corner. The two filament rheostats and the switch allowing the use of one or two valves are seen near the centre of the panel. Along the top of this latter are the three high-tension terminals, whilst low-tension and grid-bias terminals are seen on the right of the panel. The two bottom terminals on the right hand side are for the telephones, the bottom one marked plus being that to which the plus tag of the telephones or loud-speaker should be attached. With the switch in the "up" position one valve only is in circuit, whilst bringing this down to the lower position allows of the use of both valves. The last valve should, of course, be switched in and out of circuit on its own filament resistance, as well as by the use of the switch.

Components

In order that constructors may exactly duplicate the receiver, which practice is to be advised unless the constructor possesses sufficient powers of discrimination to choose suitable components, the makers' names as well as the components used are given below.

One ebonite panel, 12 in. by 9 in. by $\frac{1}{4}$ in. thick. The panel used has a matt surface, and was obtained from Messrs. Peter

Curtis, Ltd. Any good make of ebonite will, of course, do equally well, but it is advised that guaranteed material be obtained, as this obviates any necessity to remove the surface skin whether polished or not.

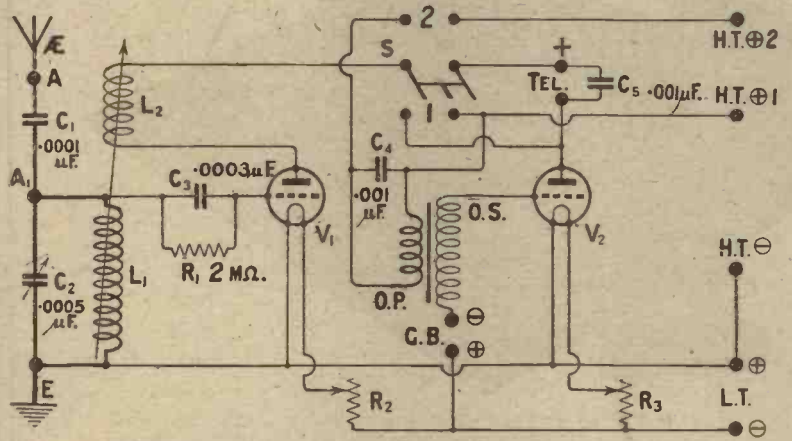


Fig. 1.—The theoretical circuit of the receiver.

One oak or mahogany sloping-type cabinet to take the above-sized panel. That shown in the photographs was made by Henry Joseph & Co., Ltd.

One Magnum two-coil holder. (Burne-Jones & Co.)

One .0005 µF square law variable condenser. (Jackson Bros.)

Two filament resistances. Those used were of the 30 ohm type, and were made by Messrs. Shipton & Co. The bright emitter or dual type resistances can equally well be used in the set, and naturally the choice of these components will be decided when you have chosen the type of valves to use.

Eight valve legs. (Burne-Jones & Co.)

One Utility two-pole double-throw anti-capacity switch. (Wilkins & Wright.) That used is nickel-plated, but these may equally well be obtained with a dark finish.

Eleven W.O. type lacquered or nickelled terminals.

Three clip-in condensers with the clips, one of .0001 µF and two of .001 µF capacity.

One .0003 µF condenser and a 2-megohm leak mounted on ebonite platform.

All of these were obtained from Messrs. L. McMichael, Ltd.

One first stage low-frequency transformer. That used is a Eureka Concert Grand. (Portable Utilities, Ltd.)

Eight 4 B.A. screws and nuts ½ in. long.

Quantity of No. 16 gauge tinned copper wire. Either round or square section may be used, but, generally speaking, it will be found easier to wire with the ordinary round section wire, and this has been used. Short lengths of flex for the flexible connections to the two-coil holder.

Drilling the Panel

Provided a guaranteed leakage-free panel is obtained, the drilling

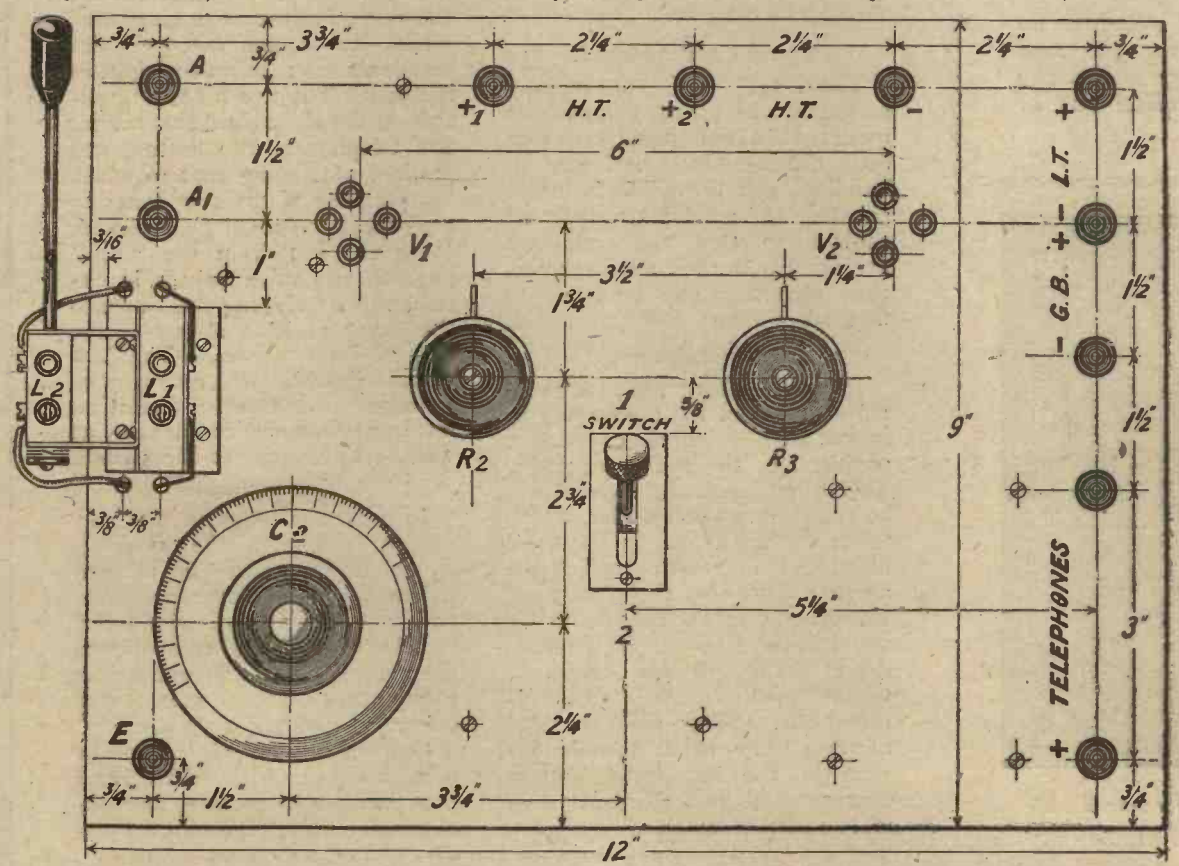


Fig. 2.—Drilling dimensions and all details relating to the layout of the panel may be obtained from this illustration.

may be carried out with little difficulty by reference to the front of panel drilling diagram of Fig. 2. If, however, such a panel is not obtained, it is advisable that the surface be first removed, using emery cloth. The only hole which may present difficulty is that which allows of the mounting of the double-pole two-way switch. If, however, two ¼-in. holes are drilled at a distance of about 1 in. apart on the centre line which takes this component, the necessary slot may be readily made by using an ordinary fret saw. In the actual receiver shown the holes for the valve legs have been tapped and no nuts used, but it will not be found detrimental if clearance holes are drilled and nuts used to secure the legs. The variable condenser is of one hole fixing type, and no difficulty will be found in mounting this, while the transformer is secured merely by four screws through the panel, and nuts. The clips for the plug-in condensers are similarly secured, as is the unit taking the grid condenser and its attendant leak. One clip of the constant aerial tuning condenser is held by the A terminal nut, as are both clips of the condenser across the telephone terminals.

Wiring

Wiring is carried out with No. 16 gauge tinned copper wire, as this is amply rigid for the purpose, and will be found less difficult to handle than that of square section type. It is advisable that the filament circuits and others with the wiring close to the panel be first completed, and finally the wires to the switches should be soldered in position. The long lead seen going from the centre right-hand contact of the switch has its end near the edge of the panel close to the coil-holder inserted into a small hole in this latter for the sake of rigidity. To it is soldered a small length of flex, which is taken through the panel and actually makes the connection to the reaction socket. For the other reaction lead a length of flex has been used, and this is taken from the plate of V1 through the panel to the plug of the coil-holder. In order to further remove any difficulty which may exist a drawing of the switch is given in Fig. 3, and the connections from the various contacts clearly marked.

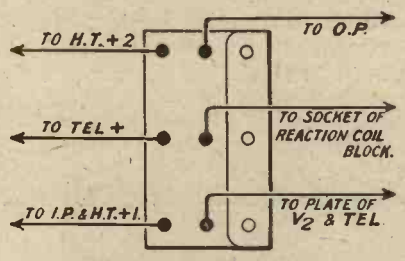


Fig. 3.—The connections to the switch.

Testing the Receiver

To test the set for wavelengths below 420 metres, first connect the aerial to terminal A and earth to E, inserting a No. 50 coil in the aerial socket, that is, the fixed socket of the two coil-holder, and a No. 50 or 75 in the reaction socket. For wavelengths above 420 and below 600 a No. 75 should be used for the aerial with a reaction coil of the same

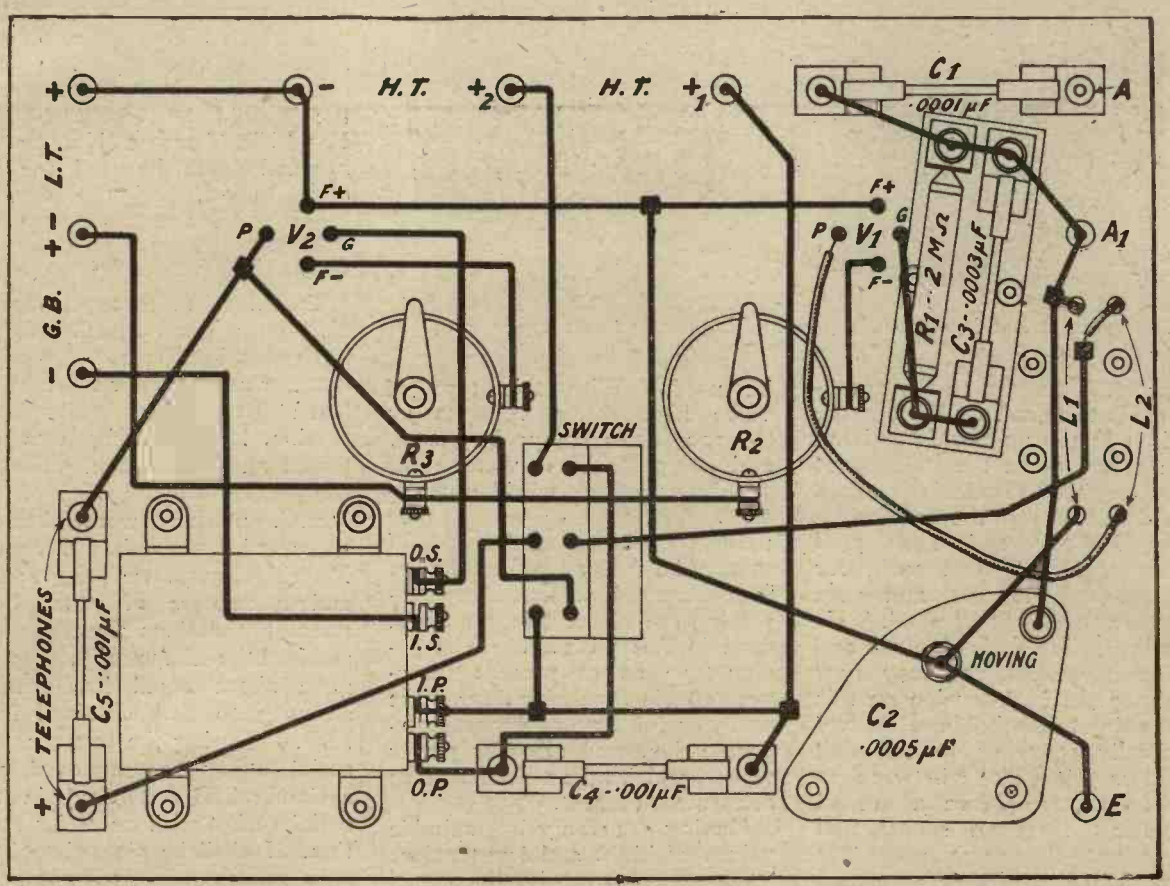
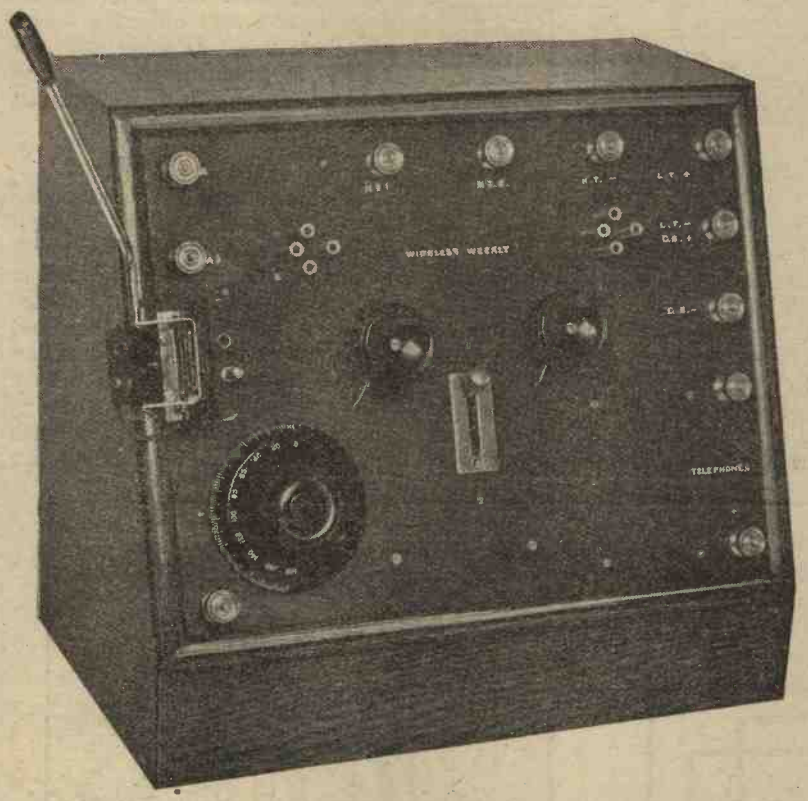


Fig. 4.—The wiring of the receiver may be carried out with the assistance of this practical illustration.

value. First connect an appropriate low-tension battery between the L.T. plus and minus terminals, and this in the case of .06 valves may be either a 4½-volt dry cell or a 4-volt accumulator. With the rheostats in the off position, first plug the valve into the socket V1 and turn the filament resistance on slightly, noting whether the valve lights correctly. Carry out the same procedure for the second valve, and then connect the negative of your H.T. battery to the appropriate terminal. With the switch in the up position giving one valve, place the telephones between the terminals marked "Tel" and tap the connection from H.T. + 1 into a small value of high-tension such, for example, as 6 volts, and note whether a slight "plonk" is obtained. If this is obtained and all seems correct, you may now advance the high-tension on this first valve to a suitable value, and generally speaking for .06 dull emitters this will be between 30 and 60 volts. Place a second valve in the second socket, and carry out the same procedure with regard to its high-tension supply with the switch, of course, in the 2-valve position. Satisfied that all is correct so far, it now remains to insert a suitable grid-bias battery between the plus and minus grid-bias terminals. This will, of course, depend on the type of valve used in the second socket, and if an ordinary .06 valve is used up to 80 volts H.T. may be applied with a grid-bias battery of about 3 volts. Alternatively, in the last socket one of the small-power valves, such as the B.6, etc., may be used. With this type of valve high-tension voltages up to 120 volts may be used, and a grid bias voltage of the order of 4½ will be necessary. The type of valve to be used in the last stage should, of course, be decided before the set is constructed, so that an appropriate type of resistance may be used in this position. The 30-ohm type as at present incorporated is suitable for the ordinary .06 type of general-purpose valve, and also for power valves, which take a similar value of filament current.



The symmetrical layout of the panel adds greatly to its appearance.

Having arranged suitable values of high- and low-tension, it now remains to give the set an aerial test. To carry this out, first arrange the aerial and reaction coils at right angles and rotate the condenser C2 until signals are heard. Next bring the coil L2 nearer to L1, retuning on C2, and note whether the signal strength improves. Providing that the set is wired as per instructions, signal strength will be found to improve as L2 is brought nearer to L1 and retuning carried out on the aerial condenser. If, however, some other type of coil-holder or arrangement is adopted, and bringing L2 nearer to L1 does not increase signal strength, the leads to the former coil should be reversed.

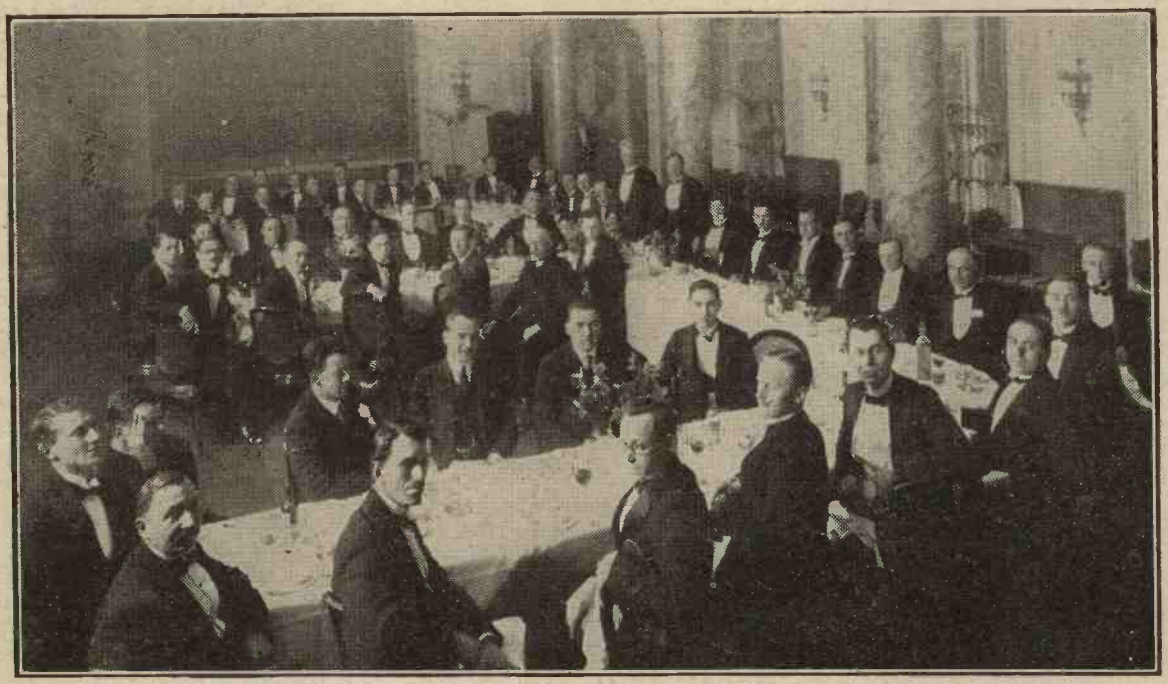
Using plain aerial tuning, it will be necessary to use a No. 25 or 35 for stations up to 400 metres or so, and above this a No. 50 should be employed. For reaction a No. 50 or 75 will be necessary, depending upon the efficiency, etc., of the aerial system. The correct size of reaction coil will, of course, be determined by experiment. The coils given are for the broadcasting wavelengths, and for 5XX a No. 150 coil will be necessary for L1, using plain parallel tuning, whilst for reaction a No. 200 coil should be satisfactory. These coils will also be satisfactory for the reception of Radio-Paris. For Eiffel Tower a No. 200 or 250 coil should be used for the aerial socket, and a somewhat larger coil for reaction purposes.

Test Report

Tested 12 miles south-east of 2LO on a good aerial, using a .06 general-purpose valve as a detector and a power valve in the last stage with 100 volts high-tension, loud-speaking was obtained on that station, whilst in the phones the majority of the B.B.C. stations were obtained at good strength. Munster, Madrid, Postes et Telegraphes, and a number of other Continental stations were also received satisfactorily. 5XX gave about equal loud-speaker strength to that obtained from 2LO. During the test constant aerial tuning was employed, and a Gambrell B coil used in the aerial socket with an A for reaction. I shall be pleased to hear from readers who decide to build this receiver.

OUR AMERICAN VISITORS

Radio Society Dinner to Well-known U.S.A. Amateurs



The company assembled for dinner at the Waldorf Hotel.

TAKING advantage of the presence in this country of the delegates sent by the United States and Canada to the recent wireless conference in Paris, the transmitters and relay section of the Radio Society of Great Britain entertained the visitors to dinner at the Waldorf Hotel on Friday, April 24. The chair was taken by Mr. Bevan Swift, chairman of the T. and R. section committee, among the guests being Mr. Hiram Percy Maxim, President of the American Radio Relay League; Mr. Kenneth Warner, Secretary of the League and editor of the famous American radio journal, *Q.S.T.*; and Major Borrett (representing Canada).

As will be seen from the photograph on this page, there was an excellent attendance, most of the British amateurs who have done so well in communicating with the United States, Canada, Australia and New Zealand, being present. Captain Durrant (GHH), whose wireless transmissions from Mosul, Mesopotamia, have become famous, reached England just in time to attend the dinner, and made a most interesting speech.

The Society were also fortunate in being able to include in the invitation M. Mesger, the French representative of the newly-formed International Committee described in our last issue.

The meeting broke up at quite a late hour, and will be long remembered as one of the most pleasant events in the history of British amateur radio.

A corner of the studio of the Eiffel Tower. A full description of this station was given in our February 11th issue.

LONG LEADS FOR LOUD-SPEAKERS.

Mr. A. E. R. Gilligan, the England cricket captain, broadcasting from the London station.

A GREAT many people nowadays desire to make use of an arrangement which will enable the loud-speaker to be used at will in one or two rooms. In other cases, again, two loud-speakers are required to work simultaneously from the same receiving set, as, for instance, when one is in the drawing-room and the other in the servants' quarters. To obtain pure and undistorted reception of broadcasting either from the same loud-speaker when used in different rooms or from a pair of loud-speakers working in different parts of the house, is sometimes rather a problem, especially if one point is much more distant from the set than the other.

A Common Arrangement

One of the commonest arrangements is that shown in Fig. 1, in which plug and socket attachments in two rooms are seen wired in parallel. With this arrangement the loud-speaker is usually placed in room No. 1 whilst tuning is done, and is then taken to the second room. If the two are a good distance apart it is often found that reception here is of not nearly such good quality as it was in the first instance. The reason is that there is considerable capacity between the flex leads which are generally used for wiring up loud-speaker points.

When the loud-speaker is removed to a distant room there

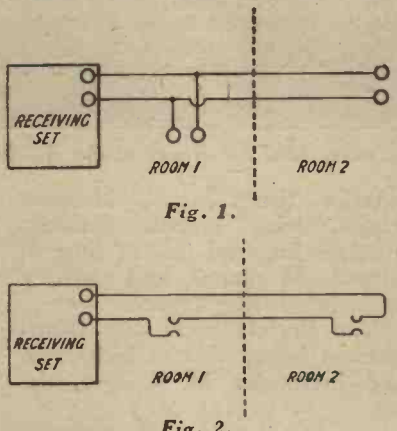


Fig. 1.

Fig. 2.

Showing two methods for wiring distant loud-speakers.

is a great deal of wire in use, and the extra capacity is often sufficient to produce woolly and rather muffled reception. A simple and often quite satisfactory way of dealing with this is to remove the condenser across the output terminals of the receiving set and to fit in its stead a pair of clips on the surface of the panel. A clip-in condenser of suitable value can then be used when the loud-speaker is in room No. 1, and if necessary another suitable condenser when it is in the second room. Or again, one may find by experiment a shunt capacity which will give satisfactory results in both rooms, a capacity, that is, not large enough to cause muffling in either room.

On the whole, however, it is, I think, better to adopt the method shown in Fig. 2. Here jacks wired in series are used, the leads of the loud-speaker itself being connected to a plug. In this case the amount of wire in circuit in the loud-speaker leads is always the same to whichever point the loud-speaker may be connected, so that the results obtained in one room will be identical with those in the other.

Plug and Socket

A very satisfactory method of carrying out series wiring without the use of plugs and jacks is seen in Fig. 3. The jack is replaced by an ordinary plug and socket mounting fixed to the wall in any convenient position. Normally the connecting plug, which is simply a plug and socket coil mount with a metal strip connected across its terminals, is kept in the mounting upon the wall. When it is desired to use the loud-speaker this plug is removed and replaced with that attached to the leads of the instrument. This method is equally useful for working one loud-speaker at will in

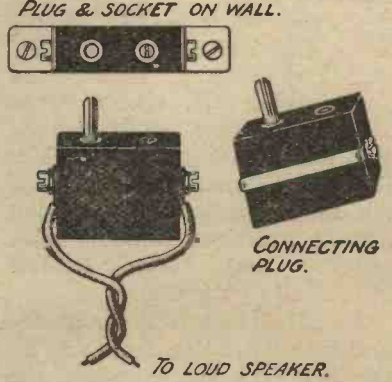


Fig. 3.—A suggested wall plug arrangement.

different rooms or for operating two simultaneously in distant parts of the house.

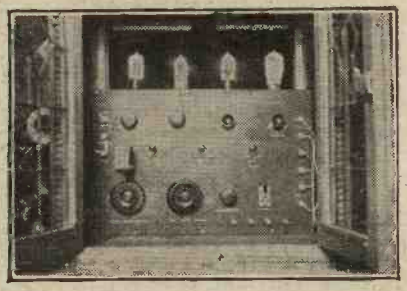
R. W. H.

ENVELOPE NO. 2

SIR,—I enclose herewith photographs of a Family Four-Valve Receiver, Radio Press Envelope No. 2, which I have constructed, and wish to say that I find the set a very useful and interesting one. I can receive every B.B.C. station at sufficient strength to work a loud-speaker, and have also received many foreign stations at loud-speaker strength.

As well as being an ideal family set, it is as suitable for a keen amateur.

Being only a mile and a half from the Hull station, I can work a loud-speaker at terriffic strength.



Mr. Hubbard's Four-valve Family Receiver

I have built many sets, but find this set far superior in every way, and the "people" are delighted at the ease of operation, just pulling a switch over.

I wish to say that I am a regular reader of *Wireless Weekly*, *Modern Wireless* and *The Wireless Constructor*.—Yours faithfully,

A. KEN. HUBBARD.

Hull.

AN INTERESTING POINT

SIR,—In "Random Technicalities," April 22 issue, I note that Mr. Percy W. Harris refers to the use of a voltmeter for measuring the voltage across the filament of a valve, but there is one point in connection with this use of a voltmeter which he does not mention, but which is in many cases of great importance. I refer to the resistance of the voltmeter, which should be as high as possible, particularly when used in connection with dull emitter valves of the .06 type, otherwise the filament voltage while the voltmeter is connected across it is considerably lower than when the instrument is removed, and I have known a .06 valve to be ruined through the use of a cheap voltmeter in this way. Many cheap voltmeters have a resistance of about 25 ohms, and if such an instrument is used across a .06 valve and the rheostat adjusted to give a reading of 3 volts, the battery voltage being 6 volts, a simple calculation will show that on removing the voltmeter the filament will have a voltage of nearly 4½ volts across it. Of course a 4-volt battery is generally used with such a valve, and the effect is not then quite so bad, but even with a 4-volt battery and a Weston Model 301-0-5-volt voltmeter having a resistance of about 250 ohms the increase on removing the instrument is about 5 per cent. Personally I use a voltmeter having a resistance of about 2,000 ohms, which is, of course, quite satisfactory.

Thanking Mr. Harris for the interesting notes he gives week by week in "Random Technicalities," which, I may say, is usually the first section I turn to upon receiving *Wireless Weekly*.—Yours faithfully,

T. A. LEDWARD.

Great Crosby.

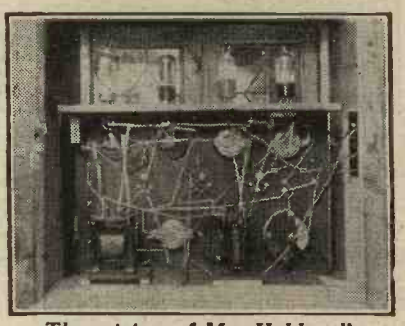
AERIAL INTERACTION

SIR,—*Re* the remarks in your paper on the dates of March 4 and 11, concerning the interaction between transmitters and receivers placed in the same room, I have noticed the same effect with the aerial current obtained at 2ACK when the receiver has been tuned to the same wave as the transmitter. I have a 1D.H. transmitter, using a Mullard 0/10 valve with 300 volts D.C. on the plate and with input of 32 milliamps. I usually have .43 amps in the aerial, but with the receiver tuned to the same wave the reading is .54 amps., and signals reported by 6UY as weaker than usual. Upon detuning the receiver the aerial current drops back, but signals increase in strength. The next experiment was to connect one side of the twin inverted L aerial direct to the fan counterpoise, which put the aerial current up to .83, but signals were hardly audible at a distance of five miles. After this different sized counterpoises were tried, but no difference was noticeable in the strength of signals received by 6UY. The fact that the aerial current increased by connecting one side to counterpoise I cannot explain, as this has still to be experimented with, I am sure some other transmitters have had the same experience, and I should be interested to know how they succeeded in overcoming same.

Wishing all your papers the best 73's.—Yours faithfully,

C. PROSSER (2ACK).

East Aberthaw, near Cardiff.



The wiring of Mr. Hubbard's receiver.

A LOW-LOSS TUNER FOR SHORT WAVES

SIR,—Although a number of reports have appeared in *Wireless Weekly* of this fascinating instrument, I feel that another would not be amiss.

I constructed this set last January according to instructions by Mr. Percy W. Harris, and had no difficulty in receiving KDKA the first time I tried it out, also a number of amateurs from "all parts." I experienced, however, considerable trouble with the reaction having a lot of overlap. This difficulty was surmounted by fitting a variable grid-leak, which in my case effected an improvement.

I was using a Marconi R valve as detector, followed by a D.E. 5. I found, however, an R. 5V. gave far better results than the R, but still the set was inclined to oscillate too freely. I decided to use separate H.T. to each valve, using 45 volts on the detector and 90 volts on the magnifier. This improved reception

by 50 per cent., and the set was much easier to handle.

I have now replaced the R. 5V. with a D.E. 5B.; this is the best combination so far, using 30 and 90 volts on the detector and the L.F. valve respectively; reaction control is perfectly smooth and signals are received with great volume.

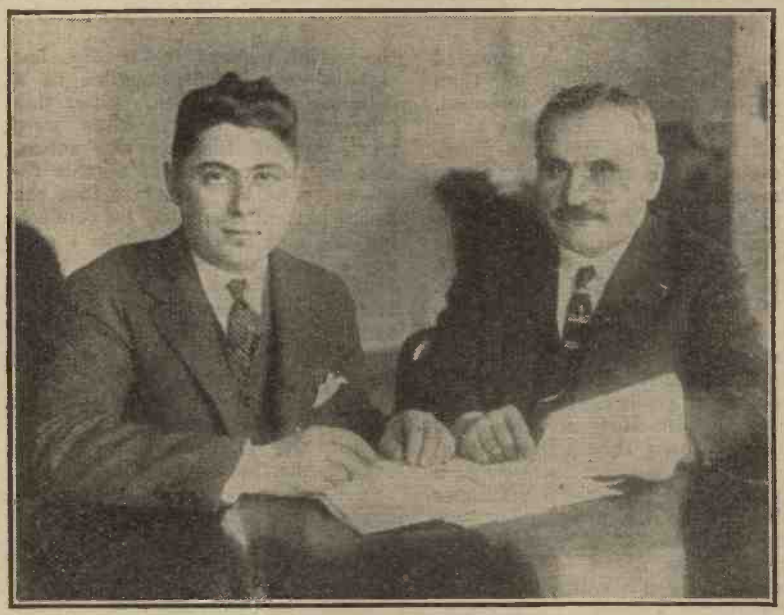
I am now about to try a D.E.V. as a detector.

Without using any aerial connection at all I have received a number of Continental and American amateurs, and also an Italian station.

Mr. Percy W. Harris is to be congratulated on such an efficient set combined with simplicity.—Yours faithfully,

R. AMOORE.

Midhurst.



Dr. Marius A. Latour (right), the well-known French inventor, who is now in the States investigating the question of infringement of his patents.

THE TWIN VALVE RECEIVER

SIR,—I think you might be interested to hear of some results from your "Twin Valve" described in *The Wireless Constructor* for January.

Results are the finest that myself and scores of friends have ever heard, the aerial being about 80 ft. long and average height about 35 ft. single.

All stations in England come in, Birmingham and Bournemouth while 2LO is working, the latter (Bournemouth) on Sterling "Dinkie," perfectly audible at about 7-8 ft. on speech, while music is quite loud. Sunday nights between 5.30 and 8.30 most of the French and German stations are quite audible in the phones. Three Sundays ago conditions must have been very good, or else I was particularly lucky, as Hamburg, broadcasting opera, was heard by all the members of my family on the loud-speaker, sitting about 3 ft. away. I have now had sufficient time to judge the capabilities of this set, and I doubt whether there is a more efficient type of set on the market made by an amateur.

London is painfully loud on the speaker, and the set has to be detuned.

I hope this letter will be of some interest, and if only those howlers would give up those "super" sets and build one such as the "Twin Valve," I think there would be more peace during broadcast hours and better results.—Yours faithfully,

E. W. SHEPHERD

Upton Manor, E.

P.S.—This is no first set effusion, as I have made four sets from *Modern Wireless* and *The Wireless Constructor*.

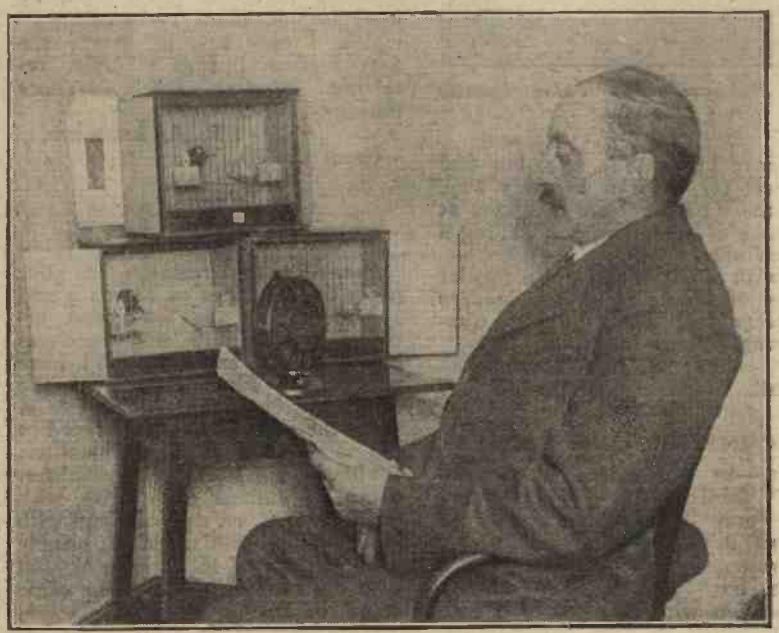
ANGLO-AMERICAN SET

SIR,—Once more I must heartily congratulate Mr. Harris on his "largest" production. I have now completed the set, and enclose brief note of results obtained the first evening; as a matter of fact, I find it takes at least a month to really learn all the fine shades of handling several valves.

It may be assumed that my aerial and earth are very good, but I am in the midst of bricks and mortar and partly screened by a big factory and barely three miles from 2LO.

The constructional description has been rigidly adhered to, and the only change in components is that the dual condenser is Sterling Square Law.

Valves are 5 D.E.R. and last stage D.E.6. Within a few minutes of completing the wiring I was listening to Rome, obtained with a purity that was astonishing. No doubt it was a good reception night, for the strength was strong phone, and so clear that I could actually follow the leading players in the orchestra. Other stations were equally good in every respect; in



Mr. J. Tomlinson and his canaries broadcasting from the Birmingham station.

fact, my marginal notes were "Crystal Purity," and there was no forcing whatever necessary, and the control of reaction was as smooth as is possible to imagine. With the aid of a wave-trap Manchester was received at full phone strength, and not the slightest vestige of the 2LO band could be heard, a condition I have not obtained before without Manchester being more or less distorted.

As one would imagine, tuning three stages of H.F. would be so difficult as to make one hesitate before adopting it. However, on trial, I can confidently say that the tuning is so easy that I almost feel that the charm of searching has been lost. Perhaps a strange way to word it, but, nevertheless, it is absurdly simple. Since then I have had several American stations at decent strength, but feel that I shall do better when I have got the neutrodyne condensers properly adjusted. This, of course, is the ticklish part, but, after all, not above the ordinary wireless fan's capacity. Yes, the set is more than worth while; it is a perfect treasure, and, like many others, I feel that I have probably reached high-water mark at last. Like the tale, my wife says, tell Mr. Harris not to dare to produce another and better set. Well, in the natural order of progress I suppose he will, but I think it will be a long time before he does.

I have also received several stations not before heard and untraceable, and as I know a smattering of French, Italian, Spanish and German, these were ruled out.

I should finally like to thank Mr. Harris for the several splendid sets he has produced for us at different periods.

Recently I had a particular friend to test the set, one who has jibbed at two stages of H.F. tuning, but he left quite converted to three stages, and we both agreed that it was a circuit without parallel and could be highly recommended to any amateur with a certainty that the utmost satisfaction would be guaranteed.

So far I have not tested out the low-frequency thoroughly, as I wished to get the H.F. perfect first, but I have heard enough to convince me that the L.F. stage will be quite up to the standard.

One word, so far as my set is concerned. The filament control is very critical and requires care, but once set it can be left untouched if a master rheostat is used.

Wishing you every success and promising to let you know at a later date some more results.—Yours faithfully,

CAPTAIN J. P. HALL.

Kentish Town, N.W.

A NEW CRYSTAL-VALVE CIRCUIT

SIR,—*Re* the single valve-crystal receiver described in the March issue of *The Wireless Constructor*, I beg to thank you for publishing this arrangement.

I have made up a rough set according to the theoretical diagram, and am so satisfied with it that I have coupled it up to a power amplifier. I have had Glasgow on the loud-speaker (when London had closed down) and I have been able to identify four U.S.A. stations. This is the more remarkable inasmuch as I only use an indoor aerial (of my own design). The "earth" is the input water pipe, crystal "Neutron" Formo 3:1 transformer, a DE5B valve which I borrowed from my five-valver.—Yours faithfully,

R. J. WAINWRIGHT-BROWN.

London.

BROADCASTING IN INDIA

SIR,—The enclosed cutting *re* broadcasting in India may be of interest to you.

The conditions out here are very difficult and X's and mush perfectly awful. Some evenings it is impossible even to put the headphones on, the noise is so terrible.

Situated as I am in the centre of India and with Indian stations at

present only of 500 watts, using a Marconiphone V2 set, one has on most occasions to bring reaction absolutely to the critical point.

This is also due to the difficulty of getting a good earth with the ground absolutely baked and subsoil water level being about 25 ft. below ground level.

I have worked with a counterpoise and have had better results, but it is very difficult I have found to make the V2 stable with that arrangement. Some "body" capacity has to be applied by keeping hold of the aerial tuning side handle, otherwise howling starts immediately.

Your articles on "Reception Conditions Week by Week" are interesting reading, and if I can find time I shall write you a few notes on Indian conditions more fully.

I had my set in Bexhill for eight months in 1924, and I am therefore able to judge better the difference than most people in India who have never heard home broadcasting.

I got a European station one night at 9.30 p.m. to 10 and could recognise *the announcing* as being German or Dutch, as I had heard it so often last year. I was unable to identify the station, as reception was only good now and then. An organ recital came in well. The wavelength was about 330 metres.

During the last month I have on Thursday evenings been getting "Colombo Calling," *i.e.*, 1,200 miles from here, and the results, with much X's, were fit to go on to the loud-speaker.

Quite a number of the ruling princes in Central India are interested, and now that an Indian company for broadcasting is to be formed, there will be a big demand for good, powerful sets from them in the near future.

The dry atmosphere in the Central parts of the country is, however, making rather a sorry mess of the cabinets, even though mine are kept covered all day and a bowl of water beside them.

Your new journal, *The Wireless Constructor*, is very interesting, and fills a demand which only your firm foresaw.

Best wishes to *Wireless Weekly*, *Modern Wireless* and *The Wireless Constructor*.—Yours faithfully,

Indore. A. E. J.

"It is officially announced that the Government of India is prepared to grant a licence to private enterprise, under certain conditions, for the provision of a broadcasting service by means of stations to be erected in British India. The Government will require one company to be registered under the Indian Companies Act with rupee capital, of which at least 60 per cent. must be offered for subscription in India and with a majority of directors in British India. A licence will be granted to the company for a period of ten years, and during the first five years the company will enjoy a monopoly of broadcasting. The Government will not undertake to contribute any capital nor to guarantee interest on capital. No restriction will be imposed upon and no monopoly will be permitted as regards to manufacturing and sale of apparatus for wireless telegraphy.

"The Government of India are further prepared to consider, if necessary, the formation of a separate company to provide broadcasting services for Burma under similar conditions."—Associated Press.

A LOW-LOSS CRYSTAL SET

SIR,—I thought it might interest you to know the excellent results which I have had from a "Low-Loss" crystal set as described by Mr. Percy W. Harris in the February issue of *The Wireless Constructor*. The set has been made exactly to specifications, the connections being soldered and square-section wire being used. The coil

is as described, about ¾ lb. of 16 d.c.c. wire being used. The condenser is a Fallon 0.0005 μF and the crystal detector a G.E.C. unit detector with a Neutron crystal and silver catwhisker. The aerial is 70 ft. long and 25 ft. high, and the earth consists of a galvanised iron rod 4 ft. in length driven into the ground immediately below the set and about 6 ft. away. The results, which are as follows, surprised me exceedingly: London (40 miles) comes in at excellent strength, while Chelmsford (70 miles) is so loud as to be almost uncomfortable. Bournemouth (85 miles) is easily readable, and a station which I believe to be Radio-Paris comes in regularly every evening. Its wavelength is about 1,700 metres, so I think that it must be so, as its times correspond with those of Radio-Paris. I have also received two other stations, one of which I believe to be Newcastle. It was, however, too faint to be readable.

Thanking you for the splendid set and wishing your publications every success.—Yours faithfully,

PHILIP R. N. HEATH

Horsham.

AN IMPROVED TWO-VALVE RECEIVER

SIR,—I have much pleasure in sending report of success obtained with the "Improved Two-Valve Set" by Stanley G. Rattee, in *Modern Wireless*, January issue.

On an ordinary single wire outdoor aerial 70 ft. long, 30 ft. lead-in, we received Manchester, Liverpool, Birmingham and Chelmsford on loud-speaker moderately loud. All the B.B.C. stations, including relay stations, good 'phone strength. We consider it exceptionally good to get four stations at loud-speaker strength on a two-valve set. We are 21 miles from Manchester and 30 miles from Liverpool, and greater distances from Birmingham and Chelmsford.

I thought you might be interested to know our results.

Thanking you for your valuable information given in *Wireless Weekly*, *Modern Wireless* and *The Wireless Constructor*.—Yours faithfully,

J. AND J. E. KETTLE.

Northwich, Cheshire.

THE 3-VALVE DUAL RECEIVER

SIR,—Regarding the Three-Valve "Dual" set of *Modern Wireless*, April issue, 1924, doubtless you and perhaps your readers will be interested in the results I have obtained with this set. I can get at least one American station *every night* after 11 p.m. The extent of audibility depends not so much upon the state of the atmospherics as upon the local oscillating fiends, who, unfortunately, are very many. I have had both WGY and WBZ on the loud-speaker. Madrid, several German and French, and Brussels quite good on the loud-speaker. I am less than one mile from 5IT, and yet I can pick up all the B.B.C. stations whose wavelengths are below Newcastle's on the loud-speaker while 5IT is transmitting, without any interference. I have built several valve sets, but in my opinion this set is equal to the best four-valve set yet known. I think it will beat your splendid staff to devise a better circuit. Wishing you and your papers every success.—Yours faithfully,

W. T. PARKER.

Birmingham.

Apparatus we have tested

Conducted by A. D. COWPER, M.Sc., Staff Editor.

The "Ultra" Hornless Loud-Speaker

The latest pattern of the "Ultra" hornless loud-speaker, reference to an earlier pattern of which was made some time ago in these columns, has been put to an extended practical test in daily broadcast reception for several hours a day, by the writer. This instrument, supplied by Messrs. E. E. Rosen & Co., resembles a small cake-basket or bonbon box in outward appearance, being only 5¼ in. diameter and standing 2¾ in. high on its rubber feet. It is highly finished in polished nickel plate, with a coloured lining visible through the perforated sides and grid top; it is actually inconspicuous in appearance in a living-room, when stood on a table or mantleshelf, and can readily be concealed by flowers or table decorations. Some suggestion of the modern small type of broadcast microphone is given by the general appearance, though it is intended for use in a horizontal position.

The Working Principle

The principle is that of a very large, light, thin-dished diaphragm concealed behind gauze, and actuated by a normal type of electro-magnetic mechanism in the base. The tone is actually rather better on music than on speech, but the latter comes out much clearer than in many types of horned instruments. The power is slightly less than with an efficient modern instrument of the latter type. With a sub-urban aerial and three valves (o—V—2, transformer-coupled), the last a small power valve, music and speech are audible throughout a large house if the instrument is placed in the hall; but in general, it is rather an every-day speaker for a living-room of moderate size than one suitable for use in large halls, etc. For this purpose, and for carrying about from point to point in a house for convenience in listening to an extended programme, at the moderate price asked for this little instrument it can certainly be recommended. Critical tests, as, for example, on a special piano recital recently transmitted from 2LO showed a very pleasing quality and wide range of response.

Information Department

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A.F.(LEEDS) uses a 4-valve receiver consisting of one H.F., detector and two low-frequency valves, the latter two stages using power valves, and complains that his loud speaker, is frequently breaking down.

The windings of some loud-speakers are delicate in nature, and we suggest that your own instrument is not sufficiently robust for use directly in the anode circuit of the last valve. We would advise that some method of isolating the windings from the direct anode supply to the valve should be adopted. Two simple methods may be adopted, and these are as follows: (1) The use of some type of filter circuit. This may consist of an ordinary type of choke coil, such as is used for low-frequency amplification, and should be placed in the anode circuit of the last valve. Between the anode side of this choke coil and the loud-speaker should be connected a large condenser of 1 to 2 μF, and in this position a Mansbridge type is suitable. The other side of the loud-speaker should be connected to the side of the choke going to the high-tension supply. With this arrangement the direct current supply to the anode of the valve is carried by the choke and does not pass through the loud-speaker windings, since the large condenser in series with the loud-speaker windings completely stops the passage of direct current. The fluctuating currents representing signals are, however, communicated through this and actuate the loud-speaker. (2) An output transformer in the anode circuit of the last valve. This may be either of a 1 to 1 ratio or one suitable for use when 120-ohm telephones or loud-speaker are used.

J.U.R. (BEXLEY) possesses a loud-speaker of the hornless type which he built from published instructions, using a pleated paper diaphragm. When first used the instrument gave quite good reproduction, but in the course of a few weeks the results steadily deteriorated, and now the quality is harsh and certain notes produce entirely false sounds from the instrument.

We have met with a number of

cases of this general type in which the loud-speaker diaphragm consists of paper which has not been protected in any way against damp. The cause has proved in most cases to be simply an alteration in the tension of the diaphragm produced by moisture, which is usually unequal to its distribution. Very careful and slow drying at some little distance from a fire will usually effect a cure. Attempts have been made to render such diaphragms proof against moisture, but so far no success has been reported to us. It seems extremely difficult to discover a varnish or other proofing agent which furnishes really adequate protection to the paper without unduly increasing its thickness.

H.K. (BROCKLEY) submits two alternative panel layouts for a two-valve receiver and asks us to pass an opinion as to the relative desirability of the two arrangements.

Our correspondent's two panel designs illustrate very forcibly some of the mistakes which the beginner is apt to make, and the points which they raise should be of general interest to our readers. The two designs were drawn for him by two different friends, and while one incorporates a number of serious mistakes, the other strikes us as an extremely good and practical layout.

The first one shows both the valves and the two condensers arranged in a row along the back of the panel, it being understood that the panel would be mounted to form the lid of a flat-topped box, while the two-coil holder is along the front of the panel, in line with the two rheostats, the single socket for the aerial coil being placed upon the end of the box. It is to be observed that in the case of a lay-out of this sort it is necessary to stretch one's arms up across the top of the panel, close to the coils, in order to reach the tuning condensers. Hand capacity effects are therefore likely to be troublesome, and it will be easy to inadvertently upset the coupling adjustments between the coils. Further, the arrangement of the two condensers is undesirable, in that the anode condenser is placed upon the left, whereas the aerial condenser is upon the right, and from this it follows that the leads to these two condensers would be unnecessarily long. Their positions should be reversed.

The position of the socket for the aerial coil is also open to question, since there is ample space for this socket upon the panel and it could quite easily be placed so as to be comfortably out of the way of the operator's hands and at the same time to dispense with the necessary flexible leads which would be involved by the alternative position upon the side or end of the box.

The alternative design shows how by a little thought one can overcome all such little difficulties as these, and the general layout is as follows: The two valves are placed at the back of the panel, and midway between them is placed the two-coil holder, in such a way that there is ample room for the two coils to open and so that the adjusting knob may easily be reached. At the left-hand rear corner of the panel the socket for the aerial coil is located, while along the front are the two filament rheostats, and immediately behind them the two tuning condensers, these latter being correctly placed so that the leads from them to their respective coils are reasonably short. It will be seen that in operating the set, with the hands resting upon the two condenser knobs, the wrists only pass over such portions of the wiring, etc., as are at earth potential so far as high-frequency oscillations are concerned.

The Latest in

Wireless Receiver Design

Not a month passes without various improvements and sometimes important advances being made in the field of science. New principles are discovered, the application of old ones more thoroughly understood, and fresh developments made.

This applies in particular to the science of wireless, and here progress is so rapid that sometimes barely a day passes but some new discovery is announced.

You can keep in touch with these new movements and read of the latest developments and schemes within the shortest possible time of their inception, by reading "Modern Wireless."

Every month this valuable paper brings you the most recent discoveries and presents them to you in clear non-technical articles. They can be read with perfect understanding by the novice and yet are detailed enough to give the advanced experimenter a clear insight into the matters dealt with.

The May issue of "Modern Wireless," for example, contains detailed descriptions of many new and original sets, which fully cover the latest trend in design of wireless receivers incorporating the most modern improvements. Not only are photographs shown of the actual sets but all the completely dimensioned diagrams necessary to construction are given with full instructions as to assembly and operation.

Of particular interest is Mr. John Scott-Taggart's article describing a new and powerful "Nine-Valve Supersonic Heterodyne Receiver," as illustrated above. Full constructional details are given and the information contained in this article goes far beyond anything that has yet appeared in print on this fascinating subject.

Sets of simple design suited to the beginner, technical articles for the amateur and pages of interesting information all combine to make this issue of "Modern Wireless" one of the finest numbers that has yet appeared. You should not be without a copy, and if you would make sure of getting this issue buy or order it at once from your local bookseller.

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A Selection from—

CONTENTS.

A Nine-Valve Supersonic Heterodyne Receiver, by John Scott-Taggart, M.C., F.Inst.P., A.M.I.E.E.

A Four-Valve de Luxe Receiver, by Percy W. Harris, M.I.R.E., Assistant Editor.

KDKA, by Capt L. F. Plugge, B.Sc., F.R.Ae.S., F.R.Met.S., Etc.

An Experimenter's Supersonic Receiver, by G. P. Kendall, B.Sc., Staff Editor. (Concluded.)

An Enclosed Crystal Set, by A. Johnson-Randall.

A Novel Three-Valve Receiver, by C. P. Allinson.

An Interesting Crystal and Valve Receiver, by Harold H. Warwick.

How to use a Power Valve, by Stanley G. Rattee, M.I.R.E., Staff Editor.

Continental Broadcast Programmes, by Capt. L. F. Plugge, B.Sc., F.R.Ae.S., F.R.Met.S., Etc.

Modern Wireless

Edited by John Scott-Taggart, F.Inst.P., A.M.I.E.E.

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