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And Electrics

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The Radio Mail

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A Sensational Valve Test

Cossor Valves hurled from aeroplane to prove that new Kalenised filament is practically unbreakable

When the cat becomes entangled in the leads to your Receiver—writes our Special Correspondent—and brings the outfit crashing to the floor, don't despair. You won't find it necessary to replace three or four costly valves—at least not if you are using the ones I saw subjected to a most amazing test at Edgware a week or two ago.

In company with Mr. Sissons Relph, of *Amateur Wireless*, Mr. Wheatley, of *Popular Wireless*, and Mr. Thompson, of *Wireless World*, I was invited to witness an unusual kind of test. It was nothing short of dropping valves from an aeroplane in full flight. It seemed a new sort of a joke—one usually reserved for the first of April. I was loth to go—the whole thing appeared to be so incredible. What else could one expect to find but a few fragments of broken glass? However the voice on the 'phone was insistent. "Please come—the others have promised—and we know you'll only kick yourself afterwards for missing the most thrilling valve-test you are ever likely to see." That fixed me! As a journalist I am all out for thrills!

On arrival at Highbury we were duly taken around the works, and invited to choose a dozen Stentor Two valves from among a huge stock ready for despatch. We were then asked to insert them into the ordinary kind of folding carton and after sealing them to number the boxes for ready identification. I should mention that no cotton wool or corrugated paper was used to protect the valves. On arrival at Stag Lane Aerodrome the parcel of valves was handed to Captain Barnard with instructions that they should be thrown overboard at a height of not less than 500 feet. As there was a spare seat in Captain Barnard's "Moth" my friend Mr. Relph, of *Amateur Wireless*, accepted the opportunity of seeing what Edgware looks like from the air.

They climbed into their seats, a mechanic gave a few preliminary turns to the propeller. "Contact!" cried Captain Barnard, and with a roar the machine dashed forward. In a few minutes it was back over our heads. "Look out—here's the first one," someone exclaimed, as a small object was seen to be falling rapidly to the ground. There was a general rush to pick up the first valve over to be thrown out of a plane. The box was badly dented, but the seal was intact, and vigorous shaking failed to disclose whether there was anything loose within. "Here's another," was the shout, and glinting in the bright sunlight—tumbling over and over in its mad plunge earthwards was another little blue and yellow box. This time luck was against it. There was an ominous rattle as the carton was shaken—the pilot told us afterwards that this box crashed against the tail plane. And so at regular intervals, three wonderful little Cossor Valves were showered down upon us. Like the parable "some fell on stony ground and some by the wayside"—three did fall on a concrete road and one landed with a resounding crash upon a corrugated iron roof.

But all—except one—were retrieved and taken under strict supervision—back to Highbury. Mr. Thompson, of the *Wireless World*, made himself responsible for their safe custody. I don't think that the great Mr. Maskelyne himself would have been able to have substituted new valves without Mr. Thompson's knowledge!

On arrival at the works, the seals are broken and the valves removed. As we surmised, the one which struck the tailplane is badly smashed. And now everyone is keyed up with excitement. One by one the valves are inserted into a socket—a switch is moved, and the needle swings over to say "All's well!" *Every filament is intact.* It is incredible. Even the valve which is smashed also registers a bull's eye. Eleven unbroken filaments out of eleven valves—well might we be proud to think that this amazing test took place in England! Surely British valves are the best in the world! As *Popular Wireless* in their issue of January 8th remarked in commenting upon this test: "It now remains for some manufacturer to agitate a valve in a cocktail shaker and then try it with a steam-roller!"

Flashes from the Test

Captain Barnard himself was so sceptical that the aeroplane test would not succeed that he bet a member of the aerodrome ground staff that at least half the valves would be smashed to pieces. Captain Barnard is now half-a-crown poorer!

* * * * *

There is no truth in the rumour that A. C. Cossor, Ltd., are proposing to perform the same test with five hundred valves over Trafalgar Square.

* * * * *

Nor do they propose to utilise this method for delivering valves to their wholesale depots.

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In deference to the wishes of the passenger, Captain Barnard was earnestly requested not to loop-the-loop!

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After reading details of this test in *Popular Wireless* one man wrote us that as he found a Cossor bright emitter on his refuse heap at the Welsh Harp which gave him good service for two years, he intended searching the aerodrome at Edgware for the missing ones. And his name wasn't McPherson either!

How long should Valves last?

—the filament has the last word, every time!

In the early days of Broadcasting we were lucky if valves lasted six months. If perchance one gave a whole year's service it was something to be shouted from the house tops. Now science has taken a hand in the game, and has given us a filament which will last for thousands of hours.

Interviewed at the works of A. C. Cossor, Ltd., the Chief Research Engineer gave our representative some details of this new Kalenised filament. "It is fundamentally different," he said, "to other types of filament inasmuch as it operates peculiarly without heat. In the past the chief trouble with filaments has always been their brittleness due to the constant contractions and expansion whenever the current is switched on and off. Because the Kalenised filament never contracts or expands its nature does not alter. It is as pliable after 2,500 hours as on the first day it is made."

"Then, presumably," asked our representative, "it does not lose its emission?" "No," he answered, "because the electron stream is given off by the Kalenised layers and not by the metal core itself. The metal core serves merely as a conductor of electricity. There is another point too, which ought not to be forgotten. And that is the wide latitude of working voltages enjoyed by this marvellous new filament. As years ago two ago every receiving set was embellished with a rheostat knob for every valve. Delicate filament control became a fad. Non-technical people were scared off wireless—they couldn't understand the array of knobs. Now we are much more sensible. Any receiver fitted with Cossor Valves needs only an On-and-Off Switch. It doesn't require any variable rheostats—the Kalenised filament in a Cossor 2-volt Dull Emitter starts giving off its electron emission at 1·92 volts and reaches its maximum at 1·94 volts. Even a fully charged accumulator would burn it—although of course it won't give any louder results."

The Curse of Microphonic Noises

Science discovers a new remedy

There is nothing more irritating than to own a valve afflicted with microphonic noises. Let anyone walk across the room—or tough the table on which the receiver is placed—and immediately there is a warning "Ping!" from the loud speaker. Microphonic noises can come from a variety of causes—but there are two principal ones. As very commonly reason is a badly designed mounting system within the valve. Sometimes the grid—or the anode—for that matter—is not sufficiently rigid. It can move—very imperceptibly of course when any vibrations are set up. But generally the fault lies within the filament. Stretched taut as a violin string, the average filament is very apt to vibrate—and once set in motion these tiny vibrations, unseen of course by the human eye, continue for quite a long time.

Now a new method of filament manufacture has been discovered which ends this curse. It is embodied in the new Cossor Kalenised filament.

Imagine, if you will, a glass tumbler struck a sharp blow by a spoon. A clear musical note is set up due to the vibrations of its edge. But behind it with string or paper tape and what happens? It is as silent as the grave. The vibrations are damped out. This simple parallel will show why the Cossor Kalenised filament is free from all suspension of microphonic noises.

The wire core is surrounded by Kalenised layers of non-metallic material. The vibrations are smothered at their source.

This exclusive Cossor feature is particularly important in power valves, and it is interesting to note that technical experts have without a single exception commented strongly upon the exceptional purity of tone of the new Stentor Power Valves.

The De Havilland "Moth" carrying out the Tests

Amateur Wireless and Electrics

The Leading Radio Weekly for the Constructor, Listener and Experimenter

Edited by BERNARD E. JONES

Vol. X. No. 243 — Technical Editor: J. H. REYNER, B.Sc.(Hons.), A.M.I.E.E. — FEBRUARY 5, 1927

More Telepathy Experiments—A Challenge Accepted—High-power Foreign Stations—A Remarkable Valve—B.B.C. Efficiency

More Telepathy Experiments

ON February 16 a novel experiment in "radio telepathy" will be broadcast from 2LO by the Psychical Research Society. Six scientists will be locked in a room at the society's headquarters, from which they will try and broadcast their thoughts to listeners. Sir Oliver Lodge, who will remain in one of the B.B.C. studios, will make the proceedings clear to listeners. All you have to do is to think of—nothing!

German Super-power Stations

WITH the advent of the Langenberg (Rhineland) station the German authorities have now realised the necessity of an increase in the power of the Königswusterhausen (Deutschlandsender) transmitter. The plant is being rebuilt, and by next summer it is hoped to broadcast the Berlin programme with an energy of some 40 kilowatts in the aerial!

B.B.C. Efficiency

ALTHOUGH complaints are being received with regard to the programmes broadcast by the B.B.C., it would appear evident that listeners can put forward no grievance regarding the technical efficiency of the transmissions. The figures recently compiled for the year 1926 show that the total programme-hours for the entire system amounted to 65,870, giving an average of 59 hours per week per station. The average percentage breakdown was 0.07. If we assume an average yearly transmission of 3,000 hours per station, a breakdown of 0.01 per cent. would actually represent a mere eighteen minutes' interruption in one complete year's broadcasting. Surely considerable credit is due to the engineers for the attainment of a service of such high efficiency!

A Challenge Accepted!

A WOMAN novelist's idea of a good broadcast programme will be given from 2LO at an early date. Miss May Edginton, criticising the B.B.C. programme, set forth a rough draft of what she would choose if she "ran the B.B.C." In reply the B.B.C. stated that they would be happy to allow Miss Edginton to sponsor a programme on the lines she suggested, provided it conformed to the present restrictions of the B.B.C. Her programme will be full of human interest, and will conclude with a *really* funny story!

Radio-Vitus

HAVE you heard the new Paris private broadcaster? The call, *Radio-Vitus*, is given out by *Radiolo*, the popular French announcer so long associated with Radio-Paris. The station has been erected by a Paris wireless firm, and transmissions are made thrice weekly on a wavelength of about 300 metres.

A Remarkable Valve

THE KL4, as it has been designated, represents a new departure in valve construction, and since by its use the electric-light mains replace the L.T. battery, it will interest all owners of wireless sets who have electric-light mains installed in their houses. Full details of the valve and a test report will be found on another page in this issue.

The Radio Sleuth

IF certain tests prove successful, the Chief of Police of Parsaic, New Jersey, will provide all constables under his command with miniature portable wireless receivers. These sets will have a range of over three miles. The constables will carry collapsible phones and a small electric bulb, which lights up as a signal to listen in. By their aid, the Chief of Police is convinced that these small sets will greatly assist in catching "gunmen."

Another High-power Station for Paris

ON recent Sundays listeners who may have tuned in to Radio-Paris for the midday concert will have noticed that the transmissions have considerably increased in strength. As a matter of fact, Radio-Paris is now trying out a new 30-kilowatt station with a view to becoming *the* French high-power station.

PRINCIPAL CONTENTS

THE TWO-VALVE RECEIVER AT G5TD

The Five Continents on Two Valves

AS great interest has been displayed by readers in the receiver at G 5 T D, on which signals have been received from over seventy different countries, the following particulars are given :

As was stated in an earlier issue, results have been excellent, amateur telephony having been heard on the short waves (35 metres) from Japan, New Zealand, South Africa, United States, Canada and Brazil, and on the broadcast band (400 metres), four American broadcasting stations, W G Y, W O R, W B Z and K D K A, have been heard in one night.

Wavelength Range

The receiver can be tuned to wavelengths of 3,000 metres down to 12 metres by means of plug-in coils, which will be described later.

G 5 T D is situated at the foot of Harrow Hill, and although the hill rises 400 ft. in the immediate vicinity, no appreciable screening effects are noticeable in this direction.

The valves used are the Marconi Osram D.E.R. type, which will oscillate to a very low wavelength and give remarkable volume on the broadcast band.

The receiver was built two years ago, before amateurs had dropped to 20 and 40 metres, so it is not so "low-loss" as is the average short-wave set to-day. The circuit is an ordinary Reinartz type, with one unorthodox modification—the grid leak is connected between the grid of the detector valve and the H.T.+ side of the H.F. choke, giving the valve a high positive bias. This has been found to give a 30 per cent. increase in signal strength.

It has been found most essential that a variable grid leak should be employed, otherwise reaction comes on with a nasty "plop."

Of several makes that have been tried, the Bretwood grid leak has been found the most suitable, although its resistance has been found to alter slightly under various conditions of temperature and humidity.

The 20- and 40-metre primary and secondary coils are wound with No. 12 bare tinned-copper wire, and are almost self-supporting. Turns are spaced ½ in. apart. For 40 metres, three turns (4 in. in diameter) are used in the primary, and eight turns in the secondary.

The variable condensers are of the square-law type, and the capacity of each is .0003 microfarad.

The H.F. choke and the reaction coil are wound with No. 16 double-cotton-covered wire, and are of the basket-weave type. The H.F. choke has fifty turns (2½ in. in diameter), and the reaction coil has thirteen turns (3 in. in diameter) for the 40-metre band. It has been found unnecessary to use filament resistances with D.E.R. valves when using a 2-volt accumulator.

No. 12 bare tinned-copper wire is used for all wiring, and all leads are kept as short as possible and are well spaced.

Components

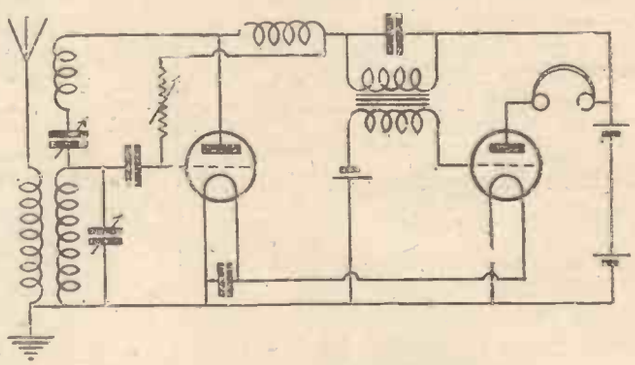
The components required are :

2 Variable condensers, .0003 microfarad.
1 Fixed condenser, .0003 microfarad.
1 Fixed condenser, .001 microfarad.
1 Low-capacity valve holder (for detector valve).
1 Ordinary valve holder.
1 L.F. transformer (5-1 ratio).
1 Bretwood variable grid leak.
4½-volt flash-lamp battery for grid bias.
1 Ebonite panel, 12 in. by 8 in.
2 D.E.R. valves.
No. 16 d.c.c. wire.
No. 12 bare tinned-copper wire.

This receiver has been in use for over two years at G 5 T D, operated by either myself or my brother, and we have received signals from 1,500 American amateur transmitters. The aerial found most satisfactory has been a two-wire type, 100 ft. long, 30 ft. high, of bare copper, and the earthing system has been the water-main.

I shall be pleased to hear from anyone constructing this set, and to know if the results obtained are as satisfactory as they are in my case.

T. A. STUDLEY.



The Circuit Diagram of the Receiver at G 5 T D.

AN EVERLASTING AERIAL POLE

AERIAL poles as generally erected, apart from being unsightly when left rough, harbour all sorts of pests and gradually decay. To paint a pole satisfactorily is no mean undertaking. If, however, a pole be carefully stripped of all bark and coated liberally with creosote it can be depended upon to remain clear of vermin and decay for some time. But if to a pole so treated a length of narrow braided cotton wick be secured with copper clouts around the summit and carried spirally to its base, and the pole stood in a drain-pipe cemented in the ground, creosote can occasionally be poured into the drain-pipe, and will find its way up the cotton wick.

This will gradually saturate the pole afresh, thus preserving it for practically all time. M. P.

EARTHING H.T. NEGATIVE

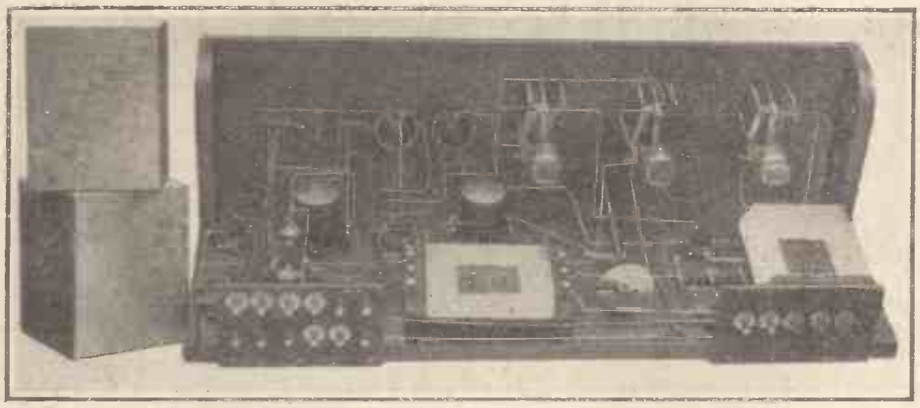
SO far as results are concerned, it does not make any difference whether H.T. negative is connected to L.T. positive or negative, except that, when connected to L.T. positive the H.T. voltage will be increased equal to that of the L.T. battery.

To avoid burning out valves, if H.T. positive is accidentally earthed, it is advisable to connect H.T. negative to whichever L.T. lead is earthed. R. H. B.

—DESIGN A BIG SET— YOURSELF!

THE home constructor sooner or later dreams of a large receiver which shall bear the unmistakeable stamp of his own individuality. A good stock of modern components is a real investment nowadays, and, after all, even if your ideas should prove faulty, there is no disgrace in a strategic retirement to some well-tried "A.W." design. You may live to fight another day.

It is assumed that you have formed definite views on the subject of high- and low-frequency amplification.



Rear View of Receiver showing Disposition of Screening Units.

Some form of screening is becoming almost universal. A simple form of screening for use with plug-in coils is shown in the diagrams Figs. 1 and 2, taken in conjunction with the photos of a six-valve receiver in which the system was adopted.

Fig. 1 shows a unit suitable for use as an aerial or tuned-anode unit. Two coil plugs are fixed 1¼ in. apart at the centre of a small ebonite panel 7 in. by 5 in. In the case of an aerial or tuned-anode inductance, the top left-hand terminal leads to aerial or H.T. + as the case may be, while the other two go to grid and filament or anode and neutralising condenser. The two terminals at the bottom of the unit go to the tuning condenser in each case. By varying the two plug-in coils of the unit, the aerial or H.T. tappings may be shifted along the inductance in either direction. An H.F. transformer on similar lines is shown in Fig. 2.

The screening boxes are made of aluminium sheet, and are 5 in. by 5 in. by 6½ in. high. For the H.F. transformer unit these will, of course, be larger in proportion. The boxes fit fairly tightly over the bases shown in the photograph, which are bolted to the ebonite panels. The construction of these is self-explanatory.

Always leave yourself loopholes of escape when designing an H.F. amplifier. The H.F. and detector circuit of the set illustrated and given diagrammatically in Fig. 3 is an example of this. Here we may employ Reinartz reaction on the tuned-anode coil, or use a centre-tapped tuned-anode coil with neutralising condenser, or even both together. Here again we may need R.F. chokes in the leads marked H.T. and O.P., or both, and room must be left for them in the layout. The grid leak may go to L.T. + or L.T. —, according to the valve used. You must be prepared to face similar possibilities in your new masterpiece.

Do not use too narrow a baseboard; about 12 in. wide is a good size. Most of the components to be mounted on the baseboard possess one terminal which leads to the grid of one valve, and another which leads to the anode of the preceding one. These two wires are the ones which need to be particularly short and well spaced. Fig. 4 shows a conventional two-valve amplifier. The dotted lines show the most important wires, which need very careful attention. The remaining wires do not need careful spacing *among themselves,* but they must not be led anywhere near those shown as dotted lines. It might be supposed from these facts that all valve holders should be placed in a row with grids to left and anodes to right, with the coupling units between them. Logically speaking this is true, but, unfortunately, our set would become very long. For example, the receiver illustrated would have been 4 ft. long at least.

Symmetry

Symmetry in valve-holder arrangement, then, is almost impossible in a big set, and we must use two or more rows of valves, moving our components from one part to another like chessmen about the baseboard.

If you think you may not be successful in your efforts, a wooden panel is cheap and quite efficient. The writer uses satin walnut carefully dried and

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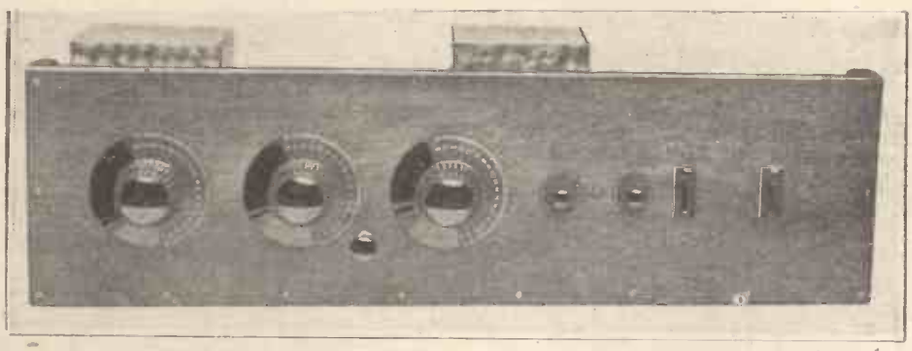


Above.—Photograph showing an Excellent Panel Layout.

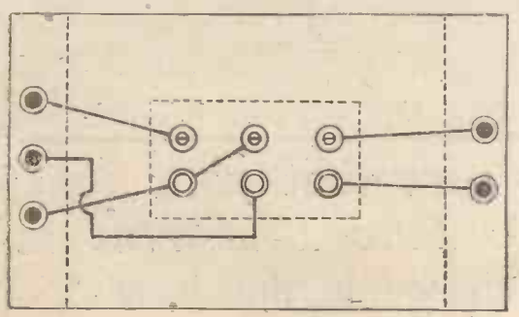


Fig. 1 (right).—Method of Screening Tuned-anode Unit.

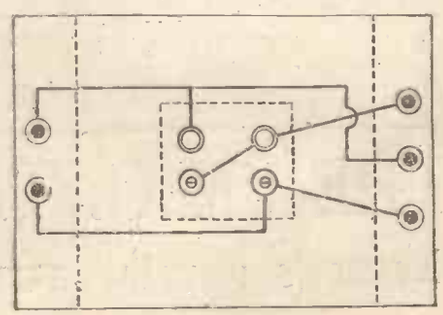


Fig. 2 (left).—Method of Screening H.F. Transformer Unit.

A Valve to Work off The Mains

A NEW valve has just been placed on the market which is of somewhat revolutionary design. This is the type KL1, and it is a valve specially designed to work without a low-tension battery. As our readers are aware, in the ordinary thermionic valve, the heater and cathode are the same (the filament). In this valve the cathode encloses a separate heating element which is connected to the low-voltage secondary winding of a transformer of suitable ratio, fed from A.C. supply mains. The actual cathode is therefore heated by radiation from this element and is in no way connected electrically to the mains, and, conversely, the heater element is not connected electrically to the receiver. The data regarding the operation of this valve, given by the makers, is as follows:

Heater volts	3.5
,, current	2.0
Anode volts (max.)	100
Amplification factor	7.5
Impedance (ohms)	5,500
Normal slope (ma. per volt) ...	1.36.

The Valve on Test

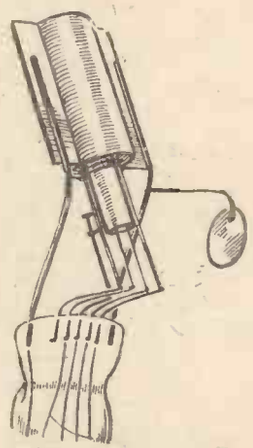
Actual tests indicated that 3.5 volts is too small a pressure, and the most practical results were obtained under the following conditions:

Heater volts	4.5
,, current	2.4
Anode volts	100
Amplification factor	7.35
Impedance (ohms)	9,000
Slope (ma. per volt)	0.825

Saturation occurred at zero grid volts, but the curve is straight down to a grid voltage of 10 volts; thus with a suitable negative grid bias the valve would make quite an efficient H.F. or L.F. amplifier, but would not seem to be so suitable as a grid-leak detector on account of the low saturation point.

The hum due to the A.C. mains was hardly noticeable.

If the filament voltage is raised to 5.8, the performance of the valve is greatly improved, as can be seen from the following figures; hum, however, at this figure becomes noticeable, and would probably upset the reception of weak signals:



Arrangement of the Elements of the KL1.

Heater volts	5.8
,, current	2.8
Plate voltage	100
Impedance (about)	6,000
Amplification factor	10.85
Slope (m.a. per volt)	1.5

With these voltages the valve will function efficiently as a grid-leak detector and H.F. and L.F. amplifier.

The KL1 valve is the latest product of the M.O. Valve Co., which, as our readers know, manufactures exclusively for the Marconiphone and the General Electric companies. It is, therefore, the Marconi KL1 and the Osram KL1.

AN ECONOMY HINT

WHEN charging an accumulator from the house mains, the heat dissipated by the charging resistance is considerable. In the ordinary way this heat is lost, with the result that the cost of charging the accumulator at home is somewhat high. If the usual bank of carbon filament lamps are arranged as a ceiling cluster to illuminate the workshop, or placed in a metal box to form a small radiator or "foot warmer," one at least has the satisfaction of knowing that although the same amount of current is being consumed, the greater portion of the heat is being put to a practical use.

Small wire-wound radiators, "glow-lamp" radiators, electric irons, electric cooking utensils—all these may be used as charging resistances, providing, of course, their resistance values are suitable, i.e. if the current consumption corresponds with the charging rate specified on the accumulator. With the aid of a small ammeter one may quickly ascertain the suitability of any available appliance.

Two amperes may be taken as the normal charging rate for the average 4- or 6-volt accumulator of 20 to 30 actual ampere-hour capacity, but a slight variation either way usually makes no difference. The selected appliance should therefore pass about 2 amperes of current. O. J. R.

Design a Big Set Yourself

(*Continued from preceding page*)

rubbed with olive oil after sand-papering. As will be observed, the result is quite pleasing and the insulation excellent. The simplest method of arranging panel components, and probably the most artistic, is a straight line. This should be the last job, as the baseboard is the thing that determines its length. G. C. P. B.

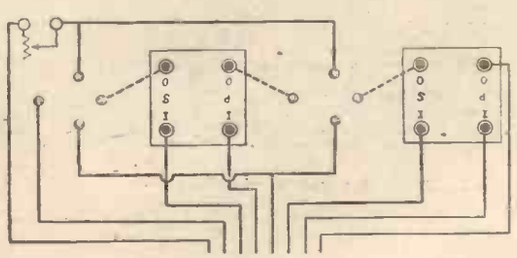


Fig. 4.—Arrangement of Conventional Two-valve Amplifier.

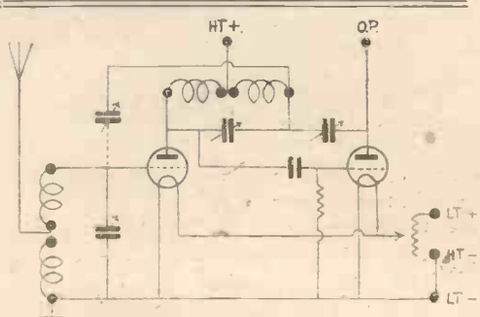


Fig. 3.—A Suggested H.F. Circuit.

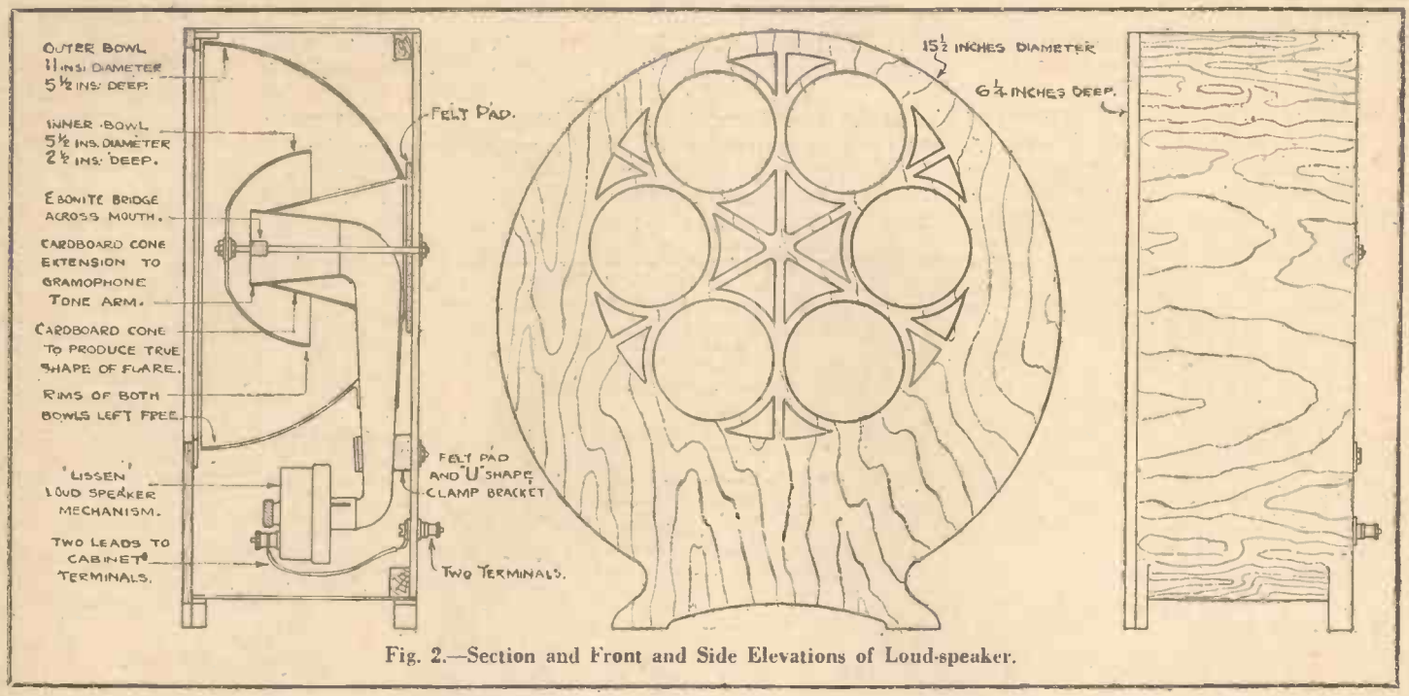


Fig. 2.—Section and Front and Side Elevations of Loud-speaker.

Making a Reflex Loud-speaker

APART from the diaphragm mechanism, the reflex bowl loud-speaker described in this article can be made throughout at home, and the result will be a really first-class instrument, both as regards appearance and quality of reproduction. In designing a cabinet-model loud-speaker one naturally desires the depth to be as small as possible, say not more than 5 or 6 in., and this cannot be achieved in the ordinary horn type.

Reflex Principle

In some makes of "reflex" loud-speakers the sound waves are directed on to the base of the inside of a bowl and then reflected outwards through the grille; but in this instrument a second and smaller bowl is introduced whereby the sound waves are twice reflected before emerging from the flare. The photograph, Fig. 1, shows the complete bowl unit, while Fig. 2 illustrates complete working details of its construction. It will be seen that a Lissen diaphragm mechanism is attached to the small end of a gramophone tone-arm, which passes through the outer bowl and is fixed so that the larger end projects towards and along the centre line of the flare. The sound waves are projected on to the base of an inner bowl, which in turn directs them on to the base of an outer bowl, which then reflects them outwards through the large flare.

Making Paper Bowls

To obtain suitable shapes for horns, bowls, and such-like is always a matter of difficulty with the amateur. The best solution the writer has found is to prepare them from strips of brown paper built up on a suitable mould, the method being shown in the photograph, Fig. 3, and the drawing, Fig. 4. For the outer bowl, by far the most suitable article to use is an enamelled washing-basin. This should

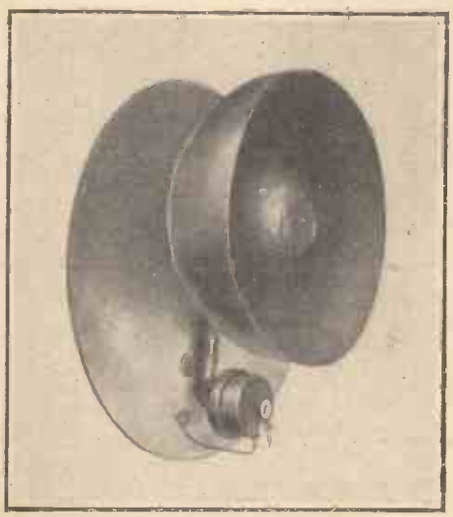


Fig. 1.—Internal Arrangement of Loud-speaker.

first of all be warmed slightly and smeared with a thin layer of lard in order to prevent the paper from adhering. Next cut three or four dozen strips of brown paper, about 1 in. wide, and thoroughly soak them in ordinary flour paste. The first strip can now be put on as shown at A, Fig. 3, at an angle of 45 degrees to the base, so that it lies evenly and without creases on the surface of the mould. A second strip is added so that it just overlaps the first, and so on until the complete circumference is covered (see also Fig. 4).

A series of overlapping strips, B, is then applied in order to reinforce the rim of the bowl, and it will be noticed that although they are put on only once round the circumference, the effect is to apply a treble thickness of material to the rim. The top of the bowl is then covered with strips, each one occupying a diametrical position. This has the effect of binding together the layers A on the flare. It is now necessary to apply a layer of strips D in a similar manner to A, only in the reverse direction. Repeat layers B, C, and A in the order named.

When this is finished, set aside until partially dry, and then trim off the edges roughly with scissors. Then warm the inside of the bowl by holding it over a gas-flame until the fat is softened, remove the paper shape, which will be in a very soft and pliable condition, and with a soft rag wipe out as much of the lard as possible from the inside; then put on one side until perfectly dry, when it will be quite strong and rigid. The rim can now be trimmed off properly down to about the middle of the reinforcement (strips B). This method of construction applies both to the large and small cones.

Determining Sizes of Bowls

Experiments to determine the relative sizes of the bowls are very interesting, as there appears to be only one combination that produces the desired result. The easiest procedure is to obtain a suitable-size mould, and produce an outer bowl

from it according to the directions just given; then build the tone-arm into it by passing the small end through a hole in the rear of the bowl from the inside (see Fig. 2). On to the larger or inner end of the tone-arm a cardboard cone is added, the mouth of which is three-quarters the distance from the back to the rim of the large flare.

A second cone is attached to the mouth of the first cone, and this increases in diameter to meet the back of the bowl; the object of this is to deflect the sound waves on to the curved part instead of allowing them to impinge straight on to the base.

All the seams and joints are held with strips of pasted paper built up to a thickness of several layers, so that when dry the small cone and noting the result. When the correct size is found, note the correct relative position, the easiest distance to measure being the height from the base of the small bowl to a straightedge placed across the rim of the large one. When this is done the basin can be used as a mould on which to form the paper inner bowl.

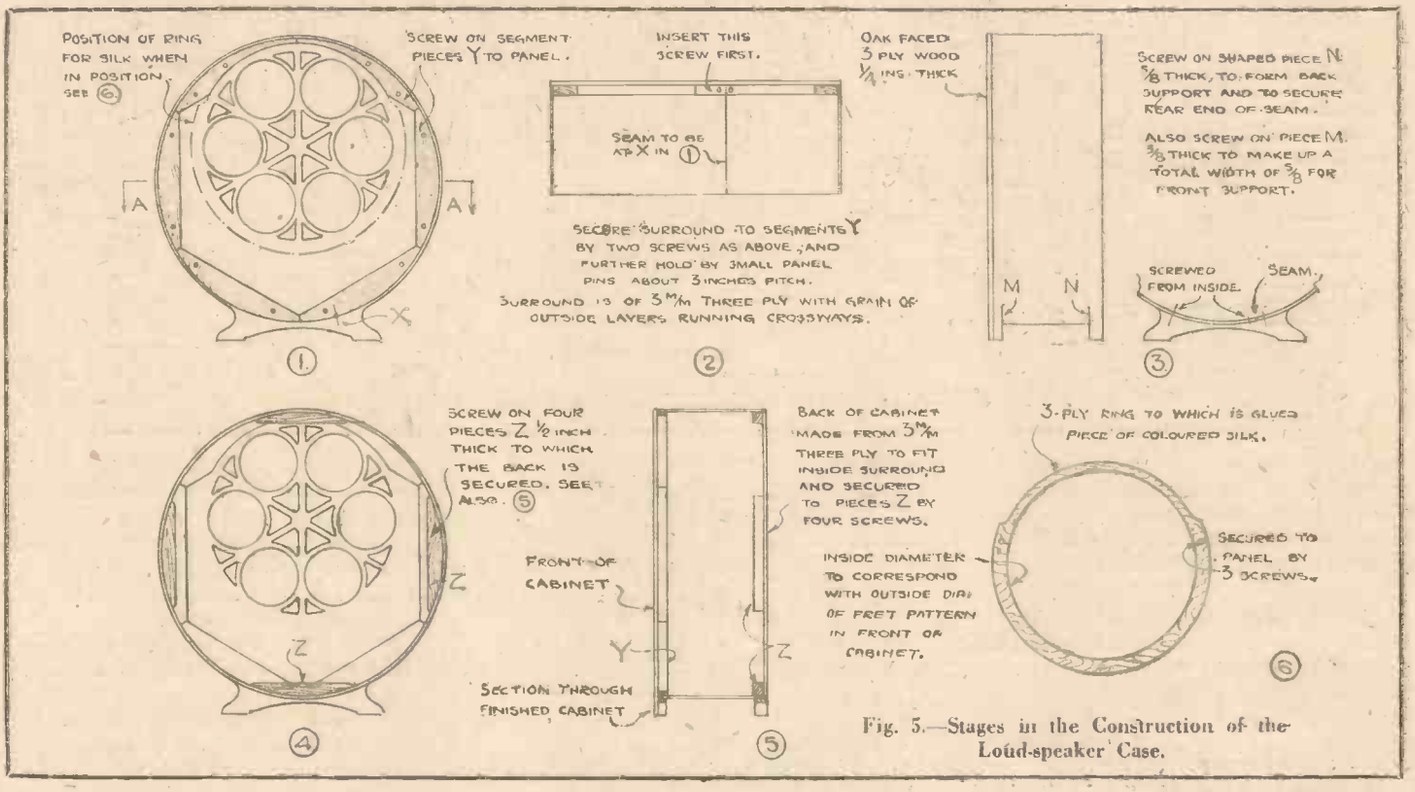


Fig. 5.—Stages in the Construction of the Loud-speaker Case.

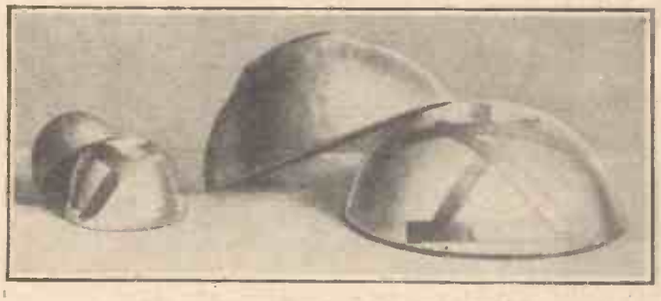


Fig. 4.—Paper Bowls ready for Assembly.

bowl, tone-arm and cones are more or less integral. It now only needs the inner bowl to complete the unit.

The size of the inner bowl is a matter of experiment, and can be determined by collecting various sizes of china pudding basins that happen to be in the house, and holding each one in turn over the

As a means of support, an ebonite strip bridging the mouth of the small cone has screwed into it a 4 B.A. rod, one end of which passes through a clearance hole in the tone-arm and the back of the cabinet, while the other end is used to clamp the inner bowl between a pair of 4 B.A. nuts (see Fig. 2).

The Cabinet

Very little description need be given of the cabinet, as its construction is shown step by step in Fig. 5. The body of the

(*Continued on page* 220)

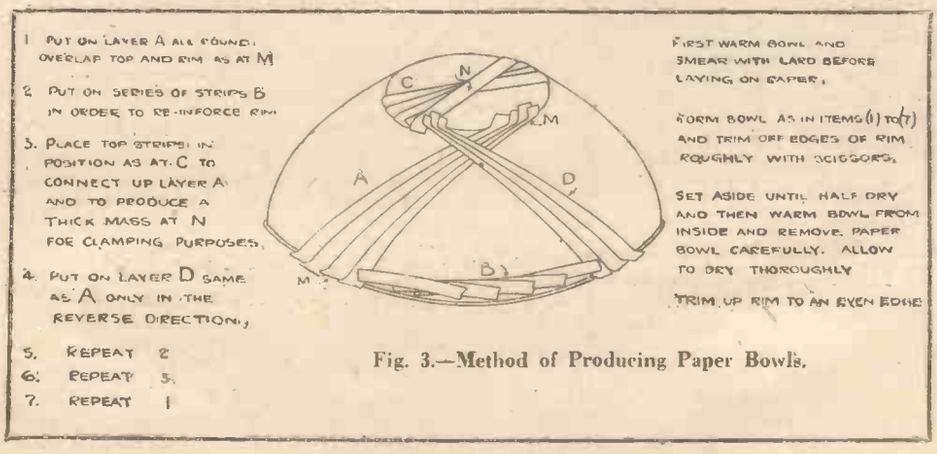


Fig. 3.—Method of Producing Paper Bowls.

Fig. 6.—The Finished Loud-speaker

AN AMAZING SUCCESS

Special Notice

OWING to the extraordinary success of S.T. valves as evidenced by the tributes from all Wireless Journals, and the fact that the sales of my valves are going up by leaps and bounds, I find it physically impossible to continue to initial with my own hand and pen the test certificate on each valve box. After January 27th a rubber stamp or other similar method will be employed.

The huge increase in sales has necessitated this step, but the policy of being personally responsible for the extremely accurate tests of every S.T. valve is in no way altered. On the other hand, I shall have more time to attend to such matters.

(*Signed*). JOHN SCOTT-TAGGART.

On Your Wavelength!

Langenberg at Last

LANGENBERG has at last let us hear something of what he can do, though he is still not nearly so strong as one would expect in view of the enormous power available. I rather fancy that at the present time he is using quite a moderate output, possibly because he has been found to exercise a wide wipe-out effect on the aerials of local listeners. When I tuned him in on Sunday afternoon a couple of weeks ago he was relaying a description of a boxing match from Dortmund. Signal strength was excellent, though the quality of the transmission was not particularly good, possibly owing to land-line effects. The description was given in the most phlegmatic way in the world, without the slightest sign of excitement or even of interest on the part of the speaker.

If you want to find Langenberg you should be able to do so without great difficulty by tuning to Bournemouth and working slowly downwards. A little below Langenberg, by the way, you will now find a much stronger Paris P T T than you knew in the past. This station has recently put his power up to 5 kilowatts, which is ten times as much as he used to have in his infant days. He is now an excellent signal, spark interference permitting.

Aerial Experiments on Short Waves

Short-wave enthusiasts can find a useful field of experiment in the difference between horizontal and vertical aerials for reception. In most cases it is necessary to arrange that the lead-in from the aerial to the set shall be as short as possible consistent with having the aerial removed to a reasonable distance from the house walls. Twenty feet of wire, with a lead-in of from five to six feet, is usually sufficient. If the radio room is in an upper part of the house, both types of aerial may be of the "T" kind, with the lead-in to the centre. They should both be ready for use, and arrangements made so that a quick switch can be made from one to the other. Surprising differences will be found in signal strength, depending on the locality of both the transmitting and receiving stations.

A Good Record

The recent report issued by the B.B.C. on the breakdowns at transmitting stations during 1926 makes a very creditable showing. Cardiff has the best record of all, but none of the others is very far behind him except Liverpool, who had rather serious trouble at one time. In the previous year Daventry suffered a good deal through the collapse of his aerial through the accumulation of ice upon it. In 1926, however, his record was a very good one.

When you visit a broadcasting station and find what a great amount of complicated apparatus has to be used, you are filled with wonder that breakdowns are not of much more frequent occurrence and of far longer duration than they are. The last one at 2 L O took place when the recent relay from Brighton was being given. It was not a complete breakdown, but if you remember the music suddenly went all tinny. Actually a valve in one of the amplifiers burnt out. The engineers were quite cut up about it. "A rotten sort of fault," they said; "it took us three whole minutes to find it!" If we could locate faults in our receiving sets in three minutes most of us would not grumble very much. Those who grouse about transmitting breakdowns should ask themselves roughly how many hours their own receiving gear was out of commission during the year owing to the presence of some fault which could not be—or, at all events, was not—tracked down for some time.

I AM PRESENTING A FREE BLUEPRINT

of the "M.C. Three," Mr. J. H. Reyner's outstanding set, with every copy of this week's issue. Mr. Reyner has been devoting much time and thought to the particular high-frequency development embodied in this set, and he will have still more to say on the subject next week. There are a good many other "plums," by the way, in next week's issue, and I make the definite request of any reader who sees us casually on this occasion that he should ask his newsagent to reserve him a copy of forthcoming issues. THE EDITOR.

Snowspherics

Just before this country of ours was transformed into one gigantic Christmas card one realised that some big change in the weather was coming owing to the atmospherics that were about. These were not of the accommodating kind that give you a chance. I mean you did not on donning the phones hear that undercurrent of cracklings which warns you not to use too much L.F. if you value your ear drums. On the contrary, all was silence when you placed the phones about your shell-like ears. "Splendid," you said: "just the night for DX work." You went for some weak and distant old friend amongst stations (or, at any rate, I did). You found him; you had just worked him up to splendid strength, and were about to change over to the loud-speaker when . . . Bang! Something went off like a pistol-shot, leaving you bewildered, stunned, deafened. Having recovered a little, you picked up the phones rather gingerly and listened, holding them well away from your ears. Not a sound of an atmospheric. More searching, more fine tuning—and then another bang.

The Best Yet!

We may, I think, say without any doubt whatever that the national concert of January 20 was the most ambitious piece of broadcasting ever successfully accomplished anywhere. The performance of Berlioz's "Requiem" requires some 400 performers, including a choir, a big orchestra and four brass bands—the kind of thing that would have shivered the timbers of any microphone a year or two ago! I used to think that choral singing was quite the least successful of broadcast items, for the loud passages so often became mere blurs of confused sound, in which it was impossible to hear anything of the various parts. To-day the difficulties have been overcome, for when the Hallé choir was letting itself go there was not the slightest sign of woolliness; one could, in fact, hear the trebles, altos, tenors and basses distinctly and clearly.

Perhaps the most wonderful feat of all was the perfect transmission of the passages by the great brass instruments. Not so very long ago very little indeed would have been heard of them, but as it was the sounds came through with their full depth and majesty. The B.B.C. is to be warmly congratulated both on its daring in tackling such an ambitious programme and on its success in transmitting it so wonderfully.

A Test for Sets

This concert provided a pretty searching test for the qualities of receiving sets. As I have said, both the choral and instrumental sounds were faithfully *transmitted*; whether they were faithfully reproduced or not depended entirely upon the receiving gear. Several friends who have hitherto been content to continue using somewhat antediluvian apparatus failed to get as much enjoyment as they might have done from the concert. They did not find the choral work clean cut, whilst the fortissimo pieces from band and orchestra seemed to have produced from their sets rather more noise than music. To get the best out of broadcasting one must march with the times, especially in the matters of low-frequency amplification and of loud-speakers.

On Your Wavelength! (continued)

It is only comparatively recently that improvements in the design of transformers and of other low-frequency couplings and big advances made in valve manufacture have enabled us to get something like perfect reproduction of what is transmitted. There is many an old set that could be brought up to date at quite small cost either by supplying it with modern L.F. transformers or by substituting resistance-capacity or choke-capacity couplings on the note-magnifying side. But it is of little use to make the set capable of dealing properly with the excellent transmissions of the present day if you yoke to it a loud-speaker which is not up to the work. If you are trying out a new loud-speaker, there are few better test items than the organ recitals from the New Gallery that are given frequently during the afternoons. A really good loud-speaker will let you hear properly both the deep bass notes and the sparkling sounds from the top of the keyboard. A bad one won't, and that is that.

Series or Parallel?

Whether, when two or more loud-speakers have to be operated from the same receiver, they should be connected in series or parallel, is frequently the source of much argument. Theories differ because some people deal with the D.C. windings of the magnets as a starting-off point, and others the impedance of the windings at various frequencies, compared with the A.C. resistance of the output valve. To settle the matter, in my own mind, I recently fitted up a switch so arranged that four instruments could instantly be connected to the receiver either in series or in parallel. The result was overpoweringly in favour of connecting in parallel when all the loud-speakers have the same D.C. resistance. If the windings to be used are of different resistances the instruments must be connected in series, because when different resistances are in parallel, the power passing is divided in proportion to the resistances, and some of the instruments will get more "juice" than the others. There is considerable loss of quality when series connection is resorted to; but it is the only possible way when using loud-speakers of different makes.

Do You Use Meters?

Now that pure and undistorted reproduction of broadcast speech and music is being demanded by a large number of listeners, measuring instruments are coming into their own. For ordinary reception work of high quality two instruments are all that are necessary. One is a milli-ammeter reading up to about 20 m.a., and the other is a two-range voltmeter reading either 15 or 150 volts. The milliammeter should be connected in the positive plate lead of the last valve. This not only shows the current consumption of the last valve, but also allows the output to be adjusted for absolutely undistorted reception, so far as the receiver is concerned. Adjustments of grid bias and H.T. should be made until the needle of the meter is absolutely still. Any movement means that distortion is present; but the distortion evidenced by a small tremble or an occasional flick of the needle may not be apparent to the ear. An upward flick of the needle means that there is too much grid bias, a downward flick that there is too little. If the needle moves both ways the valve is being overloaded, and volume should be reduced.

The two-range voltmeter should be used for regular tests on the H.T. battery, the L.T. battery and the grid-bias battery. Tests should be made whilst the valves are alight. The use of these measuring instruments will save the seeker after pure reproduction much time and trouble when the distortion is introduced at the transmitting end, as it frequently is when programmes are relayed over a long land line.

Amateurs and Interference

We are hearing far fewer complaints this winter of interference with the broadcast programmes by amateur transmitters. This is due to two reasons: one is the general higher efficiency of both the amateurs' transmitting apparatus and the broadcast listeners' sets. It is also due to the fact that the majority of transmitters who are likely to cause interference do not work their apparatus during broadcasting hours. But there is still far too much grinding out of gramophone records in the neighbourhood of 400 metres on Sunday afternoons and evenings.

Amateur transmitters are allowed to transmit on 440 metres on Sundays out of broadcasting hours; but very few of the real experimentalists ever use that wave in these days. The amateurs who do use it are none too careful to keep to their wavelength. Anyone who hears an amateur transmitting on these wavelengths who is not exactly on 440 metres should report the matter to the Transmitter and Relay Section of the Radio Society of Great Britain, 53, Victoria Street, London, S.W.1. The section officials will know how to deal effectively with the offender. But don't make a report unless you have a good wavemeter and an efficient set.

Broadcasting Events

It is amusing to note the response which broadcasts of recent football matches have called forth. In the main the criticisms have been favourable, but many would prefer more sensationalism, and would like the microphone to be placed in such a position that the asides of the football "fans" would "come over."

It is out of the question to admit the many and varied noises of a football crowd to the microphone. Such action would defeat the main object, rendering the description of the play of practically no value, as only snatches of this would be heard. The necessity of excluding some of the noise causes a good deal of preparation, as in addition to the engineers' work, a cabinet has to be erected, from which the narrator can see the game and yet be tolerably immune from the noise of the arena. There is no fear of the listener losing completely the roar of the crowd.

Some listeners are not content with the narrator, but let these remember what a difficult job it is to accomplish. Although there are many sporting correspondents who have the gift of a fluent pen, yet this new task needs far more skill than ordinary sporting journalism. In the first place the narrator must have a very sound knowledge of the game and an exceedingly quick brain. The game has to be visualised, and the picture instantaneously turned into words. Nor must these words be awkward or oft repeated, or else the description becomes wearisome. It requires a gift of fluent speech. An individual possessing these powers is not easy to find. In fact, the B.B.C. have already tried many likely candidates.

A New Feature

The listener has here a new feature to whet his jaded radio appetite. Every kind of event, if possessing sufficient topicality and interest, will no doubt be broadcast. As time passes and experience is gained, a small band of specialists will be collected whose services will be available at any point of the country. It is obvious that this branch of broadcasting will become of great importance. The football public will come to rely on the broadcast accounts of the various big matches. The same applies to racing. Next June will bring the first actual broadcast of the Derby. It is understood that the B.B.C. are not contemplating extending the new feature to chess!

In Case of Insomnia

Bedside books are a commonplace, and the man who is not a good sleeper frequently finds that half an hour of reading will bring back the sleep that has left him. The other day I heard of a case in which bedside radio had proved equally effective. The sufferer usually slept for an hour or so, and then woke about three in the morning, and was unable to sleep again. He built himself a short-wave set, which he put on the table by the side of his bed, providing it with a 12-ft. aerial slung under the ceiling. He found that on most nights he could tune in one or other of the American short-wave stations.

THERMION.

Are Your Connections "Low Loss"?

By L. I. Leslie.

IT is a matter of common knowledge that in the object of attaining efficiency it is necessary, if possible, to solder every connection in the receiver. By this means we obtain joints which are electrically perfect and will not deteriorate to any extent in use.

Perfect Connections

The perfect receiver would be one in which there were no loose connections. That is to say, the wiring was continuous from aerial to phones. In actual practice, however, this seems to be very far from the case. One need only examine an up-to-date receiver to discover a large number of joints which are made by merely pressing two metal surfaces together. In cases where a soldering tag is fitted this is held, as a rule, by the pressure between two nuts, and is not actually soldered to the component in question. The constructor is usually under the impression that when he solders a connecting wire to a tag in this manner he is making a perfect electrical connection to the component, whereas the tag has only a pressure connection, and is, in fact, inefficient.

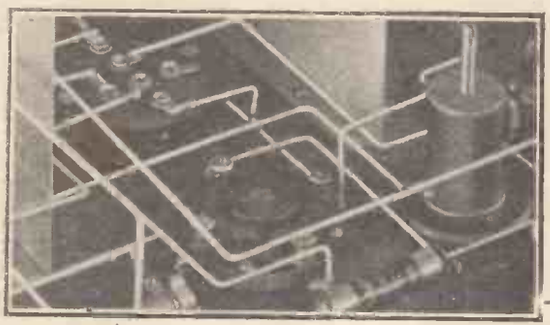
Now, is there any reason why the tags should not be soldered to the components in use? The disadvantages would appear to be twofold, namely, additional cost due to increased labour in manufacture, and also the fact that a permanently fixed tag could not be rotated on its axis to a position most convenient for making a connection. Moreover, in the case of aluminium components, soldering is of course impossible.

Formation of Film

A soldering tag when clamped securely between two nuts will present an efficient electrical joint, provided that the contact surfaces are clean. It is probable, therefore, that for a short period after a receiving set has been constructed, the connections will maintain their efficiency. Inevitably, however, a film of non-conducting material forms over the surface of the tag and the metal to which it has made contact.

The time in which it takes to form this skin, together with its thickness and consequent insulating properties, depends to a certain extent on the pressure between the surfaces in contact. It may take one month, or it may take a year, before this skin is evident; but it must form sooner or later in a pressure joint.

The effect of this skin has to be imagined rather than detected, as on test with a resistance meter or some similar device the joints may appear to be electrically perfect. However, the voltages with which we deal in the high-frequency circuits of a receiving set are very minute, and may be too small to break through even this very thin insulating skin.



Our contributor here puts forward a theory regarding a possible source of serious loss of efficiency in wireless receivers which is often overlooked. We should like to hear readers' opinions on this interesting subject.

Oscillating Potentials

The oscillations which are applied to the tuning circuit of the first valve of a receiving set start with a very small amplitude and, provided that the tuning circuit is in resonance with the frequency of oscillations being received, they will build up to a much higher value. If, however, the initial oscillation, which may have a pressure as low as one-millionth of a volt, fails to reach the tuning circuit, no resonance effect will be obtained, and the incoming signals will not have any effect on the tuning circuit.

It is quite simple to follow the fact that if there is a pressure contact between the aerial and the tuning inductance, an insulating skin may be formed on the surface of this contact, with the result that oscillations having a minute amplitude will be unable to break through to the tuning circuit. Consequently, the signals will not be received. From this explanation it is evident that if this effect is serious, the joints in the first tuning circuit must be made very carefully, and should be soldered directly on to the coil itself.

A Definite Example

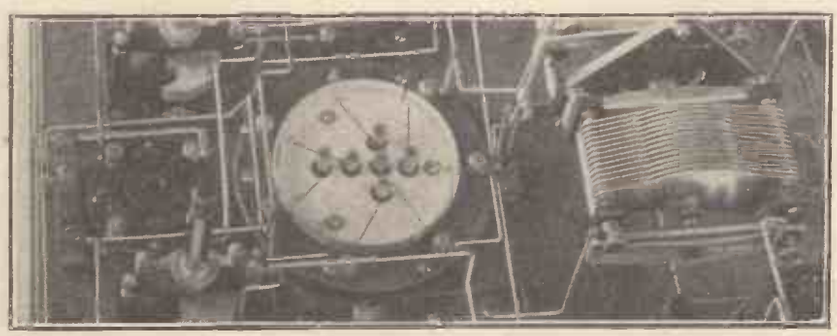
It would, however, be very inconvenient to solder every connection. Terminals must be employed for connecting up such items as the aerial, earth and batteries. In the act of making any connections by means of a terminal, we rotate one portion with respect to the other and thus scrape the contact. This will keep it clean if done periodically. Battery plugs and switches have a similar scraping action when placed in position, so that the connecting surfaces are constantly being cleaned. If, however, a set is left for a considerable period without remaking the terminal connections, it is likely that the efficiency in reception of weak signals will fall off slightly, due to the formation of this insulating layer.

—And Another!

Some years before broadcasting was introduced into this country I owned a single-valve set; the connections to the terminals on the panel of this receiver were not soldered, but merely clamped tightly between two nuts on the underside of the panel. The majority of signals received were comparatively weak, as there were no broadcasting stations functioning at that time. After about a month's use, this set would invariably lose its efficiency of reception and, as a result, I used to unscrew all the terminals behind the panel, clean the contacts and remake them again. After this process had been performed the increase in weak signals was quite noticeable. I only quote this as an example, because in these days, when there are so many broadcasting stations of high power, we cannot so easily discern small faults of this nature which may exist in our receivers.

It may be argued by some that the soldering tags attached to wireless components make a much more efficient contact than could be obtained from a piece of nickel-plated copper wire bent round in the form shown in Fig. 1, but on further

(*Concluded on page 227*)



An Example of Neat Wiring.

WITHOUT FEAR OR FAVOUR

A Weekly Programme Criticism by Sydney A. Moseley

DO you notice the inevitable reaction of campaign against the new B.B.C. programmes? The main thing of a journalist's duty is to interpret the public's mood of the moment. In these columns I indicated very early in the day that the new arrangement of the programme was not an improvement on the old, and last week I anticipated this reaction by suggesting that the criticism was being overdone. And yet one solid ground of criticism remains; that is, they endeavour to provide too many different items in one evening. This variety is no doubt the latest admirable attempt to please *everybody*, and, like most efforts of this character, it succeeds in pleasing nobody. Recently from 4.45 to 10.45 there were no fewer than eighteen items, which, as my enemy Euclid says, is absurd.

* * * * *

My recent remarks about the Sunday services have brought me one or two letters from approving and disapproving friends; but there is one thing upon which I believe we can all agree, and that is the B.B.C. should provide the same excellent studio choir for all the services. Local choirs may do very well for local needs, but when such a choir has to appeal to an audience of millions I maintain that only the very best should be given. This has not been so. Some of the choirs have been quite third-rate.

* * * * *

The first of the new health talks was useful and yet too vague. Professor Mottram should be a little more dogmatic! He should assume the position of a mentor, and tell us what to do instead of giving us so many pros and cons that one is left bewildered as to what we are expected to eat. For instance, every dietist I know commends wholemeal bread. The Professor, I gathered, put in a defence for white; but he mixed this up so much with the good points of brown bread that I could not be quite sure. There are a thousand-and-one hints that a fully-qualified medical man may give without making a song about it.

* * * * *

The critic—that applies to all of us—should take care that nothing is wrong with his set before condemning the engineers or the artistes. I have personally spent a small fortune in having my set made as perfect as possible, but I could not quite appreciate the organ recital from Mary-le-Bow, Cheapside. It can only be that some types of music do not transmit well on the organ. At any rate, it was the first time I have ever had to switch off during an organ recital.

* * * * *

An event of the greatest importance was undoubtedly the Sixth National Concert relayed from the Albert Hall. I wager, nevertheless, that a programme devoted entirely to Berlioz' music can only make a restricted appeal, and here again I suggest that these National Concerts should be made a little more varied.

* * * * *

I did not care very much for the Dogmersfield Toy Symphony Band, and since it was an item in a particularly dull evening, this was most unfortunate. The programme on this evening, in fact, fully justified the severest criticism.

* * * * *

I heard them in the train discussing J. C. Squire's programme, and they appeared to like it. Personally I thought it was more of a lecture-recital with too much lecture. The idea, however, was extremely good, and Mr. Squire happens to be a good broadcaster.

* * * * *

The London Male Voice Octet were hardly in form at their last appearance. Their voices neither balanced nor blended well. Ragged, it sounded to me. On the other hand, Leonard Gowings, who sang the same day, was never in better form. His Flower Song from *Carmen* and "Love In Her Eyes Sits Playing" were beautifully sung.

* * * * *

Cecil Lewis's first talk on "Famous Writers of To-day" was quite successful. Without rubbing in too much his personal association with the great Bernard Shaw, it made us realise that he knew enough about his subject to justify a "personal sketch." There is no doubt that Lewis is one of the best "voices" over the ether.

* * * * *

I see that the B.B.C. got Charlie Kidd, the comedian, to repeat his little "Lantern Lecture." And quite right too! This is one of the most amusing burlesques that has been heard. It was so cleverly done that I'll wager some of the listeners took it to be as serious as Father Knox's story of the uprising in London.

* * * * *

A word of praise for the production of *Julius Cæsar*. A first-rate company gave a more or less complete version in about an hour. I recommend readers to follow these plays by the book. It is possible to get a complete volume of Shakespeare for a few shillings, and the joy of listening is enhanced by the pleasure in following the "cuts." May I suggest that an effort be made to give the complete caste in the official programmes? Although I have the list of names of the actors before me I am unable to say who took the part of Brutus which I liked best of all.

* * * * *

Postscript

As these notes go to press I see a writer complains that his reception of Sandler's Eastbourne orchestra was bad. This bears out what I have said before—that criticism sometimes is the fault of the listener who has permitted his set to get out of gear.

NEXT WEEK:

ANOTHER FINE ISSUE WITH MANY UNIQUE FEATURES

"Oscillation Without Howling" with constructional details of a novel two-valver. "More about the 'M.C. Three'" with coil and operating data. "The Winter Portable," etc., etc.

A USEFUL BATTERY TESTER

A FOUR-VOLT gas-filled torch lamp makes a very efficient tester for separately testing each cell in an H.T. unit composed of these elements.

This can be mounted in a holder (which can be bought for a few pence), and fixed to a strip of hard wood of sufficient length to bridge the battery terminal strips. Wires from the terminals of the holder should be brought to two needle points (gramophone needles answer the purpose admirably) driven through the wooden strips.

The wires can be soldered to the thick end of the needles, left slightly protruding from one side of the wooden strips for this purpose. The points protruding from the reverse side of the strip are convenient for making good contact with the battery terminals.

M. P.

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This new valve has been expressly designed to work in conjunction with the famous B.5. Valve. It is intended primarily for the high frequency stages, using a tuned anode coil or high resistance of low self capacity. The B.5.H. has a very much higher amplification factor than the B.5. It can also be employed in the detector and low-frequency stages, with high resistance or low ratio transformer coupling. The B.5.H. will solve your high frequency problems. Buy one now.

Filament Volts	2·8
Filament Current	0·06 amp.
Anode Volts	40-120
Amplification Factor	17·5
Impedance	55,000 ohms.

PRICE

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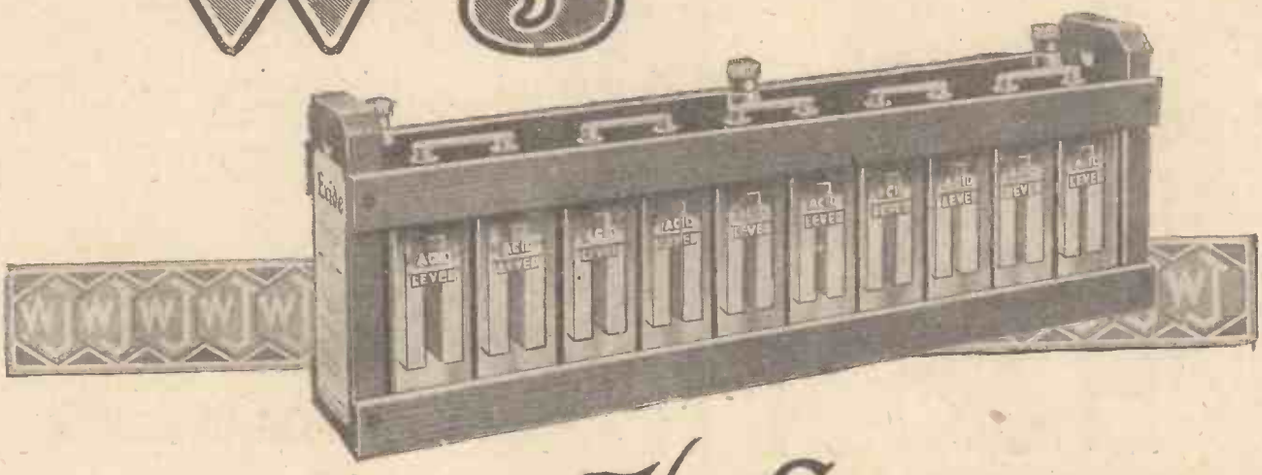

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Exide Cell, Type DBG

Types DTG and DFG

Specially designed for small discharge currents, and to hold their charge when not in use for long periods. Suitable for small Dull Emitter valve sets.

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The Supreme High Tension Battery

THIS battery provides the most satisfactory source of H.T. in existence.

It will stand for six months at least, without detriment or loss of charge even when partially run down so that its full capacity is available though the discharge be spread over such periods. It can be recharged, and, reasonably cared for, will last for years.

The discharge is steady, free from fluctuations, and ensures pure reception against a silent background that is a revelation.

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THE LONG-LIFE BATTERY

TYPE **WJ** — **2,500** milli-amp. — Price **15/-** per 20-volt unit — **9D** per volt

THE LATEST DEVELOPMENTS IN TELEVISION

The Systems of Valensi and Dauvillier

By Our Special Contributor, T. THORNE BAKER, F.C.S., F.R.P.S.

ALTHOUGH actual demonstrations of television are at present all too few, it will come as something of a surprise, perhaps, to learn that in Paris alone three systems of television are all but complete; that is to say, complete for actual use in practice. An enormous amount of time has been spent on them, and all three are likely to prove practical because they depend upon the cathode-ray oscillograph for reproducing the transmitted image.

One of these systems is the invention of Dauvillier, a research physicist associated with de Broglie, whose name is world-famous in connection with problems of the atom. By means of electro-magnetically operated tuning forks, one vibrating with a frequency of 800 per second, the other in the opposite direction with a frequency of 10, and a mirror attached to one limb of each, he is able to catch each ray of light in regular sequence from the image, to focus it on one mirror, reflect it back to the other, and thence to focus it upon a photo-electric cell in a rapid stream of discrete or separate impulses.

The transmitter in this, as in any other system of television, merely controls the wireless transmitter, so that *for each picture or image* a string of signals representing the light and shade of every tiny patch of it is radiated, the whole cycle taking place ten or fifteen times a second.

At the receiver, these currents are applied to the filament-grid of the cathode-ray oscillograph, in which the pencil of rays is directed, like the needle of a gramophone, over the entire surface of the viewing screen—a phosphorescent screen rendered brightly luminous at any spot on which the rays are concentrated. The cathode rays are readily deflected by a magnet, hence by means of two electro-magnets at right angles, working in conjunction with the two tuning forks of the transmitter, the pencil of rays is made to redraw in a luminous spiral line the image being transmitted.

Dauvillier's method differs from that of Belin in his employing electrostatic force, instead of electro-magnetic, to control the movements of the cathode rays.

What is likely to provide still quicker practical results is the system of television invented by M. Valensi, chief engineer of the French Posts and Telegraphs. Here again the image is first "explored," the light from each tiny region being thrown in rapid succession upon a photo-electric cell. But Valensi has had the courage, and we think the good sense, to dispense with trying to operate the whole thing by wireless; a telephone circuit is employed in conjunction with the wireless circuit, and thus the two people using the instruments are not only enabled to see each other (each instrument can send or receive at will), but they can talk, and *in addition* he has the use of the metallic

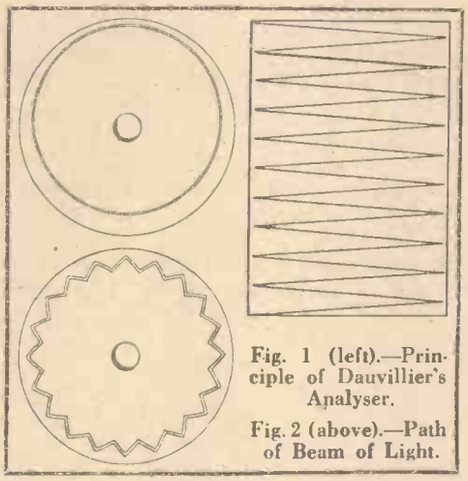


Fig. 1 (left).—Principle of Dauvillier's Analyser.

Fig. 2 (above).—Path of Beam of Light.

circuit for transmitting the alternating currents which synchronise the two installations. This is a most important advance, and likely to bring his work to a real and speedy conclusion.

Most inventors have so far explored their images by means of a spiral motion. A pencil of light has been thrown upon the image and reflected back upon a photo-electric cell so that the spot of light completely covers the image in, say, a tenth of a second by travelling over it spirally like a gramophone needle does the circular record. Dauvillier has devised an ingenious pair of discs which analyse the illuminated image by a zig-zag line. He obtains in this way an exploration of *uniform speed,* whereas in the spiral motion the speed of travel is, of course, far greater at the periphery than at the centre.

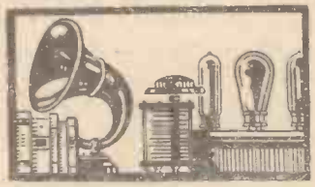
Two slotted plates, as shown in Fig. 1, are used, one with a "tooth" and the other with a circular slot displaced eccentrically. By revolving these, one at 2,400 revolutions a minute, the other at 480 revolutions, one behind the other, the eye would see a zig-zag line of light through the two, as indicated in Fig. 2. Two alternating currents of different periodicity are again used to control, in the transmitter the speed of the discs and in the receiver the motion of the pencil of cathode rays, the image in the latter being again received on a fluorescent or phosphorescent screen.

The cathode-ray oscillograph, in which any fluctuation of current is registered by the movement of the spot of light on the phosphorescent screen, is so sensitive that it will easily record two million separate signals a second. It is thus ideally sensitive for the purpose of television, and will undoubtedly solve the problem these two engineers are attacking.

It may be said in conclusion that these installations are not chimeras of the imagination. Both of them are actually in existence.

RADIO MEN FOR AIR LINERS.

At the Marconi Wireless College, Chelmsford, men are being trained as wireless operators in consequence of the new regulations making it compulsory for passenger-carrying aeroplanes to have a wireless operator.



PRACTICAL ODDS & ENDS

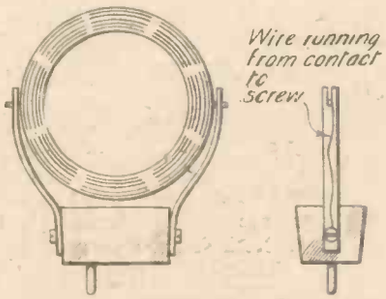
Finding the Right Coil for the New Wavelengths

QUITE a number of amateurs will be searching among the new wavelengths, and below is a rough sketch of a simple device whereby coils can be tested before being finally bound up.

Run up two arms from the screws of a coil holder made of three-ply wood. Cut a notch at the top of each arm and fit a brass contact at the top, from which a wire will run down to the plug-in screw.

Wind the coil on the former and tie up in the usual way, or just loosely, and attach a label with the exact number of turns taken.

Bring the ends out at the sides and fasten them to wander plugs, and secure rather tightly with string. The coil can then be placed in the experimental socket, turned about, exchanged with another, and



Method of Altering Coil Winding.

so on until you have discovered the right coils for the various stations. By following this method it will be easy to cut off a length of wire if too much has been included. W. A. H.

Bias Without a Battery

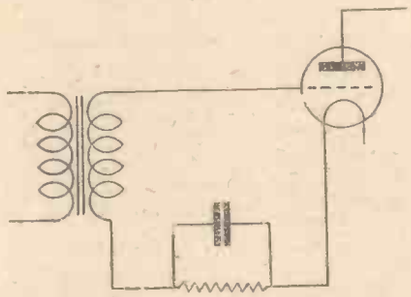
IT is not well known that grid bias may be applied to certain makes of valve, and used in conjunction with certain makes of L.F. transformer, without the necessity for an additional biasing battery.

The method of connecting up such an arrangement is shown by the diagram. A very high resistance grid leak is connected in parallel with a 2-microfarad fixed condenser, and the two are connected in series with the grid of the valve and the secondary of the transformer.

The grid of a valve, if left disconnected, will acquire a considerable negative potential with respect to the filament.

Under normal conditions the grid is connected through the secondary of the transformer to the filament battery, and the accumulated potential on the grid is permitted to escape.

By the arrangement shown in the diagram, however, the high resistance of the leak turns the accumulated potential to good account, and this bias takes the place of that usually supplied by the battery.



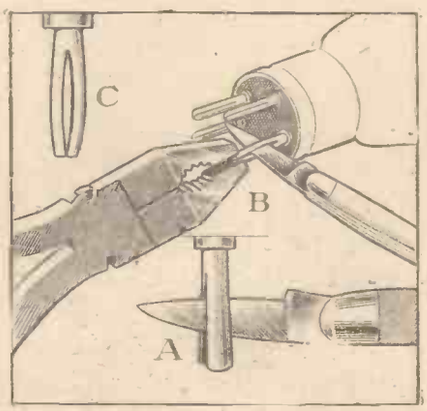
Circuit for Applying Grid Bias without a Battery.

With some makes of transformer the leak is not necessary, and it is only required to connect a large condenser in series with the transformer secondary. K. U.

Improving Valve-pin Contacts

THE usual way of dealing with valve and high-frequency transformer legs when they are suspected of making poor contact in the sockets is to open the prongs.

Another method is suggested here which will not only ensure reliable contact, but



Improving Valve-pin Contacts.

will at the same time permit the pins to be slipped in and out of the sockets with greater ease.

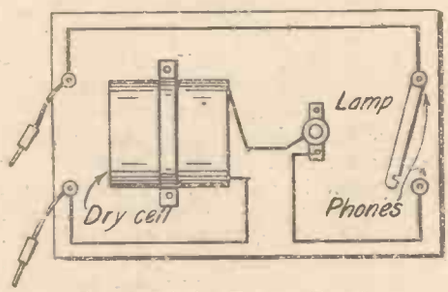
The accompanying diagram is almost self-explanatory. The small blade of a pocket-knife is inserted about half-way between the prongs, as at A, so as to force the prongs apart. By means of pliers the ends of the prongs are gripped together, as at B.

The pin will then appear bow-shaped, as at C. If this has been carefully done, it will be surprising how smoothly the pins will slip in and out of their respective sockets. C. A. W.

A Simple Testing Board

IT is very convenient to have some permanent means of testing coils for continuity and condensers for short circuits. A simple testing board may be constructed with a flash-lamp bulb and a 4½-volt dry cell, as outlined in the accompanying diagram.

With the phone terminals bridged, short circuits in condensers and the continuity of low-resistance circuits will be indicated by the lighting of the lamp. For transformer windings and coils of high resist-



Details of the Testing Board.

ance, low-resistance telephones should be used, when continuity will be indicated by a loud click. H. W. T.

Economising H.T. Current

IT is well known that when using a resistance-capacity-coupled L.F. amplifier a higher H.T. voltage is required than with transformer or choke-coupled L.F. amplification. It is not so generally appreciated that a considerable reduction in H.T. *current* results from the use of R.C.C. L.F. amplification.

Since high-impedance valves are used in conjunction with high-value plate resistances in this form of coupling, the current flowing in the plate circuits of all but the last valve (presumably a power valve) is reduced to a very small amount.

Thus the problem of supplying an adequate H.T. current to a loud-speaker set is not so acute when R.C. coupling is used. The writer has used quite small capacity H.T. batteries of high voltage for many months in an R.C.C. receiver without any sign of noises. J. B.

"A.W." TESTS OF APPARATUS

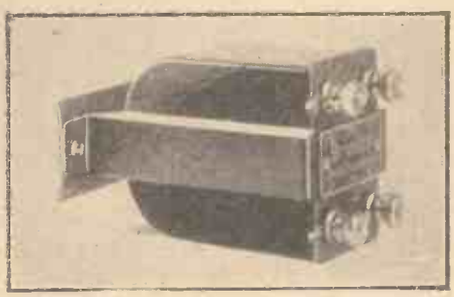
Conducted by our Technical Editor, J. H. REYNER, B.Sc.(Hons.), A.M.I.E.E.

Brandes L.F. Transformer

BRANDES, LTD., of 296, Regent Street, W.1, have submitted for test one of their first-stage audio-frequency transformers. The windings and iron core of this transformer are enclosed in a neat iron case. Four terminals are mounted on a piece of insulating material fixed to the top of the instrument; soldering tags are also supplied. This component has a transformation ratio of 3 to 1, and is suitable for use in the stage following the detector valve.

On test satisfactory results were obtained for a transformer of this price. However, it was found inadvisable to apply a large input voltage to the primary winding; if this were done, the purity of reproduction was slightly impaired. This effect was not evident unless very loud signals were being received.

A small metal plate mounted between the terminals of this instrument gives instructions as to the correct manner in



Brandes L.F. Transformer.

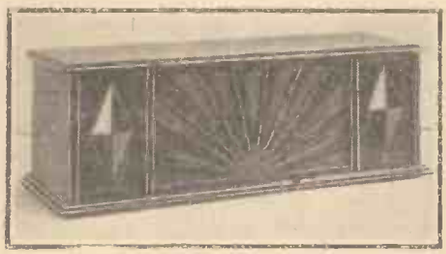
which it should be wired up in an amplifier. Two holes are drilled in the base of the iron casing, so that the instrument may be mounted on baseboard or panel. We can recommend this transformer for use where a moderately-priced, but nevertheless efficient, instrument is required.

Amplion Cabinette Loud-speaker

WE have received from Graham Amplion, Ltd., of St. Andrew's Works, Crofton Park, S.E.4, for test an Amplion Cabinette loud-speaker. This takes the form of a neat and well-made cabinet, which measures 16 in. by 5½ in. by 5½ in. The sound is conveyed from this loud-speaker by an opening in the front covered by a green cloth. This speaker has, therefore, a very pleasing appearance.

The operating mechanism consists of a standard Amplion base, attached to which is a small straight horn. This horn causes the sound to impinge on a metal reflector, which reflects it towards the opening in the cabinet. The connecting wires are taken through a small hole in the cabinet on to two Amplion terminals.

On test this loud-speaker gave very good reproduction when used in conjunction with a good-class transformer. It was found that the low notes were fairly prominent, and in consequence the tone was good. Although it is possible to obtain



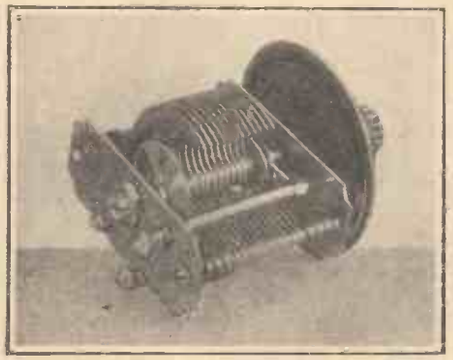
Amplion Cabinette Loud-speaker.

sufficient volume for a large room without any evidence of distortion, it is advisable not to overload the speaker.

Horn resonance is eliminated by the use of felt pads in the cabinet itself. The resistance of this speaker is 2,000 ohms, and is therefore suitable for use in any wireless receiving set. We can recommend this loud-speaker for use where purity of reproduction is required with reasonable volume.

Pyramid S.L.F. Condenser

FROM Pyramid Products, Ltd., of Cornbrook Place, Chester Road, Manchester, we have received for test an S.L.F. variable condenser. This instrument is robust in construction, and is designed on standard principles. The moving vanes are attached to the two brass



Pyramid S.L.F. Condenser.

end plates; this eliminates the harmful effects due to hand capacity. The fixed vanes are well separated from the end plates by means of thick ebonite washers. Connection to the moving vanes is made by a copper pigtail attached to a brass pillar, which is clamped to one of the end plates and surrounded by an ebonite tube to prevent accidental short circuit.

An efficient vernier device giving a reduction gear of 36 to 1 is incorporated in this instrument. This consists of two pairs of friction wheels operated by a small ebonite knob placed in front of the dial; this gives a smooth action without any sign of backlash. The large dial supplied serves to rotate the moving vanes directly.

On test the maximum capacity of this condenser proved to be .00076 microfarad. The minimum capacity was only .000014, so that a large tuning range is obtainable.

Bulgin Phone Connector

WE have received from A. F. Bulgin and Co. a wall telephone jack. This takes the form of the familiar electric-lighting rose fitting, and is adapted for fixing to a wall, so that the phones or loud-speaker may be plugged in at will.

Bulgin Phone Connector.

The jack itself and the terminals are mounted on a small piece of ebonite which is fixed to a black wooden pin. An oxidised copper cover screws on to the front of the jack, and the wires from the terminals are taken out at the back in the usual fashion. Two extra holes are drilled in the ebonite for the purpose of fixing to the wall. Variously finished covers are available, including a white-enamelled one.

On test it was found that any of the standard types of plug now on the market would fit into the jack and make a good electrical contact. We can recommend this for use when a neat and handsome fitting is desired. The address of A. F. Bulgin and Co. is 9-11, Cursitor Street, E.C.4.

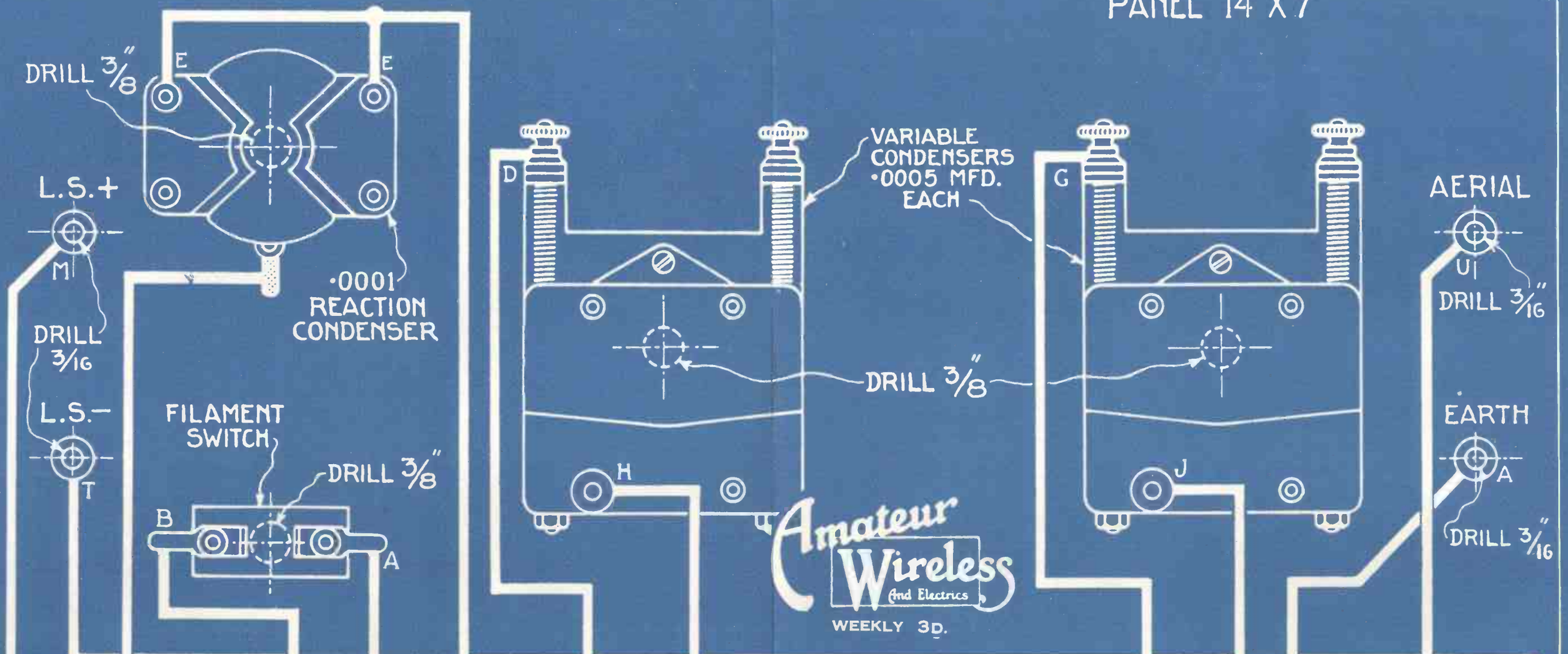
The recent successful broadcast from the Highbury football ground was very much appreciated, and opens up possibilities of future broadcasts of even more importance than a first-class League football match.

SUPPLEMENT TO "AMATEUR WIRELESS" Nº243, FEBRUARY 5, 1927

THE "M.C. THREE"

A Receiver Embodying the New Constant-coupling Principle Developed

by J.H.REYNER B.Sc.(Hons.) A.M.I.E.E.



DRILL 1/8"

DRILL 1/8"

LOWER EDGE OF PANEL

DRILL 1/8"

·004

·004 D A ·001 C F G A

·0003 2 MEGOHMS

TO PLATE

TO PLATE

TO PLATE

M A N L

K A O I

O H I

9 6 5 A A D C E 10 8

F A P J

4 2 1 A G U 3 J

H 7

L OS IS S R OP IP K

N Q Q TEMPRYTE

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P Q TEMPRYTE

F H.F. CHOKE COIL T

S B B Q Q R T

GB− GB+ LT− LT+ HT− HT+ HT+

BASEBOARD
14" X 8¾"

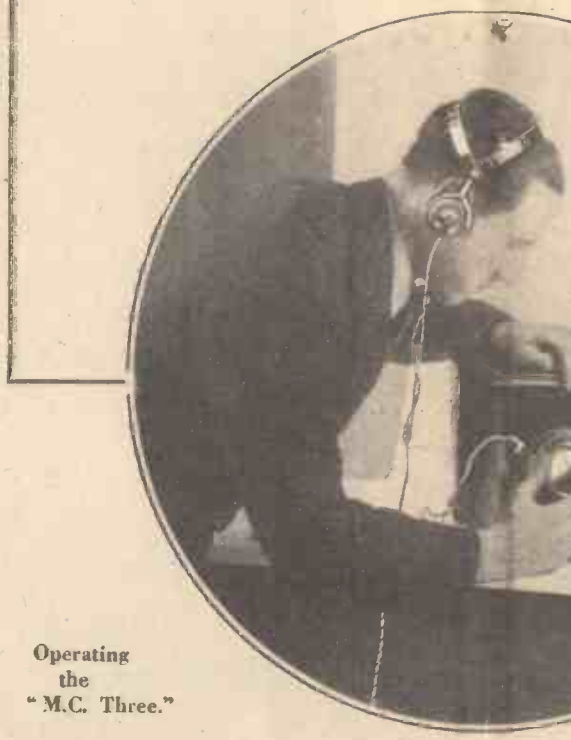
BLUEPRINT
Nº 1A

Set Designed, Constructed and Tested by J. H. Reyner 21/9/47

THE "M.C.

A Special Three-valve Receiver Embody Principle

By J. H. REYNER, B.Sc.(H



Operating the "M.C. Three."

WE have discussed in the last few issues the principles underlying the new constant-coupling arrangement. First of all the underlying idea was explained, and subsequently we had a single-valve circuit in which the reaction coupling was arranged to be constant over the whole range, so that a number of stations could be received without any alteration of the reaction adjustment once it had been set. This receiver, however, was simply made up in the form of a "hook-up," to enable readers to try the principles out for themselves and obtain a little experience in handling the new circuit.

Subsequently we showed that the principle could be applied very satisfactorily to high-frequency amplifying circuits, and that not only was the energy transfer constant over the whole of the scale, but the usual neutralising adjustments could be dispensed with. With a suitably-balanced constant-coupled H.F. transformer it is possible to change the valves at will from one of the low-impedance power types up to the new high-impedance valves which are extensively used to-day for resistance-capacity and tuned-anode circuits without any tendency to oscillate.

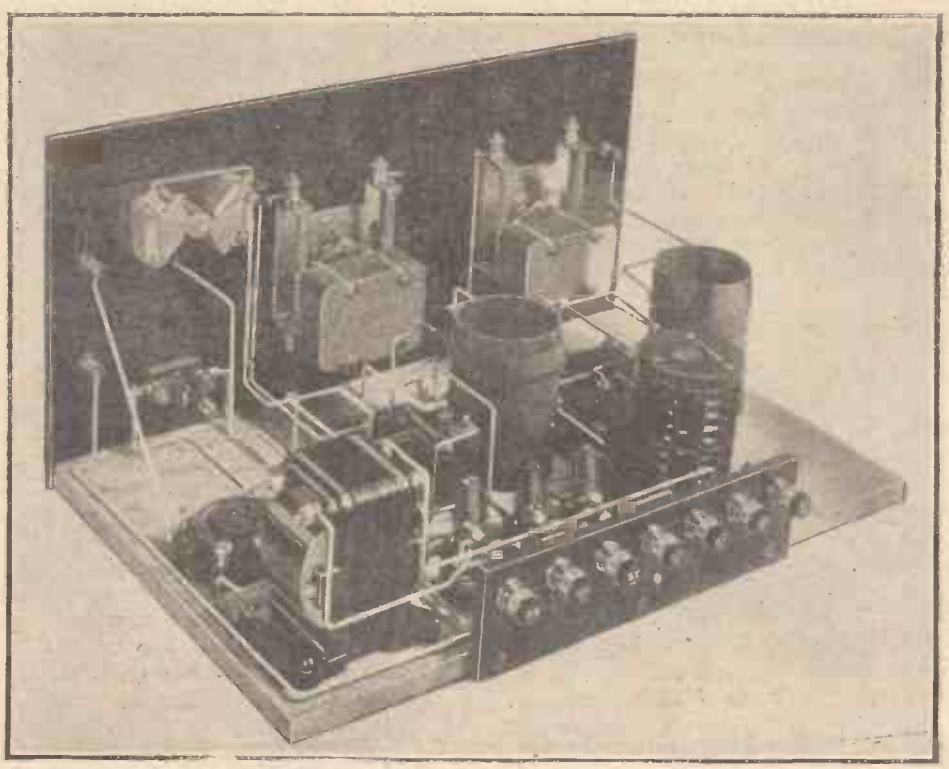
A Popular Combination

These principles have now been incorporated into a simple three-valve receiver. Three valves were chosen, as this is a very popular combination, the circuit utilising one high-frequency stage, a detector and one note-magnifier. With this arrangement quite a number of distant stations can be obtained at satisfactory strength on the loud-speaker, and with the present circuit the difficulty of tuning is reduced to a minimum.

The circuit employed in this receiver is shown in Fig. 1. This will be of interest for several reasons. In the first place, the constant coupling has been utilised not only in the high-frequency transformer but also on to the aerial circuit. The usual methods of coupling the aerial to the receiver to-day are more sensitive at the higher frequencies (lower wavelength) than at the other end of the scale. For instance, one very common method is to tap the aerial circuit across a portion of the first grid coil, or else to couple a coil more or less tightly to the grid coil, as shown in Figs. 2A and 2B respectively (p. 215). This method is adopted because it reduces the damping of the aerial to a large extent, and also very much increases the tuning range.

The Aerial Circuit

The disadvantage of the method, however, is firstly that the energy transfer falls off rapidly as the frequency decreases, so that the pick-up is less on the longer waves, while, secondly, there is the danger of flat spots occurring on the tuning of the first circuit when the aerial comes into tune with the particular frequency being received. This is a point which has been explained elsewhere, and need not be elaborated at the present stage. It will suffice to remark, however, that there is usually some point on the tuning range at which the tuning of the



This Photograph shows the Neat Layout of the Components.

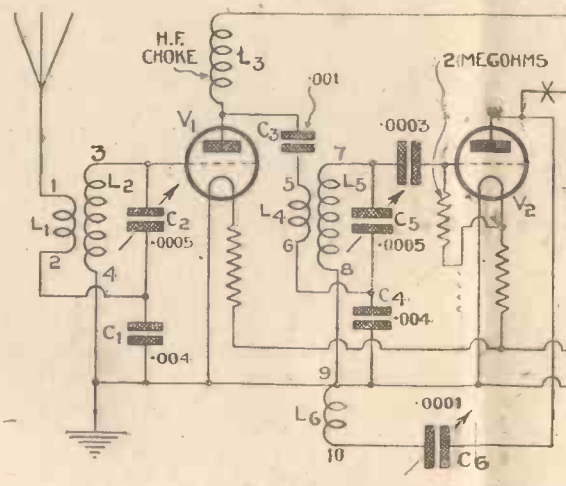
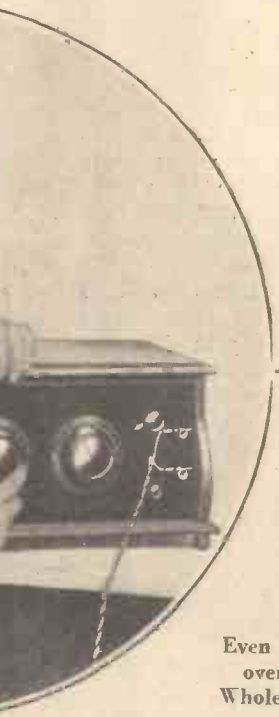


Fig. 1.—The Theoretical Circuit Diagram

THREE"

ving the New Constant-coupling

ons.), A.M.I.E.E.



Even Tuning over the Whole Scale.

frequency of the signal currents, but also it is found that the aerial characteristics are appreciably better, and that any tendency towards flat spots on the tuning range is decidedly minimised.

Suitable Proportions

The aerial, therefore, is coupled to the magnetic coupling between the coils L1 and L2, and partly by means of a capacity coupling through the medium of the condenser C1. This latter capacity is of .004-microfarad capacity, while the variable condenser C2 is .0005, as is usual. The number of turns on L1 and L2 has been worked out in accordance with these values.

The voltages developed across the coil L2 are applied across the grid and filament of the first valve V1. This valve is supplied with high tension through the H.F. choke coil L3, the high-frequency currents passing through the condenser C3 to the H.F. transformer. The latter unit is made up on the constant-coupling principle again, the energy being magnetically coupled from L4 to the secondary L5, and also capacity-coupled to the condenser C4. C4 is again of .004-microfarad capacity, while C5 is .0005, as in the case of the first circuit.

Stabilisation

With the particular transformer and combination of capacities utilised, it is found that the circuit as a whole offers a capacitative impedance when the condenser C3 is made of .001-microfarad capacity. This is all that we require for stability, and once we have made the whole circuit capacitative, then we can change the valve V1 as we desire without producing any feed-back.

Now it would be possible to design the H.F. transformer in such a manner that it was just on the verge of oscillation over the whole range. This, however, is a matter which would require a somewhat critical and careful adjustment of the receiver, and it would not be easy to carry out such an operation unless the constructor had considerable experience. In the particular case, therefore, the circuit has been designed to be a little way off the oscillation point, over the whole scale, and it is maintained in a state of sensitivity by means of a small reaction winding L6 controlled through a reaction condenser C6.

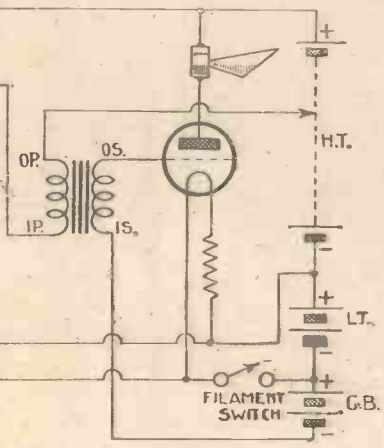
A Fine Adjustment

This does not really necessitate another adjustment, since it is possible to set the reaction condenser in such a position that the receiver is lively and sensitive, and it may then be left while all tuning and searching is done on the two main tuning dials. This method, however, does avoid

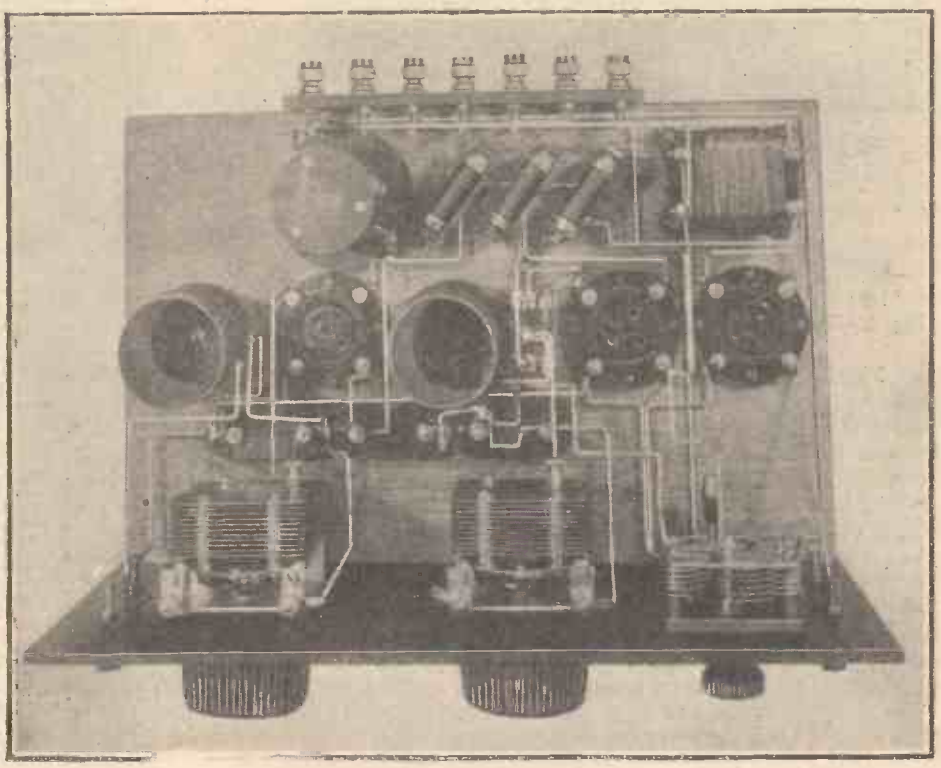
(*Continued on next page*)

ircuit becomes flat when a scheme of ctions similar to those shown in is adopted.

a constant-coupled arrangement is for the aerial circuit, however, then nly do we obtain a constant-voltage on the secondary, irrespective of the



n of the "M.C. Three."

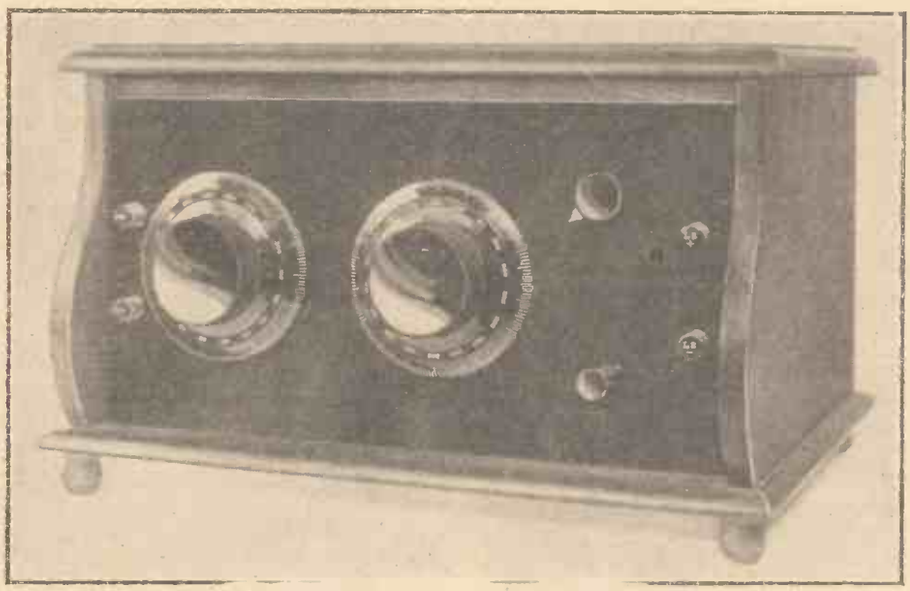


A Photograph from Above Showing the Complete Arrangement.

any necessity for very careful and critical adjustment, and it also takes account of any minor discrepancies in the values of the fixed condensers, positions of the coils, and so on, which are inevitable in the case of a receiver designed for home construction. Finally, it does enable the last ounce to be obtained from any particular station which is a little bit weak, although searching can be carried out without the aid of reaction control.

The second valve is arranged to rectify the signals, the usual grid condenser method being employed, with a leak taken to the positive of the filament. The anode circuit of the valve contains a suitable first-stage L.F. transformer, which applies the signals to the third valve, the circuit in this respect being of the conventional type. The detector valve has been provided with a separate tapping of its own, while the H.F. and L.F. valves are connected to a common tapping, and is provided with 90 to 100 volts high-tension.

The receiver has been made as compact as possible, consistent with efficiency. It was, therefore, found possible to arrange the receiver on a 14-in. by 7-in. panel, the usual baseboard construction being adopted. Components are as follow:



The Complete "M.C. Three" in Cabinet.

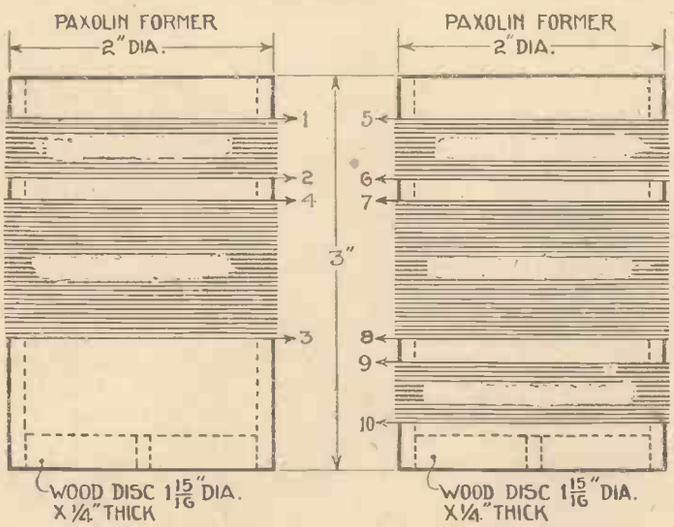


Fig. 3.—Details of Aerial Coil and H.F. Transformer.

One panel, 14 in. by 7 in. (Becol, Trelleborgs or Trolite).

One cabinet to suit, with baseboard 9 in. deep (Enterprise, Caxton or Carrington).

Two .0005 variable condensers (Ripaults, Igranic, G.E.C., Ormond or Raymond.

Two .004 and one .001 fixed condensers (Dubilier, Cosmos or Lissen).

One .0003 fixed condenser, with provision for 2-megohm grid leak (T.C.C. and Mullard grid leak).

One .0001 variable condenser for reaction (Ormond).

Three valve holders (Lotus or Sterling).

One H.F. choke (R.I. or Varley or McMichael).

One first-stage L.F. transformer. This may be of any convenient type, but it should *not* be of a pattern having a capacity connected across the primary winding, as the primary winding itself is required to act to a small extent as a choke in order to produce the necessary reaction effects. If it is desired to use such a transformer, however, another H.F. choke should be inserted at the point marked "X" in the circuit diagram. The actual transformer used was B.T.H., 2-1 ratio; among many others suitable are Lissen and Brandes.

Three fixed resistors with clips, to suit the valves in use (Temprytes or Peerless).

One special aerial coil. One special H.F. transformer. Both these coils have been designed to suit the circuit in accordance with the details obtained by experiment. They may be obtained from Messrs. Wright and Weaire, Ltd.; but further details for constructing these coils will appear in our next issue. The data given in Fig. 3 provide essential information.

Eleven terminals marked Aerial, Earth, L.T.−, L.T.+, H.T.−, H.T+1, H.T.+2, G.B.−, G.B.+, L.S.− and L.S.+ (Belling-Lee).

One terminal strip 7 in. long to carry the battery terminals.

One push-pull switch (Benjamin or Lissen).

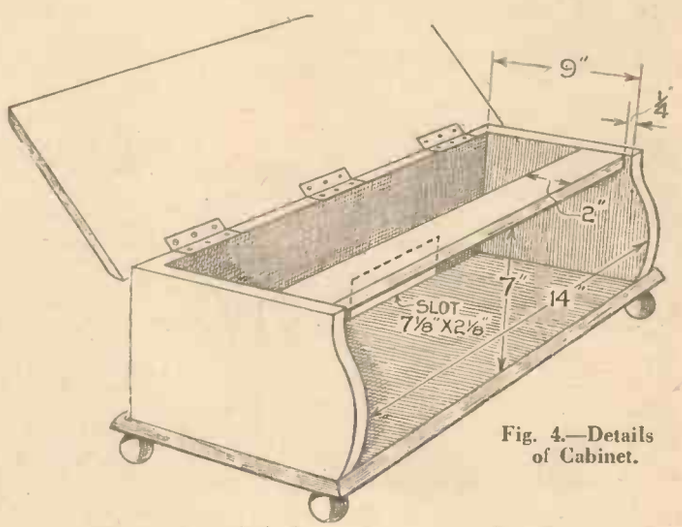


Fig. 4.—Details of Cabinet.

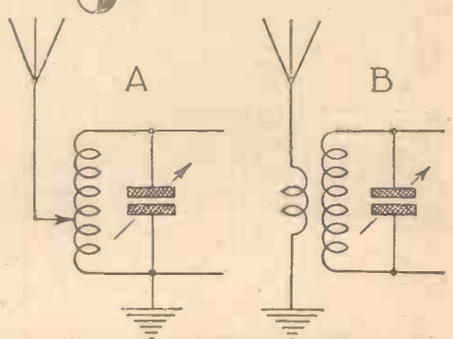
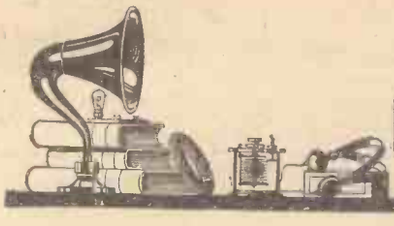


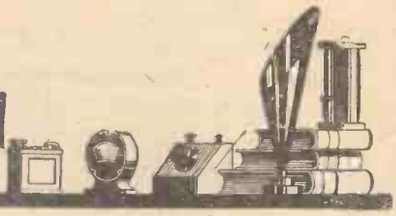
Fig. 2.—The Usual Forms of Aerial Circuit used in Modern Receivers.

The first operation in the construction is the marking out and drilling of the panel. This will be greatly facilitated by the use of the Free Blueprint which is given with this issue. The two .0005 vari-

(*Concluded on page* 226)



OUR INFORMATION BUREAU



RULES.—Please write distinctly and keep to the point. We reply promptly by post. Please give all necessary details. Ask one question at a time to ensure a prompt reply, and please put sketches, layouts, diagrams, etc., on separate sheets containing your name and address. See special announcement below.

Winding Anode Resistance.

Q.—*I want to make a wire-wound anode resistance for use in a resistance-capacity L.F. coupling, and understand that the winding should be non-inductive for best results. How can the wire be wound non-inductively?—T. L. H. (Bedford).*

A.—After determining the total amount of wire to give the required resistance, it should be divided into two equal lengths, each wound on a separate reel. The two outside ends of the wire should be joined together, and the double wire should then be wound on the resistance former as though it were a single strand. The two reels should, of course, be finished together, and when all the wire has been put on the former the remaining two ends of the wires will be the connections which are to go to the plate of the valve and to H.T. positive respectively.—B.

Charging Accumulators from D.C. Mains.

Q.—*Please explain a simple scheme whereby I can charge my accumulators from the house-lighting supply, which is 110 volts D.C.—A. B. (Kent).*

A.—The simplest scheme is to connect the mains to your accumulators through a resistance which will just pass the required charging current. If 110-volt carbon-filament lamps are used as the resistance, about 4 watts may be reckoned per candle-power. Thus if the normal charging rate of the accumulator is 2½ amperes, two 32-c.p. 110-volt carbon-filament lamps may be connected in parallel with each other, and used in series with the mains.—J. F. J.

Using a Hydrometer.

Q.—*I have recently acquired a hydrometer, and in order to make good use of it I should like to know what is the lowest permissible specific gravity of the acid when accumulator cells are fully discharged.—A. B. (Southsea).*

A.—This varies with the type of cell, but the makers' instructions should always be followed when they are available. Generally speaking, the specific gravity should not be allowed to fall below 1.18.—J. F. J.

Reducing Aerial Absorption Losses.

Q.—*I am proposing to substitute for the wooden aerial mast now in use a steel one, which will be supported by wire stays. Are any special precautions necessary in order to minimise the amount of energy that will be absorbed by mast and stays?—R. K. (Manchester).*

A.—Provided that plenty of space is available, losses due to absorption will not be serious if the free end of the aerial is not taken right up to the mast-head. The aerial wire should finish several feet from the mast, and the intervening distance be made up with rope. The stay wires can also be cut up into short lengths and joined together with insulators.—J. F. J.

An H.F. Valve Phenomenon.

Q.—*Although I can obtain good results with my four-valve receiver (1 H.F., det., and 2 L.F.), I think there must be a fault somewhere, as I find that when the filament of the H.F. valve is turned off I can still receive signals at almost the same strength as when the H.F. valve is on. I also obtain good results even when the H.F. valve is removed entirely. Can you suggest what is wrong?—J. S. (Kensington).*

A.—When using a straightforward H.F. amplifier, the effect you notice is always experienced, and it does not indicate anything radically wrong in your receiver. The signals pass to the grid of the detector valve through the capacity existing between the leads and components of the H.F. circuit. If signals are not much weaker when the H.F. valve is turned off, it indicates that the capacity coupling between the H.F. valve and the detector, via the various capacities of the wires, is excessive. Steps should be taken to space the grid and the plate connections of the H.F. valve so that stray couplings are minimised.—B.

When Asking Technical Queries—

PLEASE write briefly and to the point

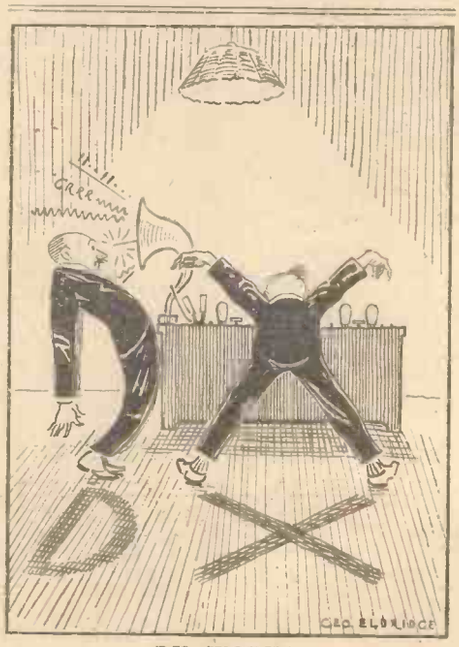
A Fee of One Shilling (postal order or postage stamps) must accompany each question and also a stamped, addressed envelope and the coupon which will be found on the last page.

Rough sketches and circuit diagrams can be provided, but it will be necessary to charge a special fee (which will be quoted upon request) for detail layouts and designs.

Improving Loud-speaker Tone.

Q.—*I have noticed the tone of a loud-speaker can often be improved by connecting a fixed condenser across its terminals. Will you please explain exactly what is the function of this condenser?—L. B. (Streatham).*

A.—The usual tendency of an L.F. amplifier is to cause distortion by accentuating the higher frequencies, and the condenser tends to correct such distortion. As it is in parallel with the loud-speaker windings, of course the condenser by-passes some of the signal energy. The reactance of a condenser decreases with an increase of frequency, and so the higher frequencies are diverted from the speaker in a greater proportion than are the lower ones. Also the condenser lowers the natural frequency of the windings, and so gives greater prominence to the lower frequencies by reason of resonance.—J. F. J.



DX WORK!

Lightning Arrester.

Q.—*I have provided a switch by which the aerial can be disconnected from the set and connected directly to earth when the set is not in use. Is there any means of protecting the set from lightning while reception is being carried out?—H. S. (Lincoln).*

A.—You can use what is known as a lightning arrester. This consists of a small spark-gap connected between aerial and earth. The weak currents due to the received signals will not be affected by the presence of the spark-gap, but high-voltage currents, such as those that might flow should the aerial be struck by lightning, would jump the gap rather than pass through the high impedance of the tuning coils.—J. F. J.

Toroidal Coils.

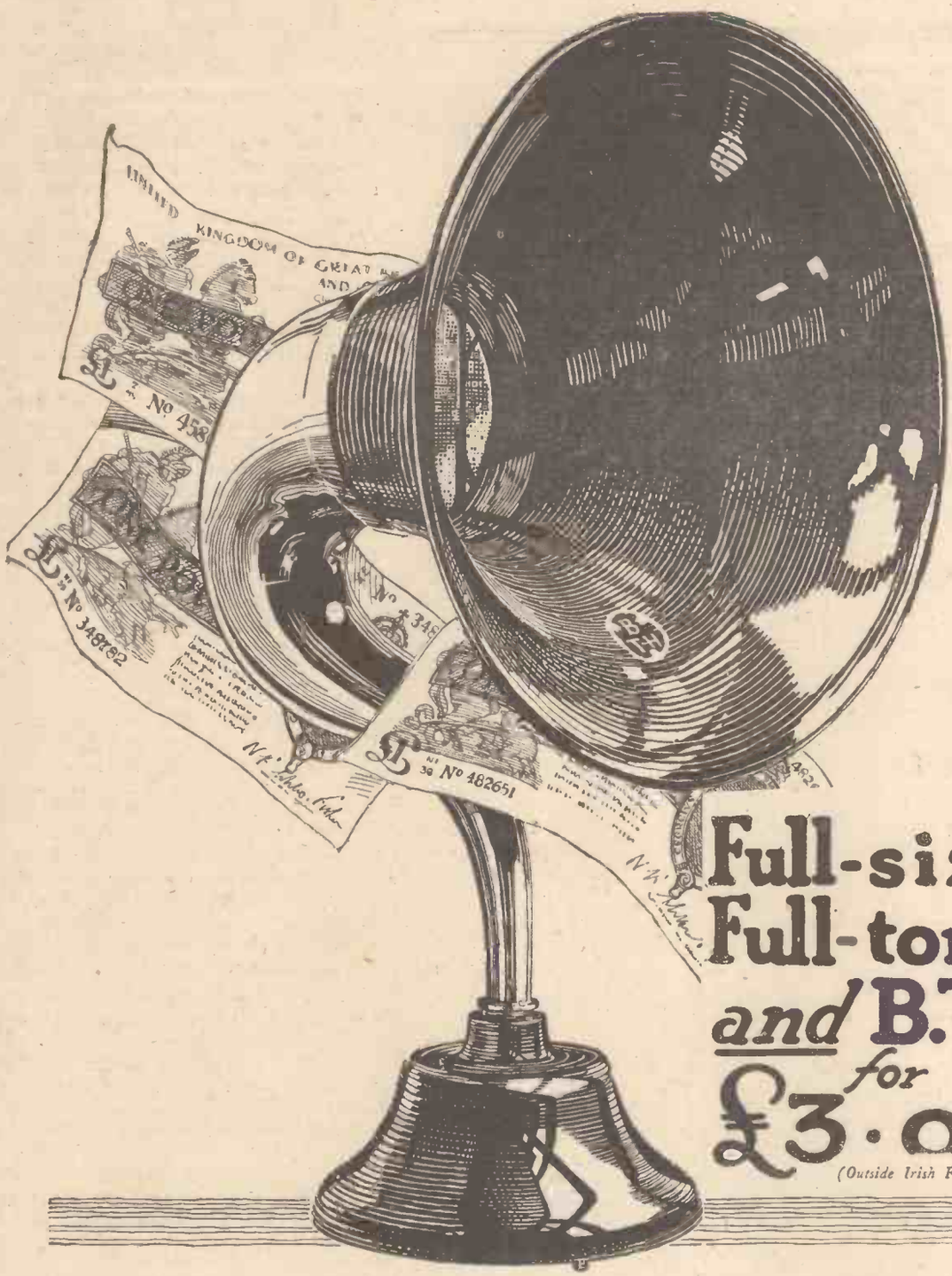
Q.—*What is a toroidal coil, and what is its special advantage?—D. S. (Essex).*

A.—A toroidal coil is really a solenoid, the length of which is great in relation to its diameter. The solenoid is bent round in the form of a circle, and the chief advantage of this method of construction is that the coil has very little external field. It is therefore very suitable for use where interaction is particularly undesirable, but it has the disadvantage of being rather bulky.—J. F. J.

Music Listener's Three.

Q.—*I am about to construct the "Music Listener's Three," appearing in "A.W.," 234. Kindly let me know why 5 Y M has used a different valve coupling between the detector and the first L.F. stage, instead of two of the Cosmos units. Would the latter arrangement give much inferior results?—S. A. (Basingstoke).*

A.—The special form of coupling for the first stage is arranged to give a high magnification and also to shift the static curve of the valve to the most favourable position for anode-bend rectification. Control of volume can be had by changing the value of the anode resistance between 1 and 3 megohms, but it should not be lowered below 1 megohm. Some improvement in the general response may be had by shunting the anode resistance with a small fixed condenser of not more than .0001 microfarad. The second coupling is, actually, of not much importance. I find that excellent results are had by making the second valve a low impedance one, and following it with a Ferranti AF3 transformer.—5 Y M.



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14 inch flare
Adjustable air gap.

FOR all its low price, the C2 can challenge comparison with loud speakers costing two and three times as much. In fact it is doubtful whether there is a better horn loud speaker at any price. Listen to a C2 at your dealer's, then consider the superlative quality of the reproduction given by this very inexpensive instrument—the only full-sized, full-toned loud speaker at or near £3.0.0

B T-H

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TYPE C.2.

Ample Stocks Available

2738

The British Thomson-Houston Co., Ltd.

RADIOGRAMS

IN order to facilitate tests to be made with the new Königsberg (Germany) 4-kilowatt transmitter, this station has exchanged wavelengths with Nuremberg, the former broadcasting on 329.7 m. and the latter on 303 m.

Motala, the Swedish high-power broadcasting station now being erected on the banks of Lake Vetter, will start its test transmissions in March. It will take over the wavelength now used by Karlsborg—namely, 1,365 m.

Similar to the principle adopted by the Bilbao station, Radio-Toulouse relays excerpts from the programmes of foreign stations almost nightly in the course of its transmissions.

The anniversary of Charles Dickens' birthday on February 7 will be the subject of a special programme, in the course of which characterisations from his novels will be given by Mr. Fred. Grove.

By special request, a repeat performance of Laurence Housman and Granville Barker's play *Prunella* will be given from Daventry on February 23.

On the occasion of the Annual Dinner of the Chamber of Shipping of the United Kingdom, at the Hotel Victoria on February 16, the Prime Minister's speech will be relayed to all stations.

Alice Delysia, who is now appearing at the Palace Theatre, will pay a return visit to the London studio on February 10.

Miss Dorothea Johnston, from California, who for many years has studied Red Indians in their reservations, will give a recital at the Cardiff station on February 10, in the course of which she will sing native songs popular among the Omahas, Navahos and Sioux.

Miss Violet Loraine is to broadcast from 2 L O on February 18; she will be remembered as the singer of the famous song "The Only Girl in the World."

In a special entertainment to be given at the London station on February 23, listeners will be given the opportunity of hearing a variety of antique musical instruments.

The White Chateau, the broadcast play written by Captain Reginald Berkeley, will be produced on the screen in the coming spring. This is the first occasion on which a play specially written for radio has been adapted for either stage or screen purposes.

Lord Balfour's address to the students of Edinburgh University next Wednesday is to be broadcast by London and Daventry.

The seventh B.B.C. National Concert from the Albert Hall will take place on February 3, when the conductor will be Hermann Scherchen, with Pouishnoff as solo pianist.

Recent experiments by Mr. J. L. Baird, the inventor of the televisor, have shown that pictures can be broadcast over 150 miles. Within a few weeks important developments are expected, involving the transmission of pictures by wireless over much greater distances.

Arrangements have been completed for the erection of a new 500-watt wireless broadcasting station in Melbourne. The station, which will be of the "B" class, will be operated from the top storey of a high building in the centre of the city. It will receive no revenue from licence fees, but will rely solely on advertising for its income. The call-sign will probably be 3 B O, and the wavelength 255 metres.

A "My Programme" burlesque by the Glasgow station staff on February 4 will be in four parts, contributed to by, respectively, "Disgusted," "Fed Up," "Bored to Tears," and "Give Us London."

Broadcast lectures to schools in the north of Scotland have now been inaugurated from the Aberdeen station. During the Spring term these broadcasts will take place each Friday. They comprise a French talk, a literary talk, and a musical interlude.

It is understood that the adjudication is now practically complete in the Scottish Radio Drama Competition of the B.B.C. The results are expected to be announced early in February.

The belief is expressed by Sir John Reith that broadcasting has achieved more in bringing about a friendly understanding amongst the different churches than any other single agency hitherto in the country. With proper co-operation from the churches, broadcasting will send people to them.

Under actual school working conditions a demonstration of educational broadcasting has been made by the B.B.C. to Edinburgh Education Authority, and is believed to have created a favourable impression.

The Polish broadcasting authorities have placed an order with an English firm for the supply of the necessary plant to erect a broadcasting station at Cattowitz (Upper Silesia). It is estimated that Poland now possesses some 100,000 wireless receiving stations, of which nearly 60 per cent. are still unregistered!

The Government of Jugo-Slavia has granted a concession to a native company authorising the installation and operation of a 2-kilowatt broadcasting station at Belgrade. Up to the present all wireless programmes have been transmitted through the telegraphy station at Rakovitza.

Fired by examples set by other French towns, the inhabitants of Caen (Normandy) recently decided to erect a small broadcasting station of their own. Within one month all the officials had been appointed and a small sum of money had been raised to defray initial expenses. It was then found that the local electricity works refused to supply power!

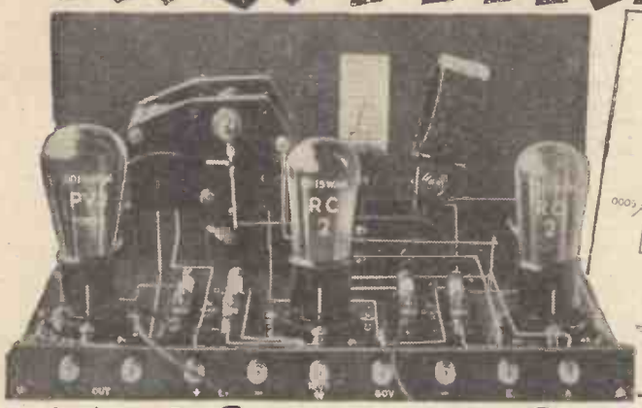
During the month of December, 1926, Germany registered a further 39,442 licence-holders, thus bringing up the grand total on January 1, 1927, to 1,376,564.

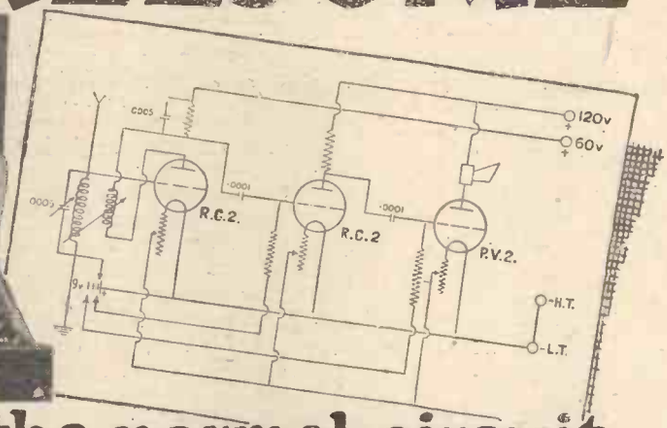
The wireless telephony plant at the Eiffel Tower military station (Paris) is undergoing reconstruction with a view to increasing its power to some 50 kilowatts. It is hoped to have the work completed by an early date in March. The new transmitter will be utilised for the broadcast, as hitherto, of weather forecasts, Stock Exchange quotations and news bulletins, as well as for the entertainments provided by *Les Amis de la Tour*.

Rumour has it that the Paris Syndicate of Electrical Industries has decided to erect in the neighbourhood of the capital another high-power station for the relay of special performances provided by outside associations. So far as information is available, the wavelength to be chosen will lie between 4,000 and 5,000 metres. In view of the new Wireless Telegraphy and Telephony Bill to be presented to the French Chamber of Deputies, by which the State would assume control of all broadcasting, it is not known whether authority for the use of the projected station will be obtained.

The *Radio Telefono-Hirmondo* — the Buda-Pesth broadcasting company — in conjunction with the Hungarian Posts and Telegraphs authorities, proposes to build a 60-kilowatt telephony transmitter on the lines of the one recently opened at Langenberg (Rhineland). Work on this new station is to be started without delay in order that it may be put on the air this year. In the meantime the power of the present Buda-Pesth station has been increased by some 30 per cent., bringing it up to 3 kilowatts. Reports of good reception have been received from the United Kingdom, Southern France and Spain.

R.C. THREESOME





Modification of the normal circuit to *increase range and selectivity*

CONSTRUCTORS have acclaimed the R.C. THREESOME as the leader of receiving sets for pure reception of the local station. In some cases, however, *additional range and selectivity* are required, and not solely a receiver for pure reception of the local station.

To meet this need a method of introducing reaction into the circuit has been devised, and in addition to providing increased range and selectivity to the constructor with a really efficient aerial, it also enables the Threesome to be used on an inefficient aerial, with first-rate results.

There are certain districts in the country which are known as "blind spots," and others where reception conditions are not good. In all these cases the modification will satisfactorily overcome the difficulties.

EDISWAN WIRELESS SERVICE

Refer your wireless problems to EDISWAN. Experts will advise you. There is no charge made. Address your queries to Service Department.

FREE BLUE PRINT & INSTRUCTIONS

In order that the R.C. THREESOME will give satisfaction even in these cases, an additional blue print (which can be laid over the original blue print) has been prepared, together with a leaflet of instructions giving details of the necessary alterations. There is no trouble whatever in carrying out the instructions.

CUT OUT COUPON AND SEND NOW!

EDISWAN

V.20

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(Publicity) 123/5 QUEEN VICTORIA STREET LONDON, E.C.4

A.W., 5/2/27

Please send, post free, presentation copies of (mark with a cross the literature required)

R.C. Threesome Instruction Book and Blue Print
R.C. Threesome Modification Blue Print and Instructions

Name .....

Address .....

PLEASE USE BLOCK LETTERS .....

CHIEF EVENTS OF THE WEEK

SUNDAY, FEBRUARY 6

London	Military Band Concert.
Birmingham	Beethoven Centenary Concert.
Cardiff	Special Service for Rugby Footballers relayed from the Cathedral, Bristol.
Glasgow	Special programme of works by contemporary composers.
Newcastle	Recital of Rutland Boughton's Music.

MONDAY

London	*The Red Pen*, short opera by A. P. Herbert.
Manchester	Tex McLeod, spinning ropes and yarns.

TUESDAY

London	Symphony Concert.
Belfast	Programme of nautical music.
Cardiff	*The Man, the Maid, and the Muddlehead*, a Cameo by Gordon McConnell.
Glasgow	Scottish Towns Series—No. 8, Kilmarnock.
Manchester	The Chamber Music of Dvorak.

WEDNESDAY

London	Programme from New Verrey's Restaurant.
Belfast	Concert relayed from the Large Hall of Queen's University.
Birmingham	City of Birmingham Police Band.
Cardiff	*The Storm*, a poetic play by John Drinkwater.
Glasgow	Govan Burgh Prize Band.
Manchester	*By Virtue of a Broadcast*, specially written for broadcasting by Frank H. Shaw.
Newcastle	*Better Times*, a Radio Revue by E. A. Bryan.

THURSDAY

London	Variety programme.
Cardiff	*Guy Weatherby's Dilemma*, a Comedy by Hilda P. K. Chamberlain.
Glasgow	*Le Villi*, an opera by Giacomo Puccini.

FRIDAY

London	Concert for school children arranged by the People's Concert Society in co-operation with the B.B.C.; Civil Service Dinner relayed from Connaught Rooms.
Newcastle	*A Tale of the Hebrides*, by D. G. Couzens.

SATURDAY

London	*Heterodyned History*, Broadcast Revue by L. du G., of *Punch*.
Birmingham	*King Arthur*, an opera by Henry Purcell.
Glasgow	Abraham Lincoln Anniversary programme.

"MAKING A REFLEX LOUD-SPEAKER" (*continued from page* 198)

cabinet is made cylindrical, as it is convenient to bend a strip of 3-millimetre three-ply wood 6-in. wide into a circle 15½ in. in diameter without any difficulty. To this body are secured six segmental pieces Y by two screws ½ in. from each end (see X in Fig. 5), and the front is glued and secured by panel pins about 3 in. pitch around the circumference. Suitable feet are then added as shown. As regard the design of the fret in the front, this is a matter of individual choice, but the one shown is simple and geometrical, and can be easily drawn on the wood for cutting out with a fret saw.

Constructional Tips

For maximum efficiency it is necessary to watch every point in the construction and in the course of preliminary experiments, and these are summarised below: (1) All nuts, washers and screws should have a coating of glue put on them before screwing up to prevent sympathetic vibration. (2) Joints made by butting one piece of material (even cardboard) should be glued before being finally held by the pasted strips of paper for the same reason as (1). (3) It is imperative that the rims of both bowls should not be secured to anything rigid, as this prevents the natural vibration of the flares and produces a certain deadness in the tone. (4) Do not put a number of coats of shellac varnish on the bowls, as this also produces "deadness"; at the most put on one coat of black indian ink on the interior for the sake of appearance. (5) Take every care in determining the relative sizes and position of bowls befofe finally assembling. H.

Since 1923 the Bulgarian authorities have made several attempts to install a broadcasting service in that country, but owing to lack of funds were unable to carry out this project. It is now reported that, simultaneously with the proposed building of a new telegraphy transmitter at Sofia, a concession will be granted for the erection and operation of a wireless telephony station. As it is not expected that a native company may be found to put up the necessary capital, it is hoped to grant the requisite authority to a foreign group of capitalists and to interest it in the revenue to be acquired by such a scheme.

We did not ask for this letter; it came to us as the spontaneous appreciation of a genuinely pleased customer

"ST. MUIR,"
LEICESTER ROAD,
NEW BARNET.

January 3rd, 1927.

DEAR SIRS,

I have pleasure in informing you that I have at last found a *perfect* "Slow Motion" dial in the "*Ormond*."

After spending a good deal of money on several well-known (*and much recommended!*) types of S M dials, and finding to my disappointment that each had a more or less serious drawback, you may well imagine how pleased I am at the moment.

I might mention that I have given the two dials now in use a very *thorough test*, and I *heartily recommend* "*Ormond's*" to any enthusiast who is really seriously interested in such components. The silky movement of the "Vernier" is quite positive —no slipping, etc., as in some makes of dials.

Although an old Radio Fan, I must admit that the dials are a revelation to me in regard to their aid to tuning—the workmanship also is above criticism in my opinion.

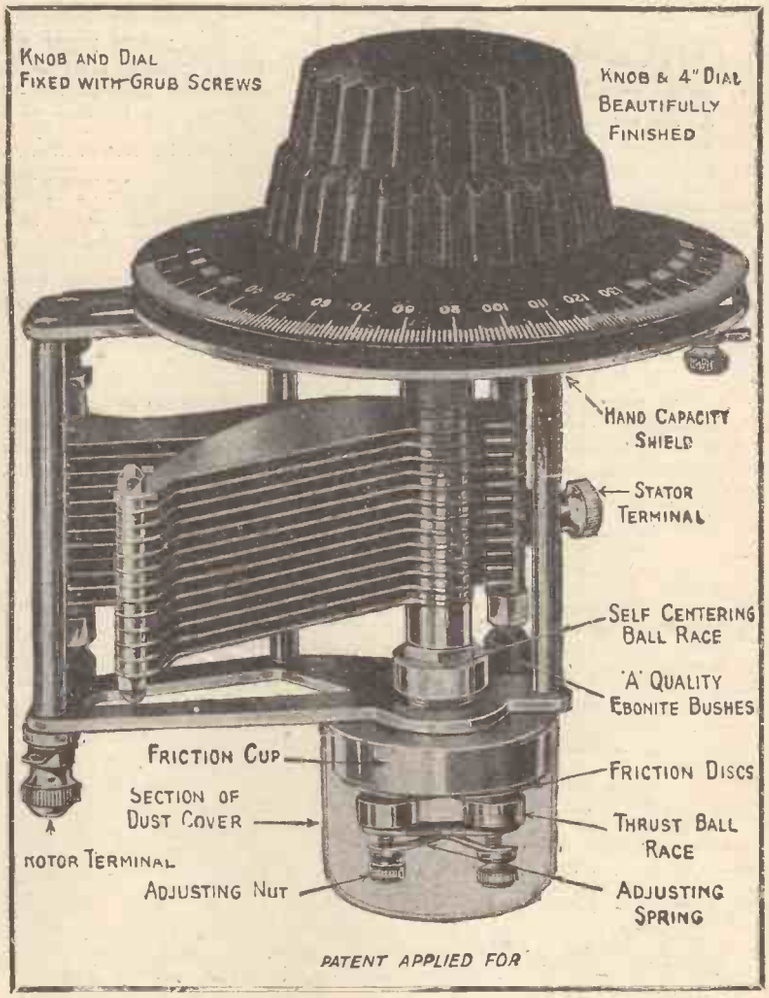
Thanking you for at last producing a really fine and much sought for Slow Motion dial that can be *relied on*.

Yours faithfully,
(Signed) F. APPLETON.

Messrs. The Ormond Eng. Co., Ltd., N.1.

P.S.—You are at liberty to make what use you like of this letter if of any service to you.

ORMOND MEANS SATISFACTION



THE ORMOND S.L.F. Condenser is all but essential now that the new "Geneva Plan" is in operation. The markings of the ORMOND Condenser dial enable listeners to pick up any station with the minimum of trouble and without any unnecessary calculations. Precise tuning adjustments with noiseless operation are ensured by the general sound construction of this popular ORMOND Product. The famous ORMOND SLOW MOTION FRICTION DRIVE (Ratio 55—1) is incorporated, and special ball bearings give liquid-like movement to every turn of the knob. This world-famous ORMOND component is easy to mount, having one and three holes for fixing, with both terminals and soldering tags for connections.

PRICES

With 4" Bakelite Knob.		With Dual Indicator Dial.	
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BROADCAST TELEPHONY

NOTE.—*In the following list of transmissions these abbreviations are observed: con. for concert; lec. for lecture; orch. for orchestral concert; irr. for irregular; m. for metres; and sig. for signal.*

GREAT BRITAIN

The times given are according to Greenwich Mean Time.

London (2LO), 361.4 m. 1-2 p.m., con.; 3.15-4 p.m., transmission to schools; 3.30-5.45, con. (Sun.); 4.15 p.m., con.; 5.15-5.55, children; 6 p.m., dance music; 6.30 p.m., time sig., news, music, talk; 8-10 p.m., music; 9.0, time sig., news, talk, special feature. Dance music daily (exc. Sundays) from 10.30 until midnight.

Aberdeen (2BD), 500 m. **Belfast** (2BE), 306.1 m. **Birmingham** (5IT), 326.1 m. **Bournemouth,** (6BM), 491.8 m. **Cardiff** (5WA), 353 m. **Glasgow** (5SC), 405.4 m. **Manchester** (2ZY), 384.6 m. **Newcastle** (5NO), 312.5 m. Much the same as London times.

Bradford (2LS), 252.1 m. **Dundee** (2DE), 294 m. **Edinburgh** (2EH), 288.5 m. **Hull** (6KH), 294 m. **Leeds** (2LS), 277.8 m. **Liverpool** (6LV), 297 m. **Nottingham** (5NG), 275.2 m. **Plymouth** (5PY), 400 m. **Sheffield** (6FL), 272.7 m. **Stoke-on-Trent** (6ST), 294 m. **Swansea** (5SX), 294 m. **Daventry** (25 kw.), high-power station, 1,600 m. Special weather report, 10.30 a.m. and 10.25 p.m. (weekdays), 9.10 p.m. (Sun.); 11.0 a.m., light music (exc. Sat. and Sun.); relays 2LO from 1 p.m. onwards.—Time sig.: 10.30 a.m., 4.0, and 10.0 p.m.

IRISH FREE STATE.

Dublin (2RN), 319.1 m. Daily, 7.25 p.m. Sundays, 8.30 p.m. until 10.30 p.m. Frequently relays sporting matches on Sundays, 3.0-5.30 p.m.

Cork (under construction), 400 m.

CONTINENT

Unless otherwise stated, all times are p.m. (G.M.T.).

AUSTRIA.

Vienna (Radio Wien), 517.2 m. (5 kw.) and 577 m. 7, con.; 9.30, dance (Wed., Sat.).

Graz, 357.1 m. (750 w.). Relays Vienna. Also own con. (Wed.), 7.10.

Klagenfurt, 272.7 m. (750 w.). Relays Vienna.

Innsbrueck, 294.1 m. (750 w.). Testing.

BELGIUM.

Brussels, 508.5 m. (1.5 kw.). 5.0, orch. (Tues., Thurs., Sat. only), news; 8.0, lec., con., news. Relay: Antwerp, 265.5 m. (100 w.).

CZECHO-SLOVAKIA.

Prague, 348.9 m. (5 kw.). Con., 7.0 (daily).
Brunn, 441.2 m. (3 kw.). 6.0, con. (daily).
Koszice, 300 m. (2 kw.). Relays Prague.
Bratislava, 263.2 m. (500 w.). Relays Prague.
Kbely, 1,110 m. (500 w.). 6.45, lec. (daily).

DENMARK.

***Copenhagen,** 337 m. (700 w.). Sundays: 9.0 a.m., sacred service; 3.0, con.; 7.0, con. Weekdays: 7.0, lec., con., news; dance to 11.0 (Thurs., Sat.).

*Relayed by Sorö (1,150 m.).

FINLAND.

Helsingfors (Skyddskar), 500 m. (500 w.).
***Tammerfors,** 368 m. (250 w.).
***Jyvaskyla,** 297 m. (100 w.).
***Porl,** 254.2 m. (100 w.).
***Oulu,** 233 m. (100 w.).
*Relay Helsingfors.

GRAND DUCHY OF LUXEMBURG.

Radio Luxemburg, 1,200 m. (250 w.). Con. 2.0 (Sun.), 9.0 (Tues.).

FRANCE.

Eiffel Tower, 2,650 m. (8 kw.). 6.40 a.m., weather (exc. Sun.); 11.0 a.m., markets (exc. Sun. and Mon.); 11.20 a.m., time sig., weather; 3.0, 4.45, Stock Ex. (exc. Sun. and Mon.); 6.0, talk, con., news; 7.0 and 11.10, weather; 9.0, con. (daily). Relays PTT, Paris, Sat., 9.10-11.0, and weekday afternoons.

Radio-Paris (CFR), 1,750 m. (about 3 kw.). Sundays: 12.0, sacred service; 12.45, con. news; 4.30, Stock Ex., con.; 8.15, news, con. or dance. Weekdays: 10.30 a.m., news, con. 12.30, con., markets, weather, news; 4.30 markets, con.; 8.0, time sig., news, con. or dance.

L'Ecole Sup. des Postes et Télégraphes (PTT), Paris, 458 m. (5 kw.). 8.30, lec. (almost daily); 9.0, con. (daily).

Le Petit Parisien, 340.9 m. (500 w.). 9.15 con. (Tues., Thurs., Sat., Sun.).

Radio L.L. (Paris), 350 m. (250 w.). Con. (Mon., Wed., Fri.), 9.30.

Biarritz (Côte d'Argent), 200 m. 6.0, con. (Mon., Wed., Fri.).

Caen (Normandy), 277.6 m. (500 w.). 9.15, con. (Mon., Fri.).

Lille, 1,300-1,500 m. Testing.

Radio-Toulouse, 389.6 m. (3 kw.). 5.30, news (exc. Sun.); 8.45, con.; 9.25, dance (daily).

Radio-Lyon, 291.3 m. (1.5 kw.). 8.20, con. (daily); 4.0 (Sun.).

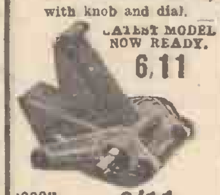
Strassburg (8GF), 222.2 m. (1½ kw.). 9.0 con. (Tues., Fri.); 9.30-12.0, dance (Sat.).

Strassburg (Military Stn.), 200.1 m. (15 kw.). Con., 9.0 (Wed.). Testing on var. wl.

Radio Agen, 297 m. (250 w.). 12.40, weather Stock Ex.; 8.0, weather, Stock Ex.; 8.30, con (Tues., Fri.).

***Lyon-la-Doua,** 475 m. (1 kw.). Own con. 8.0 (Mon., Wed., Sat.).

(*Concluded on page 224*)



"BROADCAST TELEPHONY" (*continued from page* 222)

*Marseilles, 309 m. (500 w.).
*Toulouse, 245 m. (500 w.).
*Relays of PTT, Paris.

Montpellier, 252.1 m. (1 kw.). 8.45 (Wed., Fri.).

Angers (Radio Anjou), 275.2 m. (250 w.). Daily: 8.30, news, lec., con.

Bordeaux (Radio Sud-ouest), 238 m. (1 kw.). 7.25, con. (Thurs.).

Bordeaux (Lafayette), 419.5 m. (1½ kw.). Con., 5.0, 9.0 (weekdays), 2.30 (Sun.). Relays PTT, Paris, 8.30 (Sat.).

Mont de Marsan, 400 m. (300 w.). Con. (weekdays only), 8.30.

Algiers (N. Afr.) (PTT), 310 m. (2 kw.). 7.0-10.0, daily.

Carthage (Tunis), 1,850 m. (5 kw.). 6.30, con., dance.

Casablanca (Morocco), 306.4 m. (3 kw.). 8.30, con. (daily); 10.0, dance (irr.).

Beziers, 180 m. (150 w.). 8.0.

Juan-les-Pins (Radio I.L), 230 m. (300 w.). 9.0, con., news.

GERMANY.

Berlin, on 483.9 and 566 m. 8.0 a.m., sacred con. (Sun.); 11.55 a.m., time sig., news, weather; 5.30, orch.; 7.30, con., weather, news, time sig., dance music until 11.30 (daily, exc. Tues.). Relayed on 1,300 m. by Königswusterhausen (1,300 m.) and Stettin (252.1 m.).

Königswusterhausen (LP), 1,300 m. (12 kw.). 10.30-11.50 a.m., con. (Sun.); 2.0, lec. (daily); 7.30, relay of Berlin (Vox Haus) con. (daily). 2,525 m. (5 kw.), Wolff's Buro Press Service: 5.45 a.m. to 7.10. 2,900 m., Telegraphen Union: 7.30 a.m. to 6.45, news. 4,000 m., 6.0 a.m. to 8.0, news.

Breslau, 322.6 m. (4 kw.). 11.0 a.m., con. (daily), Divine service (Sun.); 4.0, con.; 6.0, lec.; 7.30, con. Relay: Gleiwitz, 250 m.

Frankfort-on-Main, 428.6 m. (4 kw.). 5.0 to 5.15 a.m. (exc. Sun.), physical exercises; 7.30 a.m., sacred con. (Sun.); 3.0, con. (Sun.); 3.30, con.; 7.0, lec., con., weather. Dance: relays Berlin. Relay: Cassel, 272.7 m.

Hamburg, 394.7 m. (4 kw.). Relayed by Bremen (400 m.), Hanover (297 m.), Kiel (254.2 m.). Sundays: 7.25 a.m., time sig., weather, news; 8.15 a.m., sacred con.; 12.15, con.; 5.0, con.; 7.0, con. Weekdays: 6.0 a.m., time sig., weather, news; 11.55 a.m., Nauen time sig., news; 1.0, weather, con.; 8.0, con., dance.

Königsberg, 329.7 m. (4 kw.). 8.0 a.m., sacred con. (Sun.); 7.0, con. or opera, weather, news, dance (irr.). Relay: Danzig, 272.7 m.

Langenberg (Rhineland), 468.8 m. (25 kw.). Relays Elberfeld, Muenster, Dortmund, Cologne (Studio).

Leipzig, 365.8 m. (4 kw.). Relayed by Dresden (294.1 m.). 7.0 a.m., sacred con. (Sun.); 7.15, con. or opera, weather, news, dance music.

Munich, 535.7 m. (1½ kw.). Relayed by Nuremberg (303 m.). 10.30 a.m., lec., con. (Sun.); 3.0, orch. (Sun.); 3.30, con. (weekdays); 5.30, con. (weekdays); 6.15, lec., con.

Muenster, 241.9 m. (1.5 kw.). Relayed by Dortmund (283 m.). 8.0 a.m., Divine service; 11.0 a.m., news (Sun.); 6.40, news, weather, time sig., lec., con.

Norddeich (KAV), 1,800 m. 11.0 and 3 a.m., weather and news.

Stuttgart, 379.7 m. (4 kw.). 10.30 a.m., con. (Sun.); 3.30, con. (weekdays); 4.0, con. (Sun.); 5.30, time sig., news, lec., con. (daily); 8.15, time sig., late con. or cabaret. Relay: Freiburg, 577 m. (1½ kw.).

HOLLAND.

Hilversum (HDO), 1,050 m. (5 kw.). Sundays: 10.0 a.m., sacred service; 2.10, con.; 4.40, church service; 7.40, weather, news, con. Weekdays: 4.30, con.; 7.50, news, con.

Scheveningen-Haven, 1,950 m. (2½ kw.). Irr. throughout day.

HUNGARY.

Buda-Pesth (Csepel), 555.6 m. (3 kw.). 7.0, con. or opera; dance nightly.

ICELAND.

Reykjavik, 333.3 m. (700 w.). Con., 7.30.

ITALY.

Rome (IRO), 449 m. (3 kw.). 9.30 a.m. sacred con.; 4.30, relay of orch. from Hote di Russia; 4.55, news, Stock Ex., jazz band, 7.30, news, weather, con.; 9.15, late news.

Milan, 315.8 m. (1 kw.). 8.0-11.0, con.

Naples, 333.3 m. (1½ kw.). 8.0-11.0, con.

JUGO-SLAVIA.

Zagreb (Agram), 310 m. (300 w.). 7.15, con.

LATVIA.

Riga, 480 m. (5 kw.). Con. daily, 7.0. Testing on 15 kw. (1,500 m.).

LITHUANIA.

Kovno, 2,000 m. (15 kw.). 6 p.m. (daily).

NORWAY.

Oslo, 461.5 m. (1.5 kw.). 6.15, news, time, lec., con.; 9.0, time, weather, news, dance.

Bergen, 370.4 m. (1 kw.). 6.30, news, con.

*Fredriksstad, 434.8 m.

*Porsgrund, 500 m. (1½ kw.).

*Rjukan, 443 m.

*Relays Oslo.

POLAND.

Warsaw, 400 m. (2 kw.). 7.30, con.

Warsaw (High Power), 1,915 m. (10 kw.). 7.30, con.

Posen, 270.9 m. (4 kw.). Testing.

Lemberg, 247.9 m. Under construction.

RUSSIA.

Moscow (RDW), 1,465 m. (15 kw.). 4.55, news and con.; 10.0, chimes from Kremlin.

(Popoff Station), 1,010 m. (2 kw.). 6.0, con. (Tues., Thurs., Fri.).

Radio Peredacha, 420 m. (6 kw.).

Trades Union Council Station, 450 m. (2 kw.). 5.0, con. (Mon., Wed.).

Leningrad, 1,165 m. (10 kw.). 5.0.

SPAIN.

Madrid (EAJ7), 373 m. (1.5 kw.). Con. daily. Closes 1 a.m. (daily).

Madrid (EAJ4), 375 m. (2½ kw.). Con.

Madrid (Radio-Madrilena) (EAJ12). Testing on 303-310 m. (2½ kw.).

Barcelona (EAJ1), 325 m. (1½ kw.). 6.0-11.0 (daily).

Barcelona (Radio Catalana) (EAJ13), 460 m. (1 kw.). 7.0-11.0, con., weather, news.

Bilbao (EAJ9), 415 m. (500 w.). 7.0, con.

Bilbao (Radio Vizcaya) (EAJ11), 418 m. (500 w.). 8.0-12.0, con. (daily).

Cadiz (EAJ3), 344.8 m. (550 w.). 7.0-9.0, con., news. Tests daily (exc. Sun.), midnight.

Cartagena (EAJ15), 335 m. (500 w.). 8.30-10.0, con. (daily).

Seville (EAJ5), 357 m. (500 w.). 9.0, con., news, weather. Close down 11.0.

Seville (EAJ17), 300 m. (500 w.). 7.0-10.0, con. (daily).

San Sebastian (EAJ8), 346 m. (1.5 kw.). 5.0-7.0, 9.0-11.0 (daily).

Salamanca (EAJ22), 405 m. (1 kw.). 5.0 and 9.0, con. (daily). Closes down 11.0.

SWEDEN.

Stockholm (SASA), 454.5 m. (1½ kw.). 10.0 a.m., sacred service (Sun.); 5.0, sacred service; 6.0, lec.; 8.15, news, con., weather. Dance (Sat., Sun.), 8.45.

Relays.—Boden (SASE), 1,200 m.; Eskilstuna, 250 m.; Falun (SMZK), 400 m.; Gothenburg (SASB), 416.7 m.; Gefle, 204.1 m.

SWITZERLAND.

Lausanne (HB2), 850 m. (1½ kw.). 7.0.

Zurich (Hongg), 494 m. (500 w.). 10.0 a.m., con. (Sun.); 4.0, con. (exc. Sun.); 7.15, lec., con., dance (Fri.).

Geneva (HB1), 760 m. (2 kw.). 7.15, con. (weekdays). No transmission on Sun.

Berne, 411 m. (1.5 kw.). 9.30 a.m., organ music (exc. Sat.); 3.0, 7.30, con.

Basle, 1,100 m. (1½ kw.). Con. daily, 7.30.

THE "M.C. THREE," by J. H. REYNER (Continued from page 214)

able condensers are mounted at the left-hand and centre of the panel respectively, while the reaction condenser and the push-pull switch are mounted one above the other at the right-hand side. The aerial and earth terminals are on the left-hand side of the panel, and the two loud-speaker terminals on the right-hand side. The centres for the fixing of these various components will readily be obtained from the Blueprint, and no difficulty will be experienced in mounting the several components.

The baseboard layout may then be considered. Although little space has been wasted, the layout will not be found difficult to follow. The actual positions of the components should, of course, follow the layout given as closely as possible. This is particularly important in the case of the two H.F. transformers. These coils are not screened, so that there is a certain interaction between them, and this has been allowed for in the design of the receiver. The coils, therefore, should be laid out as far as possible exactly in the positions given, and here again the Free Blueprint will be of use in serving as a template for the necessary positions. Apart from this point, however, there is no need to dwell upon any particular point, and the mounting of the components is comparatively straightforward. Care must, of course, be taken to ensure that the components mounted on the panel do not foul any of those on the baseboard.

Wiring Up

The receiver may then be wired up. Commence with the filament circuits, and wire these in the manner shown. It will be seen that all the fixed resistors have been placed in a bunch together, leads being taken from this point to the respective valves. It is best to wire up the majority of the baseboard components without the panel in position, as there is a little difficulty in obtaining access to the H.F. transformers when the panel is in place.

Wire up, therefore, the remainder of the circuit, omitting the connections to the components on the panel. When this portion of the wiring has been completed the panel may be screwed in position, and the panel components duly wired in position.

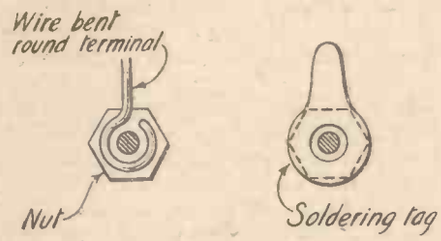
Testing Out

The receiver is now ready for testing out, and the wiring should be examined carefully in order to ensure that the circuit has been correctly connected. The receiver may then be connected up and tried out. Complete operating details, together with a full test report showing the positions at which the various distant stations may be received, will be given next week. The following preliminary details, however, will serve to enable those readers who finish the receiver before the next issue appears to carry out preliminary trials. The voltage on the detector valve should be 40 to 60 volts, while that on the H.F. and L.F. valves may be 90 to 120 volts.

The valves in use are not particularly critical. It is advisable to use a high-frequency valve in the first stage, such as the S.T.61, the D.E.5B, the P.M.5, or the equivalent of these valves in other voltage ranges. A similar type of valve may be used for the detector, or alternatively, provided the L.F. transformer is one having a very high primary impedance, one of the high-impedance new valves may be used in this place. For example, a Cosmos Blue-Spot valve is good in this position. I recently had occasion to try the S.T.61A valve, which I have found makes an excellent detector. For the last valve any reputable L.F. or power valve may be used, preferably the latter, as the volume on near-by stations obtained with this receiver is very large. The value of grid-bias, of course, will depend largely upon the valves in use.

"ARE YOUR CONNECTIONS 'LOW LOSS'"?
(*continued from page* 205)

consideration it will be evident that this is not the fact. If the wire shown in Fig. 1 is clamped between a metal contact surface and a nut, the contact pressure will depend on the surface area of the wire in contact with the nut, and also on the turning moment applied to the nut. It is, further, easy to see that the contact pressure is at maximum when the contact surface is small, so that the contact pressure with a wire will be greater for a given turning moment than with a soldering tag. Thus it can be seen that the efficiency of contact does not necessarily depend upon the surface area



Figs. 1 and 2.—Diagrams showing Contact Areas of Wire and Tag Respectively.

actually in contact. If we make the reasonable assumption that a tight contact will not deteriorate in use as much as a comparatively loose one, it follows that the bent wire is more efficient than the tag (Fig. 2).

Valve Holders

I recently examined a number of popular valve holders with the object of ascertaining whether the soldering tags provided were actually soldered on to the sockets themselves, and was surprised to find that more than eighty per cent. relied on pressure contact between the tags and the sockets. There is certainly no excuse for this state of affairs.

Out of a number of well-known receivers examined, which had been built with the best components, eighty per cent. of the connections incorporated joints which were not soldered. In fact, these receivers were almost equivalent to an experimental hook-up.

Direct Soldering Essential

To make a summary of the points outlined in this article, we have seen that in order to obtain a perfect electrical connection it is necessary to solder the joints. Loose soldering tags do not constitute a perfect electrical joint, and are unfortunately in general use at the present time. Soldered connections are of the utmost importance in the aerial and tuning circuits of the first valve. The low-frequency portion of a receiver does not call for the same care in jointing, owing to the increased amplitude of signals. The harmful effects due to pressure connections might never make themselves evident, but it is in the interest of efficiency to ensure that as many joints as possible are directly soldered.

"Water Power Plant for Country House Lighting" is the title of a most useful practical article described in "English and Amateur Mechanics" for February 4 (3d.). Other articles include: "Testing the Crystal Set's Strength," "Treating Worm in Furniture," "Making a Distant Ringing Alarm Clock," "Modern Microscopes in the Making," "A Combination Welder and Air Compressor," "Recent Commercial Inventions," "Notes and News," "Letters, Queries and Replies," "Technical Information Bureau," etc. etc.

Threshold Howling

SIR,—In reference to the complaint which has lately become known as "threshold howling" in short-wave sets, I am convinced that it is simply that with the new class of dull-emitter valves it is extremely difficult on the short waves to take the valve into oscillation gently; unless suitable measures are taken, the valve simply passes from a non-oscillating state into a state of violent oscillation. It is very simple to remedy this. Use a reliable variable grid leak (I use a Bretwood), and adjust it to a high resistance, perhaps 8 or 10 megohms; and also use a reaction condenser with a very fine vernier control. I use a micro-vernier condenser in parallel with the main condenser. It is surprising what a broad range of wavelengths can be covered with this condenser alone. I think it is proved that this is the cause of the trouble, as by using the main condenser the set will pass immediately into the howl; but by using the vernier condenser the set can be taken gently in and out of reaction.—W. H. J. (Battersea).

The "Four-advantage Three"

SIR,—In No. 241, on page 148, you state that there was a mistake in the wiring diagram of my "Four-advantage Three" receiver. I wish to point out, however, that the drawing is quite correct.

No connection should be made to the centre terminal on the coil holder, as this does not connect to anything on the coil, and is simply there as a spare in case of future developments in the coils.

The coil holder actually contains five terminals, one on either end and three on the side. The Igranic centre-tapped Xllos coils actually contain two separate coils, one being connected to one stud on the side of the coil base and the socket, and the other to the remaining stud and the plug. For use as a centre-tapped coil, the plug and socket have to be connected together, and in the Four-advantage Three this was done by connecting the plug and socket of the coil holder, as will be seen in the wiring diagram.

I trust this explanation will make the matter clear, and I am pointing it out to you as you may care to make some explanation in an early issue of AMATEUR WIRELESS.—R. H. B. (Hanwell).

A UNIQUE VIEW OF THE McMICHAEL NEUTRALISING CONDENSER.

This X-ray photograph clearly shows the internal construction of the McMichael Neutralising Condenser. The method adopted to enable a very fine and even variation of capacity to be obtained, the low self capacity and the solid construction of this popular gadget, are also made clear.

Reception from Aeroplanes

SIR,—I am one of the "comparatively few listeners" who tune in telephony from Croydon and other home and foreign stations on 900 metres. I agree with "Thermion," we shall miss their breezy remarks when morse takes the place of telephony.

On an old-fashioned (1923) five-valve set, with no variable reaction, I pick up in daylight all the English air stations in connection with Imperial Airways (Croydon, Lympne, Pulham, Calshot, Castle Bromwich). Foreign stations: Guernsey, Brussels, Ostend, Le Bourget, St. Inglevert, Abbeville, Valenciennes, Rotterdam and Cologne. (The last named is faint.)

I have heard speech from the aeroplanes from a distance of 150 to 200 miles.

It is interesting (and sometimes distinctly amusing!) to hear one machine calling another. I have heard Imperial "Beer William" over Roulers tell Imperial KZ: "I am just behind you." "Now overtaking you," etc.

On December 27 it was thrilling to follow the flight of the new D.H. Hercules G E B M X on its epoch-making flight to India, with Sir Samuel and Lady Hoare on board. At 7.45 a.m. I heard "Emma X" report leaving Croydon, and was able to pick up telephony from the machine until 9.48 a.m., when south of Le Bourget. Speech was very clear when the aeroplane was at Tonbridge, Dungeness, near Gris Nez, Paris Plage, and near Abbeville; but became fainter (though still clear) when at Beaumont and Le Bourget.—B. D. (Stock, Essex).

South African Stations

SIR,—I recently purchased a copy of AMATEUR WIRELESS, in which you refer to South African stations. The information was not very exact, and I feel it only fair to both you and your readers to have the matter placed in its proper proportion. In the first place you must realise that the Union consists of four large provinces, the largest, the Cape, being of sufficient size to put the whole of England and have room over to tuck in Wales and a large bit of Scotland. On the other hand, the white population of the whole of the Union is only a few thousand more than that of Birmingham, and that population supports three broadcasting stations.

It naturally follows that these stations are placed in those centres with the biggest

(*Continued on page 230*)

CORRESPONDENCE (*Continued from page 228*)

population, namely, Cape Town, Durban and Johannesburg, and with the exception of the latter no worse situations could be chosen. As a comparison, imagine choosing the Orkney Islands, Manchester, or rather Scarborough and Lands End, as the centres for the B.B.C.

It is also well known that the Southern Hemisphere is peculiarly liable to electrical disturbances, so that for six months in the year distant reception is very erratic, though during the winter we can obtain reception which is excellent on sets which would be considered useless for the purpose in the Northern Hemisphere.

There are many other problems which I need not go into here. With such a cosmopolitan population the arrangement of suitable programmes must be a positive nightmare to those responsible, and in my opinion I think they have succeeded remarkably well, particularly Cape Town.

As the crow flies I am placed 540 miles from Cape Town, 450 miles from Johannesburg, and 300 miles from Durban. The latter is my local station, and you can imagine my amusement at the directions so often found in radio periodicals: "First tune in to your local station." Johannesburg has about half the power in watts of the other two, but manages to get further. I don't like their programmes, so seldom listen-in.

We get all three stations on the loud-speaker with sufficient volume to be able to persuade musical friends that it was one of the new H.M.V. gramophones (I use a gramophone attachment on the gramophone), using 2 H.F. det. and 2 L.F. I have received Durban at good loud-speaker strength on o-v-1 without pushing the reaction. Generally speaking, in the winter a 1-v-1 gives excellent loud-speaker reproduction for a small room; but for all-round work I prefer an eight-valve super-het and frame aerial, which, however, has to have the volume cut down during the winter months.

I have been told, both by visitors from overseas and also by South Africans who have visited England and Europe, that we have nothing to complain of, and that, in fact, Cape Town station is in many respects superior to 2LO. I can hardly imagine anything much better, especially with respect to their relays, which are excellent.

The farming community is now waking up to the possibilities of broadcasting, and is keenly interested in the super-het, which will, however, have to be made simpler even than it is at present.—G. K. M. (Cathcart, S.A.).

"Wireless Controlled Mechanism for Amateurs."—New fields for the amateur experimenter are thrown open in the control of mechanical contrivances by means of wireless. The subject is full of interest and one which will give full scope to the man with an inventive turn of mind. Mr. Raymond Phillips, the author, who was a member of the Inter-allied Commission of Control, describes the wireless control of model airships, trains and boats, and gives some useful general information and practical hints. A chapter is devoted to stage wireless stunts. Published by Cassell and Co., and priced at 2s. 6d., the book is well written and illustrated.

It should be noted that the price of the "Short-wave Handbook," reviewed in "A.W." last week, is not 1s. 6d. as stated, but 2s. 6d.

By arrangement with the Marconi Company a wireless college has been opened at 22, Walker Street, Edinburgh. The instruction is under the same direction and supervision as that of the Caledonian Wireless College, Glasgow.

A "Calendar of Great Scots" has been inaugurated at Glasgow, in which two minutes of racy talk on the lives of famous men and women are given. Ministers, barristers, and recognised writers are compiling the series, which includes such names as Mary Slesser, Sir James Young Simpson, George Buchanan, the historian, Napier of Merchiston, Lord Braxfield, James Mac-Pherson, of Ossian, David Livingstone, James Boswell, and Sir Henry Raeburn.

"Amateur Wireless and Electrics." Price Threepence. Published on Thursdays and bearing the date of Saturday immediately following. Post free to any part of the world: 3 months, 4s. 6d.; 6 months, 8s. 9d.; 12 months, 17s. 6d. Postal Orders, Post Office Orders, or Cheques should be made payable to Bernard Jones Publications.

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Contributions are always welcome, will be promptly considered, and if used will be paid for.

Queries should be addressed to the Editor, and the conditions printed at the head of "Our Information Bureau" should be closely observed.

Communications should be addressed, according to their nature, to The Editor, The Advertisement Manager, or The Publisher, "Amateur Wireless," La Belle Sauvage, London, E.C.4.

WORTH WRITING FOR

OF special interest to the radio dealer are the new posters and leaflets, just issued by the Marconiphone Co., Ltd., of 210-212, Tottenham Court Road, W.1, illustrating the latest additions to the Marconi valve range, namely, the DEH612 and DEL612.

Magnum receivers are described and illustrated in great detail in a booklet received from Burne-Jones and Co., Ltd., of Magnum House, 296, Borough High Street, S.E.1.

C.A.C. wireless sets, valves and accessories are fully detailed in an attractive publication received from C.A.C. Valve Distributing Co., Ltd., of 10, Rangoon Street, Crutched Friars, E.C.3.

When writing for Catalogues or Kindred Trade Publications you will be sure of prompt attention if you mention "Amateur Wireless."

The Electron Co., Ltd., of Triumph House, 189, Regent St., W.1, have sent us a leaflet which gives full details of the well-known range of six-sixty valves.

From Metro-Vick Supplies Ltd., of Trafford Park, Manchester, we have received a new booklet which gives much information regarding short-path valves. Our attention is drawn to the latest additions to this range of valves, the S.P.16/R, which is a low consumption G.P. valve, and the S.P.41/U and S.P.42/U, two valve rectifiers for A.C. mains.

We have received from the General Electric Co., Ltd., of Magnet House, W.C.2, a folder giving interesting details of the Gecophone H.T. battery eliminators. These are marketed in two types—one for D.C. mains, suitable for voltages of from 100 to 120 and 200 to 240; and one for A.C. mains, a separate unit being available for a 200 to 230 volts supply, and another for 100 to 115 volts supply.

FROM the Dubilier Condenser Co., Ltd., of Ducon Works, Victoria Road, W.3, we have received the news that Commander B. L. Gottwaldt, who was in charge of the radio apparatus on the airship *Norge*, which flew over the North Pole to Alaska last year, used a wavemeter throughout the trip which was fitted with their fixed and variable condensers, taken from stock in Norway. He says in his letter: "This wavemeter was constantly in use during the whole trip, and worked very reliably the whole time, also after our arrival in Alaska."

ADVERTISEMENT INSTRUCTIONS for "Amateur Wireless" are accepted up to first post on Thursday morning for following week's issue, providing space is available.

PREPAID ADVERTISEMENTS.

Advertisements under this head are charged FOURPENCE PER WORD, minimum charge FOUR SHILLINGS.

TRANSFORMERS, Phones, Loudspeakers rewound; guaranteed efficiency 12 months, 4s. Trade invited.—Transform, 115, Links Road Tooting, London. [57

NOTICE.—If you are requiring anything Electrical, such as Dynamos, Motors, Switchboards, Cut Outs, Regulators, Batteries, Meters, Wireless Material, Generating Sets, etc. etc., it will save you pounds by dealing with us direct. We hold the greatest Government Surplus and Bankruptcy Stocks in the Country. Every article guaranteed. Please write your requirements.—T. W. Thompson & Co., Government Surplus Depot, 30/43, London Street, S.E.10. Telephone 1259 Greenwich.

FIELD-MAGNETS, Transformers, and Parts for Loud Speaker described Jan. 15th.—Star Engineering, Didsbury, Manchester.

£50 CASH PRIZE AWARDED

THREE READERS WIN £16 13s. 4d. EACH

RESULT OF CROSS-WORD No. 14.

Three coupons agreeing exactly with the sealed solution were received, and the Cash Prize of £50 has therefore, subject to the conditions, to be divided amongst the senders:—

Bray, Miss E., 19 Cantelupe Rd., Bexhill-on-Sea.
Owen, Miss M. E., Bryn, Penrhyn Devoraeth, N. Wales.
Spencer, G. T., 63 St. James's Street, S.W.1.

Cheques will be forwarded in due course.

The correct solution was as follows:—

Across:—1, Gypsy; 5, Kloof; 8, Emily; 9, Ought; 11, Elver; 13, Eo; 14, Met; 16, Ai; 17, Eras; 19, Ore; 20, Kali; 22, Rune; 23, Sir; 24, Stye; 25, Sit; 26, Beard; 28, Ear; 29, Eos; 30, Yea; 33, Leo; 35, Wit; 38, Lair; 40, Bed; 42, Dial; 44, Ain; 45, Paris; 47, Tri; 48, Pre; 49, Ravee; 50, Led; 51, Serge; 52, These. Down:—1, Grocers; 2, Pageant; 3, Yet; 4, Liberia; 5, Kye; 6, Obviate; 7, Furrier; 10, Hose; 12, Laks; 14, Moses; 15, Terry; 18, Ruin; 21, Lyam; 26, Boo; 27, Dew; 29, Eer; 31, Aid; 32, Slaps; 33, Liner; 34, Verve; 36, Title; 37, Slide; 39, Aire; 40, Baa; 41, Die; 43, Ares; 45, Pre; 46, Set.

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A STATION A MINUTE *on the* "M.C. THREE"

MORE ABOUT THIS WONDERFUL SET

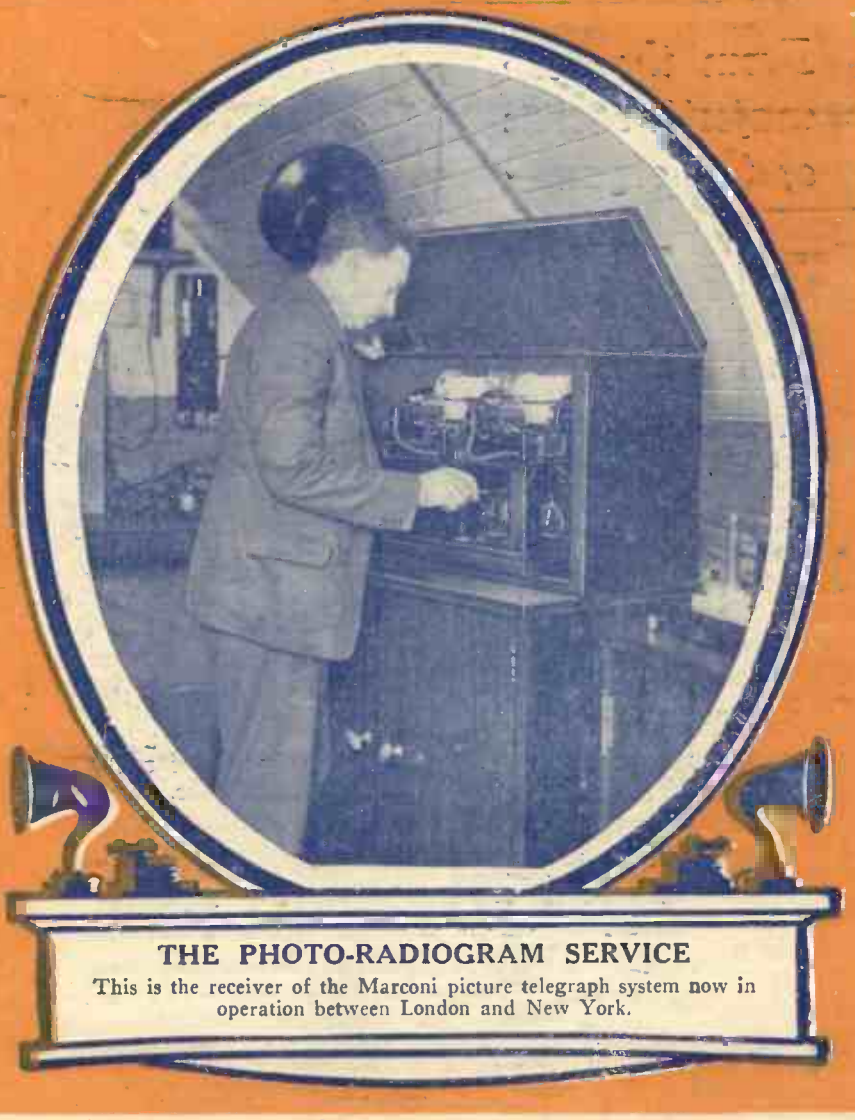
Amateur Wireless And Electrics

Vol. X. No. 244 SATURDAY, FEBRUARY 12, 1927 Price 3d

PRINCIPAL CONTENTS

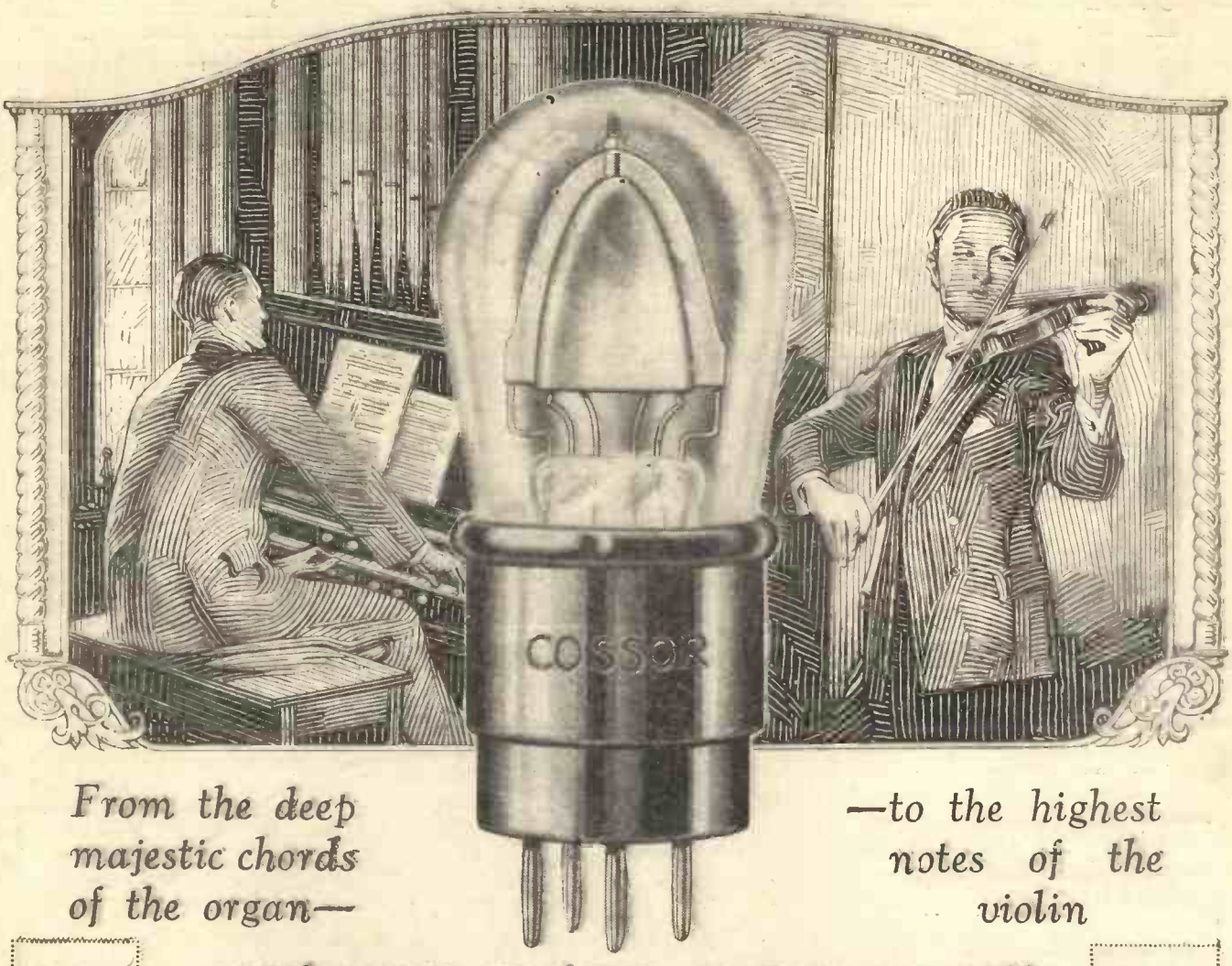
WELL ILLUSTRATED

Registered at G.P.O. as a Newspaper.



THE PHOTO-RADIOGRAM SERVICE

This is the receiver of the Marconi picture telegraph system now in operation between London and New York.



From the deep majestic chords of the organ—

—to the highest notes of the violin

The new Cossor R. C. 2 14/-

—and every register in between—all reproduced with startling realism with the wonderful new Cossor 2-volt R.C. Valve

The new Cossor R. C. 2 14/-

WIRELESS is undergoing a significant change. The latest trend is towards better tone. Quality of reproduction comes in the fore-front of every broadcast enthusiast's requirements. "Give me" he says "the voice of the living artiste—not a mechanical rendition."

Ever since Broadcasting began tonal purity has been dependent upon the use of suitable L.F. Transformers. And very few Transformers are capable of giving an equal amplification of all frequencies. Even the most expensive ones lose entirely the very low notes. How, then, can radio approximate to the original when a considerable proportion of the lower registers are missing?

But now a big change is afoot. Transformers will soon be things of the past. Experimenters have long since known that choke or resistance coupling, besides being much cheaper, gives a perfectly equal amplification of every note in the harmonic scale.

But one thing has been lacking—a suitable valve. At last even this difficulty has been removed. The wonderful new Cossor 2-volt R.C. is the solution to this 3-year-old problem. This valve—with an impedance of only 75,000 ohms, has a record amplification factor of 40—the highest yet attained. While its consumption at 1·8 units is only ·1 ampere.

Convert your Receiver at once and enjoy the living naturalness and the true beauty of every instrument—and of every voice. The cost is but little—the reward of your labour is great indeed. But be sure you use the new Cossor R.C.—no other valve has the Kalenised filament which is the real secret of its wonderful powers of reproduction.

Cossor

—the valve which serves you longest

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Gilbert Ad. 7883

Amateur Wireless

and Electrics

The Leading Radio Weekly for the Constructor, Listener and Experimenter

Edited by BERNARD E. JONES

Vol. X. No. 244 Technical Editor: J. H. REYNER, B.Sc. (Hons.), A.M.I.E.E. FEBRUARY 12, 1927

Constant Coupling Conquests—More Football Broadcasting—A Sleeping Draught!—Wireless Hotels!—On the Track!

Another Football Broadcast Coming

A RUNNING commentary will again be made on February 12, on the occasion of the England *v.* Ireland Rugby match at Twickenham. It will be relayed to London and Daventry, and taken via the wireless link by the provincial stations.

A Sleeping Draught!

A MONTANA cowpuncher, whose family consists of eight children ranging in age between six months and twelve years, recently appealed to the K O A (Denver) station to broadcast lullabies "to put my kids to sleep every night at 7.30"!

Constant Coupling Has Caught On!

FROM the large number of appreciative reports to hand from readers all over the country, it would certainly seem that our Technical Editor's latest development—constant coupling—has taken the radio fraternity by storm! Turn to another page in this issue for operating notes on the M.C.3, which, as readers know, incorporates the new constant-coupling principle.

Hotel Zum Rheinlandsender

THE opening of the German high-power station at Langenberg (Rhineland) has brought such an influx of visitors to the Hordtberg, the hill on which the transmitter has been erected, that the local authorities have decided to erect an hotel in its immediate vicinity in order to make the new broadcaster one of the show places of the neighbourhood. In view of its transmissions of a well-known dance band, in the minds of Continental radio fans 2 L O already possesses a well-known Strand hotel; further it is thought to possess a church!

OUR WEEKLY NOTE

RECTIFICATION

The great question at the moment is whether "anode-bend" rectification is worth while. Admittedly the results are purer than when a grid condenser is used, but the difference is slight. On the other hand, the difference in sensitivity is considerable.

Whether or not "anode-bend" rectification is worth the sacrifice of sensitivity is a matter which each amateur should decide for himself. It is a simple matter to arrange for either method to be used at will without any elaborate switching.

If a grid condenser (with clips for the grid leak) is wired with one side to the grid of the detector valve, and the other side to the slider of a potentiometer, a grid leak can be inserted in the clips on the condenser and the potentiometer slider set a full positive. To use "anode-bend" rectification it is merely necessary to substitute for the grid leak a piece of copper tube of the same diameter and length, and to use the potentiometer.

Chocolate Soldiers!

THE little broadcasting station now working at Luxemburg advertises a relay of a military concert given at the *Place d'Armes*, in that city, every Sunday and Thursday at 11 a.m., but only in the event of fine weather. Apparently, if it rains "there ain't goin' to be no band"!

Not To Be Missed

MOST of the B.B.C. stations will broadcast the 2 L O performance of the comic opera *Paul Jones* on February 14. The music is, as readers may remember, from the pen of Robert Planquette, composer of *Les Cloches de Corneville*, *Rip Van Winkle*, and other big successes.

Rival Broadcasting

2 H D, the experimental transmitting station operated by the Manchester Radio Society, has been broadcasting some really excellent concerts on recent Sundays. Whether these broadcasts constitute bona-fide experiments has yet to be decided by the G.P.O., and their finding will be awaited with interest by all experimenters. The owners of 2 H D maintain that since, in their opinion, they have undoubtedly improved the quality and tone of musical transmissions they *are* bona-fide experimenters, and they do not see why they should not go on improving!

Take It With You!

HAVE you ever seriously considered the undoubted advantages of a self-contained wireless set? Under the title of the "Winter Portable" is described in this issue a set which has the advantage over ordinary sets that with but little trouble it can be packed up and transplanted where you will.

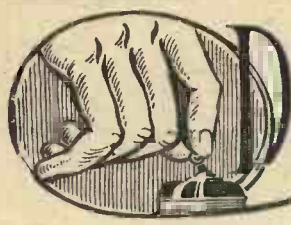
On the Track!

WINDSOR "howlers" received a shock recently, when the Post Office oscillator-locating van bore down on them as a result of complaints of oscillation from listeners in that district. Several offenders were located, and the engineers found that in every case the use of reaction was being abused. The G.P.O. officials remind listeners that the penalty for oscillating is the withdrawal of their licences!

The Foldagraph!

MR. J. H. REYNER'S latest achievement is referred to on p. 250 of this issue. It is not *all* his, inasmuch as several thousands of readers have contributed to it.

PRINCIPAL CONTENTS



Distant Control For Your Set

By 5 YM

IN very many houses the one great difficulty in the enjoyment of broadcast reception is that the set has to be somewhere in the back of the house, usually for convenience of the lead-in from the aerial and to get a short connection to the main water supply, whilst the family desires to listen in a room at the front of the house.

It is well known that the expedient of taking the amplified music any considerable distance by means of two wires is not very good if pure reception is a consideration.

Single-line Supply

The connections used for feeding the loud-speaker in the case of the "Music Listener's Three" permit the use of single-line feed, as shown in Fig. 1. All that is necessary is to take a single wire from the plate terminal (L S) of the set to the room in which it is desired to have the loud-speaker, and arrange a simple earth outside a convenient window of that room. This earth connection is made to the other terminal of the loud-speaker.

There is no necessity to make this earth connection a particularly good one. A biscuit-tin lid, or a foot of iron tube, or even an iron spike driven into the ground is quite sufficient, provided that the ground is moist. This method lends itself very conveniently to the remote control of the set from the listening end of the wire.

Most methods of remote control that have been described hitherto necessitate a complicated relay or the making of this necessary piece of apparatus.

Relay Control

Messrs. Gamage and Co., Ltd., sell a most ingenious relay which has been specially designed for filament control. It is made up on a neat box, with a small dry battery in the base. If the little press switch, which is sold with the relay, is connected to the terminals marked 2, and the battery inside the box is connected up, pressing the switch brings the relay into action by rotating a small ebonite barrel on which contact studs alternate with blank spaces. If the spring contact is on a blank space on the barrel, a press of the switch operates the magnets and brings a contact against the spring. The next press of the switch turns the barrel again, and the spring rests on a blank. If, now, the terminals marked 1 are connected, one to the L.T. negative terminal of the set and the other to the L.T. negative terminal of the accumulator, the valves of the set will light up every time contact is made on the barrel switch, and will be shut off when the spring of the relay rests on a blank space.

To work this method of remote control with the "Music Listener's Three" only three wires are necessary. Ordinary bell wire is excellent for the purpose, and three

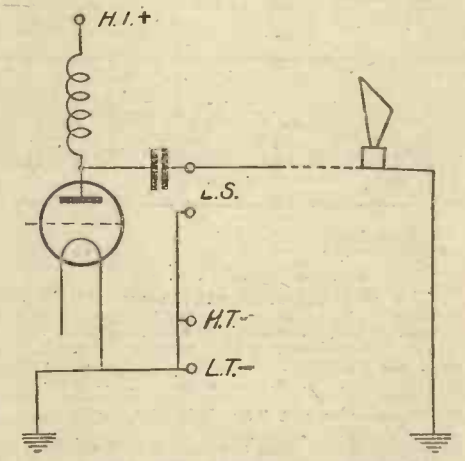


Fig. 1.—Single-line Supply to Loud-speaker.

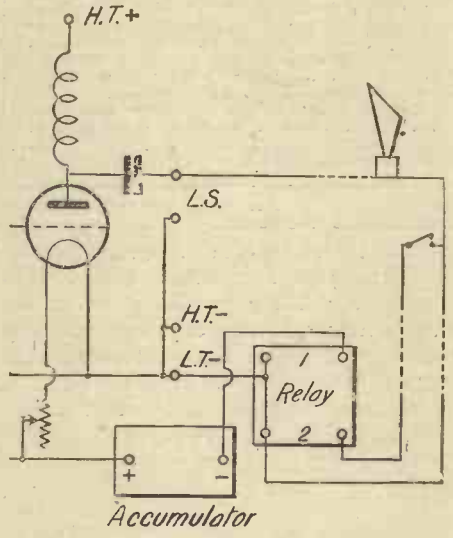


Fig. 2.—Remote Control with Relay.

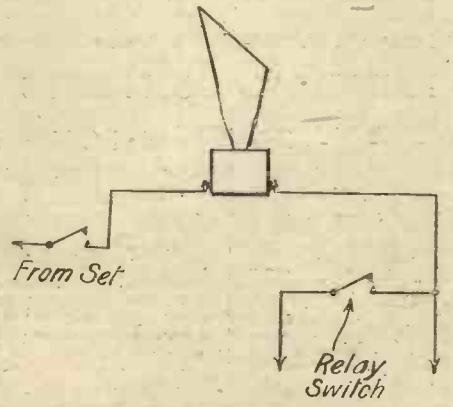


Fig. 3.—Arrangement for Alternative Loud-speakers.

lengths may be taken the necessary distance and secured to the wainscoting or a picture rail by means of staples. It will be seen, by looking at the diagram (Fig. 2), that one wire is carrying the speech and music pulsations from the plate terminal of the set, and the other loud-speaker wire is the return to the earth of the set and is also used as one wire of the relay. Now the relay wires can be quite thin, as the relay battery is only in operation for the moment during which the switch is pressed.

Alternative Loud-speakers

In cases where two or more loud-speakers are used in different rooms, and some are wanted to be in operation whilst others are required to be silent, this can be arranged for as shown in Fig. 3. Here two switches are used, the second switch being of the ordinary contact kind which remains on or off. The press switch of the relay is, of course, always off until it is pressed. The second switch is placed in the lead from the plate terminal of the set. Normally it is in the off position. If reception is desired, it is closed. If one of the other loud-speakers in the house is in operation, the loud-speaker will function immediately. If no other loud-speaker is in operation, the relay switch is pressed to bring the set to life. In closing down, the relay switch is pressed and the second switch is opened. If others are listening, they have only to press their relay again to continue the programme. 5 Y M.

THE GRAMOPHONE AND WIRELESS

IT is interesting to note that instead of killing the gramophone trade, as a great number of people predicted, wireless technique has resulted in great improvements in gramophone record reproduction, as evidenced by the latest work of the Bell laboratories in America. Here the knowledge obtained from wireless broadcasting has been applied to produce a new process for the cutting of records. This new method comprises a valve-amplification system and an electro-mechanical cutter, the whole apparatus being arranged so that all frequencies are cut in their proper proportions.

The gramophone has also received serious attention, and has been designed to have the minimum of losses by reflection, very good volume range and efficiency.

S. B.

The French Bordeaux-Lafayette broadcasting station has altered its wavelength to 419.5 metres.

The "WINTER" PORTABLE

A Miniature Receiver that You can Take Anywhere

A LARGE number of amateurs fail to realise the possibilities of a portable set, and when asked the question, "What is a portable set?" conjure up visions of a large leather-covered case containing a six- or eight-valve instrument with a Rolls-Royce car in the background. This, however, is not the case, as the ordinary amateur can build for himself a simple set which can be easily carried about. The advantages of a portable receiver are many. It can be carried from room to room; it can be used in the garden; lent to a sick friend; and taken to places where wireless has never been heard before. For testing purposes, where another receiving set has failed, or very poor results are being obtained, it is ideal.

The instrument which is to be described was primarily designed with the object of making a portable receiver for use with telephones for distant reception, and to operate a loud-speaker at reasonable distances from the local station when used in conjunction with a frame aerial and/or an earth lead. After careful consideration it was decided that, as a loud-speaker would only be used for more or less local work, compactness would be gained by not building-in the speaking unit, and further, as the majority of the potential constructors possess loud-speakers as part of their stock-in-trade, it would save the cost of another one. The frame aerial likewise is not incorporated in the cabinet.

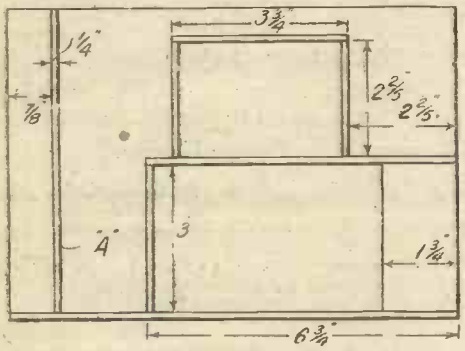
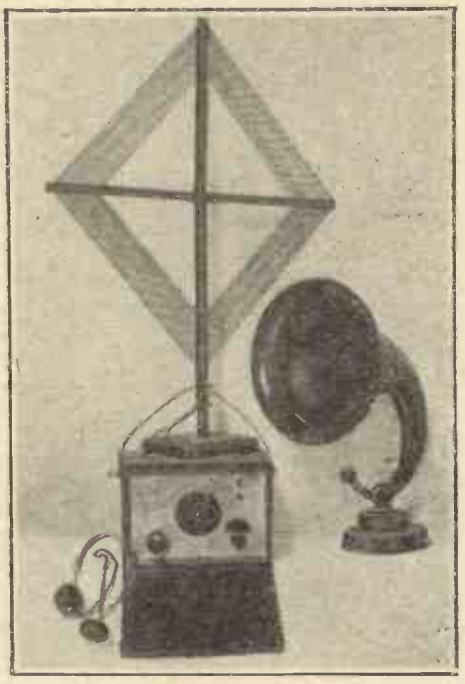


Fig. 4.—Details of Framework.

Aerial Connections

To make the set so that it could be used under all conditions, connections have been provided for outside aerial and earth also.



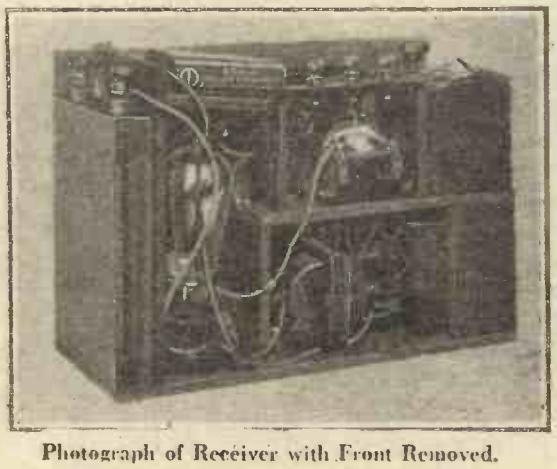
The "Winter" Portable with Frame Aerial and Loud-speaker.

The circuit adopted (Fig. 1, page 236) was selected after a large number of tests, not only due to the low voltage required for the anodes, but also to stimulate an interest amongst fellow experimenters in four-electrode valves. The DE7 Osram valves work remarkably well with a high-tension of five pocket-lamp batteries connected in series, and the filaments may be operated from a 2-volt accumulator.

Metal Panel

One novel feature is that an aluminium panel is used, this being both cheaper and lighter; it also automatically serves the useful purpose of an anti-capacity shield. Interchangeable coils allow for general reception, and the Polar series were chosen by the writer on account of their combined compactness and flexibility. Freedom of condenser backlash was eliminated by fitting a Metro-Vick vernier pulley-controlled condenser.

Before proceeding with the constructional matters, the writer would emphasise the importance of keeping to both the design and the components specified.



Photograph of Receiver with Front Removed.

Components

The following is a list of components required:

1 variable condenser, Metro-Vick vernier .0005.
1 grid condenser, Edison-Bell .0003.
1 transformer condenser, Edison-Bell .001.
1 grid leak and holder, Dubilier 2-megohm.
1 filament resistance, Edison-Bell 5-ohm.

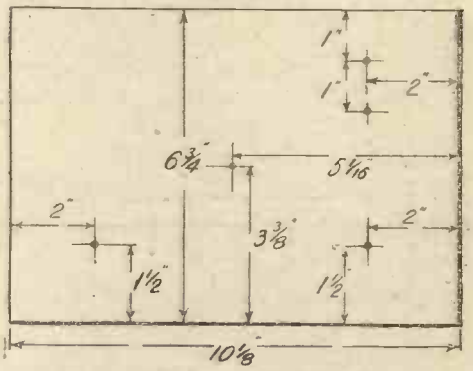


Fig. 2.—Details of Panel Drilling.

1 L.F. transformer, Kaynite 3 to 1.
1 tuning unit, Polar, with coils 400 and 500.

The Circuit

Fig. 1 gives the circuit diagram. The first valve functions as a detector, and the next valve as a low-frequency amplifier, transformer coupled. Reaction is obtained by coupling a coil from the plate circuit of the detector valve to a coil in the aerial circuit. The aerial circuit itself is tuned by a .0005 variable condenser which is placed across the frame and the aerial coil. The two valves are controlled by a single 5-ohm Edison-Bell filament resistance placed in the negative lead. The auxiliary grid and plate connections are joined to-

gether in order to simplify the set. Before wiring is commenced, special notice should be taken of the connections of the grids; in the detector, the inside grid is taken to the grid condenser, and the outside grid to the high-tension positive. The outside grid of the amplifying valve goes to the secondary of the low-frequency transformer, while the inside grid of this valve is connected to the high-tension positive. Bear in mind also that in the case of the DE7 valve the inside grid is connected to a small terminal which is fitted on the valve cap and the outside grid is joined to the grid leg.

Grid Bias

An ordinary 4½-volt pocket-lamp battery is used for grid biasing, and this is inserted between the O.S. terminal of the Kaynite transformer and the low-tension negative. Connected in this manner, not only is the consumption of the H.T. reduced, but purer results are also secured. The three terminals at the back of the instrument unit provide for either the frame or earth being connected as desired. This allows the frame aerial leads to be well away from the hands when tuning.

The grid leak is not placed across the grid condenser, but taken to the low-tension positive. This prevents the burning out of a valve filament if the grid and plate are accidentally short circuited. The grid leak holder and the grid condenser are fastened to the aluminium panel with two small bolts and nuts. The panel (Fig. 2) measures 10⅛ in. by 6¾ in., and is ⅛ in. thick. The large central ebonite knob is the main control of the tuning condenser, and on the left-hand side of the panel is the vernier controlling knob. The filament resistance, which, as previously stated, controls both the valves, is on the right-hand side; the resistance of this component should be 5 ohms. Small ebonite bushes insulate the stems of the telephone terminals from the aluminium. Constructional details of the cabinet are given in Figs. 3 and 4.

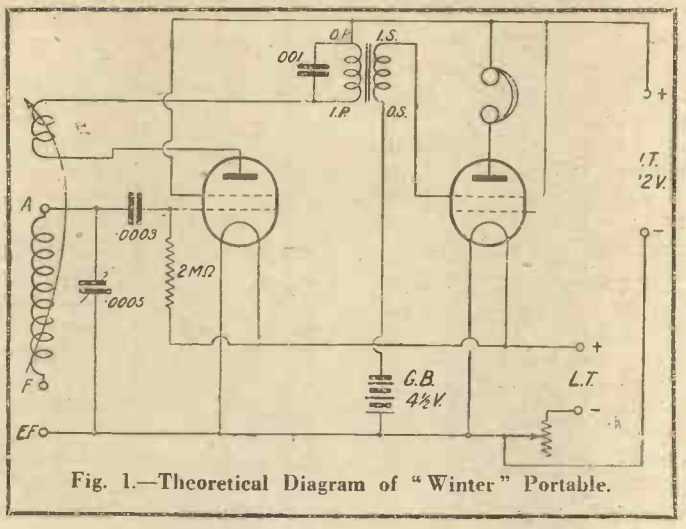


Fig. 1.—Theoretical Diagram of "Winter" Portable.

Operating the Instrument

Connect the frame aerial to the terminals F and EF, which are at the back of the instrument, or alternatively run a lead from the nearest gas or water pipe and connect it to the aerial terminal A, in the latter case short-circuiting the frame-aerial terminals. The Polar coil in the aerial circuit—according to the size of the frame used—will be either a 400 or 500. With a frame consisting of 16 turns on a 30-in. cross, a 500-coil for the aerial circuit and a 400 for the reaction can be used. If the station to be received is a weak one, better results will be obtained by lowering the value of the high-tension of the auxiliary grid of the detector valve, and also by increasing the value of the grid leak to 5 megohms. This, however, is not necessary when it is only desired to receive the local station.

A little care is needed when placing the Polar coils in position to ensure the reaction coil being put on to the spindle the correct way, otherwise the valve will not oscillate. When only a short length of wire is connected either to A or EF as the aerial, a 500-coil is suitable.

The two pocket-lamp batteries, shown in the photograph by the side of the Polar unit, are part of the high-tension; the other three batteries are beneath the shelf.

The whole of the wiring is executed with rubber-covered stranded wire.

Fig 5 shows the necessary connections when a frame aerial is used.

Results Obtained

Tested in various parts of London, the receiver gave loud-speaker results either on a frame aerial or an earth lead. At present there are no four-electrode power valves on the market, and had they been obtainable, much more volume would have been secured.

On the frame aerial a test was conducted at Keston, Hayes and Chislehurst, and loud signals were received on the phones. Loud-speaker results were then secured by throwing a piece of wire 12 yd. long over the bough of a tree.

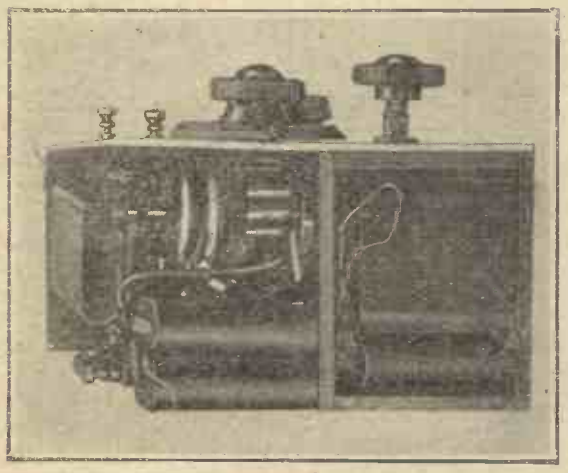
H. W. N.

GRID BIAS FROM H.T.

GRID bias can, if desired, be obtained from the H.T. battery. Move up the negative H.T. plug so that the grid bias may be taken from the negative end of the H.T. battery, inserting the grid-bias positive plug in the same socket as the H.T. negative plug or any other socket towards the negative end of the battery.

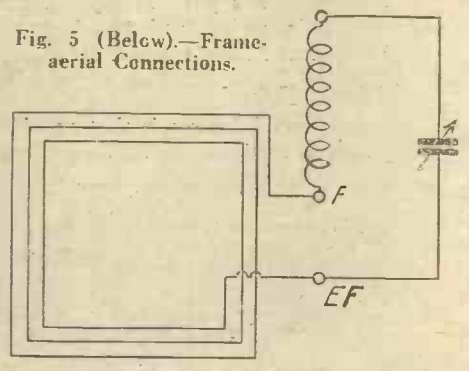
The negative grid-bias plugs may then be inserted in appropriate sockets nearer the negative end of the battery. If H.T. negative is connected to L.T. positive, the normal grid-bias voltage will have to be increased by an amount equal to the voltage of the L.T. supply, as in this case it will be equivalent to connecting the grid-bias positive to L.T. positive.

R. H. B.



(Left).—Side View of Set Showing Coils and Batteries.

Fig. 5 (Below).—Frame-aerial Connections.



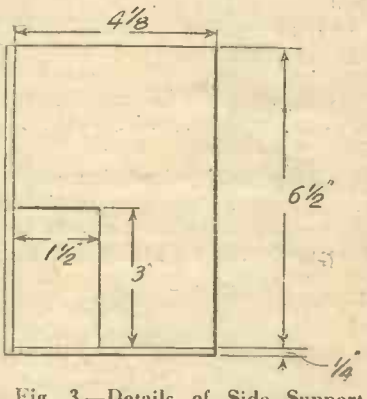


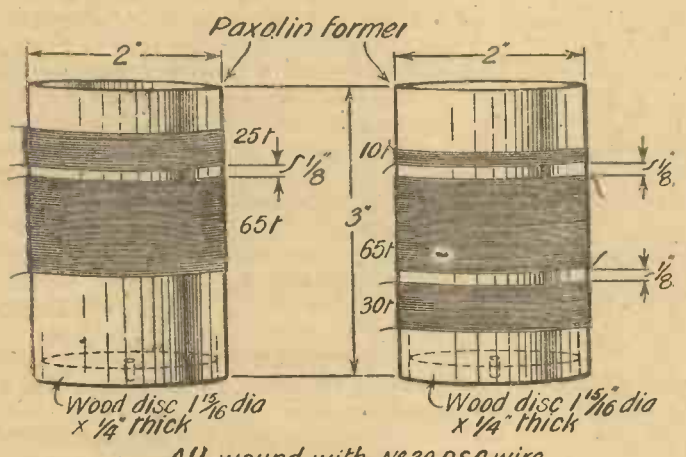
Fig. 3.—Details of Side Support for Accumulator.

MORE ABOUT The "M.C. THREE"

A Station a Minute: How to Wind the Coils: Getting the Best Results

By J. H. Reyner B.Sc. (Hons) A.M.I.E.E.

THE general description of the construction of the "M.C. Three" was given last week, and many readers, no doubt, will have built this set for themselves by now. A great deal of the success of the receiver depends upon the coils, which, as was mentioned in the last article, are specially wound to give satisfactory coupling with the circuit and layout provided. For the benefit of those readers who prefer to wind their own coils, details of the former and necessary windings are given later on in this article. It was mentioned in the previous article that the receiver had been designed to give a certain amount of sensitivity, so that a reasonably constant coupling could be obtained once the receiver had been set, irrespective of any slight deviation in the make-up of the receiver by various readers.



Dimensions of Coils and Winding Details.

It should not necessarily be expected that an absolutely constant reaction adjustment will be obtained, but it will be found that variation of the setting of the reaction condenser from the lowest point of the scale to the highest is not more than a few degrees, which is to all intents and purposes constant; and when the receiver has been nicely "hotted up" it will pull in stations by manipulating the two tuning condensers in a delightfully easy manner.

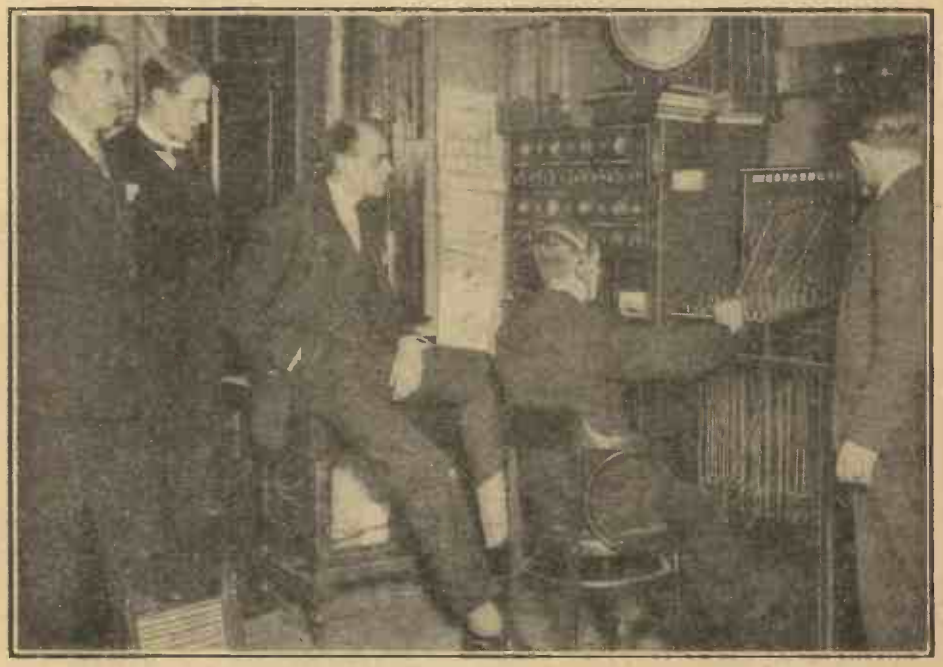
Operating the Set

The adjustment of the receiver to give its best results is a very simple matter. The various battery leads, the aerial, earth and telephones should be connected up to the appropriate terminals and the valves switched on. Set the reaction condenser about the middle of its swing, and place the two tuning condensers near the top of the scale. It will be found very convenient to do the preliminary tuning on the 600-metre ship stations, which are nearly always to be found. Now increase the reaction adjustment until the receiver is just about to oscillate.

The H.T. voltage on the detector valve should be adjusted until a smooth and easy reaction is obtained, so that the receiver slides into oscillation gently without any flopping. This is a useful feature, although in view of the liveliness of the receiver over the whole scale, it is not by any means such an important point as with the ordinary receiver. The reception of the various stations does not depend essentially upon a hairbreadth adjustment of the reaction, so that a fierce reaction control is not by any means the disadvantage that usually is the case.

At the same time, however, a smooth and easy reaction is a pleasant feature on a receiver, and the H.T. voltage tapping should be altered to obtain the best results possible. Something like 40 to 60 volts will usually give satisfactory results. It will be noted that the grid leak on the detector valve has been connected to the positive of the filament, and this will give satisfactory reception on the 2-volt valves, which are exceedingly popular at the present time. With 6-volt valves, however, it may be found that this makes the grid rather too positive, and it is a matter of a little difficulty to get smooth reaction control. In such cases it is often better to connect the grid leak to the negative side of the filament. This does not reduce the strength to anything like the extent which is popularly supposed, and it certainly does give a much more pleasant reaction control, enabling the detector valve to be worked in a more sensitive position without any danger of instability.

The voltage on the H.F. and L.F. valves, both of which are provided from the same tapping, may be raised to 90 or 120 volts. The H.F. stage, by virtue of the capacity feed in the anode circuit, is quite stable however high is the H.T. voltage. As a matter of fact, in the test report which accompanies this article 90 volts was used for this tapping and 45 volts for the



Sir John Reith, the Director-General of the B.B.C., is seen above (third from left) in the control room at the Glasgow station. On the extreme left are Mr. G. L. Marshall, the Glasgow Station Director, and Mr. D. Cleghorn Thomson, the Northern Area Director.

MORE ABOUT THE "M.C. THREE" *(Continued from preceding page)*

detector tapping. These values gave very satisfactory results.

Having adjusted the reaction condenser to make the receiver just about to oscillate, the tuning condensers should then be moved a few degrees at a time down the dial. It will then be found that numbers of stations can be tuned in one after the other, the approximate settings for different wavelengths being indicated by the test report which accompanies this article. The two tuning dials should be moved together, and it will be observed from the test report that in the upper half of the scale, at any rate, the dial readings are approximately the same. Towards the lower scale readings there is a slight falling apart, and the aerial condenser becomes 10 or 20 degrees below that of the H.F. stage.

Setting the Reaction

It may be found that as the receiver is tuned towards the bottom of the scale it commences to oscillate at some point, and the reaction adjustment should be slacked off slightly until the oscillation ceases. Continue to run down the scale, keeping the two condensers in tune until the bottom of the scale is reached. Right at the very bottom of the scale it may be found that the constant-coupling effect goes to pieces, and the reaction has to be taken right out before the receiver will stop oscillating. This, however, only occurs well below the 250-metre mark, so that it is not of any practical effect in ordinary reception.

Apart from this latter effect, however, it will be found that the reaction adjustment is nearly constant over the whole scale, and it should be left at the value required towards the bottom of the tuning condenser scale (at about 40 degrees). Various stations can then be tuned in by manipulating the two tuning dials, and it will be found in the majority of cases that adequate strength is obtained without any control over the reaction whatever. In some cases the station may be found to be a little weak, and strength may then be improved by a slight increase in the reaction condenser.

The delightful feature about the receiver, however, is that searching is carried out quite independently of the reaction adjustment, and as there are only two tuning dials to rotate, the matter is one of extreme simplicity. It will be observed that some twenty stations were obtained in a run from top to bottom of the scale, and more than half of these were sufficiently loud to operate a loud-speaker. In any case where the reception was doubtful the station was not put down, nor was it classified as suitable for the loud-speaker unless it was really good loud-speaker strength.

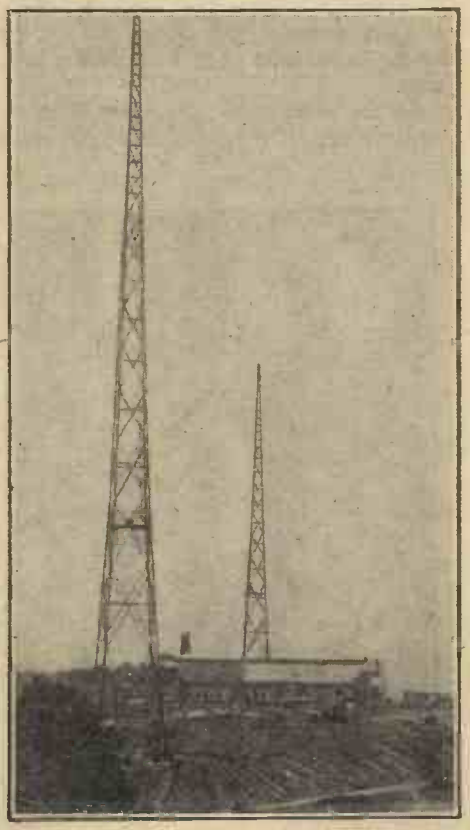
Coil Details

Details of the coils will be of interest to those who prefer to wind the coils themselves. They are constructed on 2-in. Paxolin formers, and comprise simple single-layer windings, both for the aerial coil and for the H.F. transformer. The coils are provided with small wooden discs in the bases, whereby they may be screwed down to the baseboard of the receiver. Paxolin tube has been used because it can be obtained in 2-in. diameter size readily and cheaply, although if any reader wishes to use ebonite or fibre, this may be done. The Paxolin, of course, has the least loss of any of the usual insulating materials, so that there is a small increase in efficiency derived from its use.

TEST REPORT ON THE "M.C. THREE."

Station	Wave-length	1st Dial	2nd Dial	Remarks
Gleiwitz	250	55	80	L S*
Dance music	275	80	100	Heavy mush
Edinburgh	288.5	95	115	L S
Belfast	306	110	115	L S
Newcastle	312	116	120	L S
Birmingham	326.1	127	130	L S
Nuremburg (?)	331.5	136	138	L S
London	361.4	165	165	L S
Hamburg	394.7	190	190	L S
Glasgow	405.4	200	200	L S
Unidentified	418	206	206	—
Unidentified	423	216	214	—
Frankfurt	428.6	222	220	L S
Oslo	461.5	253	250	—
Berlin	483.9	278	275	—
Bournemouth	491.8	284	280	L S
Aberdeen	500	294	290	—
Brussels	508	300	296	L S

*L S denotes loud-speaker strength.



The photograph shows the new Langenburg super-power broadcasting station which recently came into operation. Using a power of 25 kw., this German "super" transmits on a wavelength of 468.8 metres.

The H.F. coil is wound in a very similar manner to the aerial coil, except that the various coupling turns are different. The primary winding of the transformer consists of 10 turns of 30 d.s.c. wire only. There is a gap of ⅛ in., as before, and then the tuned winding, consisting of 65 turns of 30 d.s.c., is wound on the former. A further gap of ⅛ in. is left, and the reaction winding is then wound on, consisting of 30 turns of the 30-gauge wire. All these three windings are wound in the same direction from start to finish, and are also in the same direction as the windings on the first coil.

Owing to the fact that the various windings are all on the same former, the coupling between them is not as close as in the normal type of transformer where one winding is placed inside the other. It is essential, therefore, to keep the windings comparatively close together, and a space of ⅛ in. only, as marked on the diagram, should be left between the various sections of the windings.

The aerial coil carries two windings. Starting at the top of the coil, we have first of all 25 turns of 30 d.s.c. wire wound in a single layer, unspaced, as shown in the diagram. There is then a gap of ⅛ in., and then a winding consisting of 65 turns of the same gauge of wire in the same direction. This second winding constitutes the tuned winding, while the first winding is the aerial coupling coil.

Direction Important

This latter point is an important one, because there is a certain magnetic interaction between the two coils, which is impossible to avoid in the compact space provided unless screening is resorted to. As was explained in the last article, this was not done in the interest of simplicity, so that the interaction between the coils has to be arranged in a certain definite direction and allowed for in the make-up of the receiver. Thus with the particular layout given the interaction causes a slight damping effect in the receiver, which is made up for by the reaction adjustment. If one of the coils is inadvertently reversed, however, relative to the other, then this interaction is changed in direction, and uncontrollable oscillation will be produced.

This is the only point which is likely to give any trouble, and if the remainder of the layout is followed carefully some excellent results may be obtained. I have been particularly impressed by the simplicity of this receiver, and I have no doubt that many readers will be similarly impressed. I shall be very interested to hear the results obtained by readers, particularly in some of the provincial districts, where I have little doubt that the test report given will be considerably exceeded.

Edited by
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B.Sc., A.M.I.E.E.
Price 1/- Monthly

The Wireless Magazine

for February, 1927

Mr. Reyner adjusting the set.

The PUSH-PULL H.F. THREE

Designed by J. H. REYNER, B.Sc., A.M.I.E.E.

SOME OF THE CONTENTS

Free Coloured Plate

Push-pull high-frequency amplification is an entirely new development due to J. H. Reyner, B.Sc.(Hons.), A.M.I.E.E., the new Research Editor of the "Wireless Magazine." It has a number of important advantages over other methods of high-frequency amplification—it minimises the number of tuned circuits, has great electrical efficiency, simplifies the reception of distant stations, and reduces cost.

The set here illustrated—the Push-pull H.F. Three—has a remarkably neat appearance, and, with the clear and detailed diagrams supplied, is not difficult to construct. Used in conjunction with an existing note-magnifying set, it will give astonishing range and volume on a loud-speaker. Buy your "W.M." now!

SOME OF THE CONTENTS

Over Fifty Features

THIS IS A SPECIAL LOUD-SPEAKER NUMBER

On Your Wavelength!

Were You One?

I AM willing to wager that not a few dwellers in the southern parts of this country got a big fright during the thunderstorms which occurred without any warning at many places recently. During the colder months heaps of us never bother to earth the aerial when we go to bed, especially if the earthing switch is outside and the night is cold or wet. Hence, if a sudden thunderstorm arrives at this time of year, not a few wireless men spend some unhappy moments. Myself, I had a great piece of luck. My own aerial, I confess, had remained attached to the receiving set for the past three or four months, but on the night before a big storm flashed and crashed and rumbled in this part of the world something inspired me to turn over the outdoor earthing switch. Hence, when I was awakened in the early hours of the following morning by one of Nature's firework displays, I felt perfectly happy, and only hoped that my neighbours had had the same kind of brain wave. I suppose really that one ought to make a practice of earthing the aerial at all times of the year when the set is out of use, for it is not only in thunderstorms that it can become charged up to a high potential. Driving powdered snow or fine rain may have similar effects.

Good Again

The week before the thundery period we had atmospherics of the intermittent "crasher" type; then came a period during which those that made noises like the tearing of strips of American cloth were in evidence. These, though, did not last long, and at the moment of writing the ether has been as quiet as one could wish for two or three days. Reception conditions are now particularly good, large numbers of foreign stations coming in at splendid strength. Those who are fond of D X work should certainly lose no opportunity of trying round just now, for it is a long time since conditions were so good. The only drawback to D X just now is the amount of howling that is taking place.

For Crystalliser

I rather thought that when Langenberg had got really into his stride his transmissions would be receivable in good localities in this country with simple crystal sets. His strength was, as you know, nothing to write home about for the first week or so after his official opening, but after that it became very big. The station has now been received on crystal sets by hundreds of people in all parts of this country. If, therefore, you are a crystalliser, and want an alternative programme, you should, at all events, give Langenberg a trial. I am not saying that you will find him, though the odds are that, if you do not live in a place where reception is normally poor and if you have a good aerial, you may be successful.

It would be just as well, before making an attempt, to see that your gear is in thorough order, and to spend a little time in finding a really sensitive spot on the crystal. When a crystal has been in use for some little time, it is apt to lose some of its old vigour. Another German station that is quite frequently heard by crystal users is Frankfort, though his power is, in most cases, not so great as Langenberg's. At my station Langenberg's strength is not vastly inferior to 2 L O's, and very respectable crystal reception is possible with a decent aerial.

THE "A.W." FREE PRIZE BALLOT, AND THE "A.W." "BALLOT THREE"

Do not fail to read the special announcement on page 250.

Results of Piracy

It is sad to hear that the Johannesburg broadcasting station has had to close down through lack of revenue. The plain and simple reason is that wireless piracy is rampant in that part of the world, and that the Government has not taken sufficiently strong steps to enforce the payment of licence fees. Though I have never heard of its transmissions being received in this country, Johannesburg, despite its small power, achieved very long ranges in Africa; its news and entertainment programmes having been much appreciated by travellers, as well as by dwellers in out-of-the-way places. The transmitting plant is a standard ½-kilowatt Marconi unit, and the studio was always said to be one of the finest in the Dominions. Let us hope that the closing down of Jo'burg is only temporary.

QSL Cards

After some recent transmission tests I received the usual batch of QSL cards, and amongst these I perceived a new brand which I had not seen before. On inquiry I learned that this card, which bore the letters BRS, followed by a number, was the report of a receiving member of the T and R Section of the Radio Society of Great Britain. It appears that the society grants members who apply for it a BRS number, which being interpreted means a British receiving station number, and this number is used by members in their reports.

Needless to say, the identification number is very much sought after by those amateurs who are not fortunate enough to possess a transmitting licence for various reasons. It certainly gives "tone" to their reports, and classes them above the amateur who is merely seeking a card in return for the mere purpose of hanging it in his den. Of course, there is no reason why this kind of trophy hunting should not be encouraged, for it gives a zest to listening, especially on the shorter waves; and the cards make a very nice wall decoration, which increases in value as time goes on, especially if the operator is able to receive foreign amateurs. The hobby of QSL hunting is growing apace in this country, and is certainly worth indulging in if the amateur is keen enough to listen for new stations.

—and QSL Equipment

If you are contemplating in indulging in a QSL hunt you will have to build the necessary equipment to reach out to these stations, and the best thing to do is to build the very best short-wave receiver you can. Such a receiver is not an expensive proposition, seeing that the coils and chokes are very easily made by the amateur, and all the outlay involved is the cost of one or two 2-volt dull-emitter valves. I mention these valves because obviously the amateur who possesses a 6-volt valve set will not want to be for ever charging accumulators, and it is a simple matter to tap off 2 volts from almost any ordinary accumulator to feed the short-wave set. The main thing is to see that you get some good low-loss small-capacity condensers with a vernier control, and then experiment with circuits and the few components available until you get what you want.

The cost of the average short-wave receiver need not be very high, and the low-frequency transformers need not be of the pure-tone variety, for there will be very little broadcast to listen to. Having reached the best possible results, the next thing to do is to rig up the set into a working form and hook it on to any old aerial, and you will spend many hours with the phones on before you want to change again.

An advantage of these short waves is that any aerial gives quite respectable results, and there is no need to go to any great amount of trouble in erecting some-

On Your Wavelength! (continued)

thing out of the way in aerial equipment. I know an amateur who spends many evenings during broadcast listening to short-wave signals obtained from a temporary aerial slung up in the roof whilst the broadcast aerial is used by the family. He says that it is ever so much more enjoyable than listening to the various talks and lectures now put through the ether by the broadcasting stations.

W I Z

Every short-wave listener must, at some time or another, have noted with amazement the apparently everlasting activity of the United States Government station W I Z. At midnight and at noon his crystal-clear note can be heard perpetually calling "ABC." At almost any hour between, there he is, still at it. Sometimes, of course, conditions are against him, and he does not come through to this side. But one feels sure that he is working. There is a legend to the effect that "ABC" did once answer him, and that he has been heard actually working a station instead of merely calling.

The funny men of the "ham" world assert that he is ready and waiting for the Aerial Board of Control, foretold by Mr. Kipling as the ruler of the world in the year two thousand and something, and known to the characters of his stories about it as the "ABC." Whatever he is doing, he has been at it for some years now, and if ever he stops many of us will have a distinct feeling of loss.

A Transmitting Tip

Here is a little tip that may be of use to beginners in the great transmitting game, particularly those who take their power from the mains or some form of generator, and who are troubled by reports of a bad or wobbly note. The beginner's usual procedure is to tune for maximum reading on the aerial ammeter. This puts a big load on the supply, and is often the cause of all sorts of troubles.

The best thing to do is to have the aerial coil as loosely coupled as possible—anything from five inches to a foot is not too much for an aerial tuned to a harmonic—and then tune for maximum efficiency; that is, the biggest reading on the aerial hot-wire meter combined with the lowest reading on the input milliammeter. This arrangement almost always solves the problem of getting a good and steady note. But don't forget to short your aerial meter before transmitting. If you leave it in circuit, the resistance of the wire will be almost sure to give you a chirpy note.

International Call Letters

The new list of "intermediates"—that is, international call letters—put out by the United States amateurs is not likely to be accepted by European amateurs. It purports to be a list so complete that it will serve for all time; but it neglects the fact that the vast body of short-wave enthusiasts have got used to the present system of calls. For instance, any short-wave transmitter or listener knows the usual calls by heart. If he hears "FA," followed by a number and letters, he knows that the transmitting station is in French Africa. If he hears "B" or "K" or "U" or "Z," he is equally sure of the country of origin.

He would have to learn all the new intermediates by heart. Of course, that could be done in time; but the various European governments would have something to say. It is not at all likely that our own Post Office would consent to the letters "EG" instead of just "G" for Britain. Also, the new list altogether ignores national sentiments, which are very strong. It would take a great deal to persuade Austria to give up its "O," which is the initial letter of the Austrian name for the country. There are many other examples of this lack of knowledge and sympathy in the list as published.

Finding the Best Programme

It is amusing to note how broadcasting is just as susceptible to change and fashion as the theatre. The moment is seeing the total eclipse of "Revue" from our theatres, except, perhaps, one or two of the *intimé* variety. Likewise, the authorities at Savoy Hill have decided that the long concert must be reintroduced. Yet it is but six months ago that the idea of splitting up the programmes into small groups was hailed as the panacea of all ills, or at least the best compromise that could be found. It was argued that the long unbroken programme tended to boredom, while by quick changes the interest of the listener might be held, or that something to suit everyone would be found each night. Thus we had talks, interludes, short recitals, etc., splitting up the evening.

Now the policy is that of reversion. The exponents of the much split or revuesical programme have quietly dropped their panacea, and again we are to have two long concerts. I do not think that the loss of one of the fixed interludes will be mourned by many. This whole question is one of alternatives. At present there is practically no choice, but we are promised that towards the end of this year the new scheme for regional stations will be near completion.

Squaring up the Decks

Savoy Hill is slowly recovering from the effects of hammer and chisel. This time last year its long passages looked prim and neat. An air of finality had scarce settled on the premises when along came an army of workmen who proceeded to pull the newly-painted walls to pieces and uproot the carefully constructed studios.

Now, after months of chaos, the scars are beginning to heal. Some beautiful studios have been added. The large one, which traverses two floors in height, has a golden colour scheme. There are also some new ones of average size.

That Choking Feeling

These additions bear the stamp of new broadcasting ideas. They are not overdraped, and they have light and plenty of fresh air. Broadcasting has always suffered from the devastating effect a studio has upon the artistic temperament. In the past a slightly excited artiste on arrival was hushed by awesome signals, led mutely to a torture chamber, and there the wretch (sic) found that a good deal of his or her voice had been left in the lift shaft. There was also little or no air. The new studios do not retain these drawbacks.

The Frogs Who Clamoured for a King!

For some little time past Paris radio fans have been clamouring for the establishment of a high-power station, and the French press in general has devoted columns on the subject of the urgency of placing France in the forefront of the radio world. At the moment all the various organisations interested in wireless transmissions are competing for the possession of France's "loud-speaker," with the ultimate result that, so far as recent reports show, Paris should in the very near future be blessed with four stations ranging in power from 10 to 60 kilowatts.

Radio-Paris during the past three weeks has been busy testing out its new 30-kw. plant at Clichy. P T T, equally feverishly, is working on the reconstruction of its transmitter with a view to increasing its power some twentyfold, and Eiffel Tower, without undue advertisement, has been experimenting on 50 kilowatts. As if this were not deemed sufficient, a National Broadcasting Company has been launched by the Syndicate of Wireless Industries, with a nominal capital of some ten million francs; its purpose is to acquire the *St. Assise* telegraphy station with a view to its conversion to telephony. The promoters contemplate a nine-hour broadcast programme daily. The announcement of these different competitive schemes is causing considerable excitement in French radio circles, as it is feared that should all the plans mature—a consummation devoutly *not* to be wished—chaos in the ether would be complete, and considerable harm would result to the French wireless industries.

THERMION.

The TRANS-ATLANTIC TELEPHONY CAN IT BE MADE SECRET?

PERHAPS the most interesting feature of the new radio-telephone link between London and America is the use of a special type of radiation in which the pure carrier-wave is eliminated. In connection with this point some difference of opinion exists as to whether the transmitted messages can or cannot be received upon an ordinary broadcast receiving set.

Wavelength

The signals are sent out on a wavelength of 1,550 metres, so that they come within the tuning range of a standard P.M.G. aerial loaded to pick up Daventry.

It is certain that single side-band signals cannot be received intelligibly unless the missing carrier-wave is supplied or reintroduced at the receiving end. This eliminates the ordinary crystal set, which is incapable of producing local oscillations and could not therefore "detect" the original messages.

A back-coupled valve can, however, be made to oscillate, as we know only too well, and if tuned to the fundamental carrier frequency, it could in skilful hands be used to overhear the London-New York service.

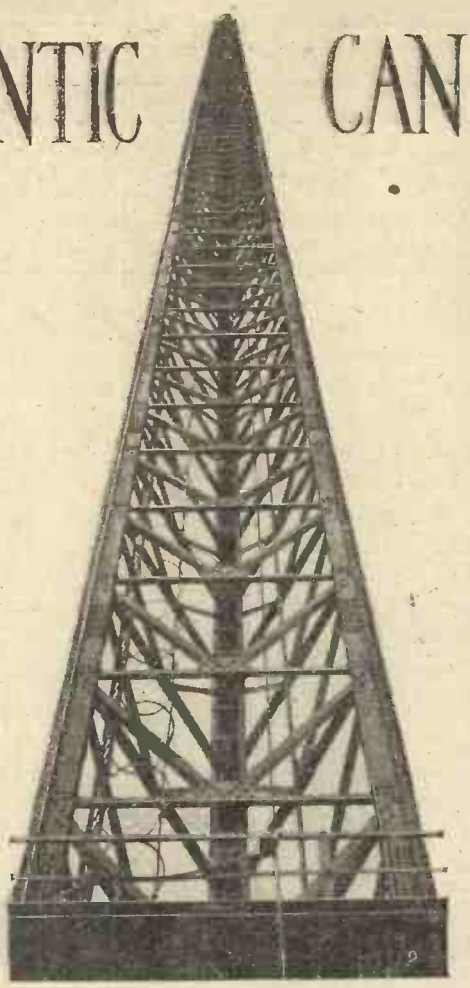
At the same time it would be difficult to intercept the messages at any considerable range without employing high-frequency amplification, which at once necessitates the use of an elaborate circuit of the super-heterodyne type. Most of the cases of long-distance "interception" recorded in the Press were no doubt secured by means of a multivalve set of this kind.

Lack of Secrecy

In any case criticisms of the new telephony service, based upon its alleged lack of secrecy, will soon lose their force. Experiments have already been made which show that it is possible to introduce complications of such a nature as to frustrate absolutely any attempt at unauthorised eavesdropping, as it is called.

One such method depends upon the use of a double or super-sonic modulation, in which either the carrier or the super-sonic frequency is continually varied or wobbled, so that detection becomes dependent upon the use of special synchronising apparatus at the receiving station.

Another comparatively simple precaution which can be taken to increase the difficulty of the outside listener is to radiate the lower instead of the upper side-band. This introduces a peculiar distortion or inversion of the original speech frequencies, which involves the use of special compensating means before clear speech can be received.



A new picture of one of the giant Aerial Masts in use at the Rugby Station. Over 800 feet high, an electric lift ascends the interior.

Sidebands

In ordinary broadcasting, when the microphone currents are superposed upon the high-frequency carrier, the resulting complex of waves can be analysed into (a) an upper side-band in which the speech currents are preserved in their original form although each frequency is increased by a fixed amount equal to the carrier frequency, (b) the carrier-wave which contains no voice frequencies, and (c) a lower side-band in which the frequencies are equal to the carrier frequency *minus* the original voice frequencies.

As these are usually broadcast simultaneously and are recombined and detected by the crystal or valve, there is no particular interest or purpose served by analysing or regarding them separately. When, however, one or the other of these components is deliberately excluded from the transmitting aerial, as is the case in transatlantic service, then a very important distinction comes into play.

As previously explained, if the upper side-band is chosen for radiation, it is only necessary at the receiving end to reintroduce the missing carrier-wave by means of a local oscillator.

If, on the other hand, by using suitable filters, only the lower side-band is radiated, then the use of a simple local oscillator does not suffice to restore intelligible speech at the receiving end.

In this case detection by means of a local oscillator will produce speech in which the high-pitched notes are inverted into low-pitched notes, and viceversa. Whilst this may not in itself ensure absolute secrecy, it goes a long way towards that end.

Receiving Apparatus

The receiving apparatus at the Houlton Station, in Maine, U.S.A., would, of course, be fitted with special demodulating valves, adapted to compensate for the deliberate inversion, and to restore the message to its clear form.

Quite apart from any question of secrecy, the use of carrier-eliminated side-band telephony has certain other definite advantages.

Although waves much longer than those now used for the London-New York service have previously been employed for wireless telegraphy, their application to the transmission of speech raises several points of peculiar difficulty as regards ether congestion.

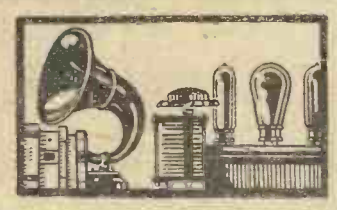
For undistorted telephony, in the ordinary way, a band of frequencies ranging from a lower limit of about 30 to an upper limit of about 5,000 is required. When this low-frequency band is modulated on a carrier-wave of 1,550 metres (194,000 cycles per second), two side-bands are produced, the lower side-band comprising the frequencies 189,000-193,970, and the upper side-band 194,030-199,000.

Thus, practically, the whole range of frequencies from 189,000 to 199,000 is occupied by one single telephony channel through the ether. In these circumstances the number of long-wave ether channels available for telephony is surprisingly small, particularly when allowance is made for the gaps already torn in the ether by existing long-wave telegraphic services.

Fortunately, the outlook is not quite so unpromising as would appear. Owing to the use of single side-band radiation, the suppression of one side-band results in two channels being made available where only one channel would exist if the full carrier were radiated.

In point of fact, the frequency range of 5,000 for the speech band necessary for undistorted reproduction could probably be reduced to 3,000 for commercial communications.

M. A. L.

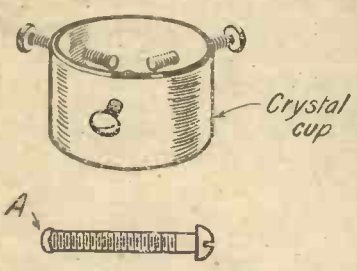


PRACTICAL ODDS & ENDS

Preventing Crystal Breakage

MANY good crystals are broken when tightening up the detector cup screws in order to make a good contact.

A simple method of preventing breakage which has been successfully used is shown in the diagram.



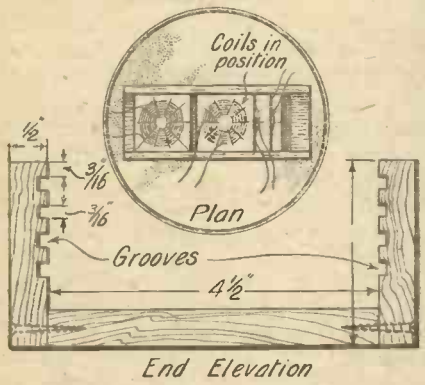
An Improved Crystal Cup.

A small blob of soft solder should be melted on to the end of each screw as shown at A.

This can be done while the screws are in the cup if the ends are first tinned. On tightening up the screws on to the crystal the solder tip will be found to give a little and hold the crystal firmly at the same time, making good contact with the latter. M. R.

A Four-way Coil Holder

IT is sometimes necessary for the experimenter to have a four-way coil holder.



Home-made Four-way Coil Holder.

Shown in the sketch is a simple method whereby four basket coils can be variably coupled together.

Three pieces of hardwood, dimensions of which are shown, are required for the coil stand. One piece is used as a base, and the other two as upright supports for the coils.

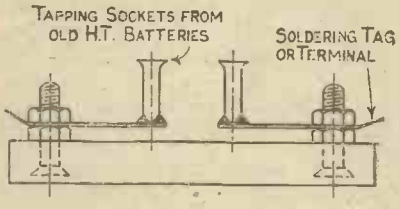
Four grooves are cut on the inside of each support, the width of which will depend on the thickness of the coils.

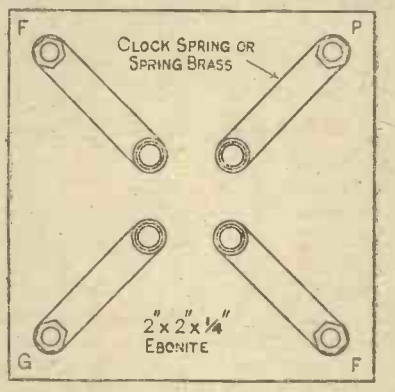
The grooves can, if desired, be arranged to take thin sheets of ebonite or wood on which can rest the coils. J. G. S.

Anti-microphonic Valve Holder

SHOWN in the drawings below is a home-made anti-microphonic valve holder, which can be made from odds and ends.

Four sockets from an old tapped H.T. battery are required. These are used as valve sockets, and if they are slightly "pinched" they will be quite efficient for the purpose.





Details of Anti-microphonic Valve Holder.

Four shaped pieces of spring brass are arranged as shown in the lower drawing, the four outer ends being connected to terminals mounted on a 2-in. square of ebonite.

If the four battery sockets are slipped on to the legs of an old valve it will be easy to solder the sockets to the inner ends of the strips of brass, so that the spacing between the sockets is accurate. R. B.

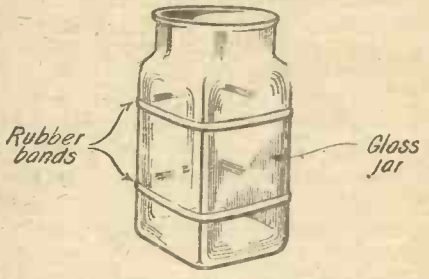
Guarding Against H.T. Battery Short-circuits

IF the H.T. battery is not enclosed in a cabinet, always stand it on its edge. It will then be impossible for people thoughtlessly to put metal ash trays, scissors, etc., across the sockets, and shorts are prevented. R. H. B.

Protecting H.T. Battery Cells

TO prevent damage to the glass container of a wet H.T. battery, the writer has successfully used rubber bands cut from an old cycle inner tube.

These are placed round every alternate



Protected Battery Container.

cell and enable the cells to be wedged firmly in the box without risk of breakage.

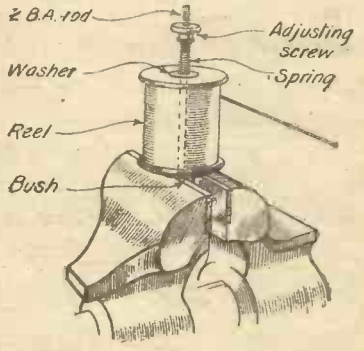
This enables the whole battery to be turned upside down (after removing the elements), when it is required to empty the cells for refilling with fresh solution.

R. M.

A Simple Coil Winder

WHEN a coil has to be wound single-handed it is necessary to improvise some method of keeping the wire taut. The sketch shows a simple coil winder which can be assembled in a few minutes.

First clamp a length of 2 BA rod in the



A Simple Coil Winder.

jaws of a vice. Then slip over this rod the reel of wire.

Over the reel slip a short coil spring, and press this against the reel with a terminal head. Washers and additional nuts can be added as desired. N. P.

A Front View of the Simplest Broadcast Wavemeter.

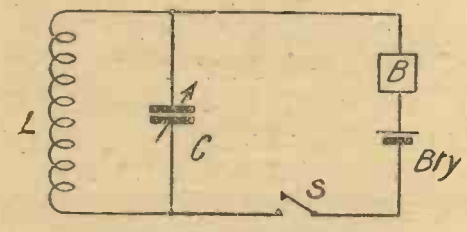


Fig. 1.—The Circuit Diagram.

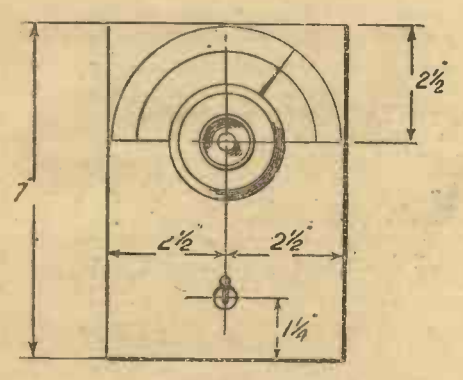
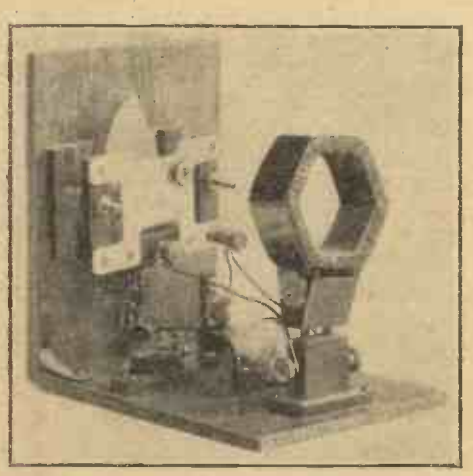


Fig. 2.—Layout of Panel.



The Simple Construction of the Wavemeter will be Apparent from this Back-of-panel View.

The SIMPLEST BROADCAST WAVEMETER

and how to make it

THE wavemeter is an almost essential accessory for anyone who goes in at all for long-distance reception, especially if his set is, as it should be if success in this line is looked for, so selective that tuning is very sharp indeed. Where there are several circuits to be kept in resonance, searching is an exceedingly difficult matter without a wavemeter, for one can never feel quite sure in moving up and down that all are exactly together unless there is some means of testing the tuning from time to time. The possession of a wavemeter, besides greatly assisting the picking up of known stations, also makes it comparatively easy to identify an unknown transmission that has been tuned in. All that one has to do is to take the wavelength of the station with the meter and then to refer to the list of regular transmissions which appears weekly in AMATEUR WIRELESS.

A Good Testing Instrument

And there is one other point of importance about the wavemeter; it enables you to determine at once whether your set is working properly or not. Suppose, for example, that you are listening to the local station and that signals die away until they finally disappear. Is your set at fault, or has there been a breakdown at the other end? Set the wavemeter buzzing and adjust its pointer to the local station's wavelength. If you hear the note as loudly as usual, the fault is not yours; but should nothing be heard, then something is wrong with your set.

The loudness of the note obtained when all circuits are tuned to resonance is also a good indication of the condition of the set. If it is heard at a good deal below normal strength, you know at once that something is wrong; probably one of the batteries is run down, or if these are fully "up," one of the valves may have lost its emission.

For the purposes of the average amateur a precision wavemeter of the laboratory type, which will read to a fraction of a metre, is quite unnecessary. To purchase or to make such an instrument would involve a considerable outlay, and in use it would not be found much more helpful than a simple instrument of the kind to be described, which can be put together for very little cost. The meter illustrated in the photographs was made up in a couple of hours, and it is quite as accurate as one can reasonably desire over the broadcast waveband. It is generally held that with such an instrument the average error to be expected is about plus or minus two per cent.; that claimed in the present instance is rather less than one per cent., though in actual working results are even better than this.

Components

Now that a new scale of broadcast wavelengths has been adopted on a frequency basis, readers must please themselves whether they use a square-law condenser, which gives practically equal spacing all round the scale of wavelengths, or a straight-line-frequency condenser, which gives similar spacing to frequencies. Whichever type of condenser is decided upon, the construction of the wavemeter is unaffected. The components required are:

Square-law (or SLF) variable condenser, .0003 microfarad (Ormond).
On-and-off flush-mounting switch (Grafton Electric Co.).
Silvertown buzzer (Grafton Electric Co.).
Baseboard-mounting single-coil holder (Grafton Electric Co.).
Single small dry cell (Ever-ready).
Mahogany or oak panel 5 in. by 7 in. by ¼ in.
Baseboard 5 in. by 7 in. by ½ in.
One No. 60 coil (Lissen).
Two small brackets (obtainable from any ironmonger).
Glazite for wiring.

The Circuit

The simple circuit is shown in Fig. 1. What happens briefly when the switch S is closed and the buzzer B set going is that every time the armature makes contact the condenser is charged up, whilst when the contact is broken owing to the armature being pulled away by the magnets, the condenser discharges through the coil L. Since L and C form a tuned circuit, this can be brought into resonance with any wavelength within the limits of the coil and condenser, and oscillations at the corresponding frequency are radiated from the coil. Thus when the wavemeter is brought near a receiving set tuned to the same wavelength, these oscillations are picked up, amplified and rectified, and then the note of the buzzer is heard.

Fig. 2 shows how the wooden panel is marked out and drilled. Having done this, mount the condenser and the switch and attach the panel to the baseboard by means of two small metal brackets. Next mount the buzzer upon a small piece of wood, ebonite or fibre, making recesses in the material for the projecting parts so as

(*Concluded on page* 264)

NEXT WEEK

The

"A.W." "Ballot Three"

Designed by

J. H. REYNER, B.Sc.(Hons.), A.M.I.E.E.

A NOVEL AND IMPORTANT GIFT

EVERY reader will remember the AMATEUR WIRELESS Free Prize Ballot, a competition which we announced in the Christmas Number published December 11 last. We asked readers to answer twelve different questions, and in due course we received many thousands of such replies, from which we have been able to extract information showing quite clearly the popular trend in receiver design.

We made over the results to Mr. J. H. Reyner, B.Sc. (Hons.), A.M.I.E.E., and he has been engaged for some time in studying them and in designing, constructing and testing a three-valver based upon the data produced by the competition. Next week he gives the result of his work to our readers in the form of a

FOLDAGRAPH

A combined full-size layout blueprint and constructional guide, absolutely complete and self-contained

The gift is something very different from anything that has yet been attempted. It is a distinct novelty and at the same time extremely useful and important. In itself it embodies all the information required to build what will prove to be an extraordinarily popular set.

When we say that the full-size layout blueprint measures no less than 20 in. x 15 in., readers will immediately see for themselves that next week's gift is of an outstanding order.

Will every reader do us the favour of ordering next week's copy at once? Special numbers such as these go out of print very rapidly and it is quite impossible to re-print to meet any extra demand that has not been anticipated. So please tell all your wireless friends and ask them all to

ORDER COPIES TO-DAY

THE FOLDAGRAPH

A combined blueprint and constructional guide GIVEN FREE with next week's AMATEUR WIRELESS - - - USUAL PRICE, 3d.

WITHOUT FEAR OR FAVOUR

A Weekly Programme Criticism by Sydney A. Moseley

IT will come as a surprise to a good many readers to know that although the B.B.C. is in the nature of being under Government auspices, the staff are the hardest worked in the Civil Service. The other night I was passing Savoy Hill on my way to the station, and I saw two of the staff coming out laden with parcels.

"Now then—what's that you're carrying?" I said in my special constable tone.

Alas! it was home-work that these fellows were carrying after a hard day's grind.

"It's the only way I can tackle this job," one of them said to me.

No doubt in the course of time these things will be altered, but readers may take it from me that it has been no mere child's play running the programmes up to now.

That, I admit, is not the concern of the public, although when you have a knowledge of such things it helps one to moderate armchair criticism.

* * * * *

Who was responsible for timing Delius's programme? Quite charming music, I am sure, and I hope the eminent composer appreciated this somewhat tardy recognition of his genius. Mr. Geoffrey Toye conducted the Wireless Symphony Orchestra for this hour's programme, and the timing was only 25 per cent. out! The result was that the popular classics had to suffer. Mr. Edward Isaacs's second Chopin pianoforte solo, the Impromptu in G flat, had to be sacrificed, as well as the Five-four Movement from the Pathetic Symphony. That is not the way to popularise unknown works.

* * * * *

By the way, those who are responsible for the news bulletin seem to have a strange idea of news value. Apparently, social events have more importance in the eyes of Savoy Hill than news items of world-wide interest. The news about China, for instance, comes after a detailed report of Lord Something-or-other's birthday. That is unmitigated snobbishness or sheer journalistic incapacity.

* * * * *

In regard to my recent criticism of the Sunday service, I am glad to say that the last studio service I heard was a great improvement. The Rev. John Bevan, of the Balham Congregational Church, is a pleasing speaker and knew when to stop. Nor was he quite so dogmatic as a good many other wireless preachers. The choir, too, sang beautifully, and, as I say, I cannot see that it is necessary for local choirs to come into the picture at all.

* * * * *

The Casano Octet made quite a good Sunday turn, and the reading of the description of the death of Socrates by Mr. J. C. Squire was simply and eloquently rendered. Although the announcement, breaking in as it did between the items of the Octet, chilled me somewhat, it wasn't very long before Mr. Squire warmed me to sincere admiration.

* * * * *

Shaw, needless to say, did the trick again. If only they could get him to be an announcer-in-chief! He made up for the controversialists, Lady Rhondda and Mr. G. K. Chesterton, who both dealt with amazing vagueness on a subject bristling with good points. Lady Rhondda, for instance, spent a quarter of her time in an unnecessary introduction, while G.K.C. went well beyond his time, and only succeeded in entertaining us with his own inimitable chuckles. It is a curious thing that these broadcast debates from the Kingsway Hall have been rich in names but dismally weak in debating points. However, it was an hour well worth while, if only for Shaw's sake.

* * * * *

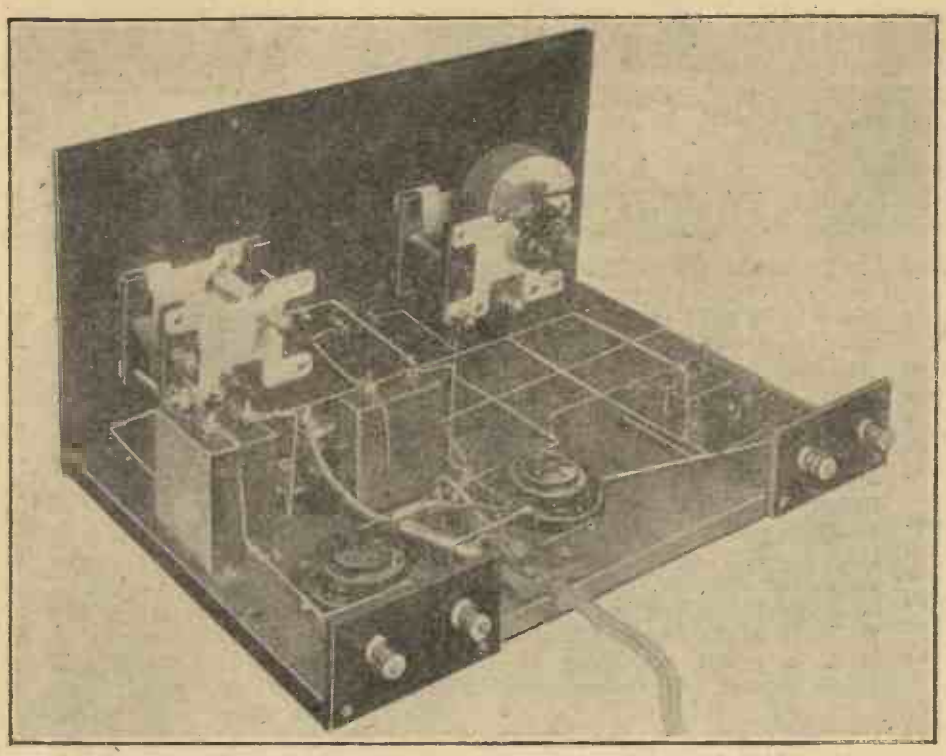
I would have given anything to have heard the comments of a good many listeners on the Stravinsky broadcast. The introductory apology to listeners that some of the notes might *seem* to be out of tune was not borne out. I found the weird music fascinating, and the play itself was admirably read. In the room with me were half a dozen low-brows, and I apologised for keeping the wireless on. "Not at all!" was the hearty reply. "This stuff is much better than your Bach fugues and things." Which surprised me not a little.

* * * * *

It is a pity that Captain Harry Grahame's "Ought the children — or not?" developed into a reading instead of a talk. When I first made my appearance before the microphone, it was pointed out to me very earnestly that one should try and be as conversational as possible. I find that this excellent rule has been forgotten of late.

LADY RHONDDA TILTS WITH MR. CHESTERTON.

George Bernard Shaw presided at a debate relayed from Kingsway Hall and broadcast from 2LO. The subject of the debate was "Is there a menace associated with women of the leisured class?"



The Simplicity of the Receiver is apparent from this Photograph.

THE "SAFEG

Oscillation Wi

By PAUL

SEVERAL circuits have been devised for preventing radiation from a receiving aerial, but for the most part they are complicated, and have necessitated very careful arrangement and adjustment of the apparatus. A very large number of experimenters normally pick up distant stations by using direct reaction from the detector valve into the aerial circuit. This being the case, the writer carried out some experiments with a view to arriving at a circuit which, although directly oscillating in the aerial circuit, would radiate only to a very small extent.

A Simple Principle

We know that the greater the power we apply to an oscillating valve the greater will be the radiation, and, of course, the greater will be the amount of interference which will result. What we have to do, therefore, is to see if we can make the power supply to the oscillating valve in the aerial circuit so small that the resulting radiation will not be sufficiently powerful to carry any appreciable distance.

Fig. 1 (p. 254) shows a circuit which fulfils these conditions. Actually it looks perfectly straightforward, and the success of the arrangement simply depends upon the values which are chosen for the various components. If we want to make the power expended in the valve very small, it means that we must work at a very low anode current, which, in turn, necessitates the use of a very low voltage. The first step, then, is to use a very high impedance valve. A high-impedance valve, however, is conveniently coupled by means of a resistance, and since we have, therefore, to use a high-impedance resistance-coupled valve, we can conveniently employ bottom-bend rectification.

If a valve is to rectify efficiently in this manner when the aerial circuit is connected to the negative end of the filament, we require a very low anode voltage, and we can obtain this by feeding the anode through a high resistance of the order of anything from 100,000 to 250,000 ohms, using a high-tension voltage of the order of 20 to 25 volts. Under these conditions the valve functions extremely well as a detector of weak signals, i.e. under conditions when reaction and actual oscillation may be required.

In Fig. 1 the reaction coil L2 is shown in series with a coupling resistance R1, which has to be shunted by a by-pass condenser C2. The valve is not connected directly to the grid, but is taken to a tapping on the aerial inductance. This arrangement, of course, is optional, but tends to minimise still further the radiation from the circuit. It is interesting to note that under normal working conditions the anode current is not milliamps, but only a comparatively few microamps.

Some Experiments

A set embodying this circuit was allowed to oscillate, and was connected to an aerial parallel with and about twelve yards from another similar aerial. No howling (trace of radiation) was experienced when listening on the other aerial.

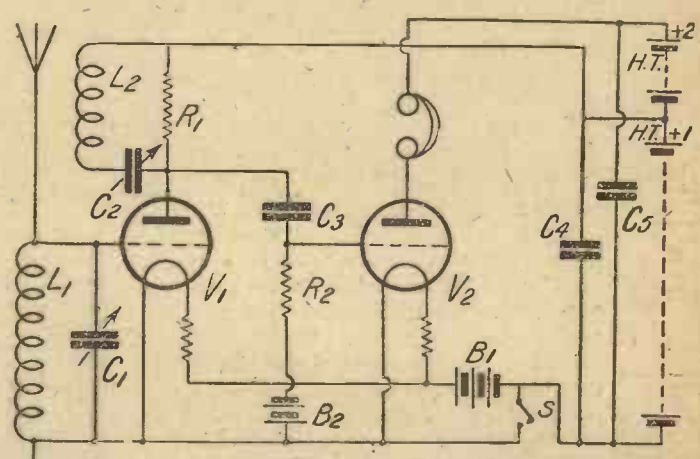


Fig. 2.—The Circuit Diagram.

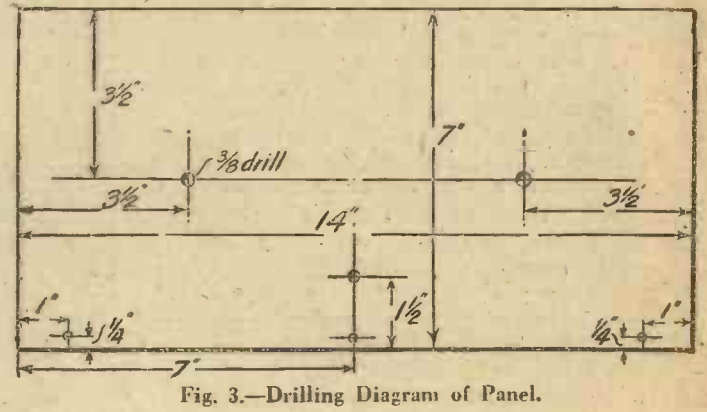
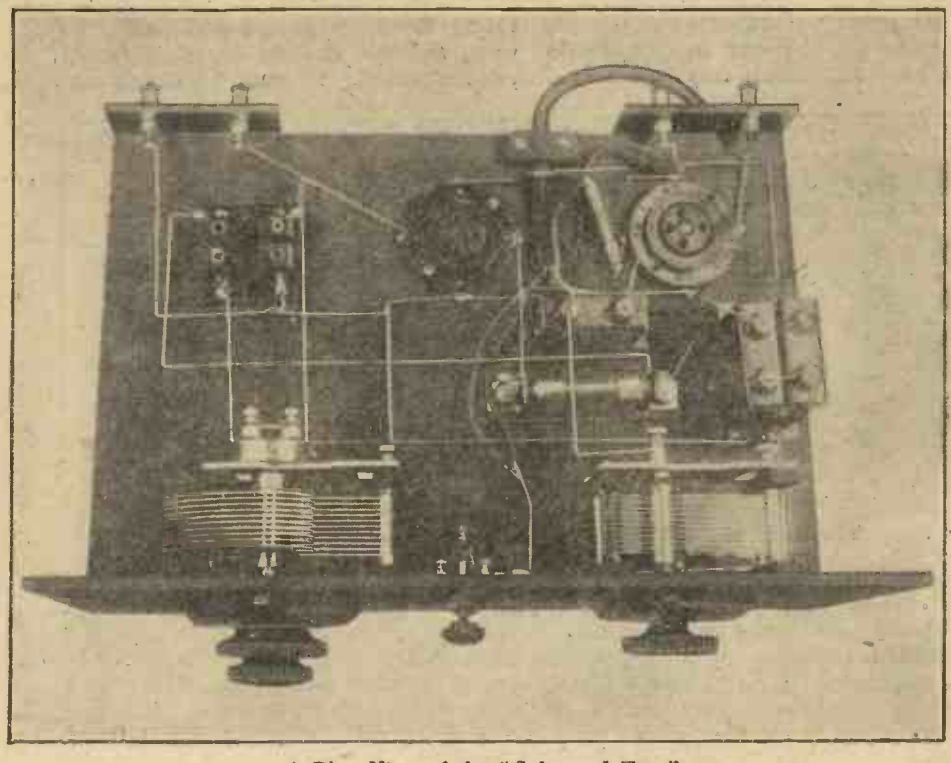


Fig. 3.—Drilling Diagram of Panel.

UARD TWO"

thout Howling

D. TYERS



A Plan View of the "Safeguard Two."

although when the other aerial, which was used with an ordinary type of oscillating valve receiver, was caused to radiate it completely interfered with the reception on the special circuit. Tests were also made at greater distances, but again no appreciable radiation was experienced. The oscillating valve in the special circuit which has just been described must be a very high resistance valve. A Cosmos short-path blue spot valve is a suitable example of a two-volt valve, while a SP55/B, DE5B or PM5A are suitable 6-volt valves.

The Circuit

Fig. 2 shows a two-valve receiver utilising the circuit arrangement shown in Fig. 1. The reaction is controlled by a variable condenser C2, the reaction coil being permanently fixed at the side of the aerial coil L1. The reaction circuit L2 C2 is a shunt arrangement, and is connected across the coupling resistance R1 (250,000 ohms).

If desired, of course, an ordinary series reaction coil variably coupled to the aerial coil may be used instead, and does not affect the arrangement at all, except, of course, that a by-pass condenser of about .0003 microfarad must be connected across the coupling resistance. The rectified currents are transferred from the resistance through a coupling condenser C3 of .1 mfd., a grid leak (R2) of ½ to ¼ megohm being connected between the grid of the second valve and a negative bias battery B2. The second valve should be a lower-impedance valve when used to work a loud-speaker from a local station, a valve such as Cosmos short-path red spot being a suitable 2-volt valve, while a DE5 or a PM6 may be used for 6-volt valves. When the set is used with phones only, for reception of distant stations a very much higher-impedance valve may be used, when the amplification of the arrangement will be considerably increased. In fact, one may use in the second stage a valve similar to that used in the first, with the exception that the grid bias must be considerably reduced.

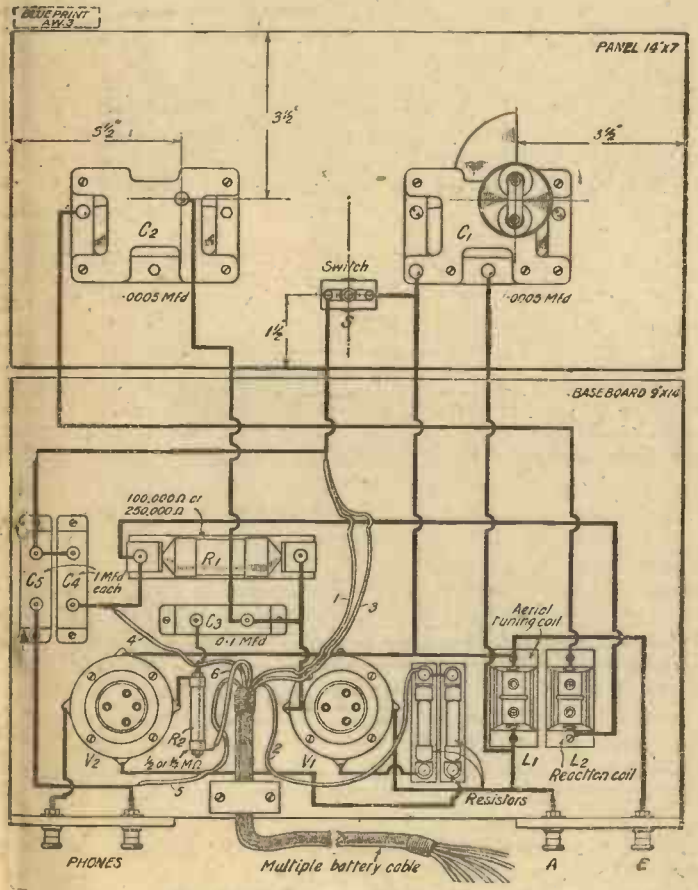


Fig. 4.—Developed Wiring Diagram.

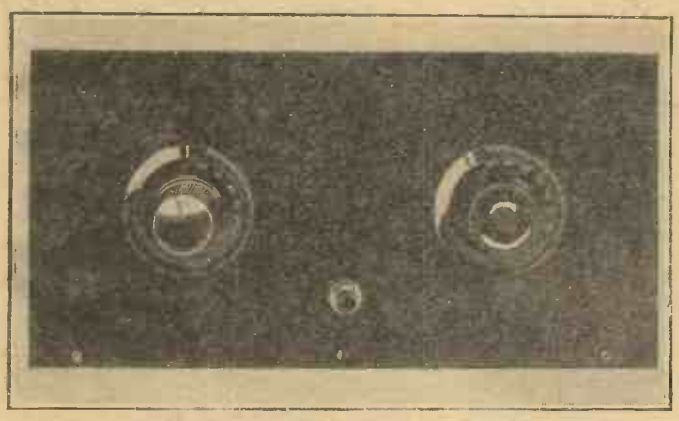
Construction

The illustrations Figs. 3 to 6 show the layout and general construction of the set. The front panel carries a tuning condenser of .0005 microfarad, with a slow-motion control, and a reaction condenser of .0003 microfarad or .0005 microfarad, the lower value usually being sufficient. The aerial and reaction coils are held in single-coil mounts fixed to the baseboard, the relative direction of the plug and socket members being important. The front panel also carries an on-and-off switch, which breaks the filament circuit. It would be better, however, to employ one which breaks both the filament and high-tension circuits.

A 250,000-ohm resistance and a .1 microfarad coupling condenser and the grid leak are mounted behind the reaction condenser, while to the left are the two shunt condensers across the H.T. tappings, these condensers being about 1 microfarad. The two valve holders are at the back of the baseboard, which carries two terminal

plates for the aerial and earth and phone or loud-speaker terminals respectively.

A multiple battery cable will be recognised for supplying the power to the set, but if preferred, of course, an ebonite strip with a row of terminals may be mounted along the back of the baseboard. The dimensional drawing will assist in laying out the panel. No special precautions need be taken with regard to the wiring, which is straightforward. It will be noticed that no filament resistances, either variable or fixed, are shown in the photographs, as it was intended to be used with a battery to which was connected a master rheostat; these are, however, indicated in the wiring diagram.



The Panel of the "Safeguard Two."

The "Safeguard Two"

(Continued from preceding page)

When using the set for receiving from the local station the voltage on the first valve may be increased, practically no reaction being necessary. When, however, the set is used for distant reception, the voltage should be lowered to about 20 or 24 volts, and full reaction up to oscillation point employed. The aerial is shown connected directly to the top of the tuned circuit of the grid of the valve, but, as previously explained, it may be taken to a tapping on the coil, or used with one of the special coupled aerial coils with which readers are no doubt familiar. This type of aerial circuit, while perhaps lowering the signal strength, will give increased selectivity and minimise the radiation.

With careful handling many foreign stations can easily be received. When using the set on the lower wavelengths a rather larger reaction coil than usual may be necessary. With some valves, and with a very high resistance aerial and earth circuit, the set might not oscillate at all. In this case it would be necessary to include a high-frequency choke in series with the coupling resistance to the first valve. This is clearly shown in Fig. 7. Should this be necessary it indicates that there is plenty of room for improvement in the aerial and earth system.

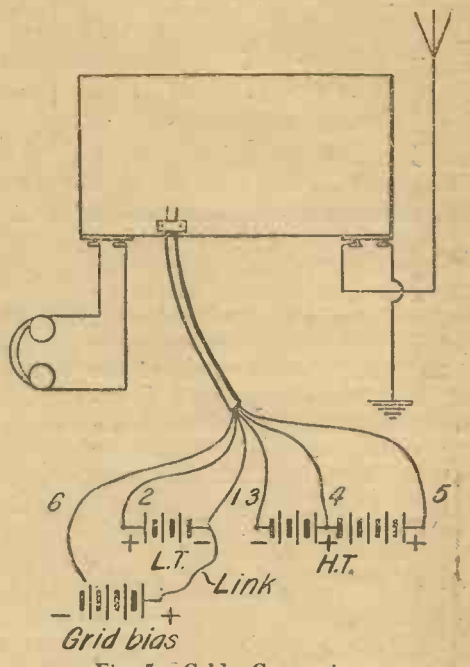


Fig. 5.—Cable Connections.

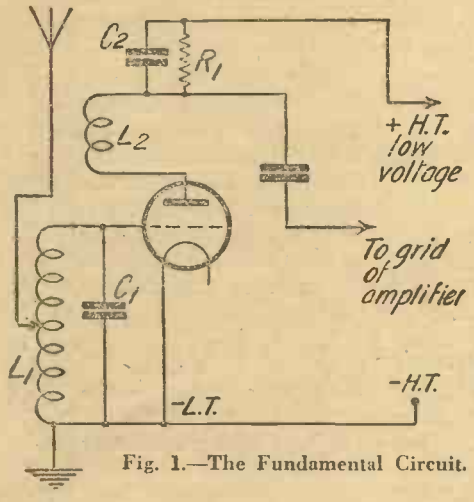


Fig. 1.—The Fundamental Circuit.

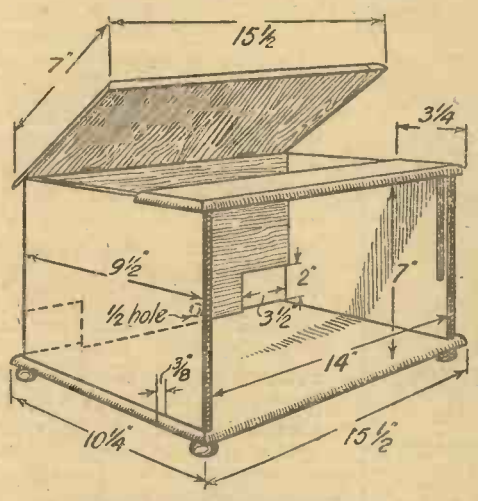


Fig. 6.—Details of Cabinet.

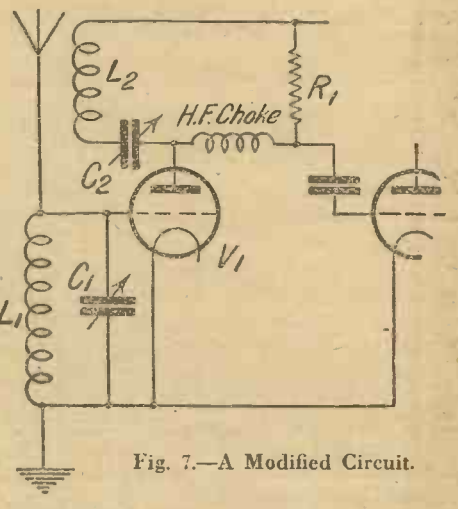


Fig. 7.—A Modified Circuit.

SHORT-WAVE OSCILLATION

SOMETIMES it is difficult to make a receiver oscillate on the 45-metre wave band, no matter how "loose" the aerial coupling may be. If this trouble is encountered it is a good plan to try the effect of reversing the coupling between the aperiodic coil and the grid coil.

The writer has found that by this simple act a Reinartz receiver, which previously only oscillated freely at certain points on the condenser scale, was made to oscillate "all round the dial." The fact that the set can sometimes be made to oscillate whichever way round the aperiodic coil happens to be, is a frequent source of bewilderment to the short-wave novice.

If, however, a larger aperiodic coil is used than is usually advocated, there will be only one direction of coupling in which the set will oscillate.

A six- or eight-turn aperiodic coil can be quite closely coupled to the grid coil, while oscillation is maintained over the whole tuning range of the grid coil if the aperiodic coil is correctly coupled. J. B.

PROVING WHEN DULL-EMITTERS ARE GLOWING

SOME dull-emitters are so dull that no glow is visible. To ascertain whether the filaments are intact, a pocket-lamp bulb may be temporarily connected in one of the L.T. leads, i.e. between the battery terminal and the corresponding terminal on the valve socket.

If the bulb glows, it will show that the filament is intact. Do not, however, expect it to glow with its usual brilliance.

R. H. B.

THE RISKS THAT LISSEN RUN TO SAVE YOU THIS 5/1 ON EVERY BATTERY!

And a day for all Battery buyers to remember—Monday, Jan. 24th, 1927

On that day the reduced price for the Lissen New Process Battery first came into operation. Before that, however, Lissen had had to take a big risk. Prior to August 16th, 1926, Lissen had been distributing through wholesale factors, but on that day a new policy of direct-from-factory-to-dealer distribution was put into operation by Lissen which eliminated all wholesalers' profits. Intended first for sale at 13/- it was only possible to sell the Lissen New Process Battery at 10/6 by drastically altering the previous method of distribution, and the decision to do this was fraught with serious possibilities, for Lissen at once had to do business with some thousands of retailers instead of a smaller number of wholesalers. There was a great risk that the wholesalers would use their influence with their retail customers to block the new Lissen policy; at any rate no wholesaler could be expected to uphold it. BUT LISSEN HAS WON THROUGH. That step alone saves users 2/6 on every Lissen New Process Battery purchase, 1/- on many other Lissen parts, and made Lissen mean to the user the best value for money in radio operators.

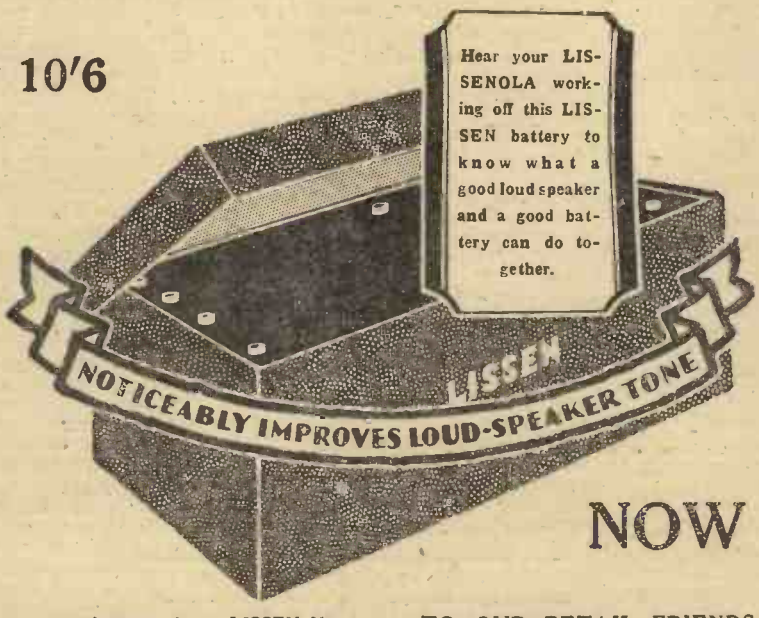
NOW LISSEN HAS TAKEN STILL ANOTHER BOLD STEP. To make the new reduced price for the LISSEN New Process Battery possible, a price actually less than many inferior foreign batteries are sold at, LISSEN have had to reduce the profit previously allowed to the retail trade, and have had to make a big sacrifice in profits themselves as well.

No user of H.T. batteries can remain unattracted by the thought of being able to obtain a LISSEN New Process Battery for 7/11—and the justification of the new step will come through largely increased sales.

It is through the co-operation of our retail friends that LISSEN batteries will be made available to you at thousands of shops throughout the country, and we therefore want users to know that it is due to the sacrifice of our retail distributors as well as ourselves that this new low price is made possible.

With high price no longer a reason for being without the LISSEN New Process Battery, your loud speaker reproduction will be better, volume bigger, and utterance clearer than ever before. The new price now places fine battery characteristics within the reach of all.

PREVIOUSLY 10/6



NOW 7/11

TO THE USER.—There is no substitute for a LISSEN New Process Battery. Ask for "LISSEN New Process" and see you get it. There is a LISSEN dealer close to you who will be glad to sell it to you; but if any difficulty send direct to factory; no postage charged, but please mention dealer's name and address, or can be sent C.O.D.

Connect two batteries in series when more than 66 volts required.

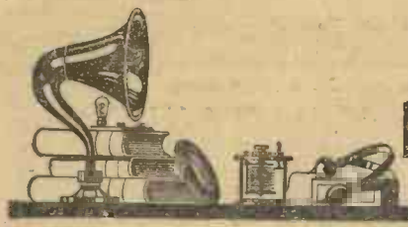
Rated at 60 volts this LISSEN New Process Battery goes considerably over. Its size is 9½ in. by 4½ in. IT IS PACKED FULL OF NEW ENERGY.

TO OUR RETAIL FRIENDS.—We were loth to lower the discount, but we think the new price is going to be justified. Full credits on existing stock have been made to stockists who obtained supplies direct from us, whose claims were in our hands by January 31st, 1927, for any LISSEN New Process Batteries in stock on January 18th which were invoiced in January. Since January 18th batteries have been invoiced to the trade at the new trade price.

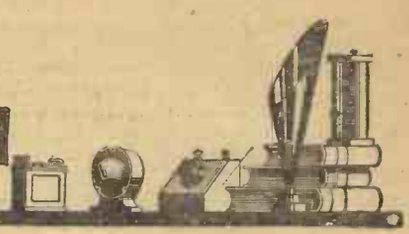
BUY IT, Not Merely Because You Prefer British, But BECAUSE IT IS THE BEST MONEY'S WORTH

LISSEN LIMITED, 16-20, FRIARS LANE, RICHMOND, SURREY.

Managing Director: Thomas N. Cole. L.244



OUR INFORMATION BUREAU



RULES.—Please write distinctly and keep to the point. We reply promptly by post. Please give all necessary details. Ask one question at a time to ensure a prompt reply, and please put sketches, layouts, diagrams, etc., on separate sheets containing your name and address. See special announcement below.

Transmitting and Receiving Licences.

Q.—*If one obtains a transmitting permit, is it also necessary to obtain a receiving licence?—T. D. G.* (*Bedford*).

A.—In such a case a separate receiving licence will be quite unnecessary, as the possession of a transmitting permit also entitles the owner to the use of receiving apparatus. —B.

Coil-winding Difficulty.

Q.—*When winding coils of the honeycomb or duolateral type, what exactly constitutes a turn?—H. K.* (*Watford*).

A.—One "turn" is completed when the wire has passed once completely round the coil, no matter what particular system of winding is being used.—J. F. J.

Filament Resistances.

Q.—*At present I am using bright valves and a 6-volt accumulator, and my filament resistances each has a value of 7 ohms maximum. I wish to use valves taking .25 amp. each worked from a 2-volt accumulator, and want to know what filament resistances to use.—G. T. L.* (*Coventry*).

A.—You can use the 2-volt valves without making any alteration to your set, as the present filament resistances will be quite suitable for the new valves.—B.

Fitting G.B. Terminals.

Q.—*I have a straight detector and transformer-coupled L.F. set which has separate H.T. positive tappings for each valve. No provision is, however, made for the application of grid bias to the L.F. valve, and I should like to fit two G.B. terminals to the set.—E. P.* (*Essex*).

A.—Fit the new terminals in any convenient position on the set, and disconnect the end of the transformer secondary which at present goes to the negative side of the filament circuit. Connect this end of the secondary instead to one of the new terminals, which will be G.B. negative, and join the other new terminal, G.B. positive, to the L.T. negative terminal.—J. F. J.

Charging Accumulators.

Q.—*I intend to charge my accumulator at home, from the mains. How shall I know when the accumulator is sufficiently charged? —O. F. D.* (*Leicester*).

A.—The battery should be charged until its voltage, measured with the charging current still passing, has risen to about 2.6 volts per cell. When the charging current is switched off, the voltage of the battery will soon drop to about 2.2 volts per cell. When it is thought that the accumulator is fully charged, the density of the acid should be measured with a hydrometer and should be about 1.2. As the charging process nears completion the cells will "gas," which means that great quantities of bubbles will rise to the surface of the acid, giving the electrolyte an almost milky appearance.—J. F. J.

Converting L.F. Coupling.

Q.—*I have a set consisting of a detector valve followed by two transformer-coupled L.F. stages, and am desirous of using resistance coupling between the last two valves. Can you tell me how to make the required alteration?—R. P. A.* (*Enfield*).

A.—You could, of course, merely substitute for the second transformer one of the complete resistance-capacity units now on the market. If, however, you wish to use separate components you can remove the second transformer from the set, and in the place of the transformer primary insert an anode resistance having a value from 50,000 to 100,000 ohms. Between the plate of the second valve and the grid of the third connect a .025-mfd. fixed condenser, and put a ½-megohm grid leak between the grid of the last valve and G.B. negative.—J. F. J.

When Asking Technical Queries—

PLEASE write briefly and to the point

A Fee of One Shilling (postal order or postage stamps) must accompany each question and also a stamped, addressed envelope and the coupon which will be found on the last page.

Rough sketches and circuit diagrams can be provided, but it will be necessary to charge a special fee (which will be quoted upon request) for detail layouts and designs.

Grid Rectification.

Q.—*I understand that the chief objection to the use of anode-bend rectification is that signals are not so strong as when the leaky grid condenser method is used. What accounts for the greater signal strength obtained with the latter method?—E. R.* (*S.E.5*).

A.—When a grid condenser is used the incoming signals charge up the condenser, which cannot immediately return to its normal potential, as the electrons forming the charge cannot easily escape from the side of the condenser nearer the grid of the valve. Thus the effect of several incoming oscillations is cumulative, and the grid condenser becomes increasingly negative. This cumulative effect is entirely absent in the anode-bend method of rectification, and it is this effect which gives rise to the stronger signals when a grid condenser and leak are used.—B.

The "No-Aerial Three."

Q.—*With reference to the receiver with the above title, which was described in "A.W." No. 236, I should like the following points made clear:* (1) *What is the full list of components required?* (2) *More particulars regarding the frame aerial would be appreciated.* (3) *What is the exact position of the valve platform?*

A.—The list of components is as follows: Ebonite panel, 15 in. by 5 in. by ¼ in.; valve platform, 7 in. by 2 in. by ¼ in.; .0005 low-loss variable condenser (Ormond, Igranic, or other good make); .0003 Polar Junior variable condenser; .0003 fixed condenser with 2-megohm leak (Edison-Bell or Dubilier); 6-ohm rheostat (Ormond); low-frequency transformer (Burndept); resistance coupling unit (Radio Communication Co.); 2 6-in. brackets; 12 clix for valve sockets; break switch (for L.T. supply); 8 pillar-type terminals; supply of 16-gauge bare tinned-copper wire, single rubber covered flex and hank of frame aerial flex (silk covered); sundry screws. The frame aerial consists of two coils, one of 21 turns and the other of 5 turns, wound together on ebonite pieces. These are screwed to the back of the cabinet, and given a saw slit to take the wire. The mean dimensions of the frame coil are 12 in. by 9 in. The valve platform occupies a position in relation to the main panel as shown in Fig. 4, there being a 4-in. gap. The brackets are 6 in. long, and the platform 2 in. wide.—DUDLEY HISCOX.

Driving Dynamo by Water Power.

Q.—*What power is required to drive a 12-volt dynamo for lighting a small bungalow? Is it practicable to drive this from a Pelton wheel, and, if so, what water pressure is necessary?—C. H. H.* (*Bristol*).

A.—The power required to drive any dynamo depends upon the watts output required—that is, volts × amperes, and not upon the voltage alone. To light even a small bungalow the equivalent of three 60-watt lamps is about the minimum allowance, say 200 watts as a margin. A 200-watt dynamo of normal efficiency will take close upon half brake horsepower to drive it, and this would be the smallest size of waterwheel to install. Whether a Pelton wheel is suitable or not depends largely upon the pressure or head of water, and nothing less than 50 to 60 lb. per square inch is very serviceable for water motors of this type—say 120 ft. fall. Low-fall turbines are, of course, obtainable, and if querist will communicate with Gilbert Gilkes and Co., of Canal Ironworks, Kendal, giving full details of his water supply, no doubt they will recommend a suitable type of motor and name a price. It may be noted, however, that direct lighting from water power is seldom satisfactory, owing to variations in pressure and speeds. The best thing to do, perhaps, is to put in a 12-volt car-lighting type of dynamo, with third brush regulation, and a 12-volt battery of accumulators. With the battery "floating" on the line, the voltage will be kept pretty constant, and the self-regulating properties of this type of dynamo will render it far less sensitive to speed variations than with a simple shunt-wound or compound-wound generator lighting the lamps direct.—A. H. AVERY.

"A.W." TESTS OF APPARATUS

Conducted by our Technical Editor, J. H. REYNER, B.Sc.(Hons.), A.M.I.E.E.

McMichael H.F. Choke

MCMICHAEL & CO., LTD., of Wexham Road, Slough, Bucks, have sent us one of their high-frequency chokes. This consists of a barrel former having a number of slots cut into it. A fairly fine-gauge wire is wound in these slots, the windings being continuous from end to end.

The self-capacity of the windings is reduced to a low value not only by placing the windings in slots, but the ends of the ebonite former are tapered, so that the winding in the first slot has a mean diameter of approximately half of those in the seven central slots.

The ends of the windings are taken out to two soldering tags at the end of the former. Finally the former is mounted

McMichael H.F. Choke.

in an upright position on a small circular ebonite base, which can be screwed down to the baseboard of the receiver. A separate base is also available, so that the choke can be mounted longitudinally between clips.

We can recommend this component to our readers for use in sets, particularly for use in reception below a wavelength of 1,000 metres.

Service D.C. Mains Unit

SERVICE RADIO CO., LTD., of 67, Church Street, N.16, have submitted for test one of their Service H.T. units. This is intended for use on D.C. mains. It takes the form of a small wooden cabinet measuring 9 in. by 3½ in. by 6 in.

On the top of the cabinet is an ebonite panel, on which are mounted the various terminals and wander plugs. At the left of the panel are two terminals, one for the earth connection and the other for the earth terminal of the receiver. On the right-hand side there are three terminals marked H.T.+2, H.T.+1 and H.T.−.

On test in a five-valve receiver the unit gave very satisfactory results. The maximum voltage obtained when working off 240 volts mains was 120 volts. This reading was taken when a current of 15 milli-

Service D.C. Mains Unit

amps. was flowing. By far the most striking quality which this unit possessed, however, was the entire absence of those noises which are usually associated with mains supply; and we can recommend this unit to our readers.

Brunet Loud-speaker

FROM Pettigrew and Merriman, Ltd., of 122 and 124, Tooley Street, S.E.1, we have received one of their P.1 Brunet loud-speakers. This loud-speaker has a height of 16 in. and a flare of 8 in. It

Brunet Loud-speaker.

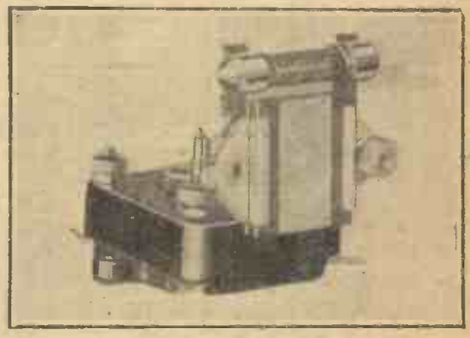
might be expected that with a speaker of these dimensions the volume output would be limited. However, on test satisfactory results were obtained. Reproduction of both speech and music was quite good, and the loud-speaker was capable of handling a large amount of volume without distortion.

The general finish and appearance of this loud-speaker are good. In the base, made of aluminium, an adjustable arm is provided for setting the speaker to its point of maximum sensitivity. The neck and the horn have a crystalline black finish. The flare can be removed by withdrawing two screws; it is necessary to see that these screws are tight, in order to prevent vibration of the horn.

We can recommend this loud-speaker for use where a small and efficient instrument is required.

Benjamin Valve Holder, Grid Leak and Condenser Unit

WE have received from the Benjamin Electric, Ltd., of Brantwood Works, Tariff Road, N.17, one of their



Benjamin Valve Holder Unit.

well-known valve holders, combined with a special type of grid leak and condenser. Attached to the grid and one of the filament terminals of this valve holder are two projecting pins. A Dubilier Micadon condenser with a grid-leak attachment clips on to the two projecting pins. This unit is thus connected up for use in the rectifying stage or in an amplifier following a tuned-anode or resistance coupling.

On test it was found that the insulation resistance of both the valve holder and grid condenser was infinity. The grid leak proved to have the stated resistance value of 2 megohms, and the condenser was found to have a capacity of .0003 microfarad, as stated.

This unit should be very useful for the experimenter, as the grid leak and condenser may be easily removed, and we can recommend it for general use.

RADIOGRAMS

IT is probable that at this year's Boat Race a commentator will be able to follow behind the boats during the race. A portable transmitter would be fitted into a launch, and on a short wave the description would be broadcast. It would then be picked up at the Keston station and relayed through the main stations.

On the occasion of the dinner of the Worcestershire Association, to be held at the Hotel Victoria, London, on February 22, the Prime Minister's speech will be relayed to 2 L O and 5 X X.

Mr. Lloyd George's speech at the dinner of the Women's Advertising Club of London, which takes place at the Piccadilly Hotel on February 14, will be broadcast from 2 L O and 5 X X.

The B.B.C. have in preparation a special Empire Day programme to be relayed from the Albert Hall.

The little-known opera of Puccini, *Le Villi* (the witch dancers), is to be broadcast from Glasgow on February 10. The scene of this two-act opera is laid in the Black Forest. It will be relayed to London, Belfast and Scottish stations.

The Home Affairs Committee of Glasgow Chamber of Commerce has unanimously resolved to make representations to the B.B.C. in favour of the retention of the time signals in all programmes.

Demonstrations of transmissions to schools have recently been made before the education authorities of Edinburgh, Dumbarton, Dumfries and Fife. It is understood that they have aroused a wide interest in the potentialities of the loud-speaker in Scottish class-rooms.

Sir John Reith has stated that over a period of four years the Post Office has only been in receipt of one charge of vulgarity against the B.B.C. This, he added, was from a listener whose mental stability was apparently in question!

An Abraham Lincoln anniversary programme is being staged at Glasgow on February 12. The first part of the evening will include scenes from Drinkwater's play *Abraham Lincoln*, and the name part will be taken by Mr. William J. Rea, who fulfilled that rôle in the London production of the play.

Dr. Le Sieur Weir, surgeon in the liner *Voltaire*, has received a £20 cheque for wireless diagnosis and treatment of a patient suffering from appendicitis. The patient was a member of the crew of the British cargo steamer *Speaker*, whose captain broadcast an appeal to any ship carrying a doctor. Dr. Weir, in a series of messages across the Equator, wirelessed his advice.

According to a message from Teheran, a general local and foreign wireless service was established there recently for the first time.

The recent decision in France to allow sermons to be broadcast on Sundays has led to a special ruling by the Cardinal Archbishop of Paris, who announces that the general authorisation given by the ecclesiastical authorities to preachers of sermons does not extend to sermons which are to be broadcast.

Mr. Alec Young, president of the Rotary Club in London, has had an interesting experience of the success of wireless telephoning beyond New York. Recently he was called up by Judge Chamberlain, who

AN INTERESTING ANNOUNCEMENT APPEARS ON PAGE 250

spoke for the Rotarians and citizens of Boston, Mass., and sent greetings and goodwill to the London Rotarians.

To eliminate interference with radio reception, the New Zealand Post and Telegraph Department has issued regulations restricting or prohibiting the use of certain types of receiver. The regulations provide that the direct coupling of the valves to the aerial shall not be effected except in the case of certain approved sets for which special permission has been given, and in the design of which special and effective provision has been made to prevent radiation or to reduce it to a negligible quantity.

Miss Phyllis Neilson Terry will take part in a performance of *Trilby* from 2 L O and 5 X X on February 23. The programme on that evening also includes a repeat broadcast by Mr. R. A. Roberts of his "Dick Turpin" sketch.

Kemback, Fifeshire, is the location of the new P.O. Transatlantic receiving station, and work is beginning immediately. The station will be connected by cable with Cupar Post Office.

Tests were recently carried out at Daventry with the object of increasing the depth of modulation. Many listeners have reported on improved reception, and the range of the station is now 120 miles, instead of 100 miles, without loss of signal strength.

Although but little is heard of the development of broadcasting in Finland, this little republic now possesses at Helsingfors a new 5 kw. station working on a wavelength of 375 m. The capital programmes are regularly relayed to the following 200 watt transmitters: Jyvaskyla (297 m.), Oulu-Uleaborg (233 m.), Bjorenberg (254.2 m.), Tammerfors (368 m.), Jakobstad (275 m.) and Lahtis (318 m.). It is in Lahtis that plans are being considered for the erection of a high-power station to serve the whole of Finland. The Helsingfors call is now: *Uoncio! Uoncio! Radio-Helsinki.*

In commemoration of the centenary of the death of the Italian physicist Alessandro Volta on March 5, 1827, a wireless exhibition is to be held from May to October this year, at Como, his native town. The committee, under the patronage of H.M. the King of Italy, has nominated Signor Mussolini and Senatore Marconi joint hon. presidents. By the same opportunity it is proposed to hold an International Telegraphy and Telephony Congress during the coming summer.

From January 1, 1927, the share of the income derived from the sale of listeners' licences to be allotted to the Prague Broadcasting Company has been reduced from 50 to 40 per cent. In view of the increased revenue collected by the Czecho-Slovak Posts and Telegraphs, this department is undertaking the reconstruction and development of the entire broadcasting system, and will lay the necessary land-lines for the inter-linking of the different transmitters to permit a simultaneous transmission of the Prague and Bruenn programmes throughout the country.

According to reports received from Washington (U.S.A.), should an increase in the number of new stations continue at the same rate as hitherto, there will be 1,000 broadcasters on the air in the United States by the end of 1927. Already 671 stations send out, at least, one programme daily; 150 new stations have been licensed since July 1, 1926. It is computed that on January 1 last the number of receiving sets in actual use was 6,500,000, and the invisible nightly audience is estimated at 26,000,000 listeners.

As a reply to rumours in Scotland, it is officially announced by the B.B.C. that the abandonment of the broadcasting station at Aberdeen is not contemplated. On the contrary, at stations such as Aberdeen ample talent and organisation is to be retained to reflect adequately local character and local artistic aspirations.

"Old Superstitions Die Hard"

SIR,—Your contributor in No. 242 starts his article by decrying the long aerial for reception of the shorter waves, and states that the short-roofed aerial gives better selectivity with no appreciable loss in range or signal strength. This is a very misleading and not very accurate statement. The whole question of aerial dimensions is bound up with the question of what type of coupling is employed between the aerial and the grid of the first valve. Most modern circuits use the so-called aperiodic coupling with the grid circuit, and here it is far better to have a long and high aerial and fewer turns than to use a short aerial with possibly more turns in the aerial circuit.

For the reception of even such short waves as 30 to 50 metres a big aerial will give better signal strength than a small one. The only case where there is truth in J. H. R.'s statement is where the aerial is connected direct to the grid end of the grid circuit. I would therefore advise your readers to use the full 100 feet allowed by the Post Office and to make the aerial as high and efficient as possible.

I doubt if there is anything to be gained by shunting an H.T. accumulator by a .01 mfd. condenser, which I should say would offer an impedance greater than the H.T. accumulator itself. On this point, however, I am open to correction.—F. G. S. (Birmingham).

Threshold Howling

SIR,—Your correspondent B. R. B. (Sudbury), in his letter on "Threshold Howling," makes a most interesting suggestion in regard to the cause of that puzzling and annoying fault which is common in many receivers, and asks for opinions upon the theory which he presents.

I have found this rather peculiar form of low-frequency oscillation to be the bugbear of many sensitive sets, and usually the more sensitive the receiver, the more prone is it to howl when on the threshold of oscillation.

The theory presented seems to contain no flaw, yet I think it correct to dispute it on practical grounds. Though I have never found this liability to howl present in a set to which I am accustomed, and only in those which have just been wired up and are in need of a little practical experimenting, on various occasions I have cured the trouble by altering the value of the grid leak. I cannot see how this fact can be fitted in to the theory suggested, unless the whole matter is far more critical than I can think possible, and it is found that rate of (almost instantaneous) increase of anode current is appreciably affected by the value of the grid-circuit resistance. May I also query whether the back E.M.F. caused by the transformer would be sufficient to alter the period of breaking into oscillation, even at the most critical threshold point?

I very much doubt whether the back E.M.F., which, of course, must exist, is high enough to alter the electronic flow. If it *is* high enough, then the effect must be present in every receiver, and would be a thing to contend with in every DX set and even in moderately efficient broadcast sets. From practical experience with sets of all types, I can state that the effect is only noticeable in about 2 per cent. of the receivers which pass under my notice.

And if that small fraction were fitted with efficient variable grid leaks (as every set should be fitted) I am positive that I could cure the trouble.—K. U. (London).

Are Multi-valve Sets Worth While?

SIR,—I am interested in the correspondence that has appeared in your columns under the above heading, and feel I should like to congratulate A. A. R. and C. R. W. upon having obtained a quality of reproduction from distant and foreign stations comparable with that of 2 L O.

I have in my time tried out a fair number of multi-valve receivers, and with some of them I have succeeded in bringing in some twenty or so Continental transmissions at good loud-speaker strength whilst 2 L O was at work. I certainly cannot claim, however, that the quality of such reception was ever in the same class as that obtainable on my "local" receiver.

Situated some four miles from 2 L O, the latter consists of "permanent" crystal rectification followed by three stages of resistance coupling, with, of course, suitable valves, H.T. and G.B.

The quality of reproduction given by this simple straight set is, I think, good. To know that equally good reproduction can be obtained from foreign stations with super-hets and multi-valve neutrodynes is, to say the least of it, most encouraging.—G. C. C. (London, N.W.).

SIR,—After listening recently to a demonstration of a new commercially-built seven-valve supersonic-heterodyne receiver, the writer was constrained to ask himself the question: Are super-sensitive receivers really of much value when entertainment is the object in view? In fairness to the designers and makers of the instrument mentioned, it must be said that its performance as regards range and selectivity was absolutely amazing; yet after careful consideration the writer came to the definite conclusion that, for personal use, he would not consider it worth the price of a good three-valver.

The reason for this is simple. Not once during the demonstration, which included reception of a number of British and Continental stations, was speech or music any real pleasure to listen to. In the first place most of the stations received were heterodyned, and even this wonderful instrument, aided by the directional properties of a frame aerial, failed to eliminate this interference. Reception from the local station was unpleasant, because the enormous amplification caused severe overloading, while in another way the extreme sensitiveness defeated its own ends. Reception of the few distant stations which were free from heterodynes was spoilt by a powerful background noise.

It appears that much the same applies to every ultra-sensitive, multi-valve receiver, and until some method of overcoming these defects is discovered it seems that owners of sets of this type are likely to become very dissatisfied after the novelty has worn off.

Contrast with this the results attainable with a good three-valve set at a fraction of the cost.

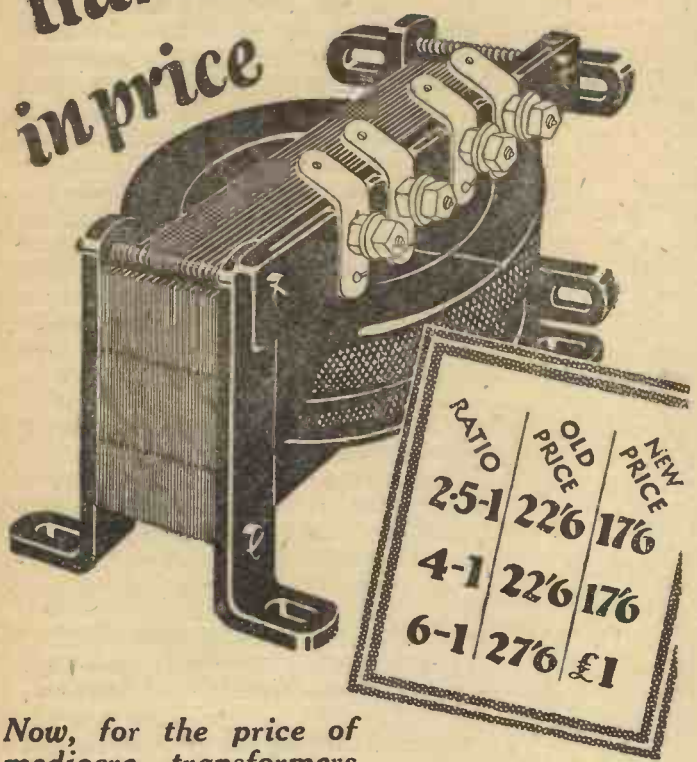
Would not the average amateur obtain far more satisfaction from improving the L.F. end of his receiver before attempting the more difficult task of applying several stages of tuned H.F. or supersonic-frequency amplification to unsatisfactory detectors and note-magnifiers?—J. H. S. F. (London, S.W.).

The Klagenfurt (Austria) relay station is to be officially opened on February 12 next, and to celebrate the occasion Vienna will relay to this transmitter a complete performance of Gounod's *Faust* as performed at the Royal Opera House. A special cable has been laid to feed the Klagenfurt station, and the system is being developed to include both Innsbrueck and the proposed station at Salzburg. A new land-line connects Munich and Vienna, and attempts are to be made to relay the Vienna programmes to Berlin, Hamburg, and other German centres.

A contract has been concluded for an additional radio broadcasting station in the Colon Opera House, Buenos Aires, at an estimated expenditure of 100,000 dollars (£20,000). The station, which is to be built by a United States company, is to be in operation by May, 1927, in time for the next opera season.

It is rumoured that the B.B.C. authorities are seeking a suitable site for a broadcasting station to be situated in North Wales.

The famous PYE LF transformers reduced in price



RATIO	OLD PRICE	NEW PRICE
2·5-1	22/6	17/6
4-1	22/6	17/6
6-1	27/6	£1

Now, for the price of mediocre transformers you can get the best on the market.—PYE.

PYE & CO. were the *first* wireless engineers to publish a Frequency-Efficiency curve certified by the National Physical Laboratory. Curves of other transformers have been published since, but *still* the Pye curve is unrivalled.

Many of the most reputable manufacturers have adopted Pye Transformers as standard in their receiving sets. Several Government Departments also use them. Could stronger proof of their efficiency be given?

Compare the Pye Transformers against any other high-class transformer, and you will not find its equal for true amplification, purity of reproduction, and all round merit.

W. G. PYE & CO.,
Granta Works, Montague Road,
CAMBRIDGE.

POINTS OF SUPERIORITY

1. Amplification is uniform on high and low notes, thus eliminating distortion.
2. Parasitic noises are *entirely* absent.
3. Can be fixed to panel in horizontal or vertical position. (*See illustration above.*)
4. Not susceptible to burning out. Voltages up to 300 can be used continuously with perfect safety.
5. Each Transformer is tested by actual measurement of amplification and a guarantee given with each.

BRINGS PYE RECEPTION TO PERFECTION

Dubilier Mansbridge Condensers

Wherever a large capacity condenser is needed in your set, see that you make it a Dubilier Mansbridge.

No other condenser in the world has behind it the combined experiences of Dubilier and of Mansbridge.

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"THE SIMPLEST BROADCAST WAVEMETER" (*continued from page 249*)

to allow it to lie flat. The simplest way of mounting it is to use fine wood screws, putting them through the holes in the lugs.

Next fix the coil holder close to the rear edge of the panel and follow this by placing near the buzzer a single dry cell. That seen in the photograph was taken from a No. 125 Ever-ready flashlamp refill. A simple way of fastening the cell to the baseboard is to cut a narrow strip from an old tin and to fasten this down with screws so as to make a strap over the cell.

The wiring is quite simple. Connect the fine wire contact of the buzzer to the positive terminal of the cell. The other contact of the buzzer is a small screw in the upright pillar which supports the arm. Connect this to the moving plates of the variable condenser. Connect these plates also to the plug of the coil holder. Join one contact of the switch to the negative pole of the battery and the other to the fixed plates of the variable condenser. When you have connected these plates also to the socket of the coil holder the job is finished.

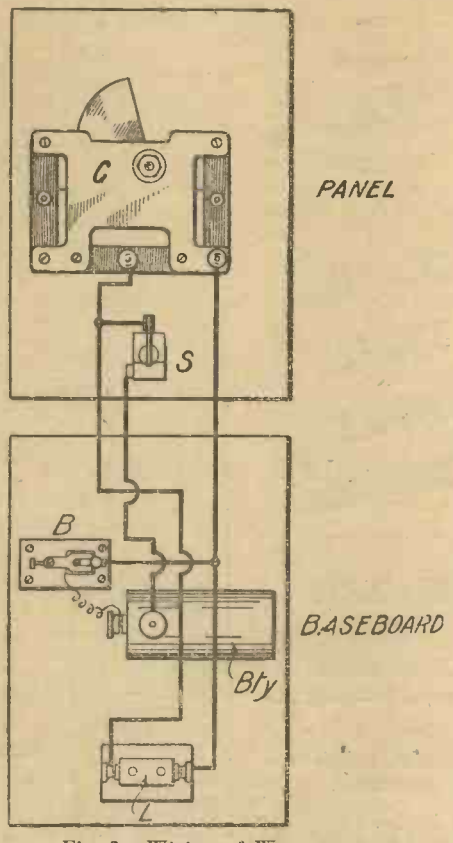

Fig. 3.—Wiring of Wavemeter.

The next thing to do is to get the buzzer tuned to a high thin note. Quite likely the buzzer will not work when you first switch on. If it fails to do so when the panel is rapped with the knuckles, adjust the contact screw and the relative positions of the armature and magnet poles.

The first rough calibration of the instrument is quite a simple business. Tune in a station of known wavelength towards the upper end of the broadcast waveband as sharply as you can with the receiving set, then place the wavemeter a yard or so away from the set with its coil "face-to-face" with the A.T.I., and switch on. Turn the dial of the variable condenser until the note of the buzzer is heard loudly in the phones or loud-speaker.

You will probably find that it is heard fairly strongly over quite a number of degrees. Either move the instrument farther away, or turn it so as to increase the angle between its inductance and the A.T.I. When the coupling between the two is loose enough the tuning of the wavemeter will be quite sharp. It is here that so many people fail when using a buzzer wavemeter; they *will* couple it too closely to a receiving set, with the result that it is impossible to obtain anything like close readings. The note of the buzzer should be only just comfortably audible at the point of sharpest tuning. Having done this, note carefully the condenser scale reading. Now tune in another station on a considerably lower wavelength and again take the reading with the meter. On a piece of squared paper mark off a vertical scale corresponding to condenser degrees, and a horizontal scale corresponding to wavelengths from 250 to 500 metres, if you are using a square-law condenser in the meter, or frequencies from 120 kilocycles to 60 kilocycles (remember that the frequency decreases as you increase the capacity of the condenser) if you are using an SLF condenser. At the intersection of the two lines corresponding to the condenser setting and the wavelength (or frequency) of the first station make a dot. Make another dot to mark the tuning of the second station. Draw a straight line joining the two, and produce it in both directions. Below about 25 degrees the settings shown by the chart may be inaccurate.

Should you desire to make your wavemeter direct-reading, obtain a piece of $\frac{1}{16}$-in. white erinoid or ivorine 5 in. wide by 3 in. deep. Draw a straight line with Indian ink right across this ½ in. from the bottom, bisect this line, and make a punch mark at its mid-point. Using this point as centre, draw a semi-circle with a radius of just under 5 in., and another one ½ in. inside it. From sheet metal cut out a pointer, drilling at one end of it a hole which will just pass over the spindle of the condenser and filing the other end quite fine.

Pin the pointer to the under-side of the edge of your dial so that it just coincides with the zero mark. Set the dial so that the moving plates are right out of mesh when the nought on the scale coincides with the left-hand portion of the horizontal line. From your calibration chart you can now mark out a scale of wavelengths or frequencies, using the graduated dial of the condenser to obtain the correct settings and making the marks at the places indicated by the pointer. R. W. H.

BROADCAST TELEPHONY

NOTE.—*In the following list of transmissions these abbreviations are observed: con. for concert; lec. for lecture; orch. for orchestral concert; irr. for irregular; m. for metres; and sig. for signal.*

GREAT BRITAIN

The times given are according to Greenwich Mean Time.

London (2LO), 361.4 m. 1-2 p.m., con.; 3.15-4 p.m., transmission to schools; 3.30-5.45, con. (Sun.); 4.15 p.m., con.; 5.15-5.55, children; 6 p.m., dance music; 6.30 p.m., time sig., news, music, talk; 8-10 p.m., music; 9.0, time sig., news, talk, special feature. Dance music daily (exc. Sundays) from 10.30 until midnight.

Aberdeen (2BD), 500 m. **Belfast** (2BE), 306.1 m. **Birmingham** (5IT), 326.1 m. **Bournemouth,** (6BM), 491.8 m. **Cardiff** (5WA), 353 m. **Glasgow** (5SC), 405.4 m. **Manchester** (2ZY), 384.6 m. **Newcastle** (5NO), 312.5 m. Much the same as London times.

Bradford (2LS), 252.1 m. **Dundee** (2DE), 294 m. **Edinburgh** (2EH), 288.5 m. **Hull** (6KH), 294 m. **Leeds** (2LS), 277.8 m. **Liverpool** (6LV), 297 m, **Nottingham** (5NG), 275.2 m. **Plymouth** (5PY), 400 m. **Sheffield** (6FL), 272.7 m. **Stoke-on-Trent** (6ST), 294 m. **Swansea** (5SX), 294 m. **Daventry** (25 kw.), high-power station, 1,600 m. Special weather report, 10.30 a.m. and 10.25 p.m. (weekdays), 9.10 p.m. (Sun.); 11.0 a.m., light music (exc. Sat. and Sun.); relays 2LO from 1 p.m. onwards. Time sig.: 10.30 a.m., 4.0, and 10.0 p.m.

IRISH FREE STATE.

Dublin (2RN), 319.1 m. Daily, 7.25 p.m. Sundays, 8.30 p.m. until 10.30 p.m. Frequently relays sporting matches on Sundays, 3.0-5.30 p.m.

Cork (under construction), 400 m.

CONTINENT

Unless otherwise stated, all times are p.m. (G.M.T.).

AUSTRIA.

Vienna (Radio Wien), 517.2 m. (5 kw.) and 577 m. 7, con.; 9.30, dance (Wed., Sat.).

Graz, 357.1 m. (750 w.). Relays Vienna. Also own con. (Wed.), 7.10.

Klagenfurt, 272.7 m. (750 w.). Relays Vienna.

Innsbrueck, 294.1 m. (750 w.). Testing.

BELGIUM.

Brussels, 508.5 m. (1.5 kw.). 5.0, orch. (Tues., Thurs., Sat. only), news; 8.0, lec., con., news. Relay: Antwerp, 265.5 m. (100 w.).

CZECHO-SLOVAKIA.

Prague, 348.9 m. (5 kw.). Con., 7.0 (daily).

Brunn, 441.2 m. (3 kw.). 6.0, con. (daily).

Koszice, 300 m. (2 kw.). Relays Prague.

Bratislava, 263.2 m. (500 w.). Relays Prague.

Kbely, 1,110 m. (500 w.). 6.45, lec. (daily).

DENMARK.

***Copenhagen,** 337 m. (700 w.). Sundays: 9.0 a.m., sacred service; 3.0, con.; 7.0, con. Weekdays: 7.0, lec., con., news; dance to 11.0 (Thurs., Sat.).

*Relayed by Sorö (1,150 m.).

ESTHONIA.

Reval, 440 m. (2½ kw.). 5.0, con. (daily).

FINLAND.

Helsingfors, 375 m. (5 kw.).

GRAND DUCHY OF LUXEMBURG.

Radio Luxemburg, 1,200 m. (250 w.). Con.: 2.0 (Sun.), 9.0 (Tues.).

FRANCE.

Eiffel Tower, 2,650 m. (8 kw.). 6.40 a.m., weather (exc. Sun.); 11.0 a.m., markets (exc. Sun. and Mon.); 11.20 a.m., time sig., weather; 6.0, talk, con., news; 7.0 and 11.10, weather; 9.0, con. (daily). Relays PTT, Paris, Sat., 9.10-11.0, and weekday afternoons. Testing on 50 kw.

Radio-Paris (CFR), 1,750 m. (about 3 kw.). Sundays: 12.0, sacred service; 12.45, con., news; 4.30, Stock Ex., con.; 8.15, news, con. or dance. Weekdays: 10.30 a.m., news, con.; 12.30, con., markets, weather, news; 4.30, markets, con.; 8.0, time sig., news, con. or dance. Testing on 30 kw.

L'Ecole Sup. des Postes et Télégraphes (PTT), Paris, 458 m. (5 kw.). 3.0, lectures (relay of Sorbonne University); 8.30, lec. (almost daily); 9.0, con. (daily).

Le Petit Parisien, 340.9 m. (500 w.). 9.15, con. (Tues., Thurs., Sat., Sun.).

Radio L.L. (Paris), 350 m. (250 w.). Con. (Mon., Wed., Fri.), 9.30.

Biarritz (Côte d'Argent), 200 m. 6.0, con. (Mon., Wed., Fri.).

Radio Vitus (Paris), 308 m. 9.0, con. (Wed., Fri., Sun.).

Lille, 1,300-1,500 m. Testing.

Radio-Toulouse, 389.6 m. (3 kw.). 5.30, news (exc. Sun.); 8.45, con.; 9.25, dance (daily).

Radio-Lyon, 291.3 m. (1.5 kw.). 8.20, con. (daily); 4.0 (Sun.).

Strassburg (8GF), 222.2 m. (1½ kw.). 9.0, con. (Tues., Fri.); 9.30-12.0, dance (Sat.).

Strassburg (Military Stn.), 200.1 m. (15 kw.). Con., 9.0 (Wed.). Testing on var. wl.

Radio Agen, 297 m. (250 w.). 8.30, con. (Tues., Fri.).

***Lyon-la-Doua,** 475 m. (1 kw.). Own con., 8.0 (Mon., Wed., Sat.).

***Marseilles,** 309 m. (500 w.).

***Toulouse,** 245 m. (500 w.).

*Relays of PTT, Paris.

Montpellier, 252.1 m. (1 kw.). 8.45 (Wed., Fri.).

Beziers, 180 m. (150 w.). 9.0 (weekdays only).

Juan-les-Pins (Radio LL), 230 m. (300 w.). 9.0, con., news.

Angers (Radio Anjou), 275.2 m. (250 w.). Daily: 8.30, news, lec., con.

Bordeaux (Radio Sud-ouest), 238 m. (1 kw.). 7.25, con. (Thurs.).

Bordeaux (Lafayette), 419.5 m. (1½ kw.). Con., 5.0, 9.0 (weekdays), 2.30 (Sun.). Relays PTT. Paris, 8.30 (Sat.).

Mont de Marsan, 500 m. (500 w.). Con., 8.30 (daily, exc. Sun. and Wed.).

Algiers (N. Afr.) (PTT), 310 m. (2 kw.). 7.0-10.0, daily.

Carthage (Tunis), 1,850 m. (5 kw.). 6.30, con., dance.

Casablanca (Morocco), 306.4 m. (3 kw.). 8.30, con. (daily); 10.0, dance (irr.).

GERMANY.

Berlin, on 483.9 and 566 m. 8.0 a.m., sacred con. (Sun.); 11.55 a.m., time sig., news, weather; 5.30, orch.; 7.30, con., weather, news, time sig., dance music until 11.30 (daily, exc. Tues.). Relayed on 1,300 m. by Königswusterhausen (1,300 m.) and Stettin (252.1 m.).

Königswusterhausen (LP), 1,300 m. (12 kw.). 10.30-11.50 a.m., con. (Sun.); 2.0, lec. (daily); 7.30, relay of Berlin (Vox Haus) con. (daily); 2,525 m. (5 kw.), Wolff's Buro Press Service: 5.45 a.m. to 7.10. 2,900 m., Telegraphen Union: 7.30 a.m. to 6.45, news. 4,000 m., 6.0 a.m. to 8.0, news.

Breslau, 322.6 m. (4 kw.). 11.0 a.m., con. (daily), Divine service (Sun.); 4.0, con.; 6.0, lec.; 7.30, con. Relay: Gleiwitz, 250 m.

Frankfort-on-Main, 428.6 m. (4 kw.). 5.0 to 5.15 a.m. (exc. Sun.), physical exercises; 7.30 a.m., sacred con. (Sun.); 3.0, con. (Sun.); 3.30, con.; 7.0, lec., con., weather. Dance: relays Berlin. Relay: Cassel, 272.7 m.

Hamburg, 394.7 m. (4 kw.). Relayed by Bremen (400 m.), Hanover (297 m.), Kiel (254.2 m.). Sundays: 7.25 a.m., time sig., weather, news; 8.15 a.m., sacred con.; 12.15, con.; 5.0, con.; 7.0, con. Weekdays: 6.0 a.m.,

time sig., weather, news; 11.55 a.m., Nauen time sig., news; 1.0, weather, con.; 8.0, con., dance.

Königsberg, 329.7 m. (4 kw.). 8.0 a.m., sacred con. (Sun.); 7.0, con. or opera, weather, news, dance (irr.). Relay: Danzig, 272.7 m.

Langenberg (Rhineland), 468.8 m. (25 kw.). Relays Elberfeld, Muenster, Dortmund, Cologne (Studio).

Leipzig, 365.8 m. (4 kw.). Relayed by Dresden (294.1 m.). 7.0 a.m., sacred con. (Sun.); 7.15, con. or opera, weather, news, dance music.

Munich, 535.7 m. (1½ kw.). Relayed by Nuremberg (303 m.). 10.30 a.m., lec., con. (Sun.); 3.0, orch. (Sun.); 3.30, con. (weekdays); 5.30, con. (weekdays); 6.15, lec., con.

Muenster, 241.9 m. (1.5 kw.). Relayed by Dortmund (283 m.). 8.0 a.m., Divine service; 11.0 a.m., news (Sun.); 6.40, news, weather, time sig., lec., con.

Norddeich (KAV), 1,800 m. 11.0 and 3 a.m., weather and news.

Stuttgart, 379.7 m. (4 kw.). 10.30 a.m., con. (Sun.); 3.30, con. (weekdays); 4.0, con. (Sun.); 5.30, time sig., news, lec., con. (daily); 8.15, time sig., late con. or cabaret. Relay: Freiburg, 577 m. (1½ kw.).

HOLLAND.

Hilversum (HDO), 1,050 m. (5 kw.). Sundays: 10.0 a.m., sacred service; 2.10, con.; 4.40, church service; 7.40, weather, news, con. Weekdays: 4.30, con.; 7.50, news, con.

Scheveningen-Haven, 1,950 m. (2½ kw.). Irr. throughout day.

HUNGARY.

Buda-Pesth (Csepel), 555.6 m. (3 kw.). 7.0, con. or opera; dance nightly.

ICELAND.

Reykjavik, 333.3 m. (700 w.). Con., 7.30.

ITALY.

Rome (IRO), 449 m. (3 kw.). 9.30 a.m., sacred con.; 4.30, relay of orch. from Hotel di Russia; 4.55, news, Stock Ex., jazz band; 7.30, news, weather, con.; 9.15, late news.

Milan, 315.8 m. (1 kw.). 8.0-11.0, con.

Naples, 333.3 m. (1½ kw.). 8.0-11.0, con.

JUGO-SLAVIA.

Zagreb (Agram), 310 m. (500 w.). 7.15, con.

LATVIA.

Riga, 480 m. (5 kw.). Con. daily, 7.0. Testing on 15 kw. (1,500 m.).

LITHUANIA.

Kovno, 2,000 m. (15 kw.). 6 p.m. (daily).

NORWAY.

Oslo, 461.5 m. (1.5 kw.). 6.15, news, time, lec., con.; 9.0, time, weather, news, dance.

Bergen, 370.4 m. (1 kw.). 6.30, news, con.

***Fredriksstad**, 436 m.

***Porsgrund**, 504 m. (1½ kw.).

***Hamar**, 566 m.

*Relays Oslo.

POLAND.

Warsaw, 400 m. (2 kw.). 7.30, con.

Warsaw (High Power), 980 m. (10 kw.). 7.30, con.

Posen, 270.9 m. (4 kw.). Testing.

Lemberg, 247.9 m. Under construction.

RUSSIA.

Moscow (RDW), 1,460 m. (15 kw.). 4.55, news and con.; 10.0, chimes from Kremlin.

(Popoff Station), 1,010 m. (2 kw.). 6.0, con. (Tues., Thurs., Fri.).

Radio Peredacha, 420 m. (6 kw.).

Trades Union Council Station, 460 m. (2 kw.). 5.0, con. (Mon., Wed.).

Leningrad, 1,165 m. (10 kw.). 5.0.

SPAIN.

Madrid (EAJ7), 373 m. (1.5 kw.). Con. daily. Closes 1 a.m. (daily).

Madrid (EAJ4), 340 m. (2½ kw.). Con.

Madrid (Radio-Madrilena) (EAJ12). Testing on 303-310 m. (2½ kw.).

Barcelona (EAJ1), 325 m. (1½ kw.). 6.0-11.0 (daily).

Barcelona (Radio Catalana) (EAJ13), 460 m. (1 kw.). 7.0-11.0, con., weather, news.

Bilbao (EAJ9), 436 m. (500 w.). 7.0, con.

Bilbao (Radio Vizcaya) (EAJ11), 418 m. (500 w.). 8.0-12.0, con. (daily).

Cadiz (EAJ3), 344.8 m. (550 w.). 7.0-9.0, con., news. Tests daily (exc. Sun.), midnight.

Cartagena (EAJ15), 335 m. (500 w.). 8.30-10.0, con. (daily).

Seville (EAJ5), 357 m. (500 w.). 9.0, con., news, weather. Close down 11.0.

Seville (EAJ17), 300 m. (500 w.). 7.0-10.0, con. (daily).

San Sebastian (EAJ8), 346 m. (1.5 kw.). 5.0-7.0, 9.0-11.0 (daily).

Salamanca (EAJ22), 405 m. (1 kw.). 5.0 and 9.0, con. (daily). Closes down 11.0.

SWEDEN.

Stockholm (SASA), 454.5 m. (1½ kw.). 10.0 a.m., sacred service (Sun.); 5.0, sacred service; 6.0, lec.; 8.15, news, con., weather. Dance (Sat., Sun.), 8.45.

Relays.—Boden (SASE), 1,200 m.; Eskilstuna, 250 m.; Falun (SMZK), 400 m.; Gothenburg (SASB), 416.7 m.; Gefle, 204.1 m.; Joenkoeping (SMZD), 201.3 m.; Kalmar (SMSN), 254.2 m.; Karlsborg (SAJ), 1,365 m.; Karlscrona (SMSM), 196 m.; Kristinehamn (SMTY), 202.7 m.; Karlstadt (SMXG), 220 m.; Linkoeping, 500 m.; Malmo (SASC), 260.9 m.; Norrkoeping (SMVV) 275.2 m.; Orebro, 218 m.; Ostersund, 720 m.; Saeffle (SMTS), 252.1 m.; Sundsvall (SASD), 545.6 m. (1 kw.); Trollhattan (SMXQ), 277.8 m.; Uddevalla, 294.1 m.; Umea, 229 m.; Upsala, 315 m.; Varberg, 297 m.

SWITZERLAND.

Lausanne (HB2), 850 m. (1½ kw.). 7.0.

Zurich, 494 m. (500 w.). 10.0 a.m., con. (Sun.); 4.0, con. (exc. Sun.); 7.15, lec., con., dance (Fri.).

Geneva (HB1), 760 m. (2 kw.). 7.15, con. (weekdays). No transmission on Sun.

Berne, 411 m. (1.5 kw.). 9.30 a.m., organ music (exc. Sat.); 3.0, 7.30, con.

Basle, 1,100 m. (1½ kw.). Con. daily, 7.30.

THE KENNETT ACCUMULATOR

IT is, of course, generally known that all accumulator batteries, whatever their size, are necessarily composed of 2-volt unit cells; but perhaps it is not sufficiently appreciated how convenient it is to be able to make up a battery to any required voltage simply by the assembly of these units. With this idea in mind H. Kennett, of 11, Liverpool Road, Islington, London, N., has put on the market a series of uniform 2-volt cells which, though absolutely complete in themselves, very readily lend themselves to block assembly either by fastening them together permanently or by the use of coupling connections. The cells are of excellent design and workmanship throughout, the plates being well supported, with ample space below, and the terminals are of ebonite, with anti-corrosion devices.

The Reval (Esthonia) broadcasting station has resumed its transmissions between 4 and 7 p.m. daily, on a wavelength of 440 m. with a power of some 2½ kilowatts.

SUB-RELAY STATIONS OF THE SWEDISH BROADCASTING SYSTEM

IN Sweden most of the broadcast entertainments are provided by Stockholm and relayed to a large number of smaller stations, but such cities as Boden, Gothenberg, Malmo and Sundsvall frequently put out their own local concerts; to a certain degree, although dependent on the capital for the bulk of the programmes, they must be considered main transmitters.

Strictly speaking, Stockholm supplies a complete service only to the following fifteen relay stations: Eskilstuna, Falun, Gaefle, Jonkoeping, Kalmar, Karlsborg, Karlscrona, Karlstad, Kristinehamm, Linkoeping, Norrkoeping, Oerebro, Ostersund, Saeffle and Umea. These vary in power from 250 watts to 10 kilowatts in the case of Karlsborg, which until Motala is on the air, is for the present the "5 X X" of the system. To these should be added, as already explained, the four main stations mentioned in the first paragraph of this article.

By arrangement with local clubs, however, smaller transmitters have also been erected in other out-of-the-way districts, where they act as *sub-relays* to the provincial main stations, and receive the capital programmes in this roundabout manner. Such stations are Boras (250 w.) on 230.8 m., Trollhaettan (250 w.) 277.8 m., Uddevalla (250 w.) 294.1 m., Varberg (250 w.) 297 m., which are linked up with Gothenberg, Halmstad (250 w.) 215.8 m. and Helsingborg (250 w.) 299 m. taking their concerts from Malmo and Hudiksvall (250 w.) 272.7 m., which relays Sundsvall. Considerable use is made of the telephone land lines, and by their aid the greater portion of the country is adequately covered.

To the Swedish Broadcasting Company (Svenska Radiotjaenst) this large number of small transmitters is not an unmixed blessing, as considerable difficulty is encountered in allotting suitable wavelengths in view of the limited broadcast band. A plan has now been put forward by which it may be found possible to operate several of the smaller relays on a common wavelength. Practical tests will shortly be undertaken to ascertain whether the scheme is a workable one. J. G. A.

A MARCONIPHONE GIFT

A CIRCUIT booklet which has been issued by the Marconiphone Co., Ltd., of 210, 212, Tottenham Court Road, W.1, will be sent free to readers who write to the above address and mention AMATEUR WIRELESS. In addition to circuits ranging from a simple crystal arrangement to an elaborate "super-het," there are photographs of experimental "hookups" accompanying each diagram. Full lists of components required and constructional details of each receiver are also given for the benefit of constructors.

WIRELESS ORGANISATIONS ADVISORY COMMITTEE

A MEETING of the Wireless Organisations Advisory Committee was held at Savoy Hill on January 31, with Captain Ian Fraser, C.B.E., M.P., in the chair.

It was agreed that the members of the committee should prepare, through the machinery of the organisations which they represent, analytical reports based on the views of listeners regarding the composition of broadcast programmes, these to be submitted to the next meeting of the committee. The committee unanimously agreed that the only means of ensuring a broadcasting service which was satisfactory to all listeners was that provided by an alternative programme scheme.

Captain Eckersley attended and gave technical evidence upon the progress of the B.B.C.'s future plans to meet this end. Further discussion on alternative programmes was deferred until the next meeting, when members of the committee will have had time to consider the evidence heard.

Dates for future meetings were considered, and it was decided that the committee should meet on the last Monday in every month, but that an additional meeting should be called for February 14.

Owing to adverse economic conditions, radio equipment is not selling well in Brazil at present. Importers are not only curtailing orders, but in some instances countermanding them. Complaint is made of the large amount of obsolete material still being offered at so heavy a discount as seriously to interfere with the importation of the latest apparatus.

The Japanese Wireless Telegraphy Company has placed a contract with a German firm for the installation of a super-power W.T. station in Japan. The contract stipulates that the transmitter shall be brought into operation in 1928. As a power of 550-600 kilowatts aerial energy is contemplated, it is expected that by means of this station direct communication will be made possible with Great Britain and the Continent of Europe.

Now that the Dutch Scheveningen-Haven wireless telephony station has been officially taken over by the authorities, weather and market reports are broadcast throughout the day by arrangement with the Amsterdam Vaz Diaz Press Agency on a wavelength of 1,950 metres, with a power of 2½ kilowatts in the aerial. It is this station which later may be used by manufacturers and other business men in Holland for a publicity service. By arrangement with the Vaz Diaz Agency simple receiving apparatus made for the sole reception of the Scheveningen transmissions can be hired from the organisers. The station announces itself as *Scheveningen Haven op* 1,950 *meter-Persbureau Vaz Diaz.*

CHIEF EVENTS OF THE WEEK

SUNDAY, FEBRUARY 13

London	Light Orchestral Concert.
Manchester	Masterpieces of Wagner.

MONDAY

London	*Paul Jones.* A comic opera in three acts.
Aberdeen	Concert by the Insch Choral Union.
Birminghan.	Radio Fantasy—"Old Memories."
Cardiff	Welsh Celebration of St. Valentine's Day.
Glasgow	*For France.* An episode of the Franco-Prussian War.
Manchester	An hour's entertainment by the Huddersfield Concert Party.

TUESDAY

London	*The Fog.* Short play by Martin Hussingtree.
Belfast	*By Virtue of a Broadcast.* By Frank H. Shaw.
Cardiff	Scenes from the life of Oliver Goldsmith.
Glasgow	Rutherglen programme.
Manchester	*Whitemail.* A one act comedy by Robert H. Blackmore.

WEDNESDAY

London	Programme by the Chief Engineer.
Aberdeen	*Guy Weatherby's Dilemma.* Comedy by Hilda P. K. Chamberlain.
Belfast	"Saint Saens." By the Station Orchestra.
Glasgow	*The Merchant of Venice.* Act II, Scene II.
Manchester	Popular Suites and Ballets.

THURSDAY

London	B.B.C. National Concert, relayed from Royal Albert Hall.
Belfast	"The Two Bobs," Entertainers.
Glasgow	Edward German Anniversary Programme.

FRIDAY

London	Concert for Schoolchildren, arranged by the People's Concert Society in co-operation with the B.B.C.
Birmingham	W. W. Allen in character studies from the works of Charles Dickens.
Bournemouth	"The Two Bobs," Entertainers.
Glasgow	Edward German Anniversary programme.

SATURDAY

London	Community singing from the Royal Albert Hall.
Bournemouth	Revue.
Cardiff	*The Rest House.* A Radio Satire by Andrew Harding.
Manchester	"Vaudeville."

RADIO ASSOCIATION

THE annual meeting of the Radio Association will be held at the Hotel Cecil on Friday, February 17, starting at 3.30 p.m. The Hon. J. M. Kenworthy, M.P., will deliver the presidential address. The meeting will be followed by a lecture, at 4.45 p.m., on "Broadcasting and Television," by Professor Fournier d'Albe, D.Sc., F.R.A., etc. The lecture will be open to the public.

From Geneva, recently, the League of Nations broadcast its first bulletin on the influenza epidemic now raging in Europe.

A wireless installation of a six-valve receiving set, with four loud-speakers and fifty headphones, has been provided for Mercer's Hospital, Dublin, due to the generosity of tradesmen and the labourers employed at the St. James's Gate Brewery. This is the second Dublin hospital to be fitted up to give the patients the great boon of wireless entertainment, which often helps, in the opinion of the medical men, towards their more speedy recovery.

AERIAL FIXED CONDENSERS

IT is sometimes advisable to insert a low-capacity fixed condenser in the aerial lead to coil and variable condenser. There is no need for an expensively-made piece of apparatus; indeed, the following will function satisfactorily in quite a number of situations where a low-capacity condenser is required:

Obtain two short lengths of thin brass or copper tube, say 2 in. long, one tube being ⅛ in. larger inside diameter than the other is on its outside diameter. To the inside of the smaller and the outside of the larger solder a short length of stout copper wire for connections.

Wrap the smaller tube with a few turns of clean white paper that has been baked in paraffin-wax and carefully drained. The thickness of paper on the tube should be such as to make it a tight fit when driven into the larger tube.

Make the larger tube hot, and drive the wrapped tube as tightly as possible into it, then place the entire article in a dish of paraffin-wax in a hot oven. Remove when the wax is melted, and allow all to become cold: dig the condenser out when the wax is set, trim off the spare wax, and you have a serviceable condenser ready for use.

M. P.

BATTERIES IN ENCLOSED RECEIVERS

NOWADAYS batteries are often enclosed in the cabinet containing the receiver. When this is done, the batteries—which, it should be remembered, are large masses of earthed conducting material—should not be placed close to components or directly underneath them.

This applies particularly to tuned circuits, as the proximity of a large earthed object will have much the same effect as is experienced if, for instance, the hand is placed close to a coil or condenser.

R. H. B.

SEPARATE H.T. BATTERIES FOR SEPARATE TAPPINGS

WHEN different H.T. tappings are taken from a battery, parts of it will be subjected to a heavier drain than others, and the current taken from those parts which are common to all tappings may, in a set containing several valves, be so heavy as to cause very rapid exhaustion.

There is, of course, no reason why separate batteries, with a common negative connection, should not be used for the various tappings. As the drain on each battery is less severe, this method will give a longer total life from the batteries than if they were used one at a time.

R. H. B.

WORTH WRITING FOR

THE General Electric Co., Ltd., of Magnet House, Kingsway, W.C.2, have issued a useful 32-page catalogue of Gecophone wireless components. All are well designed and of special interest to constructors.

J. J. Eastick and Sons, who are the makers of the well-known Eelex terminals and kindred accessories, have sent us a well-illustrated pamphlet dealing with their products.

When writing for Catalogues or Kindred Trade Publications you will be sure of prompt attention if you mention "Amateur Wireless."

The Fuller Accumulator Co. (1926), Ltd., of Chadwell Heath, Essex, have issued a descriptive leaflet on their 20-volt accumulator units.

A. F. Bulgin and Co., of 9-11, Cursitor Street, E.C.4, have sent us a catalogue of Deckorem radio products, containing many novel and useful radio gadgets.

Brown Bros., Ltd., of Great Eastern Street, E.C.2, have sent us their catalogue (No. 231) of radio receiving sets and components. All the products of the leading manufacturers are illustrated and described. This is for traders only.

An interesting booklet, issued on behalf of the Telegraph Condenser Co., Ltd., of Wales Farm Road, W.3, called "How to Build Your Own H.T. Battery Eliminator," has been sent to us for review. The first part of the booklet is devoted to a description, by a well-known technician, of how a battery eliminator works. Then follows useful information on how to build successful eliminators for both D.C. and A.C. mains. Any reader who would like a copy should write to the address given, enclose three penny stamps, and mention AMATEUR WIRELESS.

The Puradyne L.F. transformer is the subject of a pamphlet received from the Puradyne Manufacturing Co., of 27, Elgin Road, Seven Kings, Essex.

Interesting details of Shortpath valves are contained in an informative booklet issued by the Benjamin Electric, Ltd., of Brantwood Works, Tottenham, N.17. Benjamin wireless components are dealt with in another booklet issued by the same company.

WE are informed by the Carrington Manufacturing Co., Ltd., that owing to a large increase in business, due to the great demand for "Camco" cabinets, they have acquired larger works at Croydon. Their vans will deliver in the London area daily, and their new address will be "Camco" Works, Sanderstead Road, South Croydon.

It is officially stated that no part of the B.B.C.'s work is more generally appreciated nowadays than their religious operations. The Sunday evening epilogue evokes more detailed appreciative comment than the most ambitious and expensive symphony concert.

In less than a month approximately 220 blind persons in Glasgow and the West of Scotland have availed themselves of the privilege of obtaining free wireless licences.

Mr. C. W. Goyder, of Mill Hill, has added to his long-distance records by exchanging morse messages with the whaler *Sir James Clark Ross,* now about 250 miles within the Antarctic circle. This latest achievement affords a further proof of the superiority of the short waves for long-distance work on low power.

"Amateur Wireless and Electrics." Price Threepence. Published on Thursdays and bearing the date of Saturday immediately following. Post free to any part of the world: 3 months, 4s. 6d.; 6 months, 8s. 9d.; 12 months, 17s. 6d. Postal Orders, Post Office Orders, or Cheques should be made payable to Bernard Jones Publications.

General Correspondence is to be brief and written on one side of the paper only. All sketches and drawings to be on separate sheets.

Contributions are always welcome, will be promptly considered, and if used will be paid for.

Queries should be addressed to the Editor, and the conditions printed at the head of "Our Information Bureau" should be closely observed.

Communications should be addressed, according to their nature, to The Editor, The Advertisement Manager, or The Publisher, "Amateur Wireless," La Belle Sauvage, London, E.C.4.

MORE RADIOGRAMS

A BIG appeal is being launched by the managers of the various Glasgow hospitals for the provision of wireless installations for the benefit of the patients. It is stated that a ward of twenty-four beds can be equipped for approximately £50, which sum would provide entertainment for four hundred patients every year, as the average duration of a patient's stay in hospital is twenty days. Within a few days of the appeal being made £170 had been received in contributions and £200 promised.

Upon the question of political and controversial broadcasting, Mr. D. Cleghorn Thomson, the Northern Area Director of the B.B.C., claims that with its introduction listeners could hear the protagonists direct and make up their own minds, where formerly they had to accept the dictated and partial version of others.

It is stated that in the middle of February the Berlin and Vienna Post Offices will begin the regular transmission of pictures by wireless. The system to be adopted is that of the Telefunken, which was thoroughly tested six months ago, and from the technical point of view proved to be thoroughly satisfactory. It has been decided to start a regular service between Berlin and Vienna.

Part of a surplus from performances by Hawick Amateur Operatic Society has been handed over to Hawick Fever Hospital for a wireless installation. The sum given to the hospital was £60.

Igranic Neutro-Sonic Seven.—A meeting of the Kensington Radio Society was held at 136, Holland Park Avenue, on Thursday, January 13, at 8.30 p.m., when Mr. Alford, of the Igranic Electric Co., Ltd., gave a demonstration with the Igranic Neutro-Sonic Seven Receiver. He first gave a brief and interesting history of super-heterodyne receivers from their first introduction into this country from America. The meeting was interested to hear that with one of these super-sensitive receivers it was possible to hear the German warships communicating with one another in harbour.

"Germany's New Powerful Broadcast Station" is illustrated and described in an interesting article on the Langenberg station in Rhineland in this week's "English and Amateur Mechanics" (3d.), on sale at all newsagents. Other interesting items include: "Making an Ingle-nook in an Existing Room," "Something New in Metal Cutting Tools," "An Easily-constructed Drilling Machine," "Making a Reflecting Optical Lantern," "Passe-partout Picture Framing," "Wireless Notes for the Amateur," Recent Inventions and Innovations, Technical Notes and News, Correspondence, Queries, Replies, Technical Advice Bureau, etc, etc.

PREPAID ADVERTISEMENTS.

Advertisements under this head are charged FOURPENCE PER WORD, minimum charge FOUR SHILLINGS.

DEPOSIT SYSTEM.

As the Publishers cannot accept responsibility for the bona fides of Advertisers in this publication they have introduced a system of deposit which it is recommended should be adopted by readers when dealing with persons with whom they are unacquainted. It is here explained.

Intending purchasers should forward to the Publishers the amount of the purchase money of the article advertised. This will be acknowledged to both the Depositor and the Vendor, whose names and addresses must necessarily be given. The Deposit is retained until advice is received of the completion of the purchase, or of the article having been returned to and accepted by the Vendor. In addition to the amount of the Deposit, a Fee of 6d. for sums of £1 and under, and 1s. for amounts in excess of £1, to cover postage, etc., must be remitted at the same time. In cases of persons not resident within the United Kingdom, double fees are charged.

The amount of the Deposit and Fee must be remitted by Postal Order or Registered Letter (Cheques cannot be accepted), addressed to

"AMATEUR WIRELESS,"
ADVERTISEMENT DEPARTMENT,
LA BELLE SAUVAGE, LONDON, E.C.4.

TRANSFORMERS, Phones, Loudspeakers rewound: guaranteed efficiency 12 months, 4s. Trade invited.—Transform, 115, Links Road Tooting, London. [37

NOTICE.—If you are requiring anything Electrical, such as Dynamos, Motors, Switchboards, Cut Outs, Regulators, Batteries, Meters, Wireless Material, Generating Sets, etc. etc., it will save you pounds by dealing with us direct. We hold the greatest Government Surplus and Bankruptcy Stocks in the Country. Every article guaranteed. Please write your requirements.—T. W. Thompson & Co., Government Surplus Depot, 39/43, London Street, S.E.10. Telephone 1259 Greenwich.

H. T. P. GEE, MEMBER R.S.G.I., AND A.M.I.E.E. British and Foreign Patents and Trade Marks.—51-52, Chancery Lane, London, W.C.2. Phone: Holborn 1525.

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AMATEUR WIRELESS, February 19, 1927.

With Free "Foldagraph" Blueprint

CAPT. ROUND ON GIANT STATIONS FOR BRITAIN

Amateur Wireless

And Electrics

Registered at the G.P.O. as a Newspaper.

Vol. X. No. 245 SATURDAY, FEBRUARY 19, 1927 Price 3d

FREE "Foldagraph" with BLUE-PRINT

No more "lost" Chords

Cossor Valves — with the wonderful new Kalenised Filament—bring you the superb technique of the living Artiste

YEAR by year the barriers to perfect Radio reproduction are being broken down. No longer can it be said that Broadcasting suffers from mechanical limitations. With the vast improvement in the design of Loud Speakers and the development of choke or resistance capacity amplification, Radio enters upon a new phase. Every note in the harmonic scale can now be reproduced with the living naturalness of the concert hall or the studio. There are no more 'lost' chords.

But this method of amplification demands a valve specially designed for the purpose—the wonderful new Cossor 2-volt R.C. This new valve has an exceptionally high amplification factor of 40—higher than any other valve of similar type. Due to the prolific emission from its Kalenised filament it will give a richness of tone such as you have never heard before. From the deep fascinating rhythm of the lower octaves of the organ to the surprisingly sweet high notes of the violin. Every note is there, none is missing.

If your Receiving Set utilises the choke or resistance coupling method, use this superb new Cossor R.C. Valve at once—and hear Radio with a charming freshness and vitality which must amaze you.

The new Cossor 2-volt R.C.
Consuming 1 amp at 1·8 volts Impedence 70,000 ohms. Amplication factor 40 **14/-**

Other Cossor Valves

For 2-volt Accumulators

210H.F. (Red Band) H.F. use	14/-
210D (Black Band) Detector	14/-
215P (Stentor Two) Power Valve	18/6

For 4-volt Accumulators

410HD (Red Band) for H.F. or Detector	14/-
410RC (Blue Band) For Resistance or Choke Coupling	14/-
410P (Stentor Four) Power Valve	18/6

For 6-volt Accumulators

610P (Stentor Six) Power Valve	22/6

N.B. All above valves consume ·1 amp. except the 215P which consumes ·15 amp.

Cossor

— the valve which serves you longest

A. C. Cossor, Ltd. Highbury Grove, London, N. 5.

Gilbert Ad. 7899.

Amateur Wireless and Electrics

The Leading Radio Weekly for the Constructor, Listener and Experimenter

Edited by BERNARD E. JONES

Vol. X. No. 245 — Technical Editor: J. H. REYNER, B.Sc. (Hons.), A.M.I.E.E. — FEBRUARY 19, 1927

The "Foldagraph"—Regional Broadcasting—G.P.O. on the Track—Listen for Berne—"American Service"

"A.W.'s" Unique Gift

THE Foldagraph, which is presented free with this issue, is an entirely novel form of constructional guide, which will be of immense assistance to you when building the "A.W." "Ballot Three," a receiver which represents the popular opinion of modern design and a receiver which is undoubtedly destined to prove to be the most popular yet. Build it now and tell us what you think of it!

Anti-Prohibitionists!

A B.B.C. announcer, in giving the weather forecast recently, said: "Showers of snow and 'ail will occur locally." Many listeners would like the announcer to be more specific the next time he announces showers of ale, name the localities, and give the first trains there!

High-power Epidemic Spreading

YET another high-power broadcaster has been added to the already formidable number by the announcement that the Finnish Republic, whose Helsingfors transmitter now broadcasts on 375 metres, is planning the erection of a 25-kilowatt station at Lahti, for which a sum of £40,000 has already been voted. It is expected that work on the new station will be completed early next year. If there are many more "H.P." stations coming along, our poor little two-valvers will seize up as a protest!

"American Service"

THE Postmaster-General has announced a further extension in America of the Transatlantic telephone service, which became available as from February 12, when the service included places in the States of Michigan, Illinois and Wisconsin.

OUR WEEKLY NOTE

PROTECTING THE FILAMENTS

He that has handled valve sets for any length of time without ever having accidentally put the H.T. across a valve filament is indeed lucky. Even the most careful people do it occasionally when experimenting.

The valve filaments can be protected against such an accident in a very simple manner. If a suitable resistance is inserted in series with the H.T. battery, and close to it, the current which might flow through the filament of a valve, should a mistake be made with the H.T. connections, can be limited to an amount which would do no harm.

The minimum value of this resistance can easily be found from Ohms Law. If the H.T. voltage is 60 and the valves of the .06 type, 1,000 ohms resistance will limit the current which can flow from the H.T. battery to .06 amp. and thus protect the filaments. When such a resistance is used a large-capacity fixed condenser should be connected in parallel with it.

French Scientific Broadcasts

IN competition with the University lectures relayed from the Sorbonne (Paris) by the P T T stations, the Eiffel Tower will, in future, broadcast special talks given by French celebrities in the scientific world, daily at 6 p.m. In the cause of science the usual concert and entertainment will now be delayed until 8.15 p.m.!

CAPT. H. J. ROUND, M.I.E.E., on "Giant Broadcasting Stations."
See page 292.

Listen for Berne

ON the first Monday in each month the Berne station will broadcast special musical transmissions for the benefit of foreign listeners. These will take place between 10.30 p.m. and 12.30 a.m., all items being announced in English, German, French and Italian. The programmes will be mainly of a Swiss character. There will be no excuse on these occasions for not identifying that "very distant" station!

Regional Broadcasting

THERE is an insistent demand at the present time for alternative programmes, and various proposals have been put forward to this end. In the centre pages of this issue no less an authority than Captain Round, M.C., M.I.E.E., places before our readers a unique scheme whereby four super-power broadcasting stations, situated in England and Scotland, would be able to supply every listener who has a reasonably efficient set with at least two alternative programmes. We shall be interested to hear our readers' opinions of Captain Round's scheme.

Are Oscillation-tracking Vans a Success?

OSCILLATORS are on the increase, if we are to take the complaining letters that arrive at the B.B.C. as a guide. These letters have now attained the colossal total of between 500 and 600 per week, and the number is still increasing. Since the beginning of this year the G.P.O. sleuth van in search of oscillators has been at work in charge of G.P.O. inspectors and electricians. The B.B.C. is afraid that the oscillators are back at their vile game as soon as the sleuth van has gone!

PRINCIPAL CONTENTS

Do Your Fixed Condensers Matter?

By H. J. BARTON CHAPPLE, Wh.Sch.

IT is surprising how often I am asked the question: "Does it really matter whether I put a fixed condenser in such and such a position in my wireless set? The circuit, as published, certainly indicates one, but I fail to appreciate its utility." If I reply in the affirmative, pointing out that the designer of that particular circuit would certainly not have included it without some special object in view, there is the invariable query as to why this should be necessary and what settles the value of the capacity of the condenser.

Now the fixed condenser is perhaps one of the most abused of wireless components, and yet when used in its proper place it can improve the quality of the reception to a remarkable degree, while, on the other hand, it has power to ruin the performance of the set unless adequate care is taken. In over 90 per cent. of the present-day receivers one or more fixed condensers are employed in certain positions, and while the functions of many of the other components are, to a degree, understood, the amateur constructor is often nonplussed by the small fixed condenser.

Typical Cases

It is not possible to deal with all the possibilities and probabilities in one short article, but it will no doubt be enlightening to many readers to deal with a few typical cases and see how important it is to ensure the inclusion of a high-grade component. Beginning with the case of the condenser shunted across the primary of the first low-frequency transformer, the prime object here is to offer an alternative path for the high-frequency currents which are in the plate circuit of the rectifying valve. Although the signals have been rectified, there is a high-frequency component still present in the circuit, and the primary winding of the low-frequency transformer offers a very high impedance to its flow. The provision of the condenser, however, forms a suitable by-pass, and a convenient value is found to be .002. With signals at 300 metres this gives an impedance of about 80 ohms, which impedance increases to about 130 ohms at 500 metres.

The low-frequency currents will not pass through this condenser, as it offers a very high impedance (many thousand ohms) to their passage, so that its inclusion is beneficial. If omitted, the high-frequency currents would take the path provided by the self capacity of the primary winding; and this is to be deprecated, as it produces an undue strain on the winding and introduces losses. The suggested value of .002 for the condenser is not a rigid one, but it is preferable not to exceed the limits of .001 to .005.

Much of the same argument also applies to the condenser across the telephones, the capacity limits being the same; but in addition there is a kind of storage or reservoir effect produced by this condenser which will often materially improve reception. In the case of loud-speakers we have the same benefits as a result of providing the parallel condenser, with the further advantage that adjustment of this capacity gives a tone control. An increase in capacity decreases the impedance of a condenser to the flow of alternating currents, while a decrease in capacity produces an increase in impedance, so that we have a means at our disposal for "bringing out" the high or low notes as desired. A little experiment with the particular type and make of loud-speaker available will indicate this fact quite clearly, and the correct capacity can be chosen to suit individual tastes.

Reliable Makes Essential

The effect of a short circuit developing in these condensers mentioned above will be quite obvious (a reduction or vanishing of sound in the telephones), so that it is absolutely essential to choose reliable makes with good dielectric or insulating material. Condensers of inferior quality and unknown make may be cheaper at the outset, but the trouble they cause outweighs the few pence saved.

Coming now to the condenser across the H.T. battery, it will generally be found that an improvement results if one or more are included. The resistance of this battery is a quantity which depends not only on the size of the individual cells, but also on the life or number of hours during which the battery has been supplying energy to the valves. This resistance will cause a fluctuation of voltage, depending upon the amount of plate current being drawn from the battery, and will thus produce disturbing results in a multivalve set when the one high-tension battery is common to all the valves.

The provision of a condenser of the order of 2 microfarads across each anode tapping will undoubtedly effect an improvement. Each condenser acts as a sort of reservoir of energy, and smooths out

(*Concluded on page* 302)

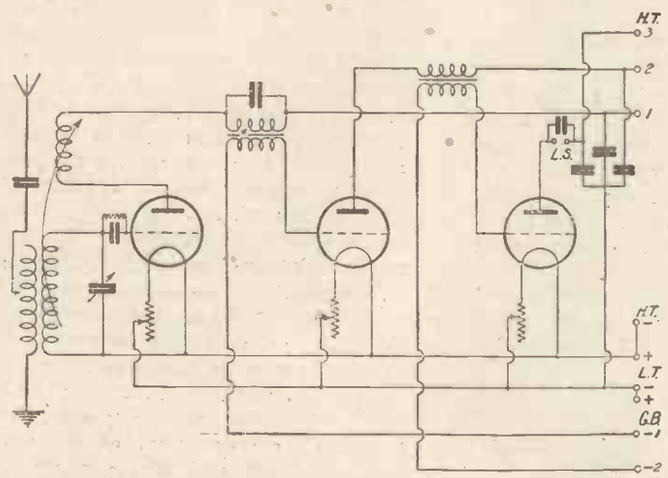


Fig. 1.—Circuit Diagram showing Correct Positions of Fixed Condensers.

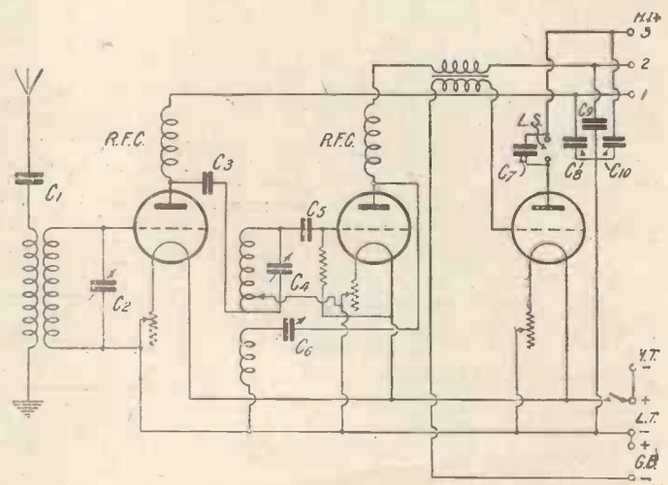


Fig. 2.—A Selective Circuit where Fixed Condensers *Do* Matter.

AN ALL-WAVE ONE-VALVE REINARTZ

CAPACITY-CONTROLLED magnetic reaction, familiarly known as Reinartz reaction, is fast becoming the most popular and widely-used system whereby a smooth and gradual application of reaction is obtained. The one-valve receiver shown in the photographs incorporates a well-tried and highly satisfactory form of Reinartz reaction.

No specially wound coils are used, since the receiver was required to operate on all wavelengths between 20 and 3,000 metres. The only satisfactory way of covering such a wide range of wavelengths is to use plug-in coils, and provided these are of reputable make, results will be equally good on all wavelengths referred to.

Three Aerial Couplings.

Since on different wavebands different methods of aerial coupling are desirable, it was decided to arrange for three distinct types of coupling. An examination of the circuit diagram (Fig. 1) and of the developed wiring diagram (Fig. 2), will show that three aerial terminals are fitted to the terminal strip. Looking at the back of the set the extreme left-hand terminal in Fig. 2 corresponds to that marked A3 in Fig. 1, and as the set is wired at present allows the use of the so-called "aperiodic" aerial coupling.

The second terminal from the left in Fig. 2, corresponding to A2 in Fig. 1, gives a direct-coupled aerial system. If the third aerial terminal is used, corresponding to A1 in Fig. 1, a .0001-microfarad fixed condenser is then connected in series with the aerial and the top of the grid coil.

Each of these terminals has its use on different wavelengths. Thus on short waves, below 100 metres, it is almost essential to use a small untuned aerial coil to make the set oscillate. On broadcast wavelengths any of the three aerial systems can be used, though, for combined signal strength and selectivity, the writer favours the series-fixed-condenser method. On Daventry's wavelength, best results are obtained when direct coupling is used; that is, when the aerial is connected to the centre aerial terminal. In any case, there is ample scope for experimenting here, and no doubt results will differ, according to the characteristics of the aerial in use.

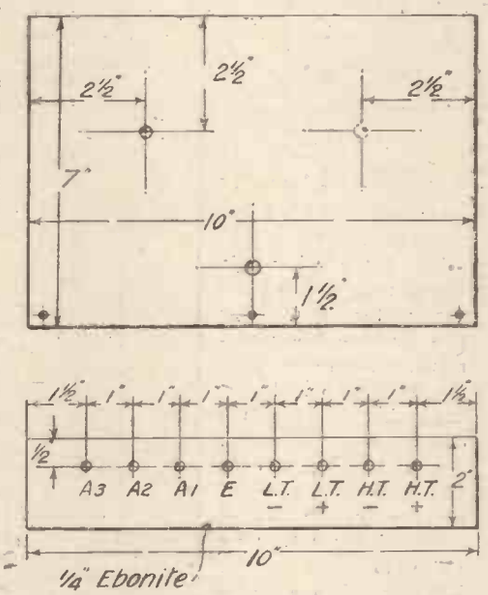


Fig. 3.—Panel and Terminal Strip Drilling Diagram.

A further inspection of Fig. 1, the circuit diagram, will show the simple system of Reinartz reaction employed. One side of each variable condenser is earthed, so that hand-capacity effects are reduced. The reaction coil is closely coupled to the grid coil, variation of reaction being obtained with the variable reaction condenser.

An important point to note is that the rheostat shown is used as a semi-fixed resistor. When once the correct amount of resistance required in circuit is found, the switching on and off of the valve filament is controlled by the phone plug. When the plug is inserted in the "three-spring" jack the filament circuit is completed, in addition to the phones being connected in the plate circuit.

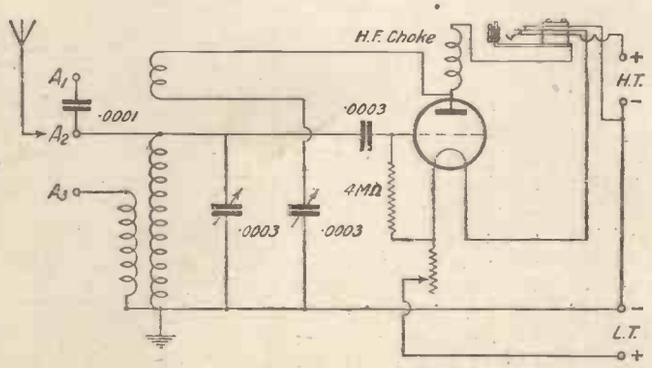


Fig. 1.—Circuit Diagram of the All-wave One-valve Reinartz.

Components

For the construction of this set the following parts are required:

Ebonite panel, 10 in. by 7 in. by $\frac{3}{16}$ in. (American Hard Rubber Co., Ltd.).

Terminal strip, 10 in. by 2 in. by $\frac{1}{4}$ in. (British Ebonite Co., Ltd.).

2 4-in. Radion dials (American Hard Rubber Co., Ltd.).

2 .0003-microfarad variable condensers (Ormond Engineering Co.).

3-spring jack (Igranic Electric Co.).

Phone plug (Garnett, Whiteley and Co., Ltd.).

H.F. choke coil (Varley, made by Oliver Pell Control, Ltd.).

Anti-microphonic valve holder with terminals (Lotus: made by Garnett, Whiteley and Co., Ltd.).

30-ohm rheostat for baseboard mounting (Igranic Pacent).

3 coil sockets for baseboard mounting (Lissen).

.0003-microfarad fixed condenser (Dubilier Condenser Co.).

.0001-microfarad fixed condenser (Edison Bell, Ltd.).

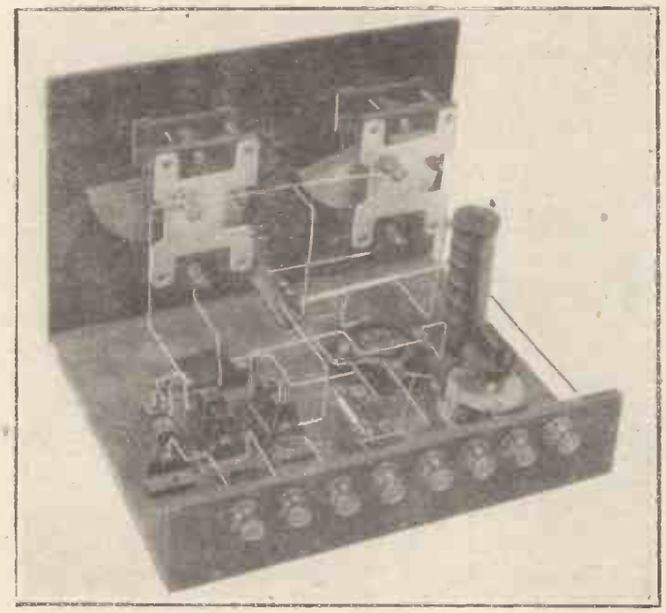
4-megohm grid leak (Dubilier Condenser Co., Ltd.).

Dumetohm grid-leak holder (Dubilier Condenser Co., Ltd.).

8 engraved terminals: 3 marked AERIAL; one each EARTH, L.T. −, L.T. +, H.T. −, H.T. + (Eastick and Sons).

16-gauge tinned copper wire. Cabinet, baseboard, wood screws, etc.

When these parts have been obtained the construction of the set can be started. The panel drilling is particularly simple,



This Photograph shows the general Layout of Components.

as only six holes are drilled in it, including the three for wood screws. Drill the panel and terminal strip in accordance with Fig. 3, and mount the two .0003-microfarad Ormond variable condensers, phone jack and terminals in their places.

Set aside the panel and terminal strip, and then lay out the other components as near as possible in the positions indicated in the drawings. The photographs, especially the plan view, will be of help in this respect. Do not mount the H.F. choke too near the reaction condenser—about two inches away from the metal-end plate at least. When the constructor is satisfied with the layout, the various components can be screwed to the baseboard.

As the photograph shows, most of the wiring is of the right-angle-bend variety.

Take great care when wiring to leave ample clearance to insert the valve in the valve holder and the coils in the coil sockets. The coil sockets, by the way, are mounted at such a distance apart that there is just comfortable clearance between coils when these are inserted. Leave a small space near the grid-leak holder so that various values of grid leak can be easily clipped in without disturbing the wiring.

Connections

Looking at the developed wiring diagram (Fig. 2), the point-to-point wiring is as follows: Connect A3 to lower end of aperiodic coil holder. A2 to left side of .0001 microfarad condenser, and to lower end of grid coil holder and to fixed vanes of tuning condenser. A1 to right side of .0001 microfarad condenser. E to L.T.– and to H.T.– and to lower filament tag of jack and to moving vanes of both reaction condenser and tuning condenser, and to top ends of aperiodic coil holder and grid coil holder. Lower end of reaction coil holder to fixed vanes of reaction condenser. Top end of reaction coil holder to plate terminal of valve holder and to one end of H.F. choke. Other end of H.F. choke to lower phone tag of jack. Upper phone tag of jack to H.T.+. Upper filament tag of jack to top filament terminal of valve holder. Lower filament terminal of valve holder to lower end of grid leak and to top side of rheostat. L.T.+ to lower side of rheostat. Top end of grid leak to grid terminal of valve holder and to right side of .0003 microfarad fixed condenser.

When the wiring is completed the set is ready for test. For this purpose the transmission from the local station should be utilised. Plug in the *centre* coil socket a No. 40 or No. 50 coil, and connect the aerial to the *centre* aerial terminal, and the earth to its terminal. Looking from the front of the set, the extreme left coil socket is for the reaction coil. A No. 60 coil should be used in this socket. Insert a suitable valve in the valve holder, and connect the accumulator to the L.T. terminals. Then insert the phone plug in the jack. Before connecting the full H.T. across the H.T. terminals, try with only about six volts, and then if all is O.K. bring the rest of the H.T. battery into service. With the left-hand condenser dial at zero, rotate the right-hand dial until signals are heard. Then bring up the strength by slowly rotating the reaction condenser dial.

Results

Owing to the delightful ease of operating this receiver it is possible to tune in a large number of transmissions. Using a set of Igranic short-wave plug-in coils, size 4 for aperiodic coil, size 9 for grid coil, and size 6 for reaction, KDKA, the Pittsburg post of the Westinghouse Electric Co., America, can be received on 63 metres any night after 11.20 p.m., at weak phone strength. With a 2-valve amplifier attached, KDKA frequently works a loud-speaker.

Using a size 2 coil for the aperiodic coil, a size 6 for the grid coil, and a size 4 or 6 coil for reaction, 2XAF, on 32.79 metres, can also be picked up at good strength after 10 p.m. on Tuesdays and Saturdays. This station is the most reliable short-wave American transmitter.

On the broadcast wavelengths the German broadcasters always make themselves heard. On long wavelengths, Daventry, Hilversum and Radio-Paris are both regularly received. A. S. HUNTER.

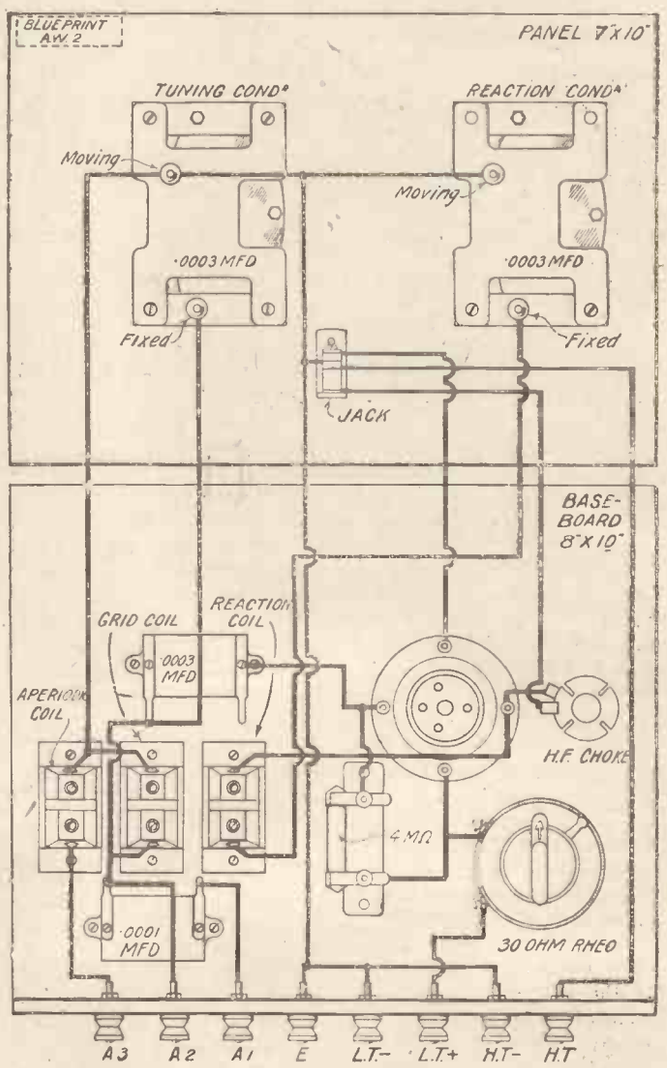
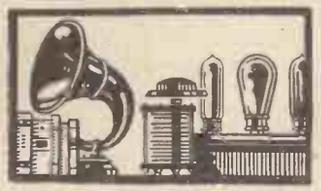


Fig. 2.—The Developed Wiring Diagram.

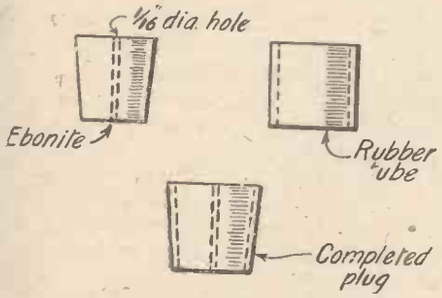


PRACTICAL ODDS & ENDS

Replacing Lost Vent Plugs

IT is not an uncommon happening when an accumulator is returned from the charging depot to find one or more of the vent plugs missing.

If a replacement cannot be obtained, a serviceable substitute may be made from



Ebonite-tube Vent Plugs.

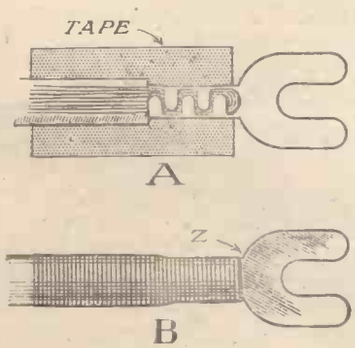
a piece of ebonite rod and a length of rubber tubing, as shown in the diagram.

The ebonite rod, which should have a diameter about $\frac{1}{16}$ in. less than the vent hole, should be tapered slightly with a file and a $\frac{1}{16}$-in. diameter hole drilled through the centre.

A piece of rubber tubing of the same length as the ebonite rod should now be slipped over the latter, in order to enable the plug to hold firmly in the vent hole without damaging the celluloid collar of the accumulator. M. R.

Durable Flex Leads

TO make a good flex connection, bend the wire of the flex as indicated at A and clamp on the spade terminal. Now



Durable Flex Leads.

take a small piece of tape and wrap it round both the wire overlap and the clip part of the spade terminal.

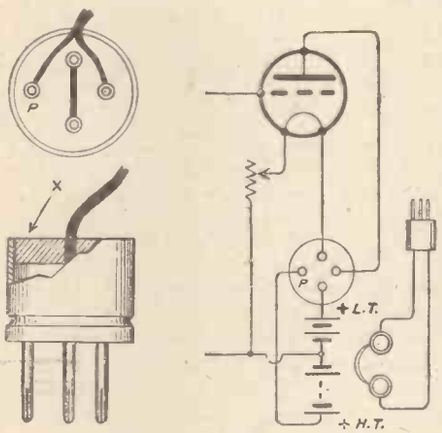
Then neatly wind on the cotton as shown at B. When a lead is constantly used, the spade part of the terminal marked Z is liable to break off.

The writer has overcome this weakness by placing two spade terminals together, one exactly on top of the other, and clipping them together on the wire; this should be done, of course, before winding on the cotton. C. A. W.

Useful Switching Device

VALVE bases containing the pins often prove to be very useful gadgets, especially when experimenting with small components of the plug-in type. The diagram indicates a method of using the base of a broken valve as a simple plug switch for the simultaneous control of the battery current and telephones (or loud-speaker) of a single-valve set.

To make the switch, short circuit the two filament pins with a piece of bare copper wire, connect a twin flexible lead to the



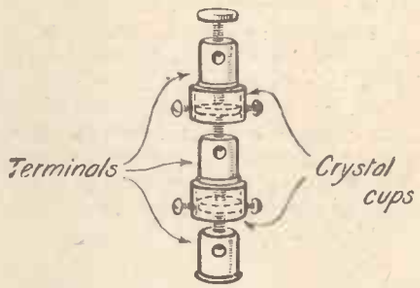
A Novel Use for Valve Base.

grid and plate pins, and pass this lead through a hole drilled through the centre of a wooden disc X, which fits tightly into the top of the cup so as to form a sealing cap. To the other end of the flexible lead connect the telephones or the loud-speaker.

Now connect up a valve holder as shown in the diagram on the right. It will be seen that when the plug is placed in the socket the battery circuit is closed via the short-circuiting link and two filament pins, the phones being connected at the same time to plate and H.T. positive. The batteries and phones are, of course, disconnected when the plug is withdrawn. O. J. R.

Using Extra Phones

WHEN it is desired to use extra pairs of phones with a set, the simple



Using Crystal Cups for Phone Connectors.

method of adding terminals shown in the diagram will prove useful.

A small crystal cup to which has been fastened a terminal is attached to the clamping screw of each phone terminal on the set.

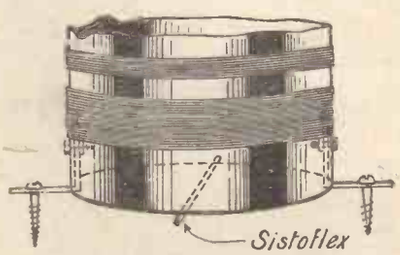
Any number of terminals may be fitted in the foregoing way to suit the number of phones it is required to use. R. M.

Mounting Tubular Coils

WHEN a solenoid coil is mounted upright on the baseboard by means of small angle-pieces it is usually necessary to screw these to the inside of the tube so that they shall not touch the windings.

This may cause the tube to wobble, however, because of the thickness of the two small pieces of metal between the edge of the tube and the board.

One method of getting over the difficulty



Rigidly-mounted Tubular Coil.

is to place a short length of sistoflex between the bottom of the tube and the board, as indicated in the accompanying sketch. H. P.

How I Designed the A.W. Ballot Three

In this article Mr. J. H. Reyner, B.Sc., A.M.I.E.E., discusses the features of the "A.W." "Ballot Three" which is the subject of the Foldagraph with full-size Blueprint Wiring Diagram presented with this issue.

WITH this issue of AMATEUR WIRELESS an entirely new type of Free Gift has been presented in the form of a Foldagraph. This consists, as readers will observe, of a full-size blueprint of the layout and wiring of the "A.W." "Ballot Three," with all the necessary information required to make up the set on the back of the blueprint, the whole being arranged to fold in a convenient booklet form.

The actual receiver described in this Foldagraph is one which has been designed in accordance with the wishes of readers, as expressed in the Free Prize Ballot recently conducted by this journal. In that competition readers were requested to supply the answers to a list of twelve questions relating to the most popular constructional features. The questions and winning answers are reproduced on this page.

LIST OF TWELVE QUESTIONS	Your Answer
(a) How many valves are there in your ideal set? (Give the number)	3
(b) In a broadcast receiver, do you prefer single-control? ("Yes" or "No")	Yes
(c) Do you prefer panels of (1) ebonite, (2) glass, (3) wood, or (4) metal? (Simply write "1," "2," "3," or "4")	1
(d) In a multi-valve set do you prefer (1) ordinary, (2) square-law, or (3) straight-line frequency condensers? (Simply write "1," "2," or "3")	3
(e) Which dials do you prefer—(1) ordinary or (2) slow-motion? (Simply write "1" or "2")	2
(f) Which circuit do you like best—(1) "straight," (2) reflex, (3) neutrodyne, (4) super-het? (Simply write "1," "2," "3," or "4")	1
(g) What voltage valves do you like best—2-volt, 4-volt, or 6-volt? (Simply write number of volts)	2
(h) Do you prefer separate filament control for each valve? ("Yes" or "No")	Yes
(i) Do you prefer to mount components on (1) the panel or (2) the baseboard? (Simply write "1" or "2")	2
(j) Do you consider that great selectivity is worth the trouble of operating a complicated tuning-system? ("Yes" or "No")	No
(k) Do you prefer to screen (1) components or (2) each complete stage? (Simply write "1" or "2")	1
(l) What form of L.F. amplification do you prefer—(1) transformer-coupled, (2) resistance-capacity coupled, (3) choke-coupled? (Simply write "1," "2," or "3")	1

Three Valves

Three valves was voted the most popular number in a receiver, and straight circuits are preferred to any other type. Great selectivity is not considered worth the trouble of a complicated tuning system; a simple set is what is required.

It was decided therefore to produce a straightforward detector circuit with two stages of low-frequency magnification. With suitable care the detector circuit can be made reasonably selective, so that quite a number of distant stations can be received without undue trouble or complication. A number of circuits were tried in order to obtain the most satisfactory results from the point of view of simplicity, as well as ease of operation, and that finally adopted is shown in the Foldagraph on page 1. This is the split-coil type often used in neutralised H.F. circuits.

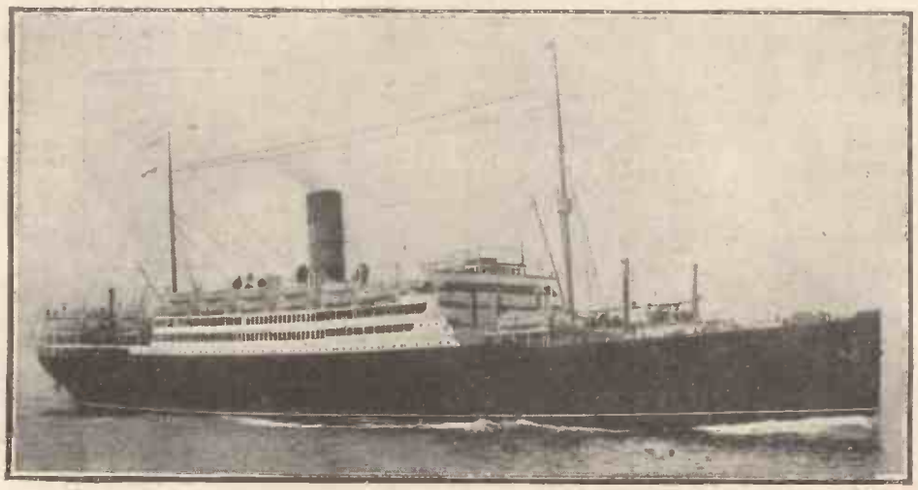
A circuit such as this provides a very good detector if suitably arranged. It will be seen that one end of the tuned circuit is connected to the grid through the condenser and leak necessary to produce the rectification effect. The filament of the valve is not connected to the other end of the tuned circuit, but to the centre-tapping on the coil, while the remote end of the circuit is connected via a small vernier or neutralising condenser to the anode of the valve.

This latter condenser provides the necessary reaction effects in the detector valve. Reaction in this circuit is produced by what may be termed the Hartley method. The bottom end of the tuned circuit is connected to the anode through a small variable condenser. This will permit the transfer of a certain amount of energy from the anode circuit back to the grid circuit, so producing a tendency to self-oscillation. As the value of the condenser is increased, so the reaction effect becomes greater, and a smooth and simple control can be obtained by this method, which is a very valuable point when the reception of distant stations is being considered. Although I know the Ballot indicated that a simple tuning system was preferred to one possessing great selectivity, yet, nevertheless, there is still a demand for some of the distant stations, many of which come in nowadays very easily on simple detector circuits.

Reaction

The particular system of reaction employed enables us to use one centre-tapped coil instead of having two coils, one for the tuning and the other for the reaction. We have to introduce the aerial into the circuit in some manner, however, and we wish to do this without causing the selectivity to fall off too badly owing to the added damping of the aerial. The simplest way of overcoming this difficulty is to connect the aerial to the grid of the valve through a small series condenser of the order of .001 microfarad, and this method has been adopted in the present instance.

(Concluded on page 294)



LINER'S WIRELESS RECORD.

Direct two-way communication has been established by the Cunard Company's cruising liner "Carinthia" (20,277 tons) and the New Brunswick (N.J.) station of the Radio Corporation of America, at a distance of 12,000 miles, which is a record for ship-to-shore wireless. Mullard 0/500x and PM6 valves were used on the liner.

Are you making the famous R.C. Threesome Valve Set?

TO get the wonderful results obtained with the original R.C. Threesome Set you should use identical components.

The Coil Holder used is a "Lotus" Left-Hand Two-Way Coil Holder for inside mounting, costing 7/-; the three Valve Holders are "Lotus" Buoyancy Valve Holders, with Terminals, costing 2/6 each.

Wireless experts decided that these were best for a very important experiment; that they would get most out of the set on which depended the very high reputation of the famous Ediswan Valves.

They were not disappointed. YOU will be more than pleased with the R.C. Threesome's performance if you fit "Lotus" Valve Holders and Coil Holder.

From all Radio Dealers.

LOTUS COIL & VALVE HOLDERS

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On Your Wavelength!

The "Props" of Radio Drama

LAST week I disguised myself as an electron and did a "dive" into the basement of the B.B.C. I was amazed to discover that the old Turkish baths had been completely swept away, and in their place are new rooms whose intricate construction at once gave me the clue to the further development of the production of radio drama.

I foretold in these columns last year that eventually a much closer technical control would have to be instituted for the effective production of intricate dramatic scenes. I well remember the difficulties under which the first radio tattoo laboured, and it became obvious then that as soon as space permitted an attempt would be made to obtain greater facilities. Now in the basement of Savoy Hill are being constructed the studios and controls from which will be broadcast the future wireless drama.

One room is to be constructed as an echo studio. This will replace the present temporary one, and will be available for further experiments. Another room will contain the implements of "the noise merchant." In this room the noise expert will listen for his cue, and produce the right noise at the right moment. Farther along the passage are the drama studios proper, while in the centre is the control or mixing room. It is this control room which will tone down each studio to the necessary strength, mix the various ingredients, and so send the balanced production up to the main control room.

The great advantage of this system is that there need be no wearisome running about; the producer will be able to control the various studios, and thus a balanced production will result.

Who is Conducting?

It may sound akin to "vandalism" for me to raise this question in these columns, usually given over as they are to non-controversial subjects. Having done so, I would like some eminent radio engineer or musician to give me more enlightenment. The B.B.C. is in the habit of obtaining on occasions a conductor of international repute to preside over a very fine orchestra—possibly the best obtainable in this country. This conductor tries to give the listener his interpretation of a musical work, but it must be remembered that between the microphone and the aerial is the control. Now the person controlling has as much, and even more, power for expression as the conductor. Furthermore, the electric control is seldom in view of the conductor. Under such conditions a great many of the fine points of conducting must be lost, while interpolations at the hands of the person controlling must occur.

It may be argued that experts are in control. Until recently the control of all broadcasts was in the hands of the engineering staff, who, although they may have possessed musical gifts, were engaged as engineers and not interpreters of the great masters. After all is said, the "control" is practically a "super" musical instrument.

The more one thinks about the matter, the more it becomes obvious that the individual controlling any broadcast must know by personal contact and rehearsal the objects aimed at by the originator of the performance. The B.B.C. may employ the greatest Wagnerian conductor, but the listener does not get this conductor's interpretation unless this famous Wagnerian has first schooled the "control," and then has him under his eye the whole time.

The same can be said of any type of broadcast. How frequently one misses completely the muted passages. I am afraid I must say that it is taking the B.B.C. a very long time to realise where is their weakest link. I am convinced that if "controlling" were placed on a higher "level," and always under the eye of the originator of the broadcast, there would be fewer expressions of disappointment with regard to musical programmes.

More S.B. Broadcasts

The B.B.C. intimates that its policy of programme concentration initiated some time ago has met with success; in these circumstances it will be further developed. The technical improvement of relay by land-line has now made it possible to cut down unnecessary duplication of effort in different parts of the country, and to transmit to listeners the unique artistic resources of London. In the same way distinctive programmes from Manchester, Glasgow, Birmingham and other centres are made available to the whole kingdom on appropriate occasions.

It is evident that the application of this policy as a consequence must cause the curtailment of local programmes from provincial stations; they cannot transmit as many of their own entertainments as they have done in the past. Statistics show that it is seldom that the provincial stations put on the air more than four of their own evening concerts in one week. On the other hand, they are now able to make a more extensive contribution to the general S.B. programmes than hitherto, and are still allowed by this means to reflect local artistic aspirations and characteristics.

It is possible that in some districts this S.B. policy may not meet with full approval, but it should be borne in mind that when the system of regional broadcasting comes into operation, the main features of the programme should be supplied from the capital. To tap local talent, a studio alone is needed. If S.B. programmes are to be developed it should be possible to spend money to better advantage on one entertainment. Provided the quality of the relay by land-line is satisfactory, the policy adopted by the B.B.C. is one which should prove of benefit to all listeners.

A B.B.C. Howler!

I wonder if any of my readers were listening in on London's wavelength on Tuesday, February 8, between 11 a.m. and 11.30 a.m. During this period the ether was filled with oscillation and heterodyning of a very powerful nature. I thought that perhaps my next-door neighbour had entered the ranks of the transmitters, and I had really begun to visualise all manner of troubles in the future.

Fortunately, however, I have been relieved of this anxiety, for I have since learnt that the noises were caused by the B.B.C.! Yes, perfectly true; the Oxford Street and the Marconi House transmitters were being synchronised for tuning, and the method adopted to accomplish this was to start both transmitters radiating a carrier wave, and then to set the adjustment of one, so that the strongest heterodyne note was obtained upon the other when checked by an accurately-tuned receiver. It is, of course, essential to have both transmitters accurately tuned to the one wavelength, so that in case of a breakdown no readjustment of receivers is necessary.

Underground Aerials

Short-wave enthusiasts who are on the look out for something new should experiment with the underground aerial, complete directions for the setting up of such a device being given in the current number of the *T. and R. Bulletin*. I tried out an underground aerial for reception purposes a considerable time ago, and found it excellent below 100 metres. Signals seemed quite as strong as with the ordinary aerial, and there was an almost complete absence of interference from harmonics of high-wave stations and statics. Of course, an underground aerial is absolutely no good for the reception of broadcast.

A New B.B.C. Venture?

I hear on very good authority that the B.B.C. may acquire the famous Queen's Hall in the near future. Of all the big halls in London, this is the best for broadcasting purposes, as all those who heard the concerts relayed from there some time ago will agree. There is no doubt that a

On Your Wavelength! (continued)

large section of the listening public is becoming more and more critical. There is a demand for good music and the best possible transmission. The acquisition of Queen's Hall would enable the B.B.C. to make permanent arrangements for the best possible reproduction, and there is room there for the largest orchestra that any composer is likely to demand, as well as seating accommodation for a very large audience, who would doubtless be admitted to the hall at cheap rates during performances to lend that "warmth" which is only apparent when an audience is listening to the actual performance.

Soon to be Heard

Before very long now Daventry X, the medium-wave high-power experimental station, will be on the air. The power used is, I believe, something pretty big, and the wavelength will be in the neighbourhood of 400 metres. It is intended, for the present at any rate, to carry out test transmissions only at times outside the ordinary broadcasting hours. I am rather wondering what the results will be. Langenberg, the German 25-kilowatt station, fades phenomenally badly, and doubts have been expressed in some quarters whether the wavelengths between 350 and 450 metres are really suitable for high-power work.

Fading is not experienced, of course, at ranges under fifty miles, but fifty miles is not very much for a super station. However, we shall see when Daventry X gets to work. I wonder how bad his wipe-out effect will be. That of Langenberg is not very severe on a sensitive set, except when he is overmodulating, whilst Leipzig, Stuttgart and Hamburg all give pretty sharp tuning—in this country, at any rate.

American Giants

Talking of big power reminds me that some of the American stations are now dwarfing anything on this side of the "Herring Pond." W G Y at Schenectady has gone up to 60 kilowatts, whilst W J Z at Boundbrook is using 40 kilowatts. K D K A has now the same rating as Daventry and Langenberg. Amongst others there are now some quite useful fellows of somewhat smaller power. W P G, the station at Atlantic City which is often well heard here, is using 7.5 kilowatts; W H A Z, at Chicago, is rated at 10 kilowatts; and W B Z at 7.5 kilowatts. What I have never been able to understand is that, though some of these are not too easy to pick up here even on the most favourable nights, one can frequently run across K G O at quite respectable strength. This station is situated at Oaklands, in California, and if you look at your map you will see that this is right away on the far side of the United States. Yet K G O is rated at only 5 kilowatts. Funny, isn't it?

U.S.A. Reception

Myself, I have not had a great deal of success with American stations lately, though I did pretty well with them at the beginning of the year. Those living in other places have been a little more fortunate, but in my own locality not much has been done. It is very seldom worth while to sit up if atmospherics are found to be bad when the set is switched on at about midnight, and this has frequently been the case of late. If you want to go for American stations just now, and can find a night when the ether is peaceful, I would advise you to tackle W J Z, W H A Z, W G Y and W P G first of all, for if you cannot get hold of one of these, it is very seldom of much use to search for anything else.

Queer Regulations

There has been quite a storm over the concert transmitted by a northern wireless society. The B.B.C. complained that their prerogative was being infringed, and the P.M.G. stepped in to administer a spanking, if necessary, to the culprits. The regulations governing transmission by amateurs are in some ways rather comic. It is laid down that you must not give a general call, but must always seek to establish contact with particular stations, and not too many of them. Why this should be, I do not know, since unless you are using the beam system, which amateurs do not, every transmission must be broadcast.

However, so long as you announce that your transmission is intended for some particular station to receive, you are guiltless of doing anything wrong. Again, you cannot broadcast concerts as concerts, or give songs, recitations, instrumental solos or gramophone records as an entertainment. But there seems to be no reason why you should not say: "Hullo, 10 X Y; 10 Y Z calling. I am now going to transmit a violin solo by Signor Longloxo. I am going to ask you to notice particularly whether my modulation is O.K., and whether there is any blasting on loud passages.

You see, so long as you do this you are experimenting in conjunction with a single correspondent, and are not broadcasting entertainment.

A Story of Temper

Spectacular tests for valves seem to be in favour at the moment, and I have just heard, from a source that I know to be authentic, of two interesting cases that prove beyond doubt the toughness of modern filaments. It is hardly necessary for me to say that the tests were quite impromptu.

The first case concerns a gentleman who constructed a two-valve receiver, but he was "fearfully disappointed, not being an expert in the matter." So, results proving unsatisfactory, in a fit of temper he tore a Mullard PM3 off the set and threw it to the ground, which was ordinary boarding covered with linoleum.

Was the valve perturbed? Not a bit; it just lay on the floor and looked up at him with a benign grin on its face. The glass bulb, even, was not smashed.

This infuriated the "tester" still more, and in a perfect frenzy (I suppose) he tore the bulb of the valve off its base, threw *that* to the ground, and walked away.

On coming downstairs the next morning he was amazed, as well he might be, to find that the bulb was still unbroken. In a fit of repentance he soldered four leads in position, and stuck the bulb back on the base with Seccotine. He afterwards found that his valve was *in perfect working order!* Can you beat that as a true wireless story?

Another "test" is worth mentioning. An enthusiast took a portable set to France, and during the return journey it was placed on the roof of a French taxi. After the manner of his kind the driver cornered at speed, and the box became a heap of splinters reposing in the gutter.

In this case the bulb of a valve (another PM3, by the way) was broken, but the filament was still intact after the enthusiast had brought the remains, quite unprotected, back to England in his coat pocket.

On the Short Waves

Many possessors of quite efficient short-wave sets do not hear the more interesting long-distance stations because they do not know at what time, and on what wavelengths, to listen for them. Some brief hints, true at the present time, may be of use.

Australian amateur stations are mostly to be heard round about 35-38 metres, and the best time for receiving them is either from about 7.30 in the evening or in the early morning. They are occasionally to be heard as early as 3 o'clock in the afternoon. About 7.30 in the evening onwards, Indian, Straits Settlements and the one and only Chinese station may be hoped for, particularly on Sunday evenings.

Remember it is always worth while listening on 40-43 metres for American stations as early as 10.30 in the evening. Occasionally strange things happen, and a United States station gets across when there is daylight all over the Atlantic.

It is always worth listening between 30 to 50 metres directly the European stations fade out, about an hour to an hour and a half after sunset, because some strange birds may be caught and logged.

THERMION.

A General-utility Crystal Set

By H. BRAMFORD

Photograph of Finished Receiver.

IN crystal receivers we have the choice of the following methods of aerial tuning: A coil with a sliding contact, or a tapped coil tuned by means of a variable condenser, a plug-in coil tuned in a similar manner, or a variometer. With tapped or plug-in coils it is obvious that the extra component, namely, a variable condenser, is required. On the other hand, the sliding-contact type of tuner usually necessitates a fair amount of constructional work in making up the receiver. There is little doubt that there is practically nothing better than the simple variometer form of tuning for efficiency and good results, especially in the case of crystal receivers where the maximum amount of volume is to be obtained and a high degree of selectivity is not necessary. For this reason, therefore, the receiver about to be described includes a variometer.

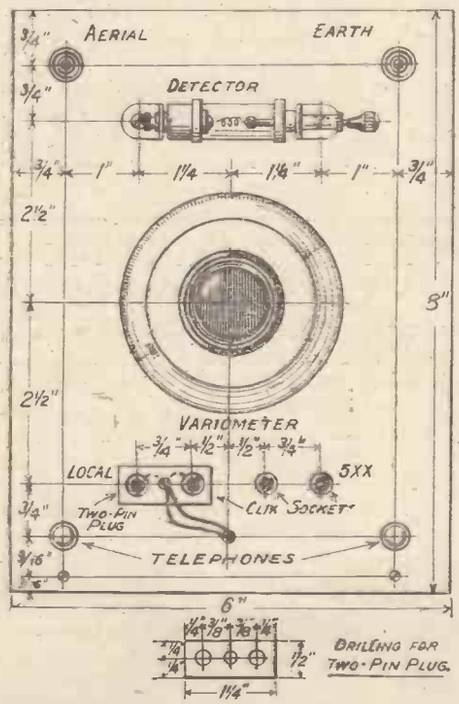


Fig. 1.—Showing Details of Panel Drilling and Disposition of Components.

Material

The material which will be required for building this set is as follows: 1 ebonite panel 8 in. by 6 in. by $\frac{3}{16}$ in. (Paragon); 1 crystal detector, panel mounting (Service Radio Co.); 1 variometer, type F (Igranic); clip-in condensers, with 3 clips (McMichael); 4 Clix sockets, 2 Clix plugs (Autoveyors); 4 terminals; piece of ebonite former 2 in. external diameter by 4 in. long (British Ebonite Co.); Glazite for wiring; small quantity of insulated flex; ¼-lb. reel of No. 30 s.s.c. wire; some odd pieces of ebonite; cabinet (Pickett).

Construction

Full details of the panel drilling and the components which are mounted upon the panel are clearly shown in the front of panel drawing (Fig. 1). After the panel has been drilled it should be secured to the baseboard by means of two wood screws, when it is then ready for mounting the components. When this has been done, prepare a small piece of ebonite, as shown in the same diagram, for the two-pin plug. At the same time we may as well prepare the strip of ebonite which is used for mounting the fixed condenser clips. Details of this strip are shown, together with dimensions, in Fig. 2. Three fixed condenser clips are mounted upon this strip in the manner shown. The strip is then secured in the position indicated upon the baseboard by means of one countersunk wood screw. With the exception of the 5 XX coil all is now ready for wiring up.

5 X X Coil

The most efficient type of coil has been chosen for this receiver for the purpose of loading up in order to receive signals upon the Daventry wavelength. First take the piece of ebonite former as specified in the material list, and wind upon this former 260 turns of No. 30 s.s.c. copper wire. This winding when completed should occupy a length of 3¼ in., thus leaving ¼ in. of ebonite former at each end. This allows for the mounting of the terminals shown upon the former itself, to which the beginning and the end of the windings are secured respectively. When completed the former is placed upon the baseboard, there being no necessity to secure it in any particular manner.

The Wiring

The wiring necessary is clearly shown in Fig. 2, and this should be quite easy to follow. Such leads as should be preferably made with flexible wire are shown. One of the flex leads which connects to the right-hand side of the detector, looking at the back-of-panel diagram, passes through to the front of the panel, and is connected to one of the Clix plugs upon the two-pin plug, as shown. The other lead, which connects to the right-hand terminal of the variometer, passes through the panel and connects to the other Clix plug.

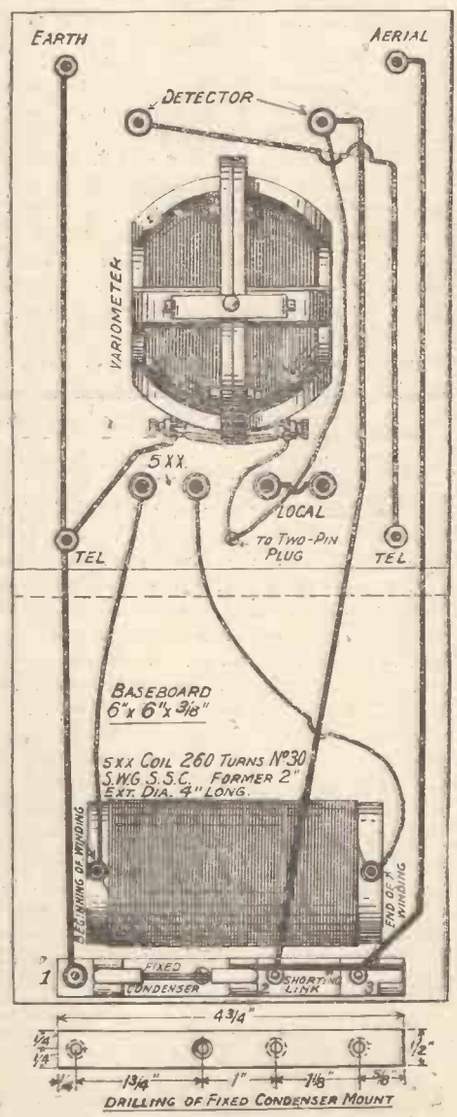
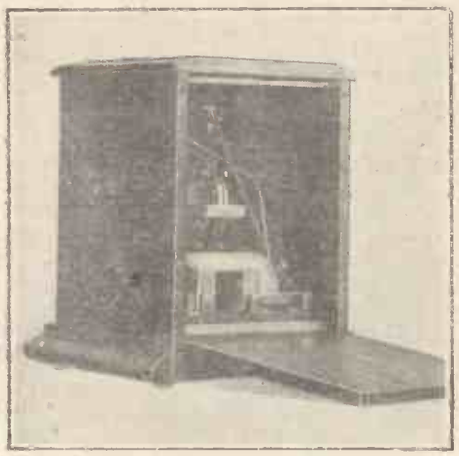


Fig. 2.—Wiring Diagram and Dimensions of Condenser Strip.

The Circuit

A diagram is given showing the theoretical arrangement of this receiver. It will be seen from this that when the two-pin plug is inserted into the two sockets which connect to the 5 XX coil, the receiver is suitable for working upon the Daventry wavelength. On the other hand, for local



Back View showing Fixed Condenser in Position.

reception the two-pin plug is inserted into the two sockets which are shorted and marked "local," as shown.

The fixed condenser arrangement is to enable the operator to employ at will a fixed capacity in series or in parallel, according to individual circumstances. Experiment will tell which is best in each particular case. It only need be remembered, however, that series capacity reduces the wavelength range and parallel capacity increases the wavelength range. Where only a poor aerial is available series capacity is recommended, providing such capacity is in the neighbourhood of only .0001 microfarad.

Operation

The receiver is simple to operate in the usual way, the only dial to manipulate being that of the variometer itself, having first adjusted the detector at its best.

A few remarks may be necessary, however, as to the use of the fixed condenser. For series capacity the fixed condenser is inserted between clips 2 and 3, as shown in the circuit diagram (Fig. 3). For parallel capacity the fixed condenser is inserted between clips 1 and 2, a thin brass link also being placed between clips 2 and 3. This method makes it possible to have just the one aerial terminal, whereas for this arrangement it is customary to use two aerial terminals. If it is not desired to use additional capacity at all, either series or parallel, a shorting link should be placed between clips 2 and 3 only.

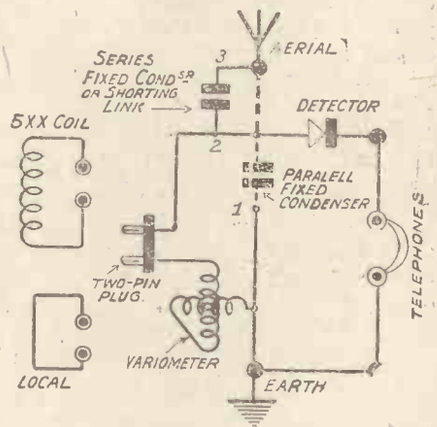
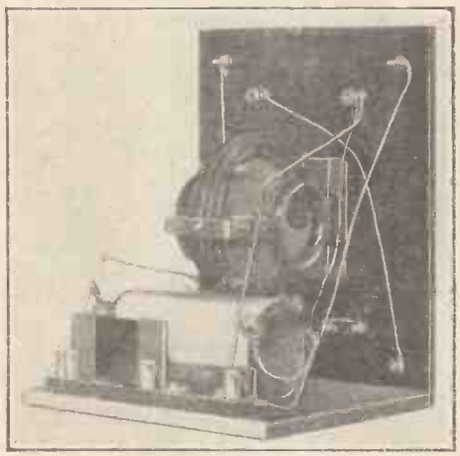


Fig. 3.—Circuit Diagram of the Crystal Set.

Remarks

This receiver should suit almost anyone who makes it, whether their aerial is good, bad or indifferent, providing that they go to the trouble of experimenting in each



View showing the Positions of the Coils.

individual case with the clip-in condenser, and of obtaining the most desirable value. Many, however, will find that they obtain excellent results without using this at all.

For the benefit of those who are making this receiver as their first attempt, it must be remembered that if the best is to be obtained from a crystal set, it is essential to erect the best possible aerial and earth system which existing conditions allow. One should also ensure having a good crystal, with a scrupulously clean cat-whisker.

VALVES TO WORK OFF THE MAINS

IN No. 243, on page 196, we published a description and test report of the new KL1 valve; but the results which were obtained were a little disappointing in view of the fact that the filament had to be considerably over-run before satisfactory results could be obtained. When the valve was operated at its rated value the emission was much too low to give good results.

We found, however, on further examination that this particular valve was not a representative sample, and we have subsequently had an opportunity of testing other specimens of this new product, which we have found perfectly satisfactory.

At the rated filament voltage of 3.5, at which point the filament current was 2.1 amps. and 90 volts on the anode and zero grid volts, we obtained an impedance of 5,600 ohms with an amplification factor of 7. When used with 5 volts on the grid the impedance rose somewhat to 10,000 ohms, but a corresponding increase of the amplification factor to 10 was produced.

Excellent amplification was obtained with the valve in use both as detector and low-frequency amplifier, and no trace of any hum was observed.

The KL1 valve is the latest product of the M.O. Valve Co., which, as our readers know, manufactures exclusively for the Marconiphone and General Electric Companies. It is, therefore, the Marconi KL1 and the Osram KL1.

Readers will be interested to know that we are describing next week a special two-valve receiver, which has been made up at Mr. Reyner's laboratory, incorporating this novel product.

NEXT WEEK

MORE SPECIAL FEATURES.

ALL ABOUT THE NEW DUPLEX AND TRIPLEX VALVES.

By Manfred von Ardenne, Dr. Loewe's co-worker.

A TWO-VALVER WITH KL1 VALVES.

By J. H. REYNER, B.Sc., A.M.I.E.E.

WAX DOPE FOR COTTON-COVERED WIRES

WHEN coils have been wound with cotton-covered wire, it is objectionable to varnish them heavily or wax them too generously; yet it is decidedly advantageous to render the cotton covering impervious to moisture.

An efficient means of accomplishing this is to "varnish" them with paraffin-wax dissolved in turpentine, in the proportion of 1 oz. of paraffin-wax to ½ pt. of pure turpentine spirit. Scrape the wax into shreds and place in a bottle containing the correct measure of turpentine spirit, stand this securely in a saucepan of cold water, place on the stove and bring gently to boiling-point, but allow to remain undisturbed for half an hour after the last particle of wax has dissolved.

This "dope" will have very little resemblance to varnish or wax in colour consistency, but cotton-covered coils impregnated with it and dried out afterwards in a warm oven will practically be waterproof for ever without any additional capacity which will be of consequence.

M. P.

WITHOUT FEAR OR FAVOUR

A Weekly Programme Criticism by Sydney A. Moseley

THE Wicked Uncle, it appears, is getting away with it these days. His latest idea was about a necklace, the owner of which was bound to tell "whoppers." And the whoppers he told! Awful, if I tell you. Some of the children's hours will have to be shifted to somewhere around nine o'clock. Wouldn't mother be pleased then?

* * * * *

I agree with Mr. Stobart, who is now chief of the educational and religious department of the talks—some of the mountainous work having been shifted from his shoulders—that they do these things more grandly in Germany. Well—*more*, but hardly more grandly. Mr. Stobart—anent my recent paragraph—maintains that the foreign languages talk takes place at 7.25, before most townsmen are ready to begin their evening's entertainment, so that any person seriously interested can usually arrange to listen. I don't see how we can quarrel with this assumption.

* * * * *

And while upon this matter I would ask a wider question:

Is it really possible to ascertain from listeners themselves what they really desire? I very much doubt it. The efforts that are made from time to time to obtain an inkling are always interesting; but as an actual guide, I ha' ma doots—for the following reasons:

First that, as in so many parliamentary elections, the placid thinker rarely rouses himself sufficiently to go and record his vote, and it is not always the man with the loudest voice who necessarily represents the bulk of his fellows. Many, moved by righteous indignation or by an outburst of enthusiasm, may not indeed represent the hundreds of thousands who are content to accept the good with the bad and be satisfied. Moreover, in a ballot, where prizes are offered, the voter may have as many chances as the coupons he purchases, and, above all, he will probably vote, not according to his own desires, but according to what he believes other people are likely to vote for, as, after all, what he is out for is to win a prize.

For instance, I would give my first vote for light symphony. That happens to be my preference; but if I were desirous of winning a ballot, I should probably put dance music!

And talking about tastes, the programmes of "popular classical" music go down well, although I would not be too sure that all the items played are "popular." However, it is a shrewd editorial touch to label them as "popular." Marvellous thing, this power of suggestion.

* * * * *

We have had more instances recently of the extraordinary policy of inviting artistes to play to audiences in the studio rather than to the millions outside. For instance, I didn't think very much of the "Golfing" sketch in which Maudie Field, Desmond Roberts, Tony Williams, and Charles Heslop took part; but I noticed that the audience in the studio enjoyed it, which I suppose matters most of all.

* * * * *

We gave a welcome to Mr. Flotsam and Mr. Jetsam last autumn when they put in their first appearance at 2LO. I am glad to see that they have made good, although, to be perfectly frank, their reappearance a few nights ago was not marked by their best efforts. Still, they are something new, and as such are worth while; they went from good to better and from better to best as the week went on.

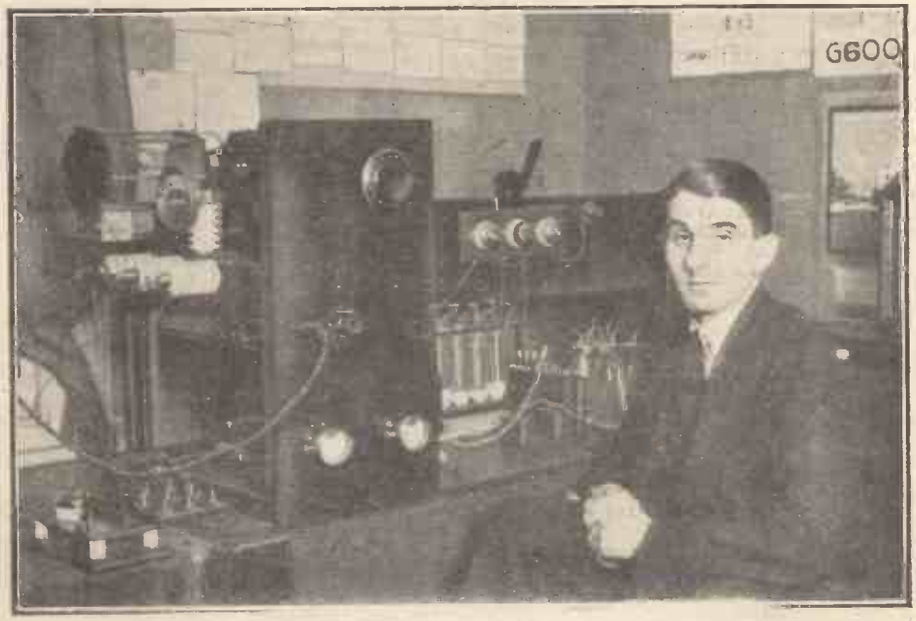
"The sort of opera," by A. P. Herbert, with music by Geoffrey Toye, was a decided success, the theme being quaint, and the music melodious, if reminiscent. The singing, too, was quite worthy of the opera, which warmed up considerably half-way through. I think it will bear repetition at a later date. I would like to point out, however, to Mr. Herbert that men prisoners are *not* sent to Holloway.

* * * * *

I made an appeal in my notes some weeks back for a better recognition of Rex Palmer, who had been shifted or promoted from the microphone to the machinery of administration. Now he is back again, and listeners will be bound to welcome him.

* * * * *

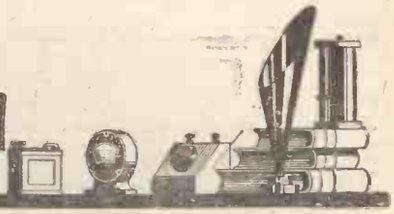
Say what you highbrows will about the crude American jazz songs, there is a catchiness about them not to be denied. Elsie Carlyle, with Bobby Alderson at the piano, were like many other turns: the vocalists who insist upon "yew" for "you" and "dew" for "do"—an irritating habit that is being followed by their English colleagues.



AMATEUR TWO-WAY COMMUNICATION WITH ICELAND.

Mr. L. H. C. Lawler, of Tooting (G 6 L R), who has been in two-way communication with Mr. Arner, of Reykjavik, Iceland (I C S N I). Signals were clear and strong with an input of 8 watts. Readers will remember that Mr. Lawler is a contributor to "Amateur Wireless."

OUR INFORMATION BUREAU



RULES.—Please write distinctly and keep to the point. We reply promptly by post. Please give all necessary details. Ask one question at a time to ensure a prompt reply, and please put sketches, layouts, diagrams, etc., on separate sheets containing your name and address. See special announcement below.

Failing Emission of D.E. Valve.

Q.—*What causes the emitting properties of a D.E. valve to deteriorate?—S. K. P.* (*Bolton*).

A.—The emitting properties will, of course, deteriorate in any case after the valve has seen a certain considerable amount of service, but we presume that you want to know what causes the emission to fall off prematurely. Using too high a filament voltage is the most common cause, and this, of course, also applies to putting the H.T. across the filaments accidentally. Too high a H.T. voltage, however, even when the connections are correct, can cause the emission to fall off. It is always best to work slightly under the makers' figures, both with regard to H.T. and L.T. voltages, and in no case, of course, should these figures be exceeded.—J. F. J.

Use of Phone Transformer.

Q.—*I have come into the possession of a 120-ohm loud-speaker, and am told that it should be connected to the set through a telephone transformer. What is a telephone transformer, and could an intervalve transformer be used instead?—H. D.* (*Newport Pagnell*).

A.—A telephone transformer has a primary winding, the impedance of which is designed to suit the anode circuit of a valve, while the secondary impedance is of the same order as that of the telephone or loud-speaker windings. This means a high-impedance primary and a low-impedance secondary. An intervalve transformer has its primary and secondary impedance arranged to suit the anode and grid circuits of valves, and consequently both windings have too high an impedance to compare with that of a low-resistance loud-speaker. Therefore, an intervalve transformer would not be at all suitable for use as a telephone transformer.—J. F. J.

Method of Fixing Crystal.

Q.—*Is there any advantage in soldering a crystal into its cup over the method of holding the crystal in place with three screws?—T. P. C.* (*Enfield*).

A.—One of the crystal contacts, that made by the catwhisker, should, of course, be of very small area. It is of advantage to make the other contact with the crystal of as large an area as possible. This can be done by securing the crystal in its cup with Wood's metal in preference to solder, which has so high a melting-point that the sensitivity of the crystal might be impaired. If you wish to use the clamping screws, you should first pack tinfoil between the crystal and the sides and bottom of the cup.—B.

Determining Accumulator Capacity.

Q.—*How can the actual ampere-hour capacity of an ordinary lead-plate accumulator be determined when the makers' figures are not available?—H. B. R.* (*Dunstable*).

A.—The actual ampere-hour capacity should be approximately equal to 10 ampere-hours per square foot of active area of the positive plates. Reckon both sides of the positive plates, and add together the areas of all the positive plates which are connected in parallel. In the case of a 4- or 6-volt accumulator, of course, only the positive plates in *one* cell must be considered.—M.

Building a Reflex Amplifier.

Q.—*I have a crystal set tuned by a plug-in coil and .0005-mfd. variable condenser in parallel. I want to build a reflex amplifier consisting of one valve acting as H.F. and L.F. amplifier, for use with this crystal set. Can you oblige with a suitable circuit?—B. C. L.* (*Leeds*).

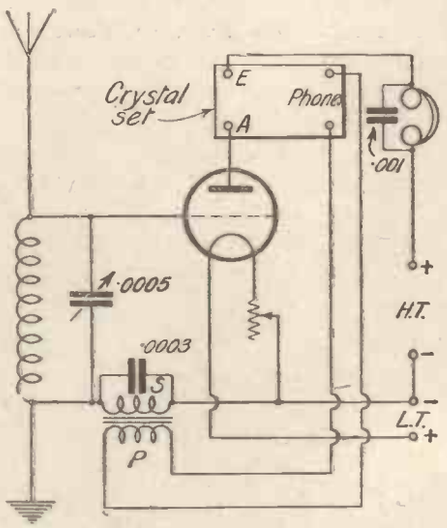
When Asking Technical Queries—

PLEASE write briefly and to the point

A Fee of One Shilling (postal order or postage stamps) must accompany each question and also a stamped, addressed envelope and the coupon which will be found on the last page.

Rough sketches and circuit diagrams can be provided, but it will be necessary to charge a special fee (which will be quoted upon request) for detail layouts and designs.

A.—The circuit given below will meet with your requirements. Care must be taken to connect the *aerial* terminal of the crystal set



Circuit Diagram of Reflex Amplifier.

to the plate of the valve and the *earth* terminal to the phones. It will be necessary to use a coil in the crystal set which is a size or two larger than that in use when the crystal set was used alone.—J. F. J.

"A.W." will solve your Wireless Problems

Signals Without H.T. Battery.

Q.—*I have a straight one-valve detector circuit, and can receive the local station at about crystal strength with the H.T. battery disconnected from the set if the H.T. terminals on the set are short-circuited. Is this unusual? I use a bright-emitter valve.—H. F. N.* (*Manchester*).

A.—There is nothing strange in your results. You are not really working without H.T. The H.T. voltage is always reckoned with respect to the negative end of the filament, and we suspect that, in the case of your set, H.T. negative is connected to L.T. positive. Thus when you short-circuit the H.T. terminals of the set you are really applying to the plate of the valve a H.T. voltage equal to the voltage of the L.T. battery. That weak signals can be received under such conditions is therefore not surprising.—J. F. J.

The "Four-Advantage Three."

Q.—*Would you please explain the following points which puzzle me in connection with the article which appeared in "A.W." No. 238 describing the "Four-Advantage Three" receiver? (1) Centre-tapped Igranic coils. The holder shows three tappings, whereas the Igranic centre-tapped low-loss coils have four tappings or terminals. (2) Volume control. I see nothing advertised like the one shown. Will you please state what make it is? (3) I have two PM4 valves and a PM3 on hand. Are these suitable for this set? (4) I have two transformers available, a Marconi 2.7 to 1 and an R.I. tapped transformer. Which would be the most efficient arrangement if these are used in this set?—E. W.* (*Richmond*).

A.—If the photographs and Fig. 2 are examined, it will be seen that there are actually five contacts on the mounting base and four on the centre-tapped coil itself. The coil has a plug and socket and two studs at the sides, and in the mounting base there are, correspondingly, a plug and socket and two springs, which make contact with the studs. There is also a spare socket to which no connection is made; this is apparently for later developments of this type of coil. (2) As explained in the description of the receiver, the volume control was a special one, but as it was in the receiver when it was photographed, the drawings were made to correspond. It was actually an Igranic high-resistance potentiometer, altered so as to have a resistance of 0·1 meg. As was pointed out, however, a standard volume control, having two terminals only, is equally suitable, and should be connected across the secondary of the first transformer with the grid terminal on the second valve holder connected direct to the "G" terminal on the first transformer (see Fig. 2). (3) A PM3 for detector and a PM4 for last stage should be very suitable, and although another PM4 could be used for the first L.F. stage, a PM3 would be more suitable, and would be in accordance with the Mullard Co.'s recommendations. (4) The designer of the set has not tried the actual combination of transformers mentioned, but would recommend the Marconi 2.7 to 1 for the first stage, with the R.I. in the second stage. The value of the condenser across the loud-speaker is not, of course, critical, and a condenser of .002 should be quite suitable.—R. H. Bradley.

"A.W." TESTS OF APPARATUS

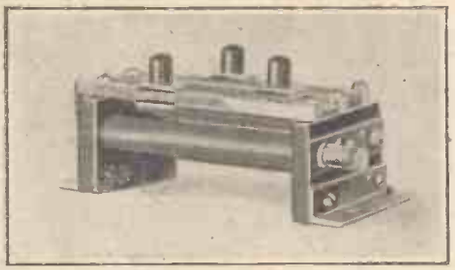
Conducted by our Technical Editor, J. H. REYNER, B.Sc.(Hons.), A.M.I.E.E.

The Loriostat

A. W. STAPLETON, of 19A, Lorrimore Buildings, Lorrimore Street, S.E.17, have submitted to us a very interesting unit known as the Loriostat. This consists of a number of sliding rheostats mounted on a single framework, each rheostat being independently controlled by a small slider.

The resistance wire is wound round a fibre tube, while the necessary contact is carried on a longitudinal bar running parallel with the rheostat. In the sample submitted three such units were mounted side by side, so that it is possible to obtain at one and the same time the advantages of a pre-set or semi-fixed resistor in each of the three filament circuits while localising the control to one quite small space on the panel or baseboard.

The component is well made and gives good contact. The resistance of each of the bobbins (rated at 15 ohms) was found to be 16 ohms. Other resistances can, of course, be obtained if desired. We think



Stapleton Loriostat.

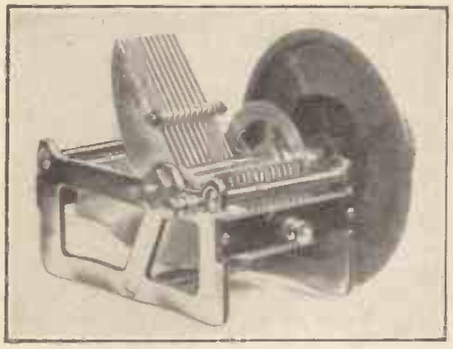
that this component will appeal strongly to our readers.

Raymond S.L.F. Condenser

FROM K. Raymond, of Lisle Street, W.1, comes a new slow-motion S.L.F. variable condenser. This is of more or less conventional construction, but has several points of outstanding interest. The moving plates are pressed into position in slots in the moving spindle, so that the usual system of spacing washers is unnecessary. The moving plates are also held rigid by a tie, as is often done with S.L.F. condensers, but this tie is placed half-way along the plates instead of at the extreme end, which is a good point.

The moving plates are provided with a direct drive and also a slow-motion drive, obtained by a combination of epicyclic and pinion gearing. The main spindle is hollow, and carries a concentric shaft which operates a pinion carried on the outside of the main spindle through the medium of two steel balls, which act as the planet wheels of an epicyclic gear. This latter pinion is then geared through a train of reducing wheels to a large pinion rigidly fixed to the main shaft.

By this means a very smooth reduction of some 110 to 1 is obtained without any noticeable backlash.

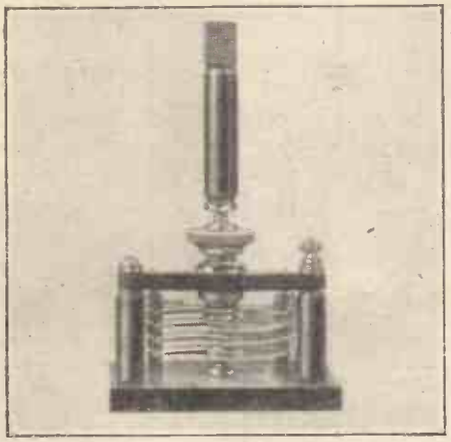


Raymond S.L.F. Condenser.

The condenser, rated at .0005 microfarad, was found on test to have a maximum capacity of .00051 microfarad and a minimum capacity of .00002. It is, as we have said, well constructed, and we can thoroughly recommend it to our readers.

Peto-Scott Neutralising Condenser

PETO-SCOTT, LTD., of 77, City Road, E.C.1, have sent us one of their neutralising condensers for examination. This condenser carries three moving plates and four fixed plates, these plates being specially shaped to give an exceptionally



Peto-Scott Neutralising Condenser.

low minimum capacity. The fixed plates are carried on two pillars, and are also provided with the usual terminal nuts and soldering tags.

The moving plates are carried on a special bearing bracket of ebonite mounted on two ebonite side-pillars. A small bearing is provided at the bottom in order to maintain the whole rigid. The actual bearing in the cross-piece is long and firm, and is also provided with a locking-ring, so that the condenser may be fixed in position once its correct adjustment has been found.

A long extension handle is provided for avoiding hand effects when operating this condenser, and we have found this of value in actual practical use.

On test the condenser was found to have a minimum capacity of less than 2 micro-microfarads, with a maximum capacity of 25 micro-microfarads. This is a very good range, and will serve to neutralise every normal type of valve.

Detex Vermo Coil-holder

WE have received from Detex Distributors, Ltd., of 59, New Oxford Street, W.C.1, a new type of two-way coil-

Detex Vermo Coil-holder.

holder for test and report. The holders themselves are made up from ebonite rod, the plug and socket projecting radially. Terminals are provided to enable ready connection to be made as required.

The coil-holders are mounted on a stout ebonite block, which also houses the operating mechanism which utilises the worm-gearing principle. The moving holder carries a worm-wheel at its base, which is driven by a worm on the operating spindle running at right angles. The bearing for the main spindle is provided with a nut, so that one-hole fixing may be obtained when mounting the component on the panel.

On test the motion of the moving holder proved smooth and easy, while the gearing was, of course, irreversible, so that no difficulty was experienced even when heavy coils were used. The component is well finished and can be recommended for use.

FOUR GIANT BROA

An important proposal FOR GREA

A LITTLE over a year ago I made the suggestion for a broadcasting scheme for Great Britain as shown by Fig. 1, each of the stations illustrated representing a 10-kilowatt unit. Of course, many variations of the high-power scheme have been discussed since the erection of Daventry, and I believe some preliminary experiments have been made. England was the first European country to inaugurate a good broadcasting system, but we have rested on our laurels too long, and except for details such as improvement of quality, little from the engineering point of view seems to have been done of late.

Continental Progress

In the meantime Germany, who was a good deal behind in the beginning, has now come very much to the front, and one can say that the German system is, as a whole, very much more powerful than the one we have; and when their latest station in the Ruhr is finally completed it will very probably be receivable at any place in Great Britain, although I suspect that Alsace-Lorraine is the chief territory it is hoped to cover.

Undoubtedly our new Corporation will take steps to remedy this state of affairs as soon as possible, and in this article I only wish, as an independent observer, to suggest certain possibilities, which I base upon my experience during the last year, and indicate alterations I would make to a scheme which I proposed.

Signal Strength

Signals from broadcasting stations seem to die away in strength in a fairly regular manner as one recedes from the station, up to distances perhaps of 200 miles. Between 100 and 200 miles, where there occurs a weak zone, one cannot say that the present 1-kilowatt standard is of very much value; but our experience shows us that at distances greater than 200, or possibly 300, miles there is a tendency for the strength not to fall off so fast, although as a general thing the signal so obtained is not sufficient for the nice working such as one really wants.

In Fig. 2 I show these effects for a 1-kilowatt station, and on the graph is drawn a line representing signal strength which will provide good reception.

Now suppose we increase the power of our transmitter, then we can shift the curve of Fig. 2 up in proportion to this increase of power. In Fig. 3, to another scale, I represent a 1-kilowatt station, a 10-kilowatt station and a 100-kilowatt station. It will be seen from this that although the 10-kilowatt station gives an increased initial range and a greater strength of distant signals, the great interval from 100 to 300 miles is not really covered. If, however, we increase the station to 100 kilowatts, then practically all signals up to 600 miles are workable.

Admittedly, fading would still occur, but as we now know how to maintain our quality when fading is occurring by correct adjustment of the transmitter, I doubt whether this fading factor would be very serious.

These curves are only intelligent guesses at the average way signals vary with distance, because, of course, there is really no constancy of signal strength at any one place. Variations take place from daytime to night-time, and from night to night.

German Stations

The German stations which at present we receive in England can be considered

Fig. 4.—Map of Eastern Europe showing Stations at London, Ca... radius of 500 ...

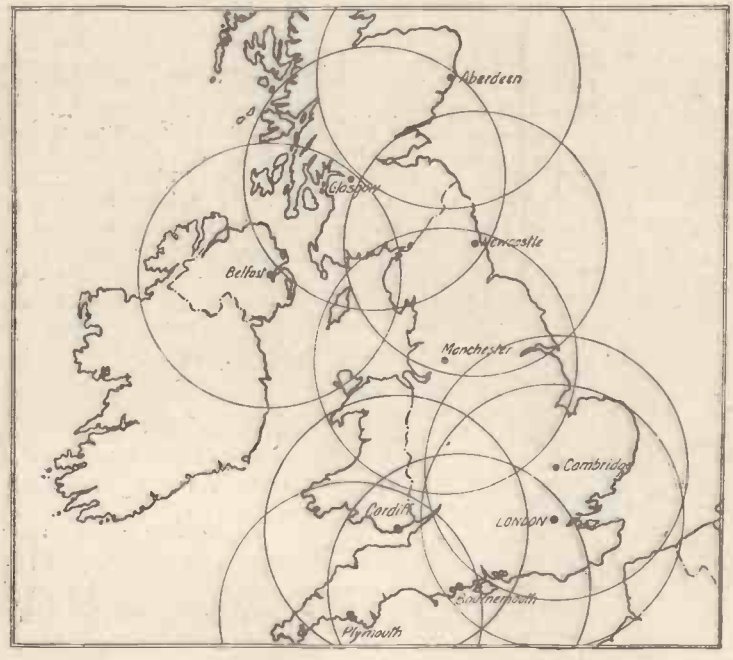


Fig. 1.—High-power broadcasting scheme suggested by Capt. Round in October, 1925. The stations shown were to be of 10-15 kilowatts, and the ranges for good signals are indicated by the circles.

ADCASTING STATIONS AT BRITAIN!

by Capt. H.I.Round. M.I.E.E.

ardiff, Manchester and Glasgow and Belfast. The circles have a miles.

as being received by us outside the weak zone, and they are certainly receivable with very fair efficiency through a good proportion of the time. I still do not consider, however, that they are good enough, and I have not much doubt that at shorter distances from these German stations, such as 100 to 300 miles, the signals will not be of sufficient strength.

During the last few weeks it has become very evident that the number of wavelengths available is even less than the Geneva Commission permitted. Great Britain has, I believe, been allotted something like nine exclusive wavelengths, and I am of the opinion that this number is still too large. Provided, of course, that the number allotted to other nations is reduced at the same time, if we can evolve a scheme which, while reducing the number of wavelengths, will give a solid range of, say, 500 miles to each station, the improvement would be very great indeed.

A Solution

To my mind, the only safe solution of this difficulty, as I have indicated in Fig. 3, is the construction of still larger broadcasting stations than have up to the present been erected or suggested in Europe, and a reduction in the number of stations. The previous idea of 10 kilowatts in the aerial will not be nearly sufficient if the number of stations is to be reduced, and my present estimate is a figure something like 100 kilowatts in the aerial. This sounds an extremely big step from our present 1- or 2-kilowatt units, although, of course, Daventry is of the order of 25 kilowatts to the aerial. But when we remember that America already has one station, and is designing several others of 50 kilowatts to the aerial, the suggestion is not fantastical. The stations would not be at all outside the capabilities of our designers, and will not be extremely costly.

Many advantages of this scheme can be given. For instance, suppose two stations, one in England and one in Germany, are in close proximity on the wavelength scale, but that one is very much more powerful than the other. The tendency will be for the smaller-powered station to be constantly on the watch, and to shift its wavelength to keep it sufficiently away from the high-powered station in order to avoid having its signals interfered with by the higher-powered station. This trouble would not be of such consequence in the reverse way, and the high-powered station would not have to be constantly on the watch for interference. One can assume right away that a station of the order of 100 kilowatts will not be interfered with, because others will automatically try to keep away from it.

With such tremendous power in a broadcasting station, and assuming that the range is what I think it will be, the necessity for a large number of stations at once goes; and I estimate that a quite satisfactory scheme (see Fig. 4) could be constructed for Great Britain by means of a station near London, one at Manchester, one at Cardiff, one at Glasgow, with, let us say, a 10-kilowatt station at Belfast. This would give us five stations only for Great Britain. It might be argued that it would be unsafe to assume that the London station would have an all-Britain carrying power, and also that all Britain seems to require the London programme.

In suggesting stations at London, Manchester, etc., I do not, of course, mean that these stations would be in the centres of population, as this would introduce con-

(*Concluded at foot of next page*)

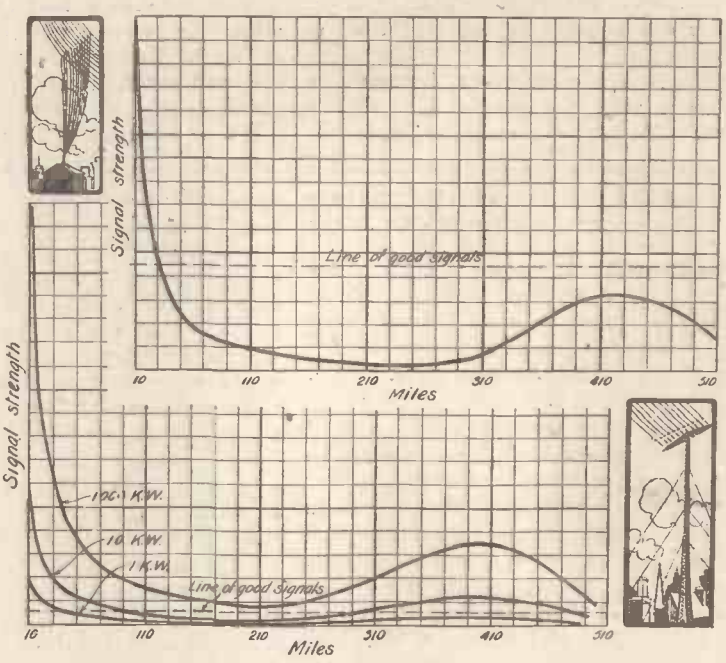


Fig. 2 (Upper).—Graph showing relation of signal strength and distance. Fig. 3 (Lower).—Graph showing relative ranges of low and suggested high powers.

HOW I DESIGNED THE "A.W." "BALLOT THREE" (continued from page 278)

Minimising Damping

This leads up to the second of the desirable features, namely, reasonable selectivity. We have just seen that the aërial damping is minimised by using a series condenser. The damping in the coil itself is kept as low as possible by using a reasonably efficient coil, and in this particular instance provision has been made for a centre-tapped Gambrell coil. There remains, however, a third source of damping which is very important, namely, that imposed by the detector valve itself.

Using grid rectification as is done in this instance for the sake of simplicity, it is necessary for a certain amount of grid current to flow in the valve, and this, as is well known, introduces damping into the tuned circuit. In the particular case in point, this damping has been reduced very considerably, because the detector valve itself is only connected across one half of the tuned circuit. It can be shown mathematically that the effect of this is equivalent to reducing the damping by a quarter, which makes for a much more selective arrangement than would otherwise be the case.

Ease of Control and Flexibility

Let us now consider the other factors as far as the tuning arrangements are concerned. We have only one tuning dial to operate, while reaction is obtained by a very small vernier condenser. If it is desired to change the wavelength range, for example, for the reception of Daventry instead of the local station, all that is necessary is that the plug-in coil shall be removed from its socket and replaced by another one suitable for the longer wavelength range.

There is one other point, however, in connection with this question of flexibility which, although very small, is, nevertheless, effective, and this is that a filament rheostat has been incorporated on the detector valve. This serves a dual purpose. In the first place, it enables the characteristics of the detector valve to be altered to some extent, which is of particular assistance in enabling a smooth control of the reaction to be obtained. It will be found that by varying this rheostat a position can readily be obtained at which reaction control is smooth and easy. This control is, indeed, all the more necessary, because in the interest of simplicity, and also to some extent in connection with the low-frequency switching arrangements which are to be described shortly, only one high-tension voltage tap has been provided, which may be connected to from 60 to 90 volts. This detector rheostat also serves to some extent as a volume control, if ever this is found necessary.

The L.F. Stages

Two transformer-coupled low-frequency amplifying stages have been provided in accordance with the terms of the Ballot. For many people living only a comparatively few miles from the broadcast station, three valves may give much too great a signal strength for operating a loud-speaker in a medium-sized room. It is desirable, therefore, to make provision for cutting out one of these low-frequency stages, and this has been done in the present case.

There is an increasing tendency nowadays, however, towards the use of a special loud-speaker valve in the last stage, so that if any switching device is incorporated it should be such that the last valve is always in circuit. In other words, it should be the first L.F. valve which is cut out, and not the second, as is done with the usual type of jack switching.

It will be seen therefore by reference to the circuit diagram that this switching has been accomplished in the particular case in question by changing over the anode circuit of the detector valve, either on to the first transformer or on to the second transformer. In the first case we have both note-magnifying valves in circuit, whereas in the second case we have only the second valve in circuit, the first valve being cut out, and at the same time the filament switched off by an additional pole on the change-over switch. By this means, therefore, the last valve, which may be of a type specially designed to give good loud-speaker reproduction, is always in circuit irrespective of the number of valves in use.

Constructional Details

The other points in the Ballot refer principally to constructional details. Ebonite panels are definitely preferred to any other type of panel, while the present method of mounting components on the baseboard, with simply the controls on the panel, appears to meet with approval. A separate filament control for each valve is desired, a very sound preference from a technical point of view.

Finally, on the subject of valves, there is a definite preference for the 2-volt series. This type of valve is admittedly convenient from many points of view. At present there is usually a noticeable increase in efficiency when a 2-volt valve is replaced by a corresponding 6-volt type, but many people are prepared to sacrifice this for the extra convenience arising from the use of the 2-volt range. In this particular case the constants have been arranged so that the receiver will give as full efficiency on 2-volt valves. When all points are considered the "A.W." "Ballot Three" should find its way into many homes.

J. H. REYNER.

"FOUR GIANT BROADCASTING STATIONS FOR GREAT BRITAIN" (*Continued from preceding page*)

siderable trouble to owners of sensitive apparatus. The stations could be placed sufficiently far away from the maximum density of population to be of good, sound strength there, but not enough to render elimination difficult.

Each of these stations would now, I estimate, be receivable all over the British Isles, and there could be five programmes of merit, which practically everyone could get on moderately priced receivers.

With such an arrangement of stations we have more or less conquered the difficulty of the weak zone. We have given multiple British programmes to all. We have reduced the number of wavelengths, and in addition decreased the tendency to interference with Continental programmes. It is very unlikely that in the near future anyone will be able to construct a station appreciably more powerful than these. An increase to 200 or 300 kilowatts would be insignificant compared with the tremendous increase from 1 to 100 kilowatts, and such a risk could be neglected. No longer would our stations be difficult to receive in Europe. Each of these stations would carry over a considerable proportion of Europe, and the political importance of this is immense.

The only serious objection to the scheme is the possible and very probable objection of the Services and the shipping people. The Services could easily handle the interference to their own receivers, as they have experts at most points; but the vast shipping interest would have to be considered, as the problems of safety at sea are concerned.

The cost of this scheme would not be beyond the capabilities of the B.B.C., as their charter permits of raising money by loans if necessary.

THE C.A.V. COMPETITION RESULT

READERS may remember that C. A. Vandervell and Co., Ltd., of Acton, W.3, recently offered 100 guineas for a suitable name for their H.T. accumulators. They are now pleased to inform us that, in accordance with the rules of the competition, prizes have been awarded as follows:

Miss Ruth Fazen, of 73, Deodar Road, S.W.5, has received 75 guineas by cheque at a special presentation at the C.A.V. head offices for the best suggested name, "Silent Sixty."

The H.T. accumulator purchased by Miss Fazen was bought through the following trader, who, in accordance with the conditions of the competition, received a cheque for 25 guineas: Captain Brechenshaw, Morlands Motors, Ltd., Sheen Lane Garage, S.W.14.

RADIOGRAMS

IT is stated that there is no prospect that Mr. Coolidge's speech on February 22 to the joint session of the American Congress at Washington will be picked up and broadcast in this country. The B.B.C. explain that at the time at which the speech will be broadcast—5.30 Greenwich time—it is practically impossible to obtain good reception from America owing to the proximity to sunset. In addition, the hour is inconvenient for the majority of British listeners.

It is officially announced by the B.B.C. that when experiments now in hand produce successful results, and when the necessary funds are available, an auxiliary short-wave transmitting plant will be established at Daventry for the purpose of Empire broadcasting.

Senatore Marconi denies that wireless and its marvels had their origin in a love-story. A contemporary reports him as having said, "Don't, for goodness sake, talk of a love-story." If wireless did not begin in a love-story, we are sure it has *ended* in more than one.

In ninety cases out of one hundred, sets in use in schools are said to have been installed at the expense of teachers. The B.B.C. estimate the cost of installing a four-valve set with loud-speaker nowadays at about £20.

Imposing fines of £2 upon users of unlicensed wireless sets at Aberdeen, the sheriff gave warning that the penalty for the offence was increasing. The prosecutor asked that the apparatus concerned in the cases be forfeited, but the sheriff declined to make an order to this effect.

On an input of four watts it is reported that G C 2 W L (Glasgow) has worked with a station in India.

When the B.N.O.C. visits the Opera House, Manchester, on March 2, the B.B.C. will relay Acts 1 and 2 of Leoncavallo's *Pagliacci* to all stations.

The St. David's Day programme, to be broadcast on March 1 from London and other stations, will be arranged by Sir Walford Davies.

Maurice Maeterlinck's play, *The Death of Tintagiles,* is to be broadcast from 2 L O on February 28.

General Booth, in person, will be heard by listeners on February 20, when he will conduct the sacred service at 2 L O. The words of *O boundless Salvation,* one of the hymns to be broadcast, are from the pen of General William Booth, founder of the Salvation Army.

Under the leadership of Mr. Percy Pitt the Wireless Orchestra will give an hour of Johann Strauss's favourite waltzes at the London station on February 19.

Two outstanding features of the programme, arranged by the B.B.C. for Thursday, February 17, will be the National Concert at the Albert Hall, with the augumented symphony orchestra conducted by Signor Bernardino Molinari, and a description of a flight to India by Sir Samuel Hoare, Air Minister.

Miss Estelle Brodie, who became famous for her acting in the film, *Mademoiselle from Armentières,* will give ten minutes syncopation in the 2 L O studio on February 26.

To popularise the new Scottish hymnary, a hymn festival in Glasgow on February 24 is being broadcast. The singers comprise the Belhaven Choir.

On February 28 Miss Ella Retford will give her first broadcast from the London studio; her performance is timed for 9.30 to 9.45 p.m.

The B.B.C. promises a surprise for February 19, when Mr. Sydney Nesbitt will give a special broadcast with the London Radio Dance Band. He will be presented to listeners in a novel manner.

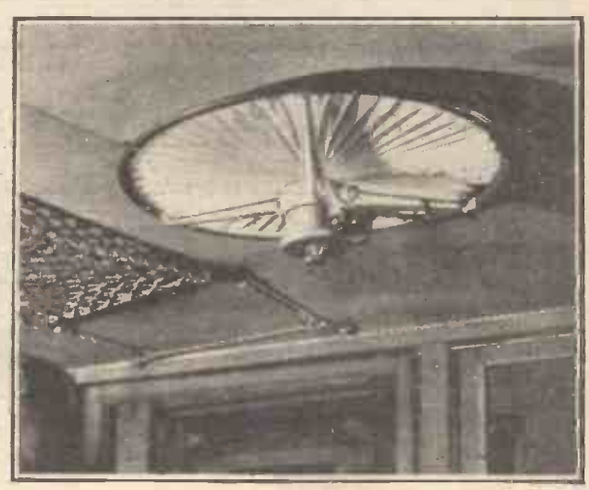
A new-comer to the microphone on February 28 is Miss Lottie Venne, the comedy actress, who for many years was associated with burlesque and humorous plays.

There is still much grumbling at the number of talks given at the B.B.C. stations. One-third of the programmes, we are told, are talks. But is not man a *talking* animal?

A broadcasting transmitter has been erected in the Hotel des Indes, at Batavia (Dutch East Indies). Concerts are given out on three evenings weekly, and relays of dance music when opportunity arises are taken from one of the incoming Dutch mail steamers. The wavelength utilised is that of 175 metres, power being rated at about 400 watts.

Although tests are being made almost daily with the new Lille transmitter, it is not expected that the station will be in regular operation before next April or May.

One hundred prosecutions are pending in Dublin and the suburbs against persons who have not paid licence duty for their wireless receiving sets.



The photograph on the left shows Captain Plugge in his Park Lane Saloon car, manufactured and fitted by The Standard Motor Co., Ltd., of Coventry. The car is equipped with a nine-valve supersonic heterodyne wireless receiving set. The right-hand picture shows how reception is effected on a loud-speaker which is fitted into the roof of the car. Reception is perfect, and the owner is able to receive the concerts of the various European stations anywhere, both whilst travelling or at a standstill.

MR. REYNER LECTURING AT LIVERPOOL

ON Monday, February 21, Mr. J. H. Reyner, our Technical Editor, is lecturing before the North Western Centre of the Institution of Electrical Engineers at Liverpool. By courtesy of the committee this lecture is being opened to the public, and a limited number of tickets will be available for AMATEUR WIRELESS readers who reside in the vicinity of Liverpool.

The lecture is entitled "Recent Developments in Radio Reception," and will be illustrated by a demonstration on a modern receiver, in all probability the "Paradyne Four," which is to be described in the March issue of the *Wireless Magazine*.

Readers who are interested should apply for tickets immediately to the Editor, AMATEUR WIRELESS, La Belle Sauvage, E.C.4 as time is very short. Please enclose stamped addressed envelope.

Captain P. P. Eckersley, chief engineer of the B.B.C., by an agreement concluded between members of the International Broadcasting Union at Brussels, has been appointed to take charge of experiments affecting the use of long wavelengths throughout Europe. He will carry out the work in co-operation with M. Braillard, of Belgium, president of the Technical Committee of the Union of Broadcasting Organisations.

EUROPE'S "ANSWER MAN"

FROM the *New York Sun* (Radio Section) of January 15 last we cull the following paragraph:

"RADIO'S HARDEST JOB IS EUROPE'S 'ANSWER MAN.'

"Europe has its radio 'answer man,' and his task is monumental. With so many stations in the various countries, using a dozen languages, his job of checking up on the broadcasts for the edification of those who thought they heard China is one which creates no envy. Listening nightly, he tunes in many foreign stations from his home in London, and keeps accurate data of all programmes transmitted.

"A great many inquiries are about American programmes, reports Joseph D. R. Freed, president of the Freed-Eisemann Radio Corporation, and the last group of answers, consisting of about five hundred responses, shows that occasionally Chicago stations are brought in, and that reception of WGY, KDKA, WPG and WBZ is quite regular."

Readers will be interested to learn that "Europe's Answer Man," referred to in the preceding paragraph, is Mr. J. Godchaux Abrahams, a regular contributor to AMATEUR WIRELESS and *The Wireless Magazine*.

It would be interesting to know which particular receiving set he uses.

AEROPLANE BATTERY SUPPLY

FIVE aeroplanes have recently left the United States on a tour of good will to South America. They are all equipped with Exide batteries. These batteries were selected because of the world-wide battery service maintained by the manufacturers. This service enables the fliers to get battery attention from authorised Exide service stations, even though they may be thousands of miles from home. Exide service stations operated by Exide distributors are located throughout Central and South America and the West Indies.

From the new station now under erection at Daventry it is hoped to transmit a first-class alternative programme entirely independent of those given from 2LO and 5XX. The studio will be situated at Savoy Hill. Although the regional stations will be few in number, there will be no diminution in the number of studios.

The Staccatone, a curious instrument invented by Hugo Gernsback (New York), and which was used to transmit as an interval signal the first three bars of the "Stars and Stripes" at the WRNY broadcasting station, has been modified to imitate the call of the cuckoo. It is a combination of clockwork and an oscillating valve.

Front View of Coil.

Eight Coils in One!

A truly universal coil to cover all wavelengths from 160 to 4,300 metres.

For use with either valve or crystal sets, as primary, secondary or reaction coil

Its selectivity is amazing—whilst its cost is only 13/6.

This wonderful new coil replaces a whole set of ordinary coils and can be used in every circuit with the utmost simplicity. It *is* actually eight coils in one. With it there is no "dead-end" effect; all the coils that are not in use being "shorted," and entirely out of the circuit. As a reaction coil, "Blue-Spot Multidyne" entirely eliminates the difficulty so often experienced in obtaining correct ratios. The carrier wave is quite easily kept free from distortion by simply adjusting a single lever. Don't be troubled with obsolete coils—get the

Back View of Coil.

"BLUE SPOT" MULTIDYNE ALL-WAVE COIL

Ask your Dealer or write to one of the following addresses for LIST "A.3" of "Blue Spot" Specialities.

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Lancashire and Cheshire: F. A. Hughes & Co., Ltd., 6, Booth Street, East, C.-on-M., Manchester.
South Wales: Watson Bros., 48, Dock Street, Newport.
Midlands: Foster-Boynton Co., Ltd., 70, Lombard St., Birmingham.
Northumberland, Durham, Westmorland and Cumberland: David Bloom, 68, Northumberland Street, Newcastle-on-Tyne.

Success with the "M.C.3"

SIR,—I must congratulate you on Mr. Reyner's "M.C.3." I put it together this afternoon out of curiosity, using some spare parts that I happened to have. The tuning condensers cost 6s., and have no slow motion. In spite of this I have just listened to Newcastle on the loud-speaker, using 2-volt valves. To-morrow the set is going into a cabinet.—C. H. W. S. (Blackheath, London, S.E.).

The Empire Wireless Chain

SIR,—I was rather amused and not a little surprised to see the following statements in Thermion's "On Your Wavelength" notes in the issue of December 11, 1926.

Speaking about the Empire Wireless Chain, Thermion says that the experts are at last considering the matter, as America has "been pursuing a policy of peaceful penetration" by means of her short-wave stations, KDKA in particular. Then he writes: "In South Africa there has long been a clamour for a British short-wave station which would be audible in South Africa. At the moment, as the South African stations are poor ones, it is the nightly habit of the inhabitants to listen to America. By doing so they inevitably absorb American views. No wonder the States are disturbed at the thought that we might follow their example."

Owing to the difference in times, if one wishes to listen-in to America, it is necessary to get up at about three in the morning. Does Thermion seriously think that the "inhabitants" of South Africa make a habit of getting up at that unearthly hour each morning to listen-in to American stations with the usual accompaniment of mush and static?

Again, what exactly is meant by the phrase "as the South African stations are poor ones"? Why are they poor? There are only three South African broadcasting stations, situated in Cape Town, Johannesburg and Durban. The Cape Town and Durban stations are of the Marconi "Q" type with a power of 6 kw., while Johannesburg has a power of ½ kw. All three stations have excellent records as far as both entertainment and range are concerned. The Cape Town station has been heard twice in California and once in England.—J. P. D. (Cape Town).

"Are Your Connections 'Low Loss'"?

SIR,—May I say with regard to the above article that I arrived at similar conclusions some years ago?

In most of my receivers I use a plug-and-socket arrangement for aerial and earth connection with which to couple long- or short-wave set. The constant withdrawal of these ensures good contact. I also make a regular practice of removing H.F. valves and cleaning the pins, since these are in H.F. circuits.

A point worth looking to is to be found in the variable condensers. The plates, spacing washers and spindle contacts are pressure contacts. I have more than once dismantled condensers for the particular purpose of cleaning these contacts. A .001 condenser may have as many as twenty-eight fixed and twenty-seven moving plates, which represent over a hundred pressure contacts. Here is a very obvious place for H.F. resistance to creep in. At the present time I use condensers in which the plates

(*Continued on page* 302)

CORRESPONDENCE (*continued from page 300*)

are cast *en bloc* or have a strip of metal soldered to each plate. There can be no doubt that this point could be conveniently taken up by manufacturers for the purpose suggested, as well as for the more usual one of keeping the plates evenly spaced.

If the items enumerated are attended to there is bound to be a considerable increase in the strength of distant transmissions. Personally, like Mr. Leslie, I say, solder all possible connections in H.F. circuits.—H. B. M. (Liverpool).

"DO YOUR FIXED CONDENSERS MATTER?"

(*continued from page 274*)

the voltage in much the same way as a flywheel smooths out any irregularities of speed in a steam engine.

This fluctuating voltage, which is often the cause of those unpleasant crackles in a wireless set, will be more apparent as the battery gets older, and the inclusion of these fixed condensers will give a longer lease of life and thus reduce battery renewals. This, of course, is in addition to the by-pass effects to the oscillating currents. Naturally, if these condensers develop a fault or short circuit the high-tension battery will be ruined in a remarkably short time, so it behoves the potential customer to choose a reliable type, such as the Mansbridge, to be on the safe side. It is really not good practice to place this large condenser across the telephones and battery; use both the small and large capacities in their respective positions; but the 2-microfarad condensers can, with advantage, be joined across the L.T. and H.T. batteries when L.T.+ is joined to H.T.−, as in Fig. 1.

Incidentally, in this circuit, which is quite a common one, it will be noticed that no condenser is placed across the primary of the second low-frequency transformer, but this is correct practice, for in the anode circuit of the second valve practically no high-frequency component of the fluctuating current is present. In passing it may also be mentioned that with the grid leak and condenser method of rectification of Fig. 1, if the usual .0003 condenser proves faulty, the rectification of the signals will be upset and distortion will be evident. The moral, of course, is obvious.

Turning now to the circuit (which incidentally is a particularly selective one to work with) illustrated in Fig. 2, we meet another important case where a fixed condenser can do considerable damage. The condenser in question is the one marked C3. It is for the purpose of passing the high-frequency currents from the anode of the first valve to the tuned circuit in the grid of the second valve, and has a capacity of about .0001. If a short circuit occurs in this condenser the high-tension battery will be practically short circuited. This will become apparent if we trace the path from H.T.+1 through the radio-frequency choke, through the short across C3 to L.T.— via the tapped portion of the coil in the grid circuit of the second valve. Thus particular attention must be paid to fixed condensers placed in circuits akin to this one.

It is worthy of note that a fixed condenser is omitted from the primary of the low-frequency transformer owing to the provision of a radio-frequency choke in the anode circuit of the second valve. This choke forces any high-frequency currents to travel via the reaction condenser C6, and thus they do not reach the primary winding.

Many other cases of "blocking" condensers can no doubt be called to mind where insertion is necessary to prevent any direct current flowing from the batteries except in the paths desired, but sufficient has been said to point out the importance of the fixed condenser.

A FREE GIFT

ELECTRADIX RADIOS, of 218, Upper Thames Street, E.C.4, are offering to supply all blind listeners free with one pair of their Hear-Easy Rubber Headphone Pads. Hospitals can obtain a free pair of pads for every pair ordered. These should prove useful to users of crystal sets who wish to cut out extraneous noises and to "DX hounds" who listen to weak distant signals. The sale price per pair to ordinary listeners is 6d. per pair.

BROADCAST TELEPHONY

NOTE.—*In the following list of transmissions these abbreviations are observed: con. for concert; lec. for lecture; orch. for orchestral concert; irr. for irregular; m. for metres; and sig. for signal.*

GREAT BRITAIN

The times given are according to Greenwich Mean Time.

London (2LO), 361.4 m. 1-2 p.m., con.; 3.15-4 p.m., transmission to schools; 3.30-5.45, con. (Sun.); 4.15 p.m., con.; 5.15-5.55, children; 6 p.m., dance music; 6.30 p.m., time sig., news, music, talk; 8-10 p.m., music; 9.0, time sig., news, talk, special feature. Dance music daily (exc. Sundays) from 10.30 until midnight.

Aberdeen (2BD), 500 m. **Belfast** (2BE), 306.1 m. **Birmingham** (5IT), 326.1 m. **Bournemouth,** (6BM), 491.8 m. **Cardiff** (5WA), 353 m. **Glasgow** (5SC), 405.4 m. **Manchester** (2ZY), 384.6 m. **Newcastle** (5NO), 312.5 m. Much the same as London times.

Bradford (2LS), 252.1 m. **Dundee** (2DE), 294 m. **Edinburgh** (2EH), 288.5 m. **Hull** (6KH), 294 m. **Leeds** (2LS), 277.8 m. **Liverpool** (6LV), 297 m. **Nottingham** (5NG), 275.2 m. **Plymouth** (5PY), 400 m. **Sheffield** (6FL), 272.7 m. **Stoke-on-Trent** (6ST), 294 m. **Swansea** (5SX), 294 m. **Daventry** (25 kw.), high-power station, 1,600 m. Special weather report, 10.30 a.m. and 10.25 p.m. (weekdays), 9.10 p.m. (Sun.); 11.0 a.m., light music (exc. Sat. and Sun.); relays 2LO from 1 p.m. onwards. Time sig.: 10.30 a.m., 4.0, and 10.0 p.m.

IRISH FREE STATE.

Dublin (2RN), 319.1 m. Daily, 7.25 p.m. Sundays, 8.30 p.m. until 10.30 p.m. Frequently relays sporting matches on Sundays, 3.0-5.30 p.m.

Cork (under construction), 400 m.

CONTINENT

Unless otherwise stated, all times are p.m. (G.M.T.).

AUSTRIA.

Vienna (Radio Wien), 517.2 m. (5 kw.) and 577 m. 7, con.; 9.30, dance (Wed., Sat.).

Relays: **Graz,** 357.1 m. (750 w.); **Klagenfurt,** 272.7 m.; **Innsbrueck,** 294.1 m.

BELGIUM.

Brussels, 508.5 m. (1.5 kw.). 5.0, orch. (Tues., Thurs., Sat. only), news; 8.0, lec., con., news.

CZECHO-SLOVAKIA.

Prague, 348.9 m. (5 kw.). Con., 7.0 (daily).
Brunn, 441.2 m. (3 kw.). 6.0, con. (daily).
*Koszice, 300 m. (2 kw.).
*Bratislava, 263.2 m. (500 w.).
*Relay Prague.

DENMARK.

***Copenhagen,** 337 m. (700 w.). Sundays: 9.0 a.m., sacred service; 3.0, con.; 7.0, con. Weekdays: 7.0, lec., con., news; dance to 11.0 (Thurs., Sat.).
* Relayed by Sorö (1,153.8 m.).

ESTHONIA.

Reval, 440 m. (2½ kw.). 5.0, con. (daily).

FINLAND.

Helsingfors, 375 m. (5 kw.).

GRAND DUCHY OF LUXEMBURG.

Radio Luxemburg, 1,200 m. (250 w.). Con.: 2.0 (Sun.), 9.0 (Tues.).

FRANCE.

Eiffel Tower, 2,650 m. (8 kw.). 6.40 a.m., weather (exc. Sun.); 11.0 a.m., markets (exc. Sun. and Mon.); 11.20 a.m., time sig., weather; 6.0, talk, con., news; 7.0 and 11.10, weather; 9.0, con. (daily). Relays PTT, Paris, Sat., 9.10-11.0, and weekday afternoons. Testing on 50 kw.

Radio-Paris (CFR), 1,750 m. (about 3 kw.). Sundays: 12.0, sacred service; 12.45, con., news; 4.30, Stock Ex., con.; 8.15, news, con. or dance. Weekdays: 10.30 a.m., news, con.; 12.30, con., markets, weather, news; 4.30, markets, con.; 8.0, time sig., news, con. or dance. Testing on 30 kw.

L'Ecole Sup. des Postes et Télégraphes (PTT), Paris, 458 m. (5 kw.). 3.0, lectures (relay of Sorbonne University); 8.30, lec. (almost daily); 9.0, con. (daily).

Le Petit Parisien, 340.9 m. (500 w.). 9.15, con. (Tues., Thurs., Sat., Sun.).

Radio L.L. (Paris), 350 m. (250 w.). Con. (Mon., Wed., Fri.), 9.30.

Biarritz (Côte d'Argent), 200 m. 6.0, con. (Mon., Wed., Fri.).

Radio Vltus (Paris), 308 m. 9.0, con. (Wed., Fri., Sun.).

Lille, 1,300-1,500 m. Testing.

Radio-Toulouse, 389.6 m. (3 kw.). 5.30, news (exc. Sun.); 8.45, con.; 9.25, dance (daily).

Radio-Lyon, 291.3 m. (1.5 kw.). 8.20, con. (daily); 4.0 (Sun.).

Strassburg (8GF), 222.2 m. (1½ kw.). 9.0, con. (Tues., Fri.); 9.30-12.0, dance (Sat.).

Strassburg (Military Stn.), 200.1 m. (15 kw.). Con., 9.0 (Wed.). Testing on var. wl.

Radio Agen, 297 m. (250 w.). 8.30, con. (Tues., Fri.).

***Lyon-la-Doua,** 475 m. (1 kw.). Own con., 8.0 (Mon., Wed., Sat.).

***Marseilles,** 309 m. (500 w.).

***Toulouse,** 245 m. (500 w.).

*Relays of PTT, Paris.

Montpellier, 252.1 m. (1 kw.). 8.45 (Wed., Fri.).

Beziers, 180 m. (150 w.). 9.0, (weekdays only).

Juan-les-Pins (Radio LL), 230 m. (300 w.). 9.0, con., news.

Angers (Radio Anjou), 275.2 m. (250 w.). Daily: 8.30, news, lec., con.

Bordeaux (Radio Sud-ouest), 238 m. (1 kw.). 7.25, con. (Thurs.).

Bordeaux (Lafayette), 419.5 m. (1½ kw.). Con., 5.0, 9.0 (weekdays), 2.30 (Sun.). Relays PTT. Paris, 8.30 (Sat.).

Mont de Marsan, 400 m. (500 w.). Con., 8.30 (daily, exc. Sun. and Wed.).

Algiers (N. Afr.) (PTT), 310 m. (50 w.). 7.0-10.0, daily.

Carthage (Tunis), 1,850 m. (5 kw.). 6.30, con., dance.

Casablanca (Morocco), 306.4 m. (3 kw.). 8.30, con. (daily); 10.0, dance (irr.).

GERMANY.

Berlin, on 483.9 and 566 m. 8.0 a.m., sacred con. (Sun.); 11.55 a.m., time sig., news, weather; 5.30, orch.; 7.30, con., weather, news, time sig., dance music until 11.30 (daily, exc. Tues.). Relayed on 1,300 m. by Königswusterhausen (1,250 m.) and Stettin (252.1 m.).

Königswusterhausen (LP), 1,250 m. (12 kw.). 10.30-11.50 a.m., con. (Sun.); 2.0, lec. (daily); 7.30, relay of Berlin (Vox Haus) con. (daily). 2,525 m. (5 kw.), Wolff's Buro Press Service: 5.45 a.m. to 7.10. 2,900 m., Telegraphen Union: 7.30 a.m. to 6.45, news. 4,000 m., 6.0 a.m. to 8.0, news.

Breslau, 322.6 m. (4 kw.). 11.0 a.m., con. (daily), Divine service (Sun.); 4.0, con.; 6.0, lec.; 7.30, con. Relay: Gleiwitz, 250 m.

Frankfort-on-Main, 428.6 m. (4 kw.). 5.0 to 5.15 a.m. (exc. Sun.), physical exercises; 7.30 a.m., sacred con. (Sun.); 3.0, con. (Sun.); 3.30, con.; 7.0, lec., con., weather. Dance: relays Berlin. Relay: Cassel, 272.7 m.

Hamburg, 394.7 m. (4 kw.). Relayed by Bremen (400 m.), Hanover (297 m.), Kiel (254.2 m.). Sundays: 7.25 a.m., time sig., weather, news; 8.15 a.m., sacred con.; 12.15, con.; 5.0, con.; 7.0, con. Weekdays: 6.0 a.m., time sig., weather, news; 11.55 a.m., Nauen time sig., news; 1.0, weather, con.; 8.0, con., dance.

(*Concluded on page* 306)

"BROADCAST TELEPHONY" (*continued from page 304*)

Königsberg, 329.7 m. (4 kw.). 8.0 a.m., sacred con. (Sun.); 7.0, con. or opera, weather, news, dance (irr.). Relay: Danzig, 272.7 m.

Langenberg (Rhineland), 468.8 m. (25 kw.). Relays Elberfeld, Muenster, Dortmund, Cologne (Studio).

Leipzig, 365.8 m. (4 kw.). Relayed by Dresden (294.1 m.). 7.0 a.m., sacred con. (Sun.); 7.15, con. or opera, weather, news, dance music.

Munich, 535.7 m. (1½ kw.). Relayed by Nuremberg (303 m.). 10.30 a.m., lec., con. (Sun.); 3.0, orch. (Sun.); 3.30, con. (weekdays); 5.30, con. (weekdays); 6.15, lec., con.

Muenster, 241.9 m. (1.5 kw.). Relayed by Dortmund (283 m.). 8.0 a.m., Divine service; 11.0 a.m., news (Sun.); 6.40, news, weather, time sig., lec., con.

Norddeich (KAV), 1,800 m. 11.0 and 3 a.m., weather and news.

Stuttgart, 379.7 m. (4 kw.). 10.30 a.m., con. (Sun.); 3.30, con. (weekdays); 4.0, con. (Sun.); 5.30, time sig., news, lec., con. (daily); 8.15, time sig., late con. or cabaret. Relay: Freiburg, 577 m. (1½ kw.).

HOLLAND.

Hilversum (HDO), 1,060 m. (5 kw.). Sundays: 10.0 a.m., sacred service; 2.10, con.; 4.40, church service; 7.40, weather, news, con. Weekdays: 4.30, con.; 7.50, news, con.

Scheveningen-Haven, 1,950 m. (2½ kw.). Throughout day.

HUNGARY.

Buda-Pesth (Csepel), 555.6 m. (3 kw.). 7.0, con. or opera; dance nightly.

ICELAND.

Reykjavik, 333.3 m. (700 w.). Con., 7.30.

ITALY.

Rome (IRO), 449 m. (3 kw.). 9.30 a.m., sacred con.; 4.30, relay of orch. from Hotel di Russia; 4.55, news, Stock Ex., jazz band; 7.30, news, weather, con.; 9.15, late news.

Milan, 315.8 m. (1 kw.). 8.0-11.0, con.

Naples, 333.3 m. (1½ kw.). 8.0-11.0, con.

JUGO-SLAVIA.

Zagreb (Agram), 310 m. (500 w.). 7.15, con.

LATVIA.

Riga, 480 m. (5 kw.). Con. daily, 7.0. Testing on 15 kw. (1,500 m.).

LITHUANIA.

Kovno, 2,000 m. (15 kw.). 6 p.m. (daily).

NORWAY.

Oslo, 461.5 m. (1.5 kw.). 6.15, news, time, lec., con.; 9.0, time, weather, news, dance.

Bergen, 370.4 m. (1 kw.). 6.30, news, con.

***Fredriksstad,** 436 m.

***Porsgrund,** 504 m. (1½ kw.).

***Hamar,** 566 m.

*Relays Oslo.

POLAND.

Warsaw (High Power), 1,111.1 m. (10 kw.). 7.30, con.

Posen, 270.9 m. (4 kw.). Testing.

Lemberg, 247.9 m. Under construction.

RUSSIA.

Moscow (RDW), 1,460 m. (15 kw.). 4.55, news and con.; 10.0, chimes from Kremlin.

Moscow (New Central), 1,000 m. (100 kw.). Testing.

Leningrad, 1,010 m. (10 kw.). 5.0.

SPAIN.

Madrid (EAJ7), 373 m. (1.5 kw.). Con. daily. Closes 1 a.m. (daily).

Madrid (EAJ4), 340 m. (2½ kw.). Con.

Madrid (Radio-Madrilena) (EAJ12). Testing on 303-310 m. (2½ kw.).

Barcelona (EAJ1), 325 m. (1½ kw.). 6.0-11.0 (daily).

Barcelona (Radio Catalana) (EAJ13), 460 m. (1 kw.). 7.0-11.0, con., weather, news.

Bilbao (EAJ9), 436 m. (500 w.). 7.0, con.

Bilbao (Radio Vizcaya) (EAJ11), 418 m. (500 w.). 8.0-12.0, con. (daily).

Cadiz (EAJ3), 344.8 m. (550 w.). 7.0-9.0, con., news. Tests daily (exc. Sun.), midnight.

Cartagena (EAJ15), 335 m. (500 w.). 8.30-10.0, con. (daily).

Seville (EAJ5), 357 m. (500 w.). 9.0, con., news, weather. Close down 11.0.

Seville (EAJ17), 300 m. (500 w.). 7.0-10.0, con. (daily).

San Sebastian (EAJ8), 346 m. (1.5 kw.). 5.0-7.0, 9.0-11.0 (daily).

Salamanca (EAJ22), 405 m. (1 kw.). 5.0 and 9.0, con. (daily). Closes down 11.0.

SWEDEN.

Stockholm (SASA), 454.5 m. (1½ kw.). 10.0 a.m., sacred service (Sun.); 5.0, sacred service; 6.0, lec.; 8.15, news, con., weather. Dance (Sat., Sun.), 8.45.

Relays.—Boden (SASE), 1,200 m.; Eskilstuna, 250 m.; Falun (SMZK), 400 m.; Gothenburg (SASB), 416.7 m.; Gefle, 204.1 m.; Joenkoeping (SMZD), 201.3 m.; Kalmar (SMSN), 254.2 m.; Karlsborg (SAJ), 1,365 m.; Karlscrona (SMSM), 196 m.; Kristinehamn (SMTY), 202.7 m.; Karlstadt (SMXG), 220 m.; Linkoeping, 500 m.; Malmo (SASC), 260.9 m.; Norrkoeping (SMVV) 275.2 m.; Orebro, 218 m.; Ostersund, 720 m.; Saeffle (SMTS), 252.1 m.; Sundsvall (SASD), 545.6 m. (1 kw.); Trollhattan (SMXQ), 277.8 m.; Uddevalla, 294.1 m.; Umea, 229 m.; Upsala, 315 m.; Varberg, 297 m.; Motala, 1,304.5 m. (25 kw.), testing shortly.

SWITZERLAND.

Lausanne (HB2), 850 m. (1½ kw.). 7.0.

Zurich, 494 m. (500 w.). 10.0 a.m., con. (Sun.); 4.0, con. (exc. Sun.); 7.15, lec., con., dance (Fri.).

Geneva (HB1), 760 m. (2 kw.). 7.15, con. (weekdays). No transmission on Sun.

Berne, 411 m. (1.5 kw.). 9.30 a.m., organ music (exc. Sat.); 3.0, 7.30, con.

Basle, 1,100 m. (1½ kw.). Con. daily, 7.30.

CHIEF EVENTS OF THE WEEK

SUNDAY, FEBRUARY 20

London	The Wireless Military Band.
Birmingham	Classical Favourites.
Cardiff	Pontypool Town and District Silver Band.
Manchester	Song Recital by John Van Zyl (bass).

MONDAY

London	Musical Comedy Extracts and Variety.
Belfast	'Derry Soloists.
Cardiff	Orchestral Masterpieces.
Glasgow	Song Recital by Mary Jarred (contralto).
Manchester	Sea Shanties and Army Songs.

TUESDAY

London	Howard Carr programme.
Belfast	In the wake of H.M.S. *Renown*.
Birmingham	City of Birmingham Police Band.
Cardiff	The Works of Frederick Humphries.
Glasgow	Scottish Towns Series—Renfrew programme.
Manchester	"Round Europe."

WEDNESDAY

London	R. A. Roberts in *Dick Turpin*.
Glasgow	Handel Anniversary programme.
Manchester	An afternoon with Samuel Pepys.

THURSDAY

London	Regimental Feature with the Wireless Military Band.
Birmingham	Schumann programme.
Bournemouth	Songs of three Nations.
Cardiff	*Spoiling the Broth*, played by Station Radio Players.
Dundee	*How the Other Half Live*, played by Dundee Radio Players.
Glasgow	Annual Dinner of the Headmasters' Association, relayed from Grosvenor Restaurant, Glasgow.
Manchester	*Eric's Winning Way*, performed by Station Repertory Players.

FRIDAY

London	*Orpheus*, an opera by Gluck.
Belfast	Claude de Ville, Pianoforte Recital Series.
Bournemouth	*Guy Weatherby's Dilemma*, a comedy.
Manchester	The Kreutzer Sonata—Winifred Small and Maurice Cole.

SATURDAY

London	Variety programme.
Belfast	Mabel Constanduros, Entertainer.
Cardiff	War-time reminiscences.
Glasgow	Revue.
Manchester	Music from the South Seas.
Newcastle	A Nautical concert.

WENR, a station in Chicago, which sends out on 266 metres, on every Wednesday, Friday, and Saturday, a musical programme beginning at midnight and ending at 2 a.m., eastern standard time, offers presents to listeners who describe the last item broadcast. The contest is called "The Last Minute Audience Club"!

At irregular intervals Radio Toulouse (France) relays by wireless link programmes from Barcelona, E A J 1 (Spain).

Two contracts have been placed by the Republic of China with a French and an American firm for the construction of 2 kw. broadcasting transmitters at Mukden and Harbin. They should be in operation towards the end of this year. Except for military purposes, up to the present the possession of wireless receiving sets was forbidden outside the South Manchurian railway line. It has been decided to grant listeners licences at a charge of approximately 15s. for crystal and 30s. for valve sets, per annum.

The Voice of the Atlantic is the slogan adopted by the Brighton Beach (U.S.A.) broadcasting station.

WORTH WRITING FOR

RADIO Instruments, Ltd., of 12, Hyde Street, W.C.1, have issued an attractively printed pamphlet detailing their new H.T. rectifier for A.C. mains. If you use A.C. mains, you should get a copy of this.

A. C. Cossor, Ltd., of Aberdeen Works, Highbury Grove, N.5, have sent us an interesting issue of the *Radio Mail* for January, containing much of value to the retailer of wireless receivers and accessories.

L. McMichael, Ltd., of Wexham Road, Slough, Bucks, have sent us a blotter which gives particulars of the MH H.F. transformers and chokes.

We are informed that Mr. J. Dorn, of 4, Great Russell Street, London, W.C.1, has secured the agency for the Loewe Multiple valves.

On Friday, March 11, the Cardiff Station programme will take the form of a Bristol night, when Bristol artistes will provide the entertainment. Among those engaged are Mr. Hedley Goodall, the elocutionist, and Miss Vera F. Clark, who will present a joint entertainment entitled "Vignettes," the Harmonic Four, glee singers, and the station trio, two of whom are Bristolians.

A wireless installation was recently the occasion of an official opening in the Halifax Infirmary. Provided by the fund of £2,000 raised during the past year to equip every hospital with wireless in Halifax and district, the installation is the largest in Halifax. It is a twelve-valve set, the apparatus being in the basement, and connected with every ward by 2½ miles of wire. There are 200 pairs of headphones, and 22 loud-speakers.

Glasgow seems to be specialising in anniversary programmes. On February 18 both Paganini and Edward German are being remembered, while Handel celebrations on February 23 will take the form of a recital of his music.

It is reported from Belgium that *Radio-Zoologie*, the Antwerp broadcasting station, has been closed down until further notice.

WIRELESS ON WHALERS

AMONG recent innovations that have brought about great changes in modern methods of whaling, wireless telephony is of outstanding importance, and a number of Antarctic whalers that have been fitted this season with Marconi wireless telephone apparatus have been enabled to spread farther afield and to adopt tactics in finding and killing whales which would be impossible without this means of inter-communication.

The Marconi ½ kw. telephone sets fitted to many of the big whaling fleets have been specially designed for this class of work. Their operation has been reduced to such a simple proposition that they may be worked by a harpoon-gunner in full kit. They are operated by a stout lever, which can be easily manipulated even when the hands are heavily gloved, and the apparatus is enclosed in a steel case, which renders it practically undamageable. Reception is by loud-speaker, so that there is no need to remove head coverings in order to use the telephone.

In addition to wireless telephones, a number of Antarctic whalers, including the British *Southern King* and *Southern Queen*, are this season fitted with Marconi direction finders, specially arranged for fitting on these small craft.

In regions close to the magnetic poles, where much of the whaling is done, the magnetic compass is of little use, and the wireless direction finder, which is entirely independent of the earth's magnetism, has been found invaluable to the whaling vessels. Like the telephone sets, these Marconi direction finders are operated by the harpoon-gunner, and thus require no extra crew.

A New Dragon Loud-speaker.—In the advertisement in last week's issue, dated February 12, of the above Amplion loud-speaker, this was stated to be type AR656, whereas actually it has been designated by the makers as type AR65 O. This and other well-known Amplion loud-speakers are manufactured by Graham Amplion, Ltd., of 25, Savile Row, W.1.

"Amateur Wireless and Electrics." Price Threepence. Published on Thursdays and bearing the date of Saturday immediately following. Post free to any part of the world: 3 months, 4s. 6d.; 6 months, 8s. 9d.; 12 months, 17s. 6d. Postal Orders, Post Office Orders, or Cheques should be made payable to Bernard Jones Publications.

General Correspondence is to be brief and written on one side of the paper only. All sketches and drawings to be on separate sheets.

Contributions are always welcome, will be promptly considered, and if used will be paid for.

Queries should be addressed to the Editor, and the conditions printed at the head of "Our Information Bureau" should be closely observed.

Communications should be addressed, according to their nature, to The Editor, The Advertisement Manager, or The Publisher, "Amateur Wireless," La Belle Sauvage, London, E.C.4.

HOLLAND'S COMMERCIAL BROADCASTER

THE Scheveningen-Haven transmitter, known to the Dutch as the Zakelijke Omroep, and which works at regular intervals daily from 7.30 a.m. to 10 p.m. on a wavelength of 1,950 metres, for the present, at least, is devoting its entire energy to the broadcast of news bulletins, Stock Exchange quotations and market reports. Although the prices are given out in clear language, the items to which they refer are coded, and subscribers to the service must first obtain a key from the Vaz Dias, Amsterdam Press Agency, against payment. In this manner it is hoped to make the service entirely self-supporting.

"The Largest and Most Accurate Flat Surfaces in the World" is the title of an exceedingly interesting article in "English and Amateur Mechanics" (3d.) for February 18, 1927. This describes the making and testing of large optical standards of flatness made from clear fused quartz. Other articles included are: "The Amateur Mechanic's Workshop," "Making Pottery for a Hobby," "How to Make a Useful Dressing Chest in Oak," "How to Whiten a Ceiling," "Increasing the Selectivity of a Wireless Set," Microscopy Notes, Astronomical Notes, Latest Inventions and Innovations, Letters, Replies and Queries, Technical Advice Bureau, etc.

ADVERTISEMENT INSTRUCTIONS for "Amateur Wireless" are accepted up to first post on Thursday morning for following week's issue, providing space is available.

PREPAID ADVERTISEMENTS.

Advertisements under this head are charged FOURPENCE PER WORD, minimum charge FOUR SHILLINGS.

PATENTS.—Trade Marks. Advice Handbook free.—B. T. King, Regd. Patent Agent, 146a, Queen Victoria Street, London.

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VALVES repaired promptly, satisfactorily. B.E. 4/6. D.E. 7/- P.V. 8/6. Lustrolux Ltd., West Bollington, Macclesfield.

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All these advantages are made possible by the wonderful P.M. Filament. Be safe and satisfied by demanding Mullard P.M. Valves that have a published official Government Laboratory Test Report.

For 2-volt accumulator
THE P.M.1 H.F. 0·1 amp. 14/-
THE P.M.1 L.F. 0·1 amp. 14/-
THE P.M.2 (Power) 0·15 amp. 18/6

For 4-volt accumulator or 3 dry cells
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THE P.M.4 (Power) 0·1 amp. 18/6

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THE P.M.5x (General Purpose) 0·1 amp. 14/-
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Super power valves for last L.F. stage
THE P.M.254 (4 volts, 0·25 amp) 22/6
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More about the 'A.W.' "Ballot Three"

THE "AERANODE" SHORT-WAVE RECEIVER

Amateur Wireless
And Electrics

Registered at the G.P.O. as a Newspaper.

Vol. X. No. 246 SATURDAY, FEBRUARY 26, 1927 Price 3d.

RUNNING YOUR FILAMENTS FROM THE MAINS

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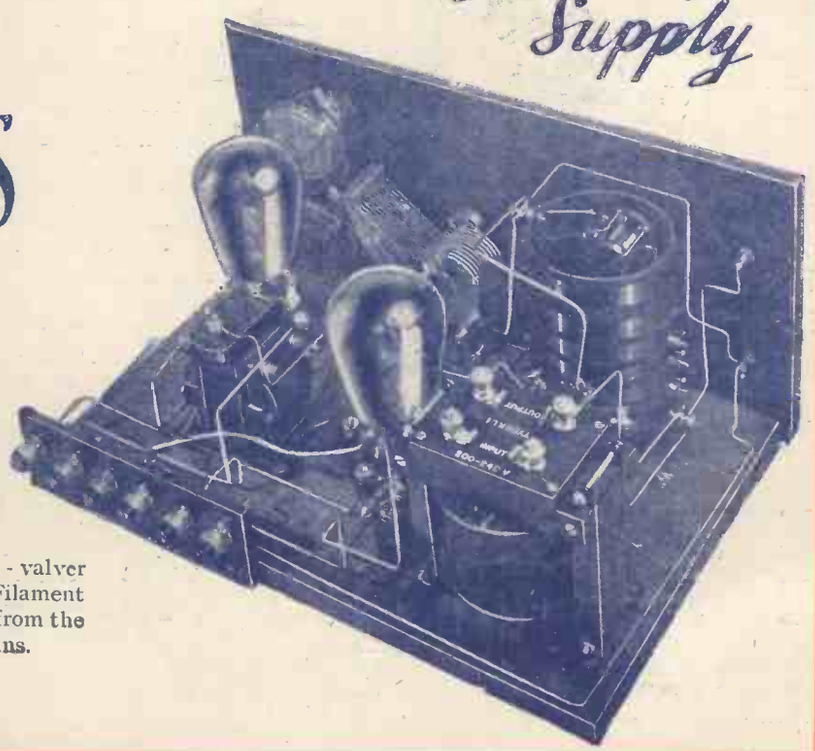
Embodying the New System of Supply



A Two-valver with Filament Supply from the Mains.

The new Cossor R.C. Valve brings you the realism of the Living Artiste

RADIO is now entering upon a new phase. Quality of reproduction is rightly being given pride of place. The chief responsibility for this has been the growing popularity of Choke or Resistance capacity amplification. Experts agree that Radio can now give a more truthful rendering of every note in the harmonic scale—from the deep fascinating rhythm of the lower octaves to the surprisingly sweet high notes

Until recently Choke or Resistance capacity coupling has been handicapped by the lack of suitable valves. But Cossor—by the introduction of wonderful new R.C. valves for 2 or 4 volt accumulators—is now supplying this vital need. The Cossor R.C. with an impedance of only 70,000 ohms., has the amazing amplification factor of 40—considerably higher than any other valve of similiar type. This remarkable efficiency is due to its Kalenised filament and its patented method of Co-axial mounting.

Although only on the market a few weeks we have received many letters from users expressing astonishment at the rare beauty and mellowness of their reproduction. They say that they are now hearing instruments in the orchestra which they have never heard before. That from end to end of the scale the chords peal forth with a grandeur which is a revelation.

Why not try out these new valves without delay—at one stroke you can abolish distortion and microphonic noises.

Without equal for richness of tone

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Look out for our announcement of a remarkable series of Cossor 6-volt Valves. A type for every purpose. Every one fitted with a Kalenised filament & embodying Co-axial Mounting.

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Cossor Two Volt Valves	
210H (Red Band) For H.F. use	14/-
210D (Black Band) Detector Valve	14/-
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215P (Stentor Two) Power Valve	18/6

Cossor Four Volt Valves	
410HF or Det. (Red Band). For H.F. or Detector use	14/-
410RC (Blue Band) For Resistance or Choke Coupling	14/-
410LF (Black Band) First 1st L.F. Stage	14/-
410P (Stentor Four) Super Power Valve	18/6

All above valves consume 1 amp. except 215P, which takes 15 amp.

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Amateur Wireless and Electrics

The Leading Radio Weekly for the Constructor, Listener and Experimenter

Edited by BERNARD E. JONES

Vol. X. No. 246 — Technical Editor: J. H. REYNER, B.Sc.(Hons.), A.M.I.E.E — FEBRUARY 26, 1927

Days of High Power—Dr. Lee de Forest—A Novel Short-wave Set Duplex and Triplex Valves—Variety!

In These Days of High Power!

CONSIDERABLE prominence has been given in the French wireless press to an announcement made by the Beziers broadcasting station to the effect that it has increased its power to 300 *watts*!

Stamboul Calling!

REPORTS reach us that the 6-kilowatt broadcasting station destined to Constantinople will begin testing towards the end of this month. Should the station require a distinctive identification signal, may we suggest a few bars of a well-known *Turkey Trot*?

De Forest Greetings

DR. LEE DE FOREST, who recently visited Spain, sent his greetings to European radio fans through the microphone of the Madrid E A J 7 station on February 11, at 11 p.m.

The Loewe Valves

READERS have probably heard of the new Loewe valves, but little first-hand information regarding them has been disclosed. In our centre pages this week, Manfred von Ardenne, a co-worker of Dr. Loewe, describes the construction and characteristics of the Duplex and Triplex valves. Owing to their unique construction, it is possible to build with a single triplex valve the equivalent of a 3-valve resistance-coupled receiver.

"Aeranode" Short-waver

ON another page in this issue will be found a description of an exceptionally good short-wave receiver, which, according to the author, gives results which are superior to those obtained with the conventional short-waver. Both K D K A and 2 X A F, the American short-wave stations, are easily received with this set.

OUR WEEKLY NOTE

INTERFERENCE FROM MAINS

Those whose houses are lit by electricity and those who live in the vicinity of an electric tramway or railway track often experience a good deal of trouble owing to interference from the electric mains.

This interference may be caused either by induction or by earth-currents, or both. If a direct connection between the set and earth is avioded, earth-currents will cease to be troublesome. This will mean, of course, that counterpoise must be used and the set and all its accessories carefully insulated from earth.

Any remaining interference must then be due to pure induction, and it may be necessary to go to some lengths to eliminate it. The aerial should be placed as nearly at right-angles as possible to the mains and transformer-coupled L.F. amplification should be avoided. After this it may be necessary totally to enclose the set in an earthed metal case and, if this is not sufficient, to be content with what results can be obtained with a frame aerial.

THE BUREAU.

Invariably Pronounced Wrong!

IN view of the discussions which are taking place in respect to Standard English, we might point out that there exists a word which even the B.B.C. announcers invariably pronounce wrong: W-R-O-N-G!

Those Charming Announcers!

AT a recent examination a public school girl, as a subject of an essay on prominent persons, was requested to state whom she would like to meet. She chose three celebrities in the following order: the 2 L O announcer, the Prince of Wales, and Marconi!

More Variety!

MR. JACK DE FREECE has been appointed by the B.B.C. to assist in securing fresh talent for the variety side of the programmes.

B.B.C. Announcers for India

TWO B.B.C. officials, Mr. C. C. N. Wallich and Mr. Lesley B. Page, respectively directors of the Plymouth and Hull relay stations, are sailing on the s.s. *Ranchi* on March 4 to take up similar positions with the Indian Broadcasting Company. Mr. Wallich has been appointed director of the Calcutta station and Mr. Page to that shortly to be opened at Bombay.

Wireless in Ceylon

IT is reported from Ceylon that a draft Ordinance now being prepared to amend the Ceylon Telegraph Ordinance, will simplify the conditions necessary to get a licence for a wireless set. There was a complaint that the form now in use was much too complicated and that it was the main reason for the slow growth of wireless in Ceylon. The new proposals will allow the public to secure a wireless licence on demand from any post office.

In Ceylon it is intended to arrange one-third of the programme to suit European taste, and two-thirds Indian,

PRINCIPAL CONTENTS

SORTING OUT WIRELESS CURRENTS

IN the wireless receiving set we are concerned with two entirely different kinds of electric current: the oscillating and the direct. Just what is an oscillating current is understood very easily if one thinks for a moment of the steam-engine. At one moment steam is behind the piston pushing it forwards and driving the piston rod out of the cylinder. An instant later, when the piston has reached the end of its travel, steam enters in front of it and drives it back, drawing in the piston rod.

of turns of wire wound upon a former which may or may not have an iron core; it all depends upon the frequency with which we have to deal. Let us see if we can discover just how a choke does the work that is assigned to it. Look, for example, at Fig. 1. The first valve V 1 is the rectifier, the second V 2 being a low-frequency amplifier. In theory only low-frequency oscillations should appear in the plate circuit of the first valve owing to the action of rectification. Actually, however,

value, which endures until the switch is opened. When we switch off, the current does not immediately fall to zero.

The magnetic field opposes both the starting and the stopping of current; it also opposes any change in the rate of flow. If we wind the wire into a coil we shall find that its opposition is enormously increased, since the magnetic fields surrounding the turns cut one another.

Now take the case of an alternating or oscillating current which meets with a coil

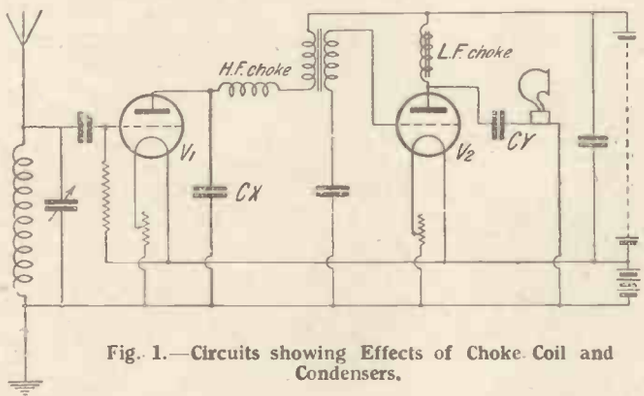


Fig. 1.—Circuits showing Effects of Choke Coil and Condensers.

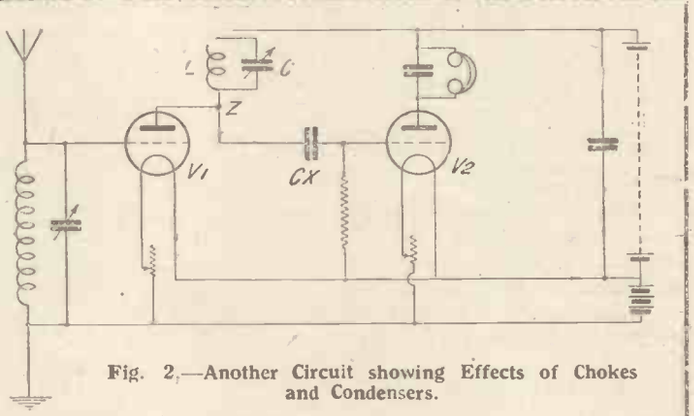


Fig. 2.—Another Circuit showing Effects of Chokes and Condensers.

Current Actions

In oscillating currents the positive half-cycle is an impulse whose energy increases in what we may call an upward direction until the maximum point is reached; then a decline sets in and the energy falls to zero. Next comes the negative half-cycle, when energy increases in the opposite direction until the maximum is reached, after which there is a return to zero. Here again we get the push and the pull. In direct current there are no periodic increases, no declines to zero, and no changes of direction. The energy does not vary; it is always a push or a pull, depending upon the way in which we regard it, in one and the same direction.

Effect of Choke Coil

Very fortunately for us there are simple means of sorting out direct and oscillating currents; we can, in fact, sort and control them just as a policeman on point duty at a busy spot controls and separates the traffic. All this is done by means of two components. These are the choke coil and the condenser.

The choke consists of a varying number

there is always a certain high-frequency component, which we do not want in the primary of the low-frequency transformer; the high-frequency oscillations have done their work and we wish to get rid of them for good and all. We therefore place a choke coil between the plate of the rectifying valve and the primary of the low-frequency transformer so as to stop the high-frequency oscillations from going where they are not wanted. Naturally they must go somewhere; we therefore provide the condenser c x to act as an open path to earth for them.

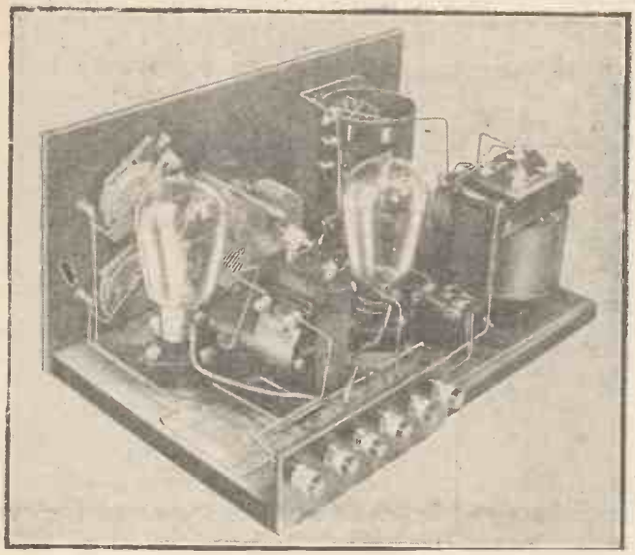
Changing Current Flow

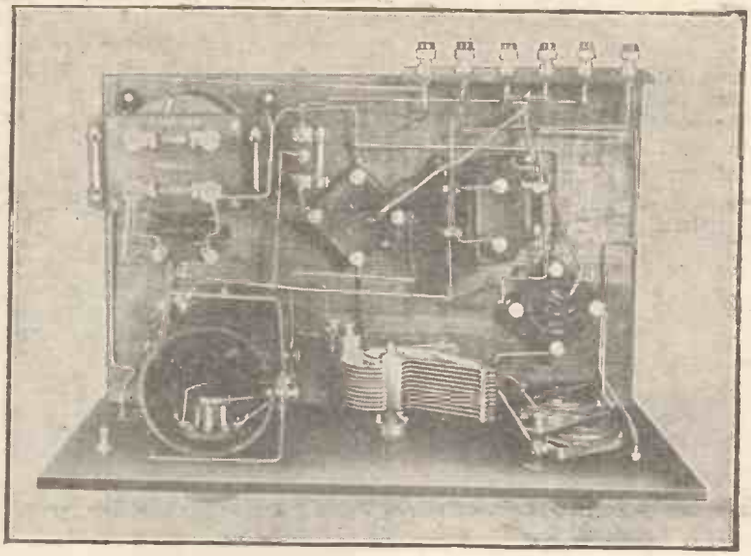
If we connect a length of wire through a switch directly across the terminals of a battery and switch on, a rather curious effect takes place. Current (this of course is direct current) does not immediately rise to its maximum value. As the switch is closed the wire offers an enormous resistance to its passage. It cannot in fact flow freely until the magnetic field has been built up fully round the wire. Energy is expended by the battery in building up this field. As soon as the field is complete, current reaches its maximum

of wire in its passage. The rise of the positive half-cycle to the maximum point is vigorously opposed by the coil. There is a similar opposition to the fall to zero and the change to the maximum negative value. If we make the coil of the right size, its opposition will be so strong that the oscillating current will be entirely prevented from sending through it its increases, its declines and its reversals of direction. To put it in another way, a choke of the right size acts as an absolute barrier to the passage of an oscillating current of a given frequency. The higher the frequency the smaller is the choke needed to act as a barrier. Thus in the Fig. 1 circuit the small high-frequency choke stops high-frequency currents but offers no opposition at all to direct current from the high-tension battery, and very little indeed to rectified low-frequency oscillations which pass, as we wish them to do, into the primary of the inter-valve transformer.

The way to earth for the strained-out high-frequency currents is furnished by the condenser c x. If direct currents could also pass through a condenser, c x would

(*Concluded on page* 347)





These two Photographs show the Simplicity of the Receiver described in this Article.

RUNNING YOUR FILAMENTS FROM THE MAINS

Details of a Two-valver Embodying a New System

By J. H. REYNER, B.Sc. (Hons.) A.M.I.E.E.

NO little interest has been aroused recently by the arrival on the market of a new type of valve, specially designed for operating from electric-light mains. This particular valve, which is known as the K.L.1. is similar in general principles to the ordinary three-electrode valve of to-day, but instead of the ordinary filament being heated to a sufficient temperature to emit electrons, an independently heated cathode is provided.

A description of this new valve has already appeared in AMATEUR WIRELESS, together with a drawing showing the salient points, and it will be remembered that in place of the ordinary filament is a metal cylinder which is coated with active material. The filament proper is inside this metal cylinder which, of course, is very thin, so that it readily absorbs the heat radiated by the filament inside.

Economical Running

The filament which provides the heat in the first place is comparatively robust and is run at a bright temperature, requiring 2 amperes at 3.5 volts, in order to heat it. Although, when an accumulator has to be used, a current of 2 amperes is quite a serious consideration, yet when running a valve such as this from the mains through a step-down transformer, the problem is not at all serious.

In the particular receiver in question, we have two such valves, taking a total current of 4 amperes at 3.5 volts. We supply these with current through a transformer operating off, say, 240 volts, so that if the transformers were perfect, we should consume $4 + 3.5 \div 240 = .058$ ampere. In practice, of course, the transformer is not fully efficient and a certain amount of loss occurs, but even allowing for this the total current taken from the mains is less than 100 milliamperes, about as much as is required to run a 20-watt lamp.

Apart from this independent heating of the cathode or emitting surface, the valve behaves in every respect as an ordinary one, and a receiver has been designed accordingly to operate with these valves.

It was thought that the use of the electric-light mains would make the strongest appeal to readers who were interested mainly in simple reception from the local station, Daventry, and possibly one or two other stations, for which purpose a straightforward detector with note-magnifier suffices.

High-Tension Supply

The question then arose as to whether it was desirable, not only to supply the filament from the mains, but also to provide high-tension supply from the same source. After some consideration it was decided that for a simple two-valve receiver, it was not altogether necessary and even of doubtful economy. The addition of a unit for supplying the high-tension from the mains would require a rectifying valve or valves, and smoothing apparatus, the total cost being in the neighbourhood of £3 or £4 extra.

A simple two-valve set such as this only carries 5 or 6 milliamps high-tension current, even allowing for a power valve in the last stage, provided the correct grid bias is utilized, and therefore a comparatively small type of battery costing 15/- to 20/- for a 60 or 70-volt unit would last for a considerable period.

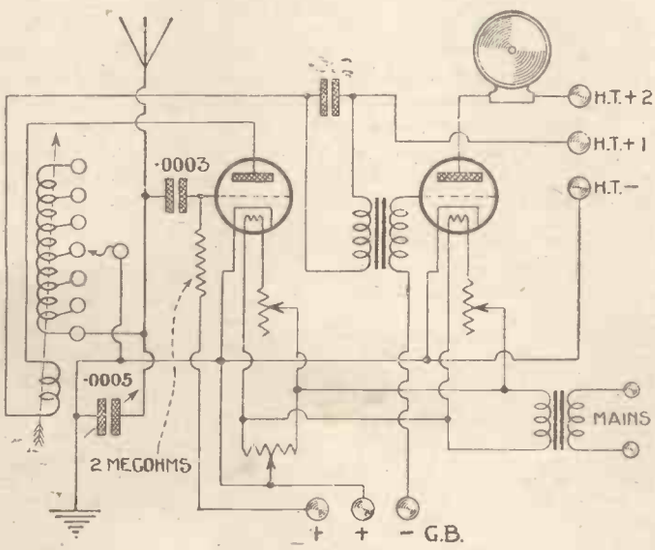


Fig. 1.—The Circuit Diagram.

In the circumstances it was decided to provide for an external high-tension battery, arranging to run the filaments from the mains, thereby dispensing with the bulky and somewhat messy accumulator. This, of course, simplifies the circuit very considerably, and it only remains to consider what type of circuit to employ for the detector.

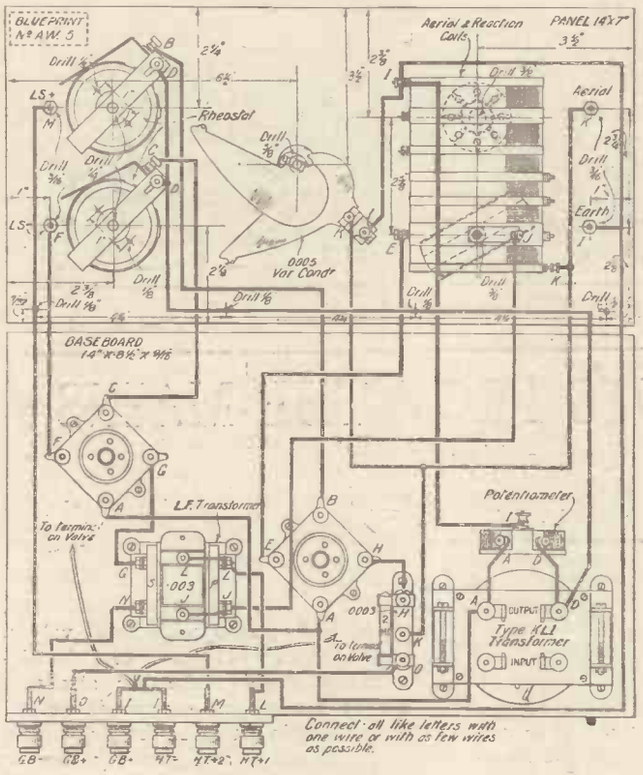


Fig. 2.—Developed Wiring Diagram.

The Circuit

In an arrangement such as this where every endeavour is being made to give trouble-proof reception, it was considered advisable to dispense, if possible, with the necessity for changing coils, etc., when it was desired to alter the range of reception from the local station to Daventry. In this case, therefore, a

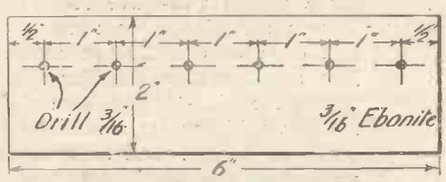


Fig. 3.—Panel Drilling Diagram.

regenerative tuner has been incorporated, covering a wavelength range of 250 to 1,800 metres. A reaction coil is provided on this which is sufficient to give reaction over the whole of the scale and the whole combination provides a very simple and trouble-proof receiver.

The circuit utilised is shown in Fig. 1, and apart from one or two minor deviations, it will be seen to be conventional in character. The changes from the normal are as follows:—

(1). The filament heating circuits are independent from the cathode.

(2). The H. T. negative and grid-bias positive are taken to the cathode instead of to the filament.

(3). The earth connection is taken to the cathode and also to the slider of a potentiometer connected across the secondary of the filament-lighting transformer.

This point is very desirable in order to eliminate hum from the alternating current mains.

The Necessary Components

The components required are as follows:

- 1 Panel 14-in. by 7-in. by ¼-in.
- 1 K L 1 filament-lighting transformer (R.I. Ltd.): It is necessary to specify the voltage of the mains when ordering.)
- 2 K L 1 valves.
- 2 Anti-microphonic valveholders (Benjamin.)
- 1 L. F. transformer, 2nd stage (B.T.H. 4 to 1.)
- 1 .0003-microfarad fixed condenser (T. C. C., S. P. type.)
- 1 .003-microfarad fixed condenser (Dubilier.)
- 1 2-megohm gridleak (Dubilier.)
- 1 .005-microfarad S. L. F. variable condenser, with slow-motion dial (Formo Co.).
- 2 4-ohm rheostats to carry 2 amperes (Igranic Electric Co.).
- 1 Baseboard-mounting potentiometer (Lissen, Ltd.).
- 1 Terminal strip to take 6 terminals. Terminals marked Aerial, Earth, L. S. +, L. S. —H. T. + 1, H. T. + 2, H. T.—, G. B. + 1, G. B. + 2, G. B—.
- 1 Regenerative tuner (Wright & Weaire).

The Transformer

It will be noticed that the transformer specified is a second-stage instrument. This is desirable because the K. L. 1 valve has a low impedance of the order of 6,000 to 9,000 ohms, depending upon the conditions. It is therefore practicable to use a second-stage transformer with the somewhat higher step-up which is obtained from the use of such a component, while there is also the important question of saturation to be considered.

The anode current of the K L 1 is higher than is normally the case with a detector valve, which as a rule has an impedance of about 20,000 ohms and over; if this anode current flows through the primary winding of a transformer having a very high inductance, designed to suit a valve having a considerably higher impedance, there is the danger that the iron circuit of the transformer will become saturated, with consequent distortion. It is for this reason that it has been considered desirable to specify a second stage transformer in this circuit and in actual practice the results obtained are excellent.

The complete Receiver for Operation from the Mains.

Mounting the Components

The panel drilling is shown by Fig. 3. The mounting of the components is simple in the extreme. The tuner, variable condenser and two rheostats are mounted on the panel with the aerial and earth terminals at one end and the loud-speaker terminals at the other. The filament-lighting transformer is mounted on the left-hand of the baseboard behind the tuner, the remaining components being conveniently placed.

For the sake of convenience it will be seen that the .002 fixed condenser has been mounted on top of the L. F. transformer, being held in place by the wire used to connect it in circuit. In a similar manner, the potentiometer across the filament-lighting transformer is also held in place by the connecting wires. This is quite satisfactory as the best point on this potentiometer need only be found once and for all for the particular system of mains in use.

No further difficulty will be experienced with the components, and the instrument may then be wired up in accordance with the diagram Fig. 2. It will be observed that two flex leads are taken from the H. T. negative terminal (which corresponds to the ordinary L. T. terminal) which have to be connected to the terminals on the side of the bases of the K L 1 valves, this being the point to which the independently heated cathode is brought out.

Testing Out

The receiver is then ready for test, which may be carried out in the following

(Concluded on page 350)

BROADCASTERS OF THE MONTH

Maurice Cole, one of the earliest of broadcast pianists, is still in his early twenties. He shared honours on the 25th with Miss Winifred Small in the "Kreutzer Sonata." He is a pupil of Arthur de Greef, the Belgian pianist.

Gladys Naish, one of the best oratorio singers, sung the Handel arias at 2 L O recently. She is popularly known as the "Welsh Nightingale" and makes a special cult of colorature music.

Ernest Wellbeloved, frequently heard in 1925, is a singer and entertainer of very high standards. He was heard again on the anniversary of Charles Dickens at 2 L O, in readings from that great author.

Kathleen Moorhouse has played with the Hallé orchestra, and has broadcast from several stations, as well as appearing at 2 L O. She is a fine 'cellist, her tone being devoid of harshness or sonority.

Winifred Davis was heard at Belfast quite recently, when she sang out of an extensive operatic repertoire as well as a wide range of ballads. She is one of the members of the Old Vic opera company.

Stanley Holt is an outstanding name in wireless annals, for he was the first to introduce his syncopated orchestra, was conductor of the Radio Radiance Dance Band, and is now leader of the Daventry Quartet.

Arthur Salisbury, the well-known violinist, is at present leading the orchestra at Verrey's. His appearance recently on the variety halls met with immense enthusiasm. He is one of the best players of Wagnerian music.

Miss Kelly Lange, a clever violinist, who hails from Ireland, has been heard again recently. She took part in the Feis Ceoil, the Irish Annual Festival, which corresponds to the famous Welsh Eisteddfod.

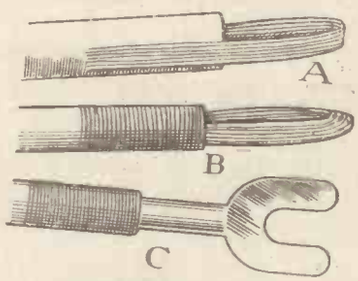
Winifred Small is one of our best-known broadcasting violinists. She is a Londoner, and therefore a true daughter of 2 L O. With Mr. Maurice Cole, she played the "Kreutzer" Sonata, at 2 L O, on the 25th of this month.

PRACTICAL ODDS & ENDS

Strengthening Flexible lead Terminals

UNDOUBTEDLY the most convenient method of dealing with the end of a flexible lead is to fix a spade terminal to it; but unfortunately it will not stand a great deal of wear. The writer has for some time adopted a simple, neat and effective method for overcoming this disadvantage. First scrape off the rubber or silk covering to the extent of about 1 in., but take great care in the process not to cut the wire strands.

Bend the wire back as shown at A; then lash the loose end to the flex covering by winding on a neat layer of cotton or thread as indicated at B; black cotton



Improving Spade Terminals

could be used for the negative lead and red for the positive. The spade terminal can now be gripped at the end with pincers in the usual way; the end will then appear as in C. C. A. W.

A Use for Sheet Cork

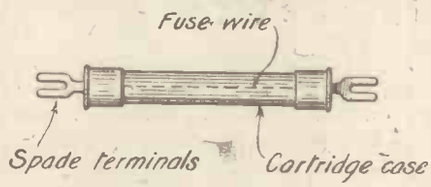
THOSE who wish to prevent their wireless cabinet from injuring their best polished table can easily do so by obtaining a sheet of thin cork. This is cut to the size of the base of the cabinet, and glued to the underside.

Seccotine is very useful for this purpose. This scheme will effectually prevent any scratches from appearing upon a polished table upon which your wireless receiver is displayed. Those who prefer elevated feet can make these by cutting two corks in half after boring a hole through the centre of each. H. B.

An Accumulator Protector

TO prevent an accumulator from being partially ruined owing to accidental short circuits, it is a good plan to provide an L.T. fuse. Shown in the sketch is a simple home-made one which will serve admirably.

A cartridge case is used as protector for the actual fuse wire, and to each of the metal ends are soldered spade tags and the ends of the fuse wire. As only one metal end is provided with a cartridge case, it will, of course, be necessary to



Home-made Accumulator Protector

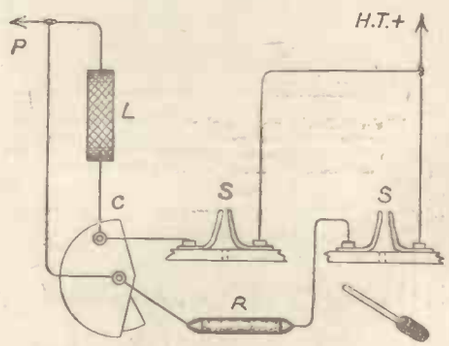
obtain the second one from another case. It will be found that the completed fuse will be of suitable length to replace one of the busbars of a 4 or 6-volt accumulator. If a 2-volt accumulator is used the fuse can be connected in series with one of the L.T. leads. H. W. T.

Selecting Valve Coupling

MANY amateurs prefer to couple their H.F. valves on the tuned-anode principle when working on the low to medium band of wavelengths, and to change over to resistance coupling when receiving 5 X X.

The diagram shows how to change over in a very economical and convenient manner.

The only parts required for the two switches S are four strips of springy sheet



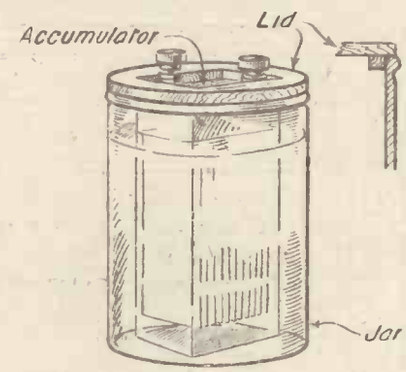
Choosing your Valve Coupling

brass, four small bolts, and a length of $\frac{1}{8}$-in. brass rod, which is arranged as a simple plug.

Wire up the tuned-anode coupling L C and the resistance coupling R exactly as shown, taking the lead P to the plate of the H.F. valve in the usual way. It will be seen that when the plug is inserted between the left-hand clips the tuned-anode coupling is in use, and by transferring the plug to the right-hand clips the resistance is immediately connected up, the tuned-anode coupling then being cut out of circuit. O. J. R.

Using Leaky Accumulators

AN accumulator which leaks badly may be kept in use with every satisfaction so long as it is placed bodily in a jar or other acid-proof container which is filled with acid solution. If required, a wood or ebonite lid may be made, as shown in



Using a Leaky Accumulator

sketch, to fit the jar to keep out dust, etc. When "topping up" or refilling the liquid should be poured in both jar and accumulator to the correct level.

An ordinary glass jam or pickle jar will serve quite well for the purpose, but it is preferable that a wood carrying-box be provided so that the jar may not be cracked if it is accidentally knocked against other hard objects. M. R.

Stair-rod Earth

ALMOST efficient earth the writer alighted on in an amateur receiving station consisted of discarded stair-rods driven into the ground alongside of a garden path, in the direction of the aerial.

The rods were spaced about 18 in. apart, driven into the ground to within about 6 in. of the top, with two lengths of stranded aerial wire, 4 in. or so apart, attached to these rods formed a sort of garden edging.

Instead of binding the stranded aerial wire to the stair-rods with binding wire, as was done in this case, it might have been an improvement in efficiency and neatness had the stair-rods and aerial wire been tinned at the points of contact and well soldered. M. P.

PULLING TOGETHER

ARE your valves pulling together? Individually, they may be excellent; but what of their collective efficiency? Co-operation is just as important in the functioning of a wireless set as in the winning of a boat race. If you are using valves which, however good in themselves, were not designed for group operation, then you are not getting the best out of your set.

The two series of B.T.H. valves listed below have been designed expressly for group operation; the B5 group for 4 volt accumulators and the B4 group for 6 volt accumulators. The B5 and B4 valves are, of course, well known to be the most economical and efficient valves in their respective classes, and for the specific purposes for which they were designed. But by themselves they were incomplete and did not fully satisfy the needs of the multi-valve user. Now that the B5H and B6 have been added to the B5, and the B4H to the B4, there are available two complete groups of valves which will meet every requirement of the 4 volt and 6 volt user. Either group, according to the voltage of your battery, will give you *better* results than any other similar combination of valves.

Valve	Purpose	Fil. Volts	Fil. Amps	Anode Volts	Amplification Factor	Impedance	Price.
							s. d.
for 4v B5H	H.F	2.8	0.06	40–120	17.5	55000 ohms	14 0
for 4v B5	Det.	2.8	0.06	20–80	7	17000 ohms	14 0
for 4v B6	Power L.F.	2.8	0.12	40–120	8	12000 ohms	18 6
for 6v B4H	H.F. & Det.	6	0.25	60–150	20	28000 ohms	14 0
for 6v B4	Power L.F.	6	0.25	40–120	6.5	6000 ohms	18 6

RADIO VALVES

Use B.T.H. Valves for efficient team work

The above prices are applicable in Great Britian and Northern Ireland only

THE BRITISH THOMSON-HOUSTON CO., LTD.

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[Edited by Bernard E. Jones]

The Wireless Magazine

for March, 1927

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WIRELESS IN THE WARDS!

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RADIOPHONING TO A TRAIN!

AN H.T.—FROM D.C.—MAINS UNIT

PHOTOGRAPH YOUR BROADCAST RECEPTION!

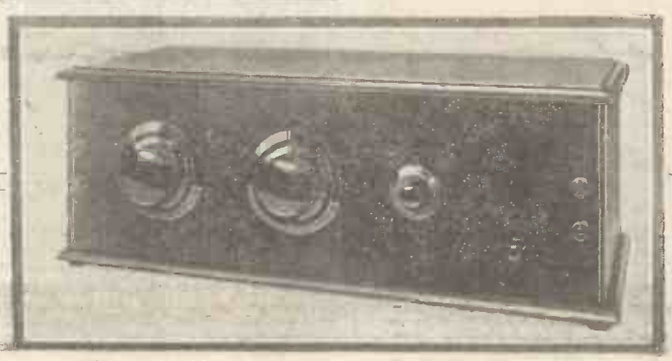
WHEN SHIPS TALK

Free Blueprint of a Reyner Tone Control and Filter Unit

On page 102 the Editor Announces the Special Blueprint Service.

THE PARADYNE FOUR

is a special four-valver designed by J. H. Reyner, B.Sc., A.M.I.E.E., (Research Editor of the *Wireless Magazine*) that incorporates constant reaction coupling. This means ease of control and freedom from undesired oscillation. It is a set that has given splendid results on test.



Note the Neat Appearance of the Paradyne Four

THE NEW B.B.C. DOUBLE-DECKER STUDIO

WHAT BOYS THINK OF WIRELESS

A ONE-VALVER FOR A FRAME AERIAL

VOICES OF THE NIGHT! By J. Godhand Abrahams

ONE-STATION LISTENERS

HOW THE VALVE WASTES POWER By Com. H. W. Shove

WHY HAVE AN UGLY AERIAL?

WAS MARS SIGNALLING? By Dr. E. E. Fournier d'Albe

THE P's AND Q's of I.F.T.'s

WIRELESS THROUGH THE LOOKING GLASS

MORE ABOUT PUSH-PULL H.F. CIRCUITS

ALL'S WELL WITH THE ACCUMULATOR!

MORE THAN 38 STATIONS ON THE LOUD SPEAKER!

EASIER TO OPERATE THAN A NEUTRODYNE RECEIVER

Don't Miss This Splendid Number

IT'S THE VACUUM THAT'S VITAL!

Why is it impossible to make your own Valves?

The glass work could be done by a boy in his school laboratory, while the electrodes can be made with a pair of scissors and pliers. The great stumbling-block is the vacuum. So important is it to get a good vacuum in the bulb, that every process in the manufacture of a valve is, or should be, carried out with a view to the ultimate vacuum. But for the vacuum, valves would sell at quarter the price. Valves with an inferior vacuum *are* sold at cheaper prices because vital costly processes are omitted. The result is a short life and not even a gay one, because although the valve is often nicely constructed the poor vacuum affects the emission and passage of electrons, and also the life of the filament.

A valve is as good as its vacuum and its life is the life of its vacuum. The cheap Dutch valve had such a short life because its vacuum was "soft" (i.e. poor). Recent measurements carried out on even the leading makes of valves show amazing variations in vacuum. The perfect vacuum of the S.T. Valve stands out by contrast in extraordinary fashion and not only helps to explain why POPULAR WIRELESS stated that "every S.T. has proved to be highly efficient," but why the S.T. is the only valve whose long life is so certain that Lloyds have insured it in the case of every valve sold by us.

BUY 'S.T.' — THE VALVES WITH THE PERFECT VACUUM!

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S.T. 21 (H. F.) 0·1 amp. ... 14/-	S.T. 41 (H. F. and Det.) 0·1 amp. ... 14/-	S.T.61A (Res. Cap.) 0·1 amp. amplification 40 14/-
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(Next to Australia House.)

On Your Wavelength!

An Important Announcement

IN the past most of us have not been quite sure as to how we stood when the junior members of our family became afflicted with wireless fever and installed valve or crystal sets of their own. Those with tender consciences probably purchased a separate licence for each set in use in the house; others took it that their own licence would most likely suffice, and left it at that, hoping for the best. Anyhow, we were not quite sure how we stood; but we know now, for the Assistant Postmaster-General stated the other day in the House of Commons, in answer to a question that one wireless receiving licence covered any number of sets installed on the same premises for the use of the licensee, his family or his servants. Any other person, however, occupying a portion of the same house under a separate tenancy, and installing wireless receiving apparatus, must take out a separate licence.

This means quite simply that you can have a dozen wireless sets in the house all working at one and the same time if you wish, and that one licence will cover them, provided that they belong to and are used by yourself, your family, or your domestic staff. Apparently the single licence does *not* cover portable sets, for which a separate one must be taken out.

Wireless Exchanges

In the same answer Lord Wolmer stated that when a licensee runs leads from his set to the house of a neighbour or to any other premises but his own for the purpose of conveying broadcast programmes there, a separate licence is necessary in each case. The wireless exchange, then, such as was inaugurated some time ago by an enterprising south-coast electrician, is perfectly legal so long as each of its subscribers takes out a broadcast licence. In one's own home a single licence will suffice for any number of loud-speakers worked in different rooms by means of temporary long leads or permanent wiring taken to plug points. If, though, wires are taken from your own set to a room occupied by a lodger to enable him to use telephones or loud-speaker, he should take out a licence of his own in order to be within the law.

A Queer Point

I am rather wondering how boarding-houses and schools stand under this decision. In many schools boys are allowed to have wireless sets of which they make a considerable amount of use during their leisure hours. Does a licence taken out by the house-master cover them? Since the house-master stands during term time *in loco parentis*, his boys are, from this point of view, members of his family. On the other hand, the fathers, as many of us realise only too well when the school bills come in, have to pay for the board and lodging of their offspring. This being so, boys in the school boarding-house are apparently lodgers. Members of the family do not require a licence; lodgers do. If the boys are both at one and the same time what exactly is their position in the eyes of the law?

General Post

There have been a good many exchanges of wavelengths upon the broadcast band lately made necessary by local circumstances. Oslo and Bergen have re-swopped, the former going back to 370.4 metres and the latter to 461.5. Graz has taken Leipzig's 365.8 metre wavelength and Leipzig has gone down to 357.1. Many readers living near London will regret this last change, since Leipzig used to be a fine signal on his old wavelength when the set was selective enough to get him.

It is always much harder to tune out a strong interfering station on a wavelength a little above that of the one that you want, and now that Leipzig has gone just below London many will not be able to hear him at all, or at any rate will be unable to tune him in as a solo—and duets between him and 2 L O are not particularly attractive. Antwerp has had to close down through lack of funds, though it is hoped that its disappearance will be only temporary. A newcomer to the broadcast band is Radio Vitus, which brings up the number of stations now in operation in Paris to no less than six. At present the new station is using a power of one kilowatt and is transmitting nominally on 300 metres. I picked him up the other night, though, on a wavelength a good way below this.

The Champion Fader

When Brussels worked on about 263 metres one used to think that no station could possibly fade more regularly or more violently than he did. His record, however, has been eclipsed by Langenberg, who would walk away with the fading championship if there were one! I have had several reports on the reception of this station during the last month from correspondents living in places scattered all over these islands. Each and every one has the same tale to tell; when he is strong he is almost equal to the local station, but during his weak periods he may go down to mere telephone strength, or even become entirely inaudible for several seconds. It would be very interesting to know how he is received in France and Belgium as well as in Germany itself. I should be most grateful to any readers living in those countries who would send me a line on the point. From what I have heard, I rather gather that the authorities at Langenberg are disappointed and rather puzzled over the station's performances up to date.

Loud-Speaker Diaphragms

Speaking the other day of the new Rice-Kellogg loud-speaker marketed in this country by the British Thomson-Houston Co., a friend of mine commented on the comparatively small diaphragm. The tendency in cone loud-speakers generally has been towards larger and larger diaphragms in the past year or so. We have had twenty-seven and thirty-inch cones actually marketed as commercial propositions. Yet the new R.K. speaker, which is considered by many to give the nearest approach yet obtained to perfect reproduction is provided only with a cone less than a foot in diameter. My friend was rather puzzled as to how it would be possible to obtain satisfactory reproduction of the low tones, with such a comparatively small diameter.

The explanation really lies in the difference between the principles upon which the ordinary cone speaker and the R.K. instrument operate. With the ordinary cone type of loud-speaker, standing waves are set up on the cone itself. The centre point of the cone is caused to vibrate, and this sets up vibrations which travel outwards along the material of the cone itself until they reach the outer edge. Here they are reflected, the nature and extent of the reflection depending on the method of suspension of the outer edge, that is whether it is free or not, and the reflected wave and the transmitting wave interfere with each other at certain definite points and produce points of maximum and minimum capacity, the whole effect being known as a standing wave.

Prolific in Harmonics

The object of the cone loud-speaker of the normal type is to obtain the lowest possible value for the fundamental frequency of this standing wave. The cone will then respond to this frequency and to all the harmonics, to a more or less uniform extent. If, for example, we can make the fundamental frequency 50 cycles per second, then we obtain additional resonance points at 100, 150, 200, 250 and so on every 50 cycles right away up to the highest. This would give a fairly uniform response,

On Your Wavelength! (continued)

but if we could reduce the fundamental frequency to 32, say, not only could we respond to the somewhat lower frequency, but our harmonic points would occur every 32 cycles instead of every 50 cycles, giving us a much more even distribution of the energy.

It is in pursuit of this very low-frequency that the usual cone loud-speaker is made of a large diameter. The point, however, is that this method is dependent on resonances for its operation, whereas the essential principle of the Rice-Kellogg type is that it is not dependent in this manner on any resonant effects in the operating mechanism. The ideal loud-speaker was shown by Rice and Kellogg in their original paper to be one in which the diaphragm or other sound producing mechanism was absolutely responsible to the current. In other words if we had a current in one direction, the diaphragm would be attracted and it would not return again until a current flowed in the other direction. What is required therefore is an absolutely free and floating diaphragm which has no restoring force whatever, so that its motion is entirely controlled by the current and not by any spring or other restoring mechanism whatever.

The Rice-Kellogg loud-speaker as finally developed was the nearest practical approach to this ideal condition. The diaphragm itself which is conical in form, carries the moving coils at its centre, and is suspended at the outside by a comparatively wide sheet of thin rubber. This mechanism has a natural frequency of something like 1 or 2 per second only, so that to all intents and purposes, it is entirely free and it is actually pulled and pushed back again by the current flowing through the coils. In such circumstances, it is not necessary to have an exceptionally large diaphragm; in fact this would definitely be a disadvantage because it introduces a little too much inertia into the whole system, so requiring a very much greater operating force.

Praiseworthy or Otherwise?

Not infrequently readers send me long lists of the stations that they have received, for most of us wireless folk like to tell others of our achievements. The ones which give me most furiously to think are those which begin, "I am sending you this just to show what a single-valve can do. . . ." Like most wireless people, I have done a good deal of work in my time with a single-valve set, and I know something of the possibilities of a well-designed and well-made instrument. I also know that it is the most difficult of all sets to use for long-distance work without causing widespread despondency amongst one's neighbours.

If people were content to tune-in only those stations that are really within the range of the set, it would not matter; but there is a strong temptation to aim at higher things. Just a little movement of the reaction control, and, oh the increase in the number of stations that the set will bring in! "Surely those little squeaks that I make cannot do any harm! Anyhow, I'll loosen the reaction coupling in a moment, after I have got this one last fellow that I am trying for. . . . By Jove! there's another one; I must have him. . . ." And so it goes on, what time everybody else in the neighbourhood is tearing his hair and thinking murderous thoughts. Seriously, I very much doubt whether there are more than about a dozen stations at the outside within the real range of a single-valver in the best of circumstances. When a fellow reports reception of things such as the Swedish relays, Naples and Graz, one can only feel the deepest sympathy with his neighbours.

Where are the Programme Sparks?

I cannot help feeling that the reason for a great deal of the dissatisfaction with regard to programmes is not on account of the standard, but of their flatness. Variety is the spice of life. The programmes of the B.B.C. have lost their "flair." It was the frequent bursts of brilliance which held the admiration of the average listener.

There is a laboured repetition about present-day programmes. Where are the big stars that one used to hear? Not that they were electrifying, but they prevented monotony. The present machine does things well, but Jack Horner did not live entirely on plums. It would appear that broadcasting wants a new perspective. The time is coming when present methods will go by the board. There are some entertaining alternatives being discussed, but their originators are not giving their ideas away. Why should they?

The Regional Scheme

Some interesting speculation is proceeding as to which stations will cease to exist, as stations, under the new scheme. Although every district will benefit by the change, there is bound to be considerable heartburn in those areas where it is felt that their town should possess broadcast autonomy. In the past, the territorial aspect has been stressed.

It is obvious that if the power of the four chief stations were raised to approximately that of Daventry, the majority of the other stations as transmitting centres would be unnecessary and wasteful. Thus a good many stations must become collecting centres—merely outlying studios of a regional station. It can be argued that this arrangement merely makes the small station whenever it does broadcast, of more importance than at present. Yet I fear there will be considerable opposition when the change does occur.

Fewer Programmes

I remember the fuss that was made some time ago over the amount of simultaneous broadcasting included in the programmes.

What will be said when the regional system comes into being? The whole scheme rests on the development of simultaneous broadcasting.

At present there are several different programmes available, but in the near future there will be a maximum of four. Although the owner of a crystal set may then listen to three or four different programmes, by buying a valve set he will only get the same number, unless he looks abroad. The cheapness of the scheme would appear to have fascinated its authors. True, the present system dissipates income with but poor result, but when such is the case there is always an alternative.

Heads I Win . . .

I cannot say that I regard the attitude of the railway companies towards valves which suffer damage in transit as strictly fair. The other day I received in a passenger parcel two valves of a special kind that I had ordered. When the packet was delivered it was covered with jam, and looked as if it had been used as a footstool by some heavy person wearing hobnailed boots. Fearing the worst, I signed for it as "Not examined," and called the attention of the vanman to its condition. The valves were most carefully packed, their own boxes being contained in a stout cardboard case filled with soft shavings. One of them was all right; the other had a broken filament. Some days after reporting the casualty I had a visit from an inspector, who, after examining the original wrappings, admitted that the parcel had obviously been roughly handled. A claim was put in to the railway company, who declined to do anything in the matter on the ground that "there might have been some constructional defect in the valve." Pretty steep, in view of their own inspector's remarks—what?

THERMION.

NEXT WEEK.

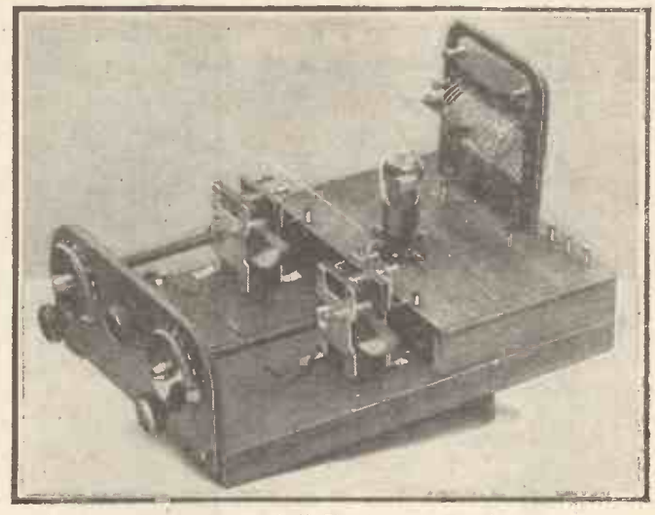
IMPROVISED H.T. SUPPLY
by Capt. H. J. Round, M.I.E.E.

WHERE L.F. CIRCUITS FAIL
by C. P. Allinson, A.M.I.R.E.

Long-wave Coils for the "M.C. Three"
by J. H. Rayner, B.Sc., (Hons.), A.M.I.E.E.

THE "AERANODE" SHORT-WAVE RECEIVER

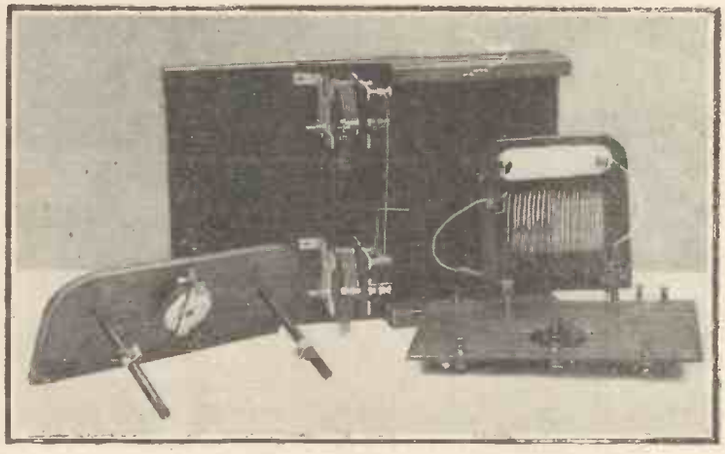
By G. C. P. BRAUN



The "Aeranode" Short-wave Receiver.

SOME time ago the writer described a circuit ("A.W." No. 212) which appeared to be entirely new for short-wave work. Considerable modification and improvement on the original experimental form have been effected and the receiver may now be fairly classed as tame and fool-proof.

On the writer's aerial this set has shown a marked superiority over the conventional parallel-feed type of receiver, especially in daylight reception. Particularly this is the case on wavelengths below 20 metres. However, aerial and locality are doubtful quantities in wireless, and it is perhaps best to rely on the receiver's chief features: simplicity of construction and short wiring.



The Receiver before Assembly.

As the diagram shows, the circuit is of the type proposed by Colpitts, May, Dr. Forest and others. In those bad old days when our panels looked like masses of half-cooked spaghetti the tuning systems suggested by them were largely abandoned as unstable.

The whole pith of their ideas was that the tuning inductance is situated between anode and grid instead of grid and filament, the aerial being applied direct to the anode. Such an arrangement is productive of "a certain liveliness" which in itself is a definite advantage on low wavelengths, but modern methods of control and layout are more effective.

The moving vanes of the two variable condensers are bridged by a wire which is connected to earth and L.T.—. Two stopping condensers .006 microfarad each are placed in series with these and can be seen at the bottom of the panel layout. These condensers are essential in order to prevent short circuits or dust noise. The grid condenser is ·0003 microfarad and the leak 5 megohms. On the left of the panel view will be seen the R.F. choke.

This consists of No. 30 enamel wire wound on in a layer 2½ in. long on a rectangular wooden former 3½ in. by 1½ in. by ¾ in.

Terminals

Top from left to right. Nos. 1 and 2, phones, No. 3 H.T.+, No. 4 L.T.+, No. 5 L.T.—, No. 6 earth. H.T.— is taken direct to the negative terminal of the battery. Bottom row: Nos. 1 and 3 fixed vanes of variable condensers, No. 2 moving vanes.

The two terminals on the Lissen combinator serve for connections to rheostat on front panel by means of twin flex.

The C.A.T. condenser is made from stout aluminium sheet in two strips 3½ in. by 1¼ in. with the ends rounded. At the top of the coil former will be seen the two alternative aerial terminals. The lower condenser vane is kept flush with the ebonite by the left-hand terminal.

The other vane is kept at a distance of about $\frac{1}{32}$ in. above it by means of a suitable washer between the right-hand terminal and the ebonite. A lead and clip is taken from this terminal to connect the aerial to any point down the coil. The lead and clip attached to the small terminal on the left of the former short circuits turns from the grid end as desired.

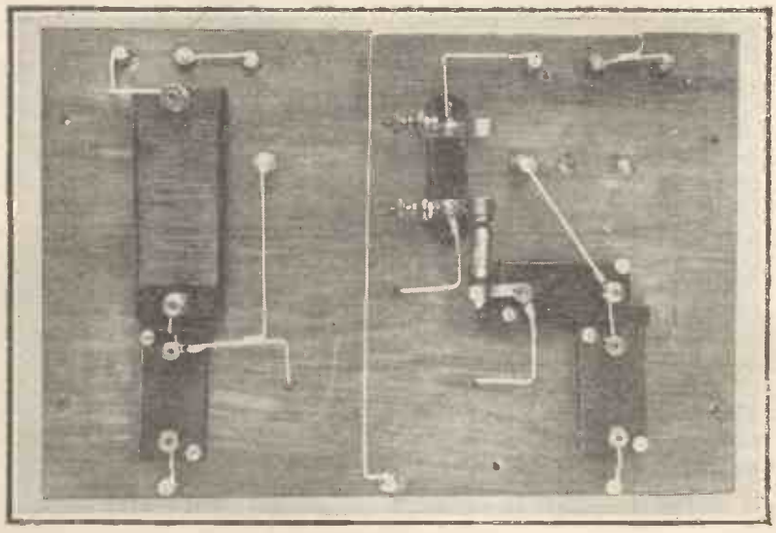
The coil consists of 20 turns of No. 16 wire spaced $\frac{3}{16}$ in.

Extension Couplings to Variable Condensers

The condenser couplings are made from ebonite tube about $\frac{3}{16}$ in. bore; ¼ in. screwed rod is made a tight fit at one end for attachment to the dials. The other end is drilled out so as to be a fairly tight fit over the condenser spindles, and the tube is held securely on the spindles by means of small aluminium collars, this end of the tube being slotted with a hacksaw so as to close up on to the spindles when the collars are put on.

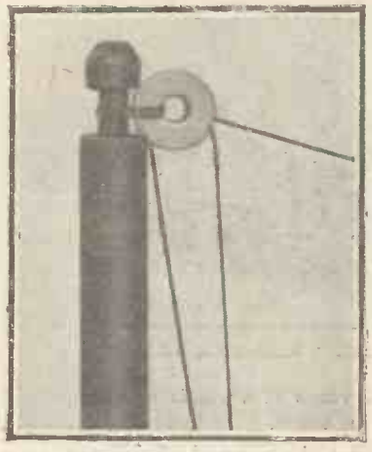
The dimensions of the various parts are as follows: Base board 16 in. by 11 in.; horizontal panel 7¼ in. by 11 in.; Coil

(*Concluded in second col. of next page*)



Under Side of Baseboard.

TWO AERIAL TIPS



A Simple Mast-head Arrangement

THE windiest month of the year is yet to come, and there is still time to overhaul the aerial and its fixings and prepare it against the fierceness of March gales. Unless the mast, or the support at the house end of the aerial, is securely fixed in place it may be brought to the ground in a sudden gust of wind.

The aerial, too, must be strong enough to stand up to the extra stretching forces that it will have to contend with. There is also the third danger that the halyard may be wrenched from the cleat at the foot of the pole and aerial, halyard and insulators then dropping to the ground.

All three of the forementioned troubles may be prevented by the use of stout stranded cable, of the type used by the Signal Corps during the War, for both aerial and halyard.

The photograph shows the head of a wireless mast, with its pulley and halyard, special precautions having been taken to guard against the possible effects of a storm. An ordinary ring insulator is used in place of a pulley, there being no metal parts to rust and get out of order. The halyard slides easily on the glazed surface of the porcelain. The "pulley" is lashed to the mast by a length of the stranded cable; an annular space is cut out of the pole so that the insulator may be lashed very tightly to it without it sliding down the mast, as shown in the photograph,

A conical metal cover for the mast head (removed for the sake of clearness) covers the assembly at the mast head, and prevents moisture penetrating down the grain of the wood and rotting the mast. A.D.

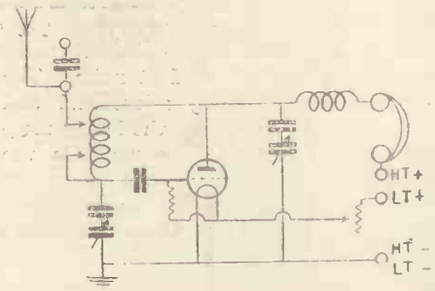
THE "AERANODE" SHORT-WAVE RECEIVER

(*Continued from preceding page*)

former 6½ in. high by 6 in.; couplings 5 in. long; front panel 5 in. by 11 in.

Operation

With the C.A.T. condenser in action clip on to the 20th turn and remove the grid clip so that the whole coil is in use. Set the left-hand dial at 180° and the right-hand at zero. Rotate the right-hand dial until oscillation is obtained and move both dials towards zero until signals are heard. K.D.K.A. should be heard on this setting. If a note magnifier is used (and one is quite essential) a howl may occur. This can be prevented by placing a variable resistance of about



Circuit Diagram of Aeranode Short-Wave Receiver.

100,000 ohms across the secondary of the transformer.

For 2 XAF place the grid clip on about the 6th turn and the aerial on about the 13th. With this type of setting it will probably be found that the procedure with the condensers will have to be reversed, that is, start with the right-hand dial at 180° and the left at zero. On the whole it is better to try to manipulate the clips so that the former method is used. If you are lucky you may be able to apply the aerial direct to the coil without the use of the C.A.T. condenser.

Signals obtained in this way are far louder, but unfortunately you may hear Daventry at the same time as KDKA! even though the latter is extremely sharply tuned. This is due to shock exitation of the aerial. When the aerial is used direct in this way the aerial clip will have to be moved towards the grid end for some turns before the set will oscillate. By using a coil of 3 turns and tapping on to the middle turn this receiver oscillates quite happily on 5 metres, but the writer has not heard any signals below eight.

The Postmaster-General announces that a further extension in America of the trans-atlantic telephone service will take place at 1.30 p.m. (British time) as from Wednesday, February 16, when the service will become available to and from all places in the States of Virginia, West Virginia, Kentucky, Tennessee, North Carolina, South Carolina, and Georgia.

PROTECTING THE VALVES

A Neat Valve Protector

PROBABLY ninety per cent. of the designs for valve sets published nowadays embody a constructional feature which was at one time regarded as American. Receivers of to-day have their valves placed behind the panel, usually mounted on the horizontal baseboard at the base of the cabinet. The objection once held out against this practice, namely that it was impossible to see the valve filaments, is now of no consequence. Nevertheless, the owner of a set made two or three years ago, and working satisfactorily, will not wish to alter the whole lay-out simply to place the valves under more complete protection.

Neat protecting covers, to suit sets which are not of the "American" type, are shown by the photograph. Perforated zinc is the metal used, as this has not the effect of increasing the stray magnetic couplings existing in most valve sets. Covers made in this neat, grey metal, too, add to the appearance of the receiver.

The protectors shown are elongated and of a size to cover two valves; but cylindrical covers for single stages can be made if desired. The tops of the cases are cut out with shears (if thick zinc be employed) and attached to the sides by soldering.

If the covers are to be in place permanently, "feet" should be formed at the bases, through which securing screws to the panel may be passed.

Though these are not shields in the proper sense of the term, it will be found that the use of these covers on the H.F. side of the set, and the connecting of them together and to earth, will increase stability and reduce the tendency to oscillation. K.

"A FOOL-PROOF & EVER-READY SET"

The "Threesome" is the simplest three-valver to make and to operate that it is possible to imagine . . . . So far as cost goes the claim that the set, apart from valves and the necessary accessories, can be made for less than £3 is a modest estimate. Using parts which I knew to be good, regardless of their cost, the figure in my own case was £2 : 17 : 0 . . . . As to performance, the set gives ample volume and excellent purity . . . . The set is, as an additional advantage, practically foolproof; is ever-ready at the turn of the switch, and is very economical of both high and low tension current. (*Daily Sketch, 21-12-26.*)

A LOCAL RECEIVER

Misapprehensions regarding the "Threesome"

So many people have written to me concerning the Ediswan "Threesome" resistance-capacity set that I think a general reply is justified.

One correspondent finds the set will not work properly with the R.C.2 valves in the first and second sockets; he has to use a P.V.2 as a detector.

This shows that there is some error in wiring—though exactly what, it is impossible to say without examining the set.

Other readers ask me whether, instead of the stipulated make and type of valve, various others may be used. The reply is emphatically in the negative, unless other valves of precisely similar characteristics as to impedance, etc., are used.

Speaking generally, however, the Ediswan "Threesome" should not be regarded as a distance-getter, first because in the interests of purity no reaction is used, so that the detector valve is little better than a crystal

Secondly (also in the interests of purity) anode rectification is employed in place of the more usual and more sensitive grid leak and condenser.

All these things can be easily altered, but then the set ceases to be the "Threesome." If it is regarded—as its designers regard it—simply as an ultra-pure toned loud speaker receiver for the local station only, it will give satisfaction.

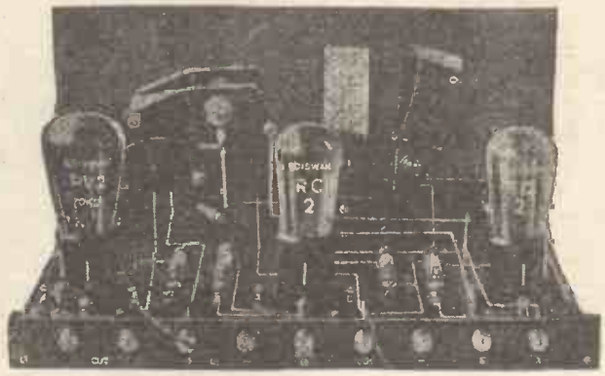
(*Daily Sketch, 1-1-27.*)

EDISWAN
SERVICE DEPARTMENT

If you have any wireless problem, let Ediswan solve it for you. No charge is made. Queries should be addressed to Service Department, The Edison Swan Electric Co., Ltd., 123/5 Queen Victoria Street, London, E.C.4.

R.C. THREESOME

SUCCESSFUL TEST BY A GREAT NATIONAL NEWSPAPER



THE tonal purity, volume, and entire absence of "mush" of this remarkable set has already converted tens of thousands of listeners. It is acclaimed the finest loud-speaker receiver of its kind ever designed, yet it is so easy to make . . . . and cheap, too.

The two new EDISWAN valves used with the R.C. Threesome are R.C.2. and P.V.2. Undoubtedly these two new valves—both from the new EDISWAN Quarter-watt POINT ONE ECONOMY Range — are the secret of the phenomenal success of the R.C. Threesome. Ask your dealer about them.

FREE BLUE PRINT & INSTRUCTION BOOK

YOU can build the R.C. Threesome easily in an evening. £3, or less, will cover the cost. The easy-to-follow Blue Print and non-technical Instruction Book are FREE.

FILL IN COUPON - NOW!

EDISWAN

V.21

A.W., 26/2/27.

To THE EDISON SWAN ELECTRIC CO., Ltd.,
(Publicity) 123/5 QUEEN VICTORIA STREET, LONDON, E.C.4.

Please send, post free, presentation copies of the "R.C. Threesome" Instruction Book and Blue-print.

Name .....

Address .....

PLEASE USE BLOCK LETTERS .....

MORE ABOUT THE "A.W. BALLOT THREE"

By J. H. REYNER B.Sc. (Hons.) A.M.I.E.E.

THE convenience of the Foldagraph of the "A.W. Ballot Three" presented free with our last issue will have resulted in a large number of readers having constructed this popular type of receiver. General instructions for its operation were given, but some further particulars will be desirable.

Battery Voltage

Having chosen suitable valves in accordance with the general instructions, these will be inserted in their correct positions, and battery voltages used as follows :—

The low-tension voltage will, of course, depend on the valves in use.

The high-tension voltage should be from 60 to 90 volts. As was explained in the last issue, only one H.T. tapping is provided, chiefly in order to simplify the switching arrangements. The value of the H.T. must be chosen, therefore, to be suitable not only for the L.F. stages, but also for the detector.

Grid Bias

Grid-bias voltages should be chosen in accordance with the makers' instructions for the particular valves in use. In testing out the receiver, as was mentioned last week, various combinations of valves were tried. Some satisfactory combinations are as shown below :—

	6-VOLT	
ST 61 B	ST 62	ST 63
PM 5	PM 6	DP 256
DEH 612	DEL 612	DE 5-A
	4-VOLT	
Cossor Det.	Cossor L.F	Cossor Stentor 4
SS 3	SS3	SS 7
B 5	B 5	B 6
	2-VOLT	
SP 18/G	SP 18/R.	SP 18/R
ST 21	ST 22	ST 23
DE 2 HF	DE 2 L.F.	DEP 215

These are not intended as recommendations, but merely as indications of the type of valve which can satisfactorily be employed in the various stages.

Operation

The operation of the receiver is simplicity itself. The value of the H.T. and the position of the detector rheostat should be adjusted until the reaction control is smooth and easy. Then by rotating the tuning dial, keeping the set at the oscillating point by means of the reaction condenser, a number of stations will be receivable, some on the loud-speaker and others on the telephones.

Dial Positions

As an indication of the positions around the dial at which the various stations may be expected, a test report has been appended. The selectivity of the arrangement is naturally only moderate, and if the receiver is operated close to a main station, signals will be heard over a considerable portion of the dial. It will be found, however, that when distant stations have been correctly tuned in, the signals from the local station will disappear.

The switching from two to three valves should prove particularly useful in cutting down the strength of the local station, while still retaining excellent quality if a suitable valve has been used in the last stage. A super-power valve is desirable in the last stage in order to obtain full and mellow reproduction on all stations, both near and far.

Test Report on the "A.W. Ballot Three"

Dial setting.	*Station.*
50 ...	... Malmo (L.S.)
57 ...	... Leeds
66 ...	... Lyons
76 ...	... Belfast
78 ...	... Marseilles
81 ...	... Newcastle (L.S.)
86 ...	... Dublin
88 ...	... Birmingham (L.S.)
95 ...	... Copenhagen
106 ...	... London (L.S.)
118 ...	... Manchester
123 ...	... Hamburg (L.S.)
130 ...	... Frankfurt
142 ...	... Ecole Superieure
146 ...	... Langenberg (L.S.)
153 ...	... Bournemouth (L.S.)
158 ...	... Brussels

NOISY SETS

WHEN a valve set develops "crackles," the first step is to make sure that the trouble is not due to atmospherics. The simplest way to test this is to disconnect the aerial and earth, and listen on a pair of headphones. If the noises disappear, they are due to atmospherics and nothing much can be done.

If they still persist, the most probable cause is the high-tension battery. Test this by altering the settings of the wander plugs. Sometimes the chief source of the trouble can be traced to one or perhaps two of the individual cell-units. If so, cut the offenders out by short-circuiting.

Generally speaking, however, once this defect sets in the only remedy is to replace the existing H.T. battery by a new one. Sometimes, of course, "crackling" is due to a loose connection or a faulty valve. This can usually be traced by tapping the set lightly with the knuckles, or by testing the connections in turn until the fault has been definitely located.

M. A. L.

TUITION FOR BROADCASTERS.

The B.B.C. have decided to experiment in the training of artistes for the microphone at the Royal Academy of Dramatic Art, where a special course has been commenced to develop broadcasting talent.

WITHOUT FEAR OR FAVOUR

A Weekly Programme Criticism by Sydney A. Moseley

ONE realizes how difficult it is for the talks department to arrange for topics that will please everybody. On the whole I find them quite interesting. No. 6 Studio succeeds very well! But there are strange lapses. At 9-15 p.m. for instance we were regaled with a "topical" talk on Malta. Why topical? Because, apparently, of some movement of troops in connection with the situation in China. Why not Dover or Gib., Port Said or Alexandria? Malta, at any rate, is a subject of limited interest and in any case should have come under the category of educational broadcast.

◆ ◆ ◆

I was asked recently, and I replied in this column, that had I my choice I should place "light symphony orchestras" as first in my list of an ideal programme. I am prepared to wager that the widest popularity exists for some of the orchestras whose music is relayed from the hotels and restaurants. I refer now to Arthur Salisbury and his New Verrey's orchestra which are now added to the splendid array of outside orchestras which are on the B.B.C.'s list. It is a good thing that some of these musicians, after a lifetime of study, should have the opportunity of playing to a wider audience than an hotel or restaurant can offer.

◆ ◆ ◆

Did you hear the programme of Spanish music? All Spanish! The rhythm and melody of the music from the land of Carmen are always delightful to hear but the objection to a *whole* programme of music from one nation still obtains. Give us a little variety!

◆ ◆ ◆

Do you notice that titles are gradually creeping in among the eminent people who direct their cars these evenings to Savoy Hill? But if they are all as good as some of those who have already appeared before the microphone we'll let it pass. For instance, Lord Ronaldshay gave us a romantic and nicely coloured adventure talk of a visit to Ranchenjunga and an Oracle of Thibet. Some of these fellows are so modest and matter-of-fact in recounting experiences which some of us would make a book about!

◆ ◆ ◆

It is always interesting to know that readers closely study these notes. I have been pulled up recently by a correspondent who says that the compliments I paid to Charlie Kidd for repeating his lantern lecture parody were out of place. "As a matter of fact," he writes, "Kidd actually kept his listeners waiting so that the announcer got somebody else to fill in the gap." While I appreciate this criticism I am afraid my critic must try again. The lantern lecture was in every detail the same as that of the first transmission. I heard them both very clearly and if Mr. Kidd was not the artiste responsible, then the official announcement was incorrect. As a confirmation of what I have written I hear from Savoy Hill that "both lantern lectures" were the same.

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Extraordinary thing that our famous poets seem to read poetry in a like manner. It is a privilege for us to hear such men of renown as John Masefield and Laurence Binyon reading from their own work. Both have full-toned voices, but so sombre, so restrained. Mr. Binyon for instance read a poem about joyful children in exactly the same pitch and expression as a poem about a funeral. Nevertheless, may I add that even with these defects I would not forego the inestimable experience of listening to them.

THE FOOTBALL BROADCASTS
An Exciting Moment!

The other day the fog gave me another opportunity to send a note of excuse to the City and I settled down to a whole day's programme.

From 11 a.m. till 11 p.m. I heard some excellent music, highbrow and lowbrow, a speech by Lloyd George, a French lesson, a talk about a voyage to South America, and indeed only had a little respite when somebody began to talk about "Furniture in the Home." Really some of us may be a bit blasé, but this is a remarkable achievement, and I hope I shall never become so disgustingly ungrateful as to take all this as a matter of course.

◆ ◆ ◆

What a fine list of women singers the B.B.C. has. Dorothy Bennett the other night sang exquisitely. I wish she had sung a few more songs.

◆ ◆ ◆

My musical education has no doubt been neglected. Perhaps that is the reason why I was puzzled with the string band of the Royal Marines executing the Second Hungarian Rhapsody by Liszt. "Executing" is the word, for they succeeded in chopping off all the notes in the introduction. Tell me why, mother?

◆ ◆ ◆

Listening to the Children's Hour the other afternoon, as I often do, it occurred to me more forcefully than ever that the dropping of the avuncular prefix is open to question. Mind, I am glad that the B.B.C. held out against what they believe to be uninformed criticism, but when you hear the announcer referring to "Sophie" you wonder if this is the best way to initiate children into the art of addressing people. If the intimate terms are not according to the new policy, why not refer to the speakers as *Mr.* So-and-so or *Miss* So-and-so.?

More than double the customary number of wireless licences have been taken out daily in the Southampton area since six wireless "pirates" were fined.

Sir Landon Ronald is to conduct the ninth of the series of National Concerts, which will be broadcast from the Albert Hall on Thursday, March 3. The programme chosen is on popular lines, and the Tchaikowsky's E-minor Symphony and Dvorak's Carnival Overture will be included. The soloist is Jan Kiepura, the young Polish tenor, who will be making his first appearance in England.

"A.W." TESTS OF APPARATUS

Conducted by our Technical Editor, J. H. REYNER, B.Sc.(Hons.), A.M.I.E.E.

Lewcos Battery Leads

THE London Electric Wire Co. & Smiths, Ltd., of 7 Playhouse Yard, Golden Lane, E.C.1, have submitted for test a set of battery leads. These consist of a number of separate rubber-covered leads, bound together in a very neat form. Two of these leads are made of a heavier gauge wire and fitted at each end with spade terminals having red and black insulated ends.

These form the low-tension positive and negative connections. There are three other leads for connecting to the high-tension battery. Spade terminals with black, green, and red ends are attached to the leads, which should be connected to the terminals on the receiving set.

Owing to the fact that the rubber insulation on the wires has a different colour corresponding to that on the end of the spade terminal, there is no likelihood of any

Lewcos Battery Leads

mistake occurring, due to one of the leads being taken to the wrong terminal.

When it is desired to connect the batteries to a receiving set in a neat and quick manner, these leads are ideal. The total length from end to end is about 5 ft., which should be ample for most purposes.

It is also possible to obtain extra leads for the grid-bias battery, if desired. We can thoroughly recommend them for use in any receiving set.

Harlie Anti-Microphonic Adaptor

WE have received from Harlie Bros., of 36 Wilton Road, E.8, for test a Harlie anti-microphonic adaptor. This is intended for the purpose of converting the old type of rigid valve-holder into a modern anti-microphonic type.

Four valve sockets, protected by ebonite sleeves, are attached to four brass pins by means of coiled copper-wire springs. The upper portion of the springs forms a contact surface for the valve pins, whilst the lower portion serves to insulate from vibration the small piece of ebonite on which the adaptor pins are mounted. The adaptor is plugged into a valve-holder, and will itself serve as an anti-microphonic valve-holder.

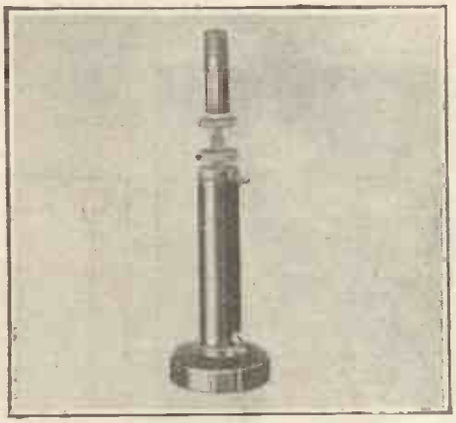
The insulation resistance between the sockets proved to be infinity, and it was

Harlie Anti-Microphonic Adapter

found that various types of valves fitted well and made good electrical contact in the sockets. The insulation from vibration was also good. We can recommend this component for general use.

Service Neutralising Condenser

FROM the Service Radio Co., Ltd., of 67, Church Street, N.16, we have received a Service neutralising condenser. This component is made for panel mounting. It consists of an ebonite cylinder mounted vertically, inside which are two brass cylinders which form the condenser electrodes. The inner electrode is attached to a large threaded spindle which has an ebonite knob at the far end. By rotating



Service Neutrodyne Condenser

this knob, the inner cylinder can be raised or lowered.

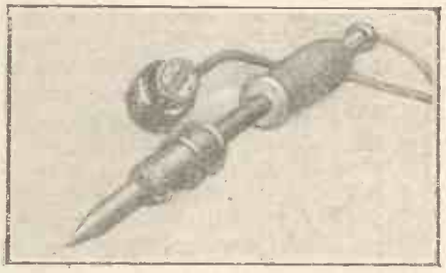
In the position of maximum capacity, the inner cylinder lies inside the outer and fixed electrode. A thin cylindrical piece of ebonite is fixed between the inner and outer electrodes in order to prevent the possibility of a short circuit. Another piece of ebonite prevents contact between the two electrodes in the position of maximum capacity.

On test this component proved to be gradual and smooth in action; the maximum capacity was found to be 17½ micro-microfarads and the minimum capacity was 3 micro-microfarads, which is ample range for most valves.

Ersa Soldering Iron

S. WOLF & CO., LTD., of 115 Southwark Street, S.E.1, have sent us for test an Ersa electric soldering iron. This instrument is for use with A.C. mains and is designed to work off a voltage of 200.

It was found, however, that it functioned quite satisfactorily and did not overheat when used with a voltage of 240, although



Ersa Soldering Iron

it would be more conducive to the long life and efficiency of the component had a transformer been employed.

In construction this instrument is simple, but effective. A normal electric-light plug is supplied with 2 yards of insulated cable. The other end of the cable is led in through the handle of the iron. The cable at the point of entrance, however, is protected by a short length of rubber tubing.

This is an excellent feature, as it prevents damage to the cable at a point where it is continually being bent and twisted. The ends of the wire are connected by means of a coil of resistance wire embedded in a block of fireclay. In the centre of the fireclay there is a small hole, into which one end of the copper bit fits.

Thus when the plug is put into an electric-light socket, the coil of resistance wire becomes hot and heats the fireclay covering, which in its turn heats the copper bit. On test it was found that the iron was ready for use after the current had been flowing for approximately 10 minutes. The total power consumption is about 100 watts. We can recommend this iron.

ALL ABO

THE

LOEWE DU

AND

TRIPLEX VA

BY

MANFRED VON ARDENN

Dr. Loewe's Co-Worker.

A Three-valve Set in One valve: Amplification on Broadcast Wavel More than O

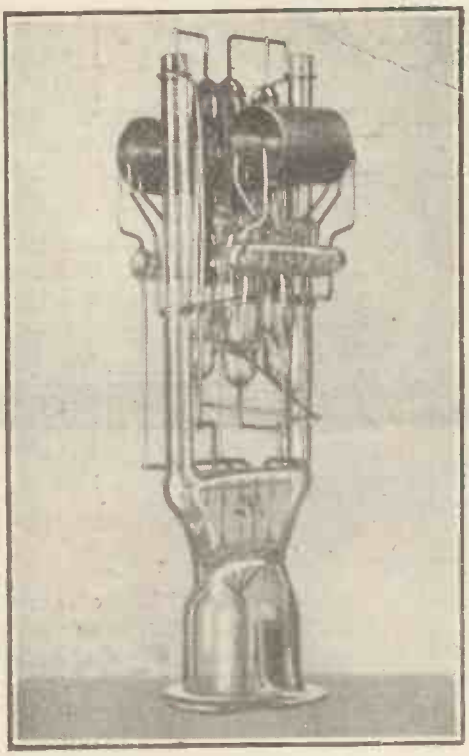


Fig. 1.—Interior of Duplex Valve.

RESISTANCE-CAPACITY coupled high-frequency amplifiers have of course often been used on wavelengths above about 2,000 metres. On shorter wavelengths, however, especially on the broadcast band, efficient amplification could not be obtained by that method. In order to make DX reception possible, one was forced to amplify the high frequencies received by means of tuned-circuit H.F. amplifiers, or else by the use of reaction. Both reaction and selectively tuned amplifiers, however, introduce a certain amount of distortion because of the sharp resonance peaks present in receivers employing such methods.

There are, however, two ways of obtaining aperiodic high-frequency amplification on the broadcast band. One of them is by the reduction of stray capacities to the lowest possible value. Most probably the conceivable minimum has already been reached by mounting the amplifying valves together with coupling resistances and condensers *all together in a single evacuated glass bulb*, according to the method invented by Dr. Loewe, Berlin. By this remarkable method aperiodic high-frequency amplification has been obtained down to a wavelength of 200 metres.

Aperiodic H.F. Amplification

The other way of obtaining such a result is to dimension, especially the valves and resistance-capacity coupling units, according to the novel principles evolved by the writer. By the combination of both methods mentioned, Dr. Loewe and the writer have succeeded in solving the problem of aperiodic H.F. amplification on broadcast wavelengths to a very satisfactory degree. The lower limit of H.F. amplification of these amplifiers lies at about 70 *metres*, and therefore most efficient amplification is obtained on the whole range of broadcast frequencies. Fig. 1 shows the interior of such an H.F. duplex valve. The valves used in the system are specially-designed four-electrode valves. Their impedance remains at a comparatively low value, even when the high anode resistances are in circuit.

Special Construction

Since these valves necessitate six, instead of the usual four connections, it was found advisable to construct a special base and socket, which are both shown in Fig. 2, together with the type of valve now on the market. Fig. 3 shows the manufacturing process of these valves in five stages. If such a high-frequency duplex valve, suitably coupled, is added to existing receivers, a remarkable improvement in sensitivity will become apparent, without any decrease of purity or undue complication of tuning controls. The filament consumption is .17 amp. at 4 volts. If a 4-volt accumulator is used, no filament resistance will be found necessary. The same applies to the low-frequency triplex valve, to be described.

Stray Capacities

The original reason for enclosing complete amplifying arrangements in a single valve was on account of the great reduction of stray capacities. It has since become apparent, however, that the cost of production may be reduced considerably as

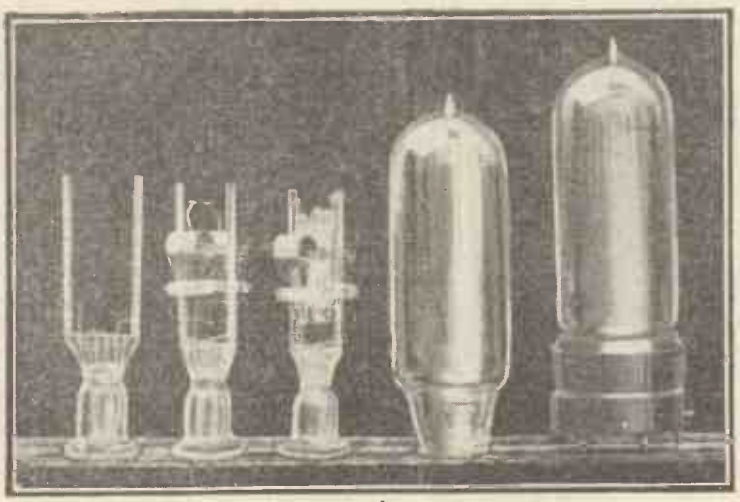


Fig. 3.—Stages in the Manufacture of a Duplex Valve.

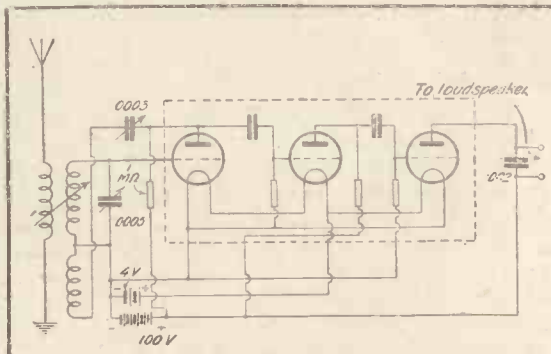


Fig. 7.—Triplex Circuit with Reaction.

...UT ...UPLEX ...ALVES ...E,

Fig. 2.—Valve and Socket.

...Efficient Resistance-capacity H.F. ...engths: An Amplification Factor of ...ne Thousand.

compared with the usual method of mounting valves and coupling components separately in wireless receivers. The evacuation, especially, of such a system presents considerably less difficulty than that of a corresponding number of separate valves.

These advantages were the chief reasons which led to the construction of the low-frequency triplex valve. It contains two resistance-capacity coupled valves, followed by a power valve in the last stage, together with the necessary coupling resistances and condensers. As Fig. 4 shows, the resistances and condensers are enclosed in glass bulbs to facilitate satisfactory evacuation of the whole system.

The Triplex Valves

Fig. 5 shows the production of the triplex valve in manufacture stage by stage. Unlike valves of usual construction, which only yield a mean potential amplification of 5 to 10, these triplex systems have an actual amplification factor of over 1,000. It is of interest to note that, as with the H.F. duplex system, this valve works well with only 90 volts on the plates. Its filament and plate-current consumption amounts to no more than that of a single power-valve of conventional design.

High Amplification

The reason for the high amplification and the low-current consumption is that, as the writer suggested, valves with high-amplification factors (about 33) are used in conjunction with anode resistances of about 3 megohms. A triplex valve of special design is shown by Fig. 6. This valve has a special connection to the first anode, in order to allow reaction to be applied.

The reduction of stray capacities, especially those between grid and anode, enables sufficient reaction to be obtained even if the first anode resistance is as high as 1 megohm, without any undue increase of H.T. voltage. Naturally, the components of the receiving circuit should be of low-loss design. This triplex valve with reaction (Fig. 7) gave good loud-speaker reception of many European stations. Rectification takes place in the first valve under the influence of grid current without the use of grid-condenser and leak.

Combined Duplex and Triplex Systems

Extremely good results are achieved with receiving arrangements embodying a combination of both duplex and triplex systems. The circuit of such a receiver is shown in Fig. 8. If the

Fig. 6.—Triplex Valve of Special Design.

second variable coupling is kept reasonably tight, reaction is obtainable without the use of the reaction condenser C. Because of the high aperiodic H.F. amplification reaction does not need to be applied as far as the point of oscillation, but can be kept at a much lower value than usual, thus reducing side-band distortion considerably.

If reaction is only controlled by the second coupling, then selectivity is dependent on the sensitivity of the receiver to an undesirable degree. In order to avoid this, a special reaction condenser C is included. The maximum capacity of this condenser should not be greater than .000003 microfarad, because of the high amplification of the duplex valve. Since

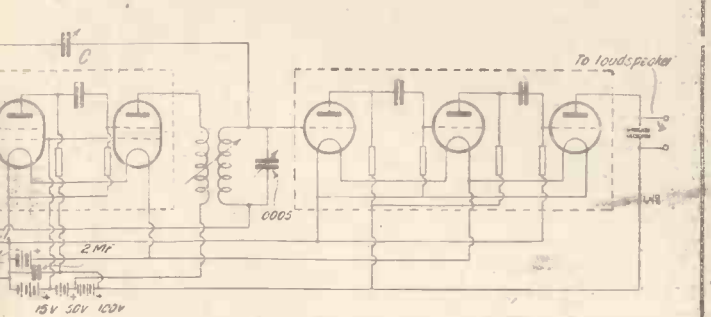


Fig. 8.—Circuit Embodying Duplex and Triplex Systems.

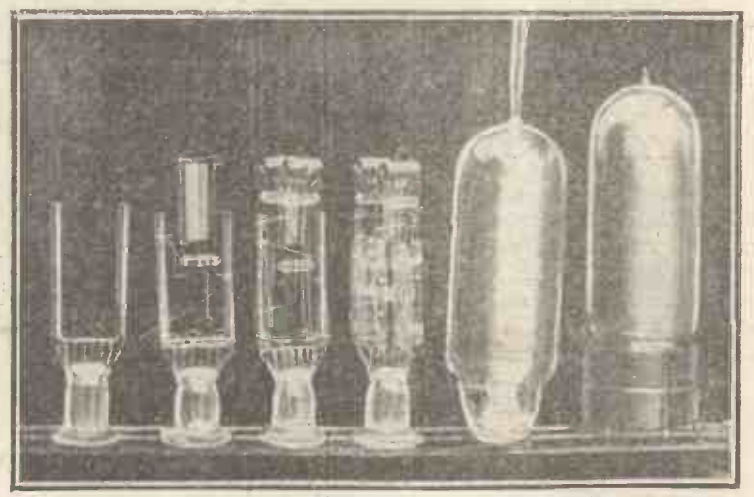


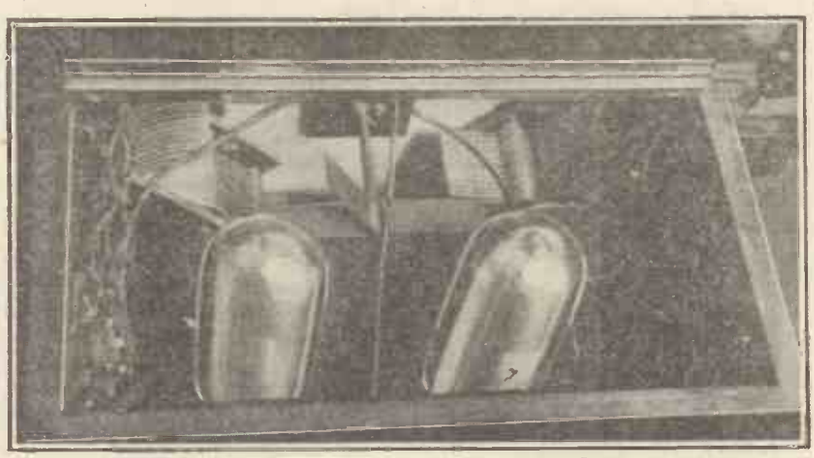
Fig. 5.—Stages in the Manufacture of a Triplex Valve.

"ALL ABOUT THE LOEWE DUPLEX AND TRIPLEX VALVES" (Continued from preceeding page)

these multi-valve systems are not very much larger than ordinary power valves, receivers embodying them may be of considerably smaller dimensions than usual. Fig. 9 is a photograph of a receiver embodying the circuit shown by Fig. 8.

Fig. 10 shows the interior of the same receiver provided with an interesting type of small reaction condenser. Experiments have shown that on efficient outdoor aerials, stations at distances of several hundred miles could be received at a strength sufficient to be distinctly audible in a large hall. Therefore, these receivers should by no means be inferior to those of the conventional type having more complicated circuits.

Under favourable reception conditions with regard to atmospheric interference, it was even possible to receive distant stations with the same purity as the local station, a fact largely due to the absence of side-band distortion. The triplex valve by itself is also very suitable as a low-frequency or intermediate-frequency amplifier for general use in all receiving circuits. Very effective arrangements of this description have been used, especially those embodying the neutrodyne and super-heterodyne principles



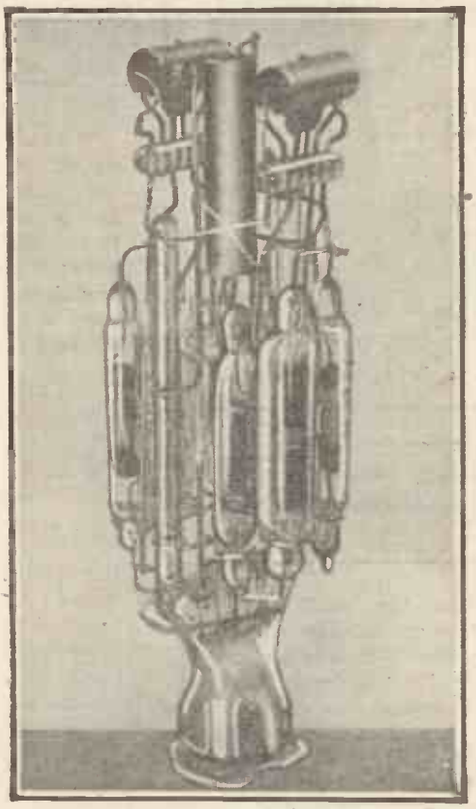


Fig. 9 (top left).—Receiver Embodying Duplex and Triplex Systems. Fig. 10 (left).—Interior of Receiver above. Fig. 4. (above).—Photograph showing Resistances and Condensers.

DON'T SOLDER YOUR BIT—TIN IT

TO many constructors, soldering is the most unsatisfactory part of their work. All too often one sees a poorly soldered joint surrounded with a mass of flux. In spite of the many hints and articles on soldering there persists this inability on the part of many amateurs to make a really good job of soldering.

In the writer's opinion, the main stumbling-block to good soldering is the absence of a well-tinned bit. So many "solderers" never tin their bits at all, but simply run a blob of solder on—and wonder why the thing won't work!

To tin a bit, heat the soldering iron to *nearly* red heat, then rub it vigorously with an old file and plunge into a tin lid in which there is a smear of flux and a blob of solder.

Each "face" of the bit should be so treated, and the result will be a *tinned* bit.

But all this will be useless if (*a*) the joint, (*b*) the flux, and (*c*) the bit, are not all kept scrupulously clean. J. B.

During the first six days of the wireless telephone service between Scotland and America no calls were transmitted from Scotland; and only two received—one in Glasgow and the other in Edinburgh.

CRYSTAL "POWER" RECTIFIER

AN American inventor, S. Rubens, is developing the use of crystals as an economical means of rectifying alternating current from the mains. The current-carrying capacity is, of course, very small, and it is found that a high terminal voltage is impracticable, but by using several crystals in a series-parallel combination, it becomes possible to operate a "trickle charger."

This seems to open out an interesting development in the old rivalry between crystal and valve. The most popular type of home rectifier at present in use is undoubtedly the Tungar. M.A.L.

GETTING THE BEST out of the "M.C. THREE"

—and a Test Report

THE interest aroused by the publication of the construction of the "M.C. Three" receiver, the first details of a practicable three-valver incorporating the new constant-coupling principle, was instantaneous. We have received a number of letters from enthusiastic readers who have made up this receiver and who all express keen appreciation of its ease of handling and remarkable DX properties.

A few further words of advice concerning the actual operation of the receiver will be of interest. One of the particular features of the circuit is the comparative sharpness of the tuning. It is quite possible, therefore, at first to miss some of the distant stations, which are not heard until both the dials are in tune. On the whole, the method I have found best is to start with the 600-metre ship stations. These are very broadly tuned, and may be heard at the upper end of the scale without much difficulty. Tune in to one particular station and note the settings of the dials. These should be approximately the same, and if there is a serious discrepancy it is advisable to rotate one of the dials on its spindle until the readings are practically together. Then by moving the dials together a little at a time it will be found possible to receive numbers of distant stations one after the other.

As a matter of interest I asked Mr. H. E. Hassall, the winner of the International prize in America with the "All-British Six," to give his opinion of the "M.C. Three" after a personal test, and this is reproduced below.

It will be seen that he also has obtained excellent results on the receiver and is full of enthusiasm for this new principle.

Interchangeable Coils

Some readers have raised the question of interchangeable coils for this receiver. I am at present working on this aspect of the subject, but there are one or two minor difficulties, chiefly owing to the fact that it is not only the coil which has to be changed, but certain other constants have also to be altered in order to maintain the necessary balance between the capacity and the magnetic-coupling.

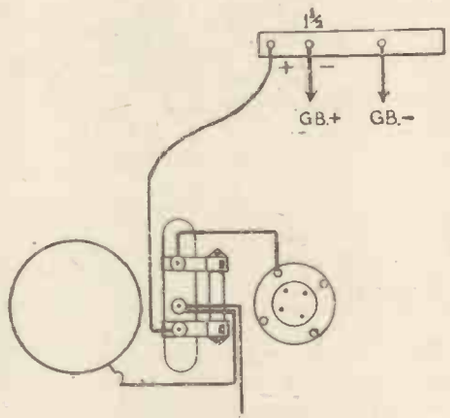
In my next week's article I hope to describe the results of some experiments made on long-wave reception with this constant-coupled circuit, and I shall then be able to indicate what alterations are necessary in order to make interchangeable coils for this receiver. J. H. REYNER.

A TEST REPORT

BY H. E. HASSALL.

I RECENTLY had the pleaure of trying personally, the "M.C. Three" receiver described by Mr. J. H. Reyner in No. 243 of AMATEUR WIRELESS. A few of my friends had made up this receiver from the instructions given, and had expressed a very favourable opinion of its capabilities, so that I was interested to be able to try it out for myself. I may say at once that the results that I obtained far exceeded my expectations.

One does not look for exceptional reception in a three-valve receiver, and in this particular case, where the circuit is of such a nature that constant sensitivity is obtained over the whole of the scale, I was prepared to find that a certain sacrifice of signal strength had been made in obtaining the ease of control. I found, however, that the sensitivity and ease of tuning on this receiver were positively remarkable.



The Modified Connections to which reference is made in the Test Report.

It was merely necessary to tune in to the local station, and adjust the reaction condenser a little short of the oscillation point; then, by rotating the two tuning dials simultaneously, a large number of English and foreign stations were received at good loud-speaker strength. It was possible, in fact, to forget all about the reaction control over the whole range of 250 to 600 meters, while the selectivity struck me as being very good indeed.

I noticed that in the original article Mr. Reyner suggested that it was desirable in some cases to connect the grid leak on the detector valve to a separate grid-bias tapping, rather than take it to L.T. +. This is a point which I have found myself on other receivers, and I removed the grid-leak connection accordingly and substituted a flex lead which I could take to the grid-bias battery as desired (see diagram). I found that a value of 1½ volts positive gave a much smoother reaction effect and avoided any semblance of back-lash. The performance of the receiver was much enhanced when it was operated in this condition.

I took the opportunity of trying a number of 2-volt valves in the receiver, and obtained very good results with them. The signal strength was good, as also was the selectivity, while the same degree of constant coupling was obtained. This latter point struck me as of particular interest, and also the somewhat remarkable fact that the receiver remained stable even when the valves were changed.

I tried replacing the H.F. valve with a number of different types, and was surprised to find that the circuit remained perfectly stable whatever valve was used, and no alteration had to be made to the adjustments. This appears to me to be a decided advance in radio technique, and I shall look forward with interest to future articles and receivers on this new principle.

(Some further letters relating to this receiver appear in our Correspondence columns.—ED.)

FADING

IT is a curious fact that although fading is usually more noticeable at night-time than during the day, the range at which effective communication can be maintained is, generally speaking, greater during the hours of darkness. This is probably due to the fact that energy transmitted during the daytime travels mainly in the form of "earth-bound" waves. The free or "space" waves are dissipated in the Heaviside layer, which during the day is highly ionized by the action of the sun.

Now "earth-bound" waves necessarily suffer considerable losses by contact with buildings, trees, and similar obstacles, so that their normal range is somewhat less than the "space" waves when these can travel under favourable conditions. The latter condition obtains during the night-time when, owing to the disappearance of the sun, the Heaviside layer becomes less absorptive. At the same time the peculiar fluctuations to which the "space" waves are subject, owing to reflection from the layer, come into prominence at the receiving end. L. M.

One of the characteristic features of the wireless broadcasting in India will be the special appeal it is going to make to the purdah women. "Those who will particularly appreciate broadcasting in any and every form," said Mr. Dunstan, the manager of the Indian Broadcasting Company, "will be the purdah women in India." With this end in view a special selection board is being organised to arrange for the programmes to be broadcast. It is planned to arrange one-third of the programme to suit European taste, while two-thirds will be specially for Indian subscribers.

WHA WIRELESS HAPPENINGS ABROAD

THE *Journal Parle* at the Eiffel Tower station, with its vigorous printed supplementary paper *La Parole Libre T.S.F.*, which might be translated "Free Speech on the Wireless," is sometimes a bit too "go-ahead" to please politicians in power; in other words, it has at times been up against the "powers that be," and some big hits, both spoken and printed, have been "censored" quite unreasonably. M. Nourisson, one of the *Amis de la Tour*—a sort of radio club of genuine enthusiasts—wrote to me saying that the French Government was simply looking for trouble, and he finished his letter with a genuine appeal for help from wireless enthusiasts in England: "*Aidez-nous; protestez de votre cote, on vous ecoutera. Defendez nous!*"

All Friends!

As, of course, I am a great believer in radio enthusiasts in all countries sticking by one another and helping each other whenever they can, I wrote at once to the editor of "Free Speech on the Wireless," M. Maurice Privat, asking him exactly what was wrong, and whether I could really be of any help in the matter. In his reply the editor of *La Parole Libre* said: "I thank you for your friendly letter, which I very much appreciate and which has greatly touched me. As M. Nourisson pointed out to you, we certainly had serious trouble about the end of November last; moreover, the position of affairs is still precarious enough, and will only become stable the day we get a radio statute in France and an organisation analogous to the B.B.C. Just when M. Nourisson wrote to you, many adherents to our group were protesting to the President du Conseil (Prime Minister) against the unjustifiable cuts which had been made in the course of our transmissions; he was wanting to ask you to organise a petition on your side, the same as has been done in France. Now, of course, it is too late to do anything; but if the same state of affairs should happen to arise again, it might be of the greatest service if you could protest to the public authorities and especially petition the President du Conseil."

So, ye wireless enthusiasts of Merry England, don't forget your brothers in foreign parts! For my part, I am ready to take off my coat in the cause of wireless in any country under the sun.

A Sabbath Entertainment

The other Sunday night, about 6.30 G.M.T., I was peacefully trying some new coils when, quite unexpectedly, I suddenly found myself at the ring-side of a boxing match somewhere in Germany (I believe it was a championship match at Dortmund). It was quite exciting to hear the German at the microphone giving out the fight punch for punch! A brass band played "The Entrance of the Gladiators," the crowd cheered, and then those two energetic sportsmen punched each other scientifically and otherwise for a full half-hour.

A pleasant sort of Sunday evening amusement, so to speak. You could hear the gong go for the rounds; you could hear that characteristic pug-like "grunt" when one boxer knocks the wind out of the other's body; you could almost see the brilliant electric lights overhead; it was like being at the ring-side. There was some terrific hitting; in the last round the chap at the microphone said both men were fairly exhausted. At the close every one seemed very excited and all talking together; as far as I could make out, the match was a draw. "Rosemann is sitting doubled up in his corner," said the German at the microphone in a sympathetic tone. Some cheering followed. "Rosemann is given an ovation as he leaves the ring," said the speaker sympathetically.

The German Way

About the middle of January I received a special request from the Hochfrequenzkommission des Wurtembergischen Elektrotechnischen Vereins, Stuttgart, for a report on their three days' test, and it was very interesting to me to see the care and accuracy with which the German carries out these things. big printed form was sent me to fill up, on which I had to give every detail concerning my receiving station, height, length and class of aerial, what sort of surroundings, what kind of earth, how many valves and the maker's name, a diagram of the theoretical circuit of my receiving set, and so forth, with, of course, the exact time of observations, the state of the weather, with thermometer and barometric readings.

Everything heard had to be mentioned on the report, all interference, oscillations to be signified by the letter "R" (Rückkoppler), atmospherics "L" (Luftstorungen), heterodyning from any other station "F." Even if nothing at all was heard, the fact was to be reported, as this sort of negative report is often of special value. This care shows us, perhaps, why the Stuttgart station is about the best on the Continent to-day.

Radio in Triest

In a recent number of "Deutsche Rundfunk" there was an interesting article on radio conditions in far-off Triest. The correspondent, J. Bretz, says they will soon have their transmitter going, the wavelength allotted by Geneva being 230.8. He says that after six in the evening all the English broadcasting stations come in: Dublin is often at loud-speaker strength; Bournemouth is almost always louder than London. The transmission from the Albert Hall when Richard Strauss was conducting was simply perfect in tone ("*klang tadellos*"), and carried through in masterly style. Unfortunately, that night reception was much spoilt by atmospherics. Generally speaking, the English stations have a beautifully free modulation; Cardiff, Belfast, Newcastle, Aberdeen come in well late at night. It is altogether a very interesting report, for Triest is some thousand miles away from our northern stations.

LYONS.

CHIEF EVENTS OF THE WEEK

SUNDAY, FEBRUARY 27.

London	A programme of favourite Wagner excerpts.
Cardiff	*The Sleeping Beauty.*
Manchester	Mozart's Last Masterpieces.
Glasgow	Longfellow Anniversary Programme.

MONDAY

London	Musical Comedy.
Bournemouth	Schumann and Schubert programme.
Cardiff	*my Virtue of a Broadcast.*
Manchester	A 'Rag' programme by Manchester University Students.
Glasgow	Scenes from *King James* I.
Aberdeen	*Love and the Washtub*, one-act comedy.
Belfast	Traditional Irish Music.

TUESDAY

London	St. David's Day programme.
Cardiff	Taunton Musical Society concert.
Manchester	"If Winter Comes, Can Spring be Far Behind?" (Musical programme).
Aberdeen	"Chopiniana"—anniversary of Chopin's birth.

WEDNESDAY

London	*Pagliacci*, performed by the B.N.O.C.
Birmingham	An Eighteenth Century Hour.
Cardiff	"The Super Six."
Manchester	Vaudeville.
Newcastle	*Pagliacci*, from the Manchester Opera House.

THURSDAY

London	B.B.C. National Concert relayed from Royal Albert Hall.

FRIDAY

London	"My Programme," by the Chief Engineer.
Birmingham	*For France*, an episode of the Franco-Prussian War.
Cardiff	*The Prodigal*, a Jest in one act by Anton Tchekov.
Manchester	"A Tale of the Hebrides."

SATURDAY

London	Revue.
Birmingham	Concert from the Birmingham and Midland Institute.
Manchester	Wingate's Temperance Prize Band.
Newcastle	*After the Trip*, a Tyneside Comedy by E. A. Bryan.
Glasgow	The Glasgow (English) Concertina Band.
Belfast	Public Concert relayed from Wellington Hall.

RULES.—Please write distinctly and keep to the point. We reply promptly by post. Please give all necessary details. Ask one question at a time to ensure a prompt reply, and please put sketches, layouts, diagrams, etc., on separate sheets containing your name and address. See special announcement below.

Using Counterpoise Earth.

Q.—*Should a counterpoise always have exactly the same number and length of wires as has the aerial with which it is used?—S. C. P. (Birmingham).*

A.—For best results the counterpoise should have more wires than the aerial—as many wires, in fact, as is practicable. Also the wires forming the counterpoise should preferably extend beyond the limits of the aerial. When a counterpoise is used the effective height of the aerial is the vertical distance between aerial and counterpoise, for which reason the latter should be placed as near to the surface of the ground as is convenient.—J. F. J.

Swinging Aerials.

Q.—*I notice that on very windy nights signals from distant stations fluctuate in strength. What can account for this?—F. C. S.*

A.—Most likely your aerial is not quite taut, in which case it may be swinging in the wind. This might cause it to approach more or less closely to earthed bodies, such as trees, buildings, etc., and so vary the capacity of the aerial to earth. On distant stations tuning is very critical, and slight variations of the aerial capacity may be sufficient to detune the aerial circuit enough to make the signals fade as you describe.—J. F. J.

One-valve Circuit.

Q.—*In order to obtain long-distance reception with a single valve, which of the three following circuits would you advise me to use: detector valve with reaction, H.F. amplifier and crystal detector, valve and crystal reflex? I shall, of course, only use headphones.—T. S. R. (Barnet).*

A.—We think that the simple detector with reaction circuit would suit your requirements best. Great ranges can be covered with this arrangement under favourable conditions, and it is suitable for reception on any wavelength. While the H.F. and crystal circuit might, theoretically, have a somewhat greater range, this advantage would be offset in practice by the instability of the crystal and the necessity for two tuning controls. The reflex circuit, which would doubtless give you stronger signals from the nearer stations than either of the other two arrangements mentioned, would probably have less range than either of them.—J. F. J.

Saturation Point.

Q.—*What is the saturation point of a valve?—H. O. (Leicester).*

A.—This is really the point on the characteristic curve where the curve stops sloping upwards and proceeds horizontally. In practice it is reached when the whole of the electrons being emitted from the filament are reaching the plate. No variation of the grid potential can then increase the anode current. A greater anode current can only be obtained by increasing the H.T. voltage or the filament temperature.—M.

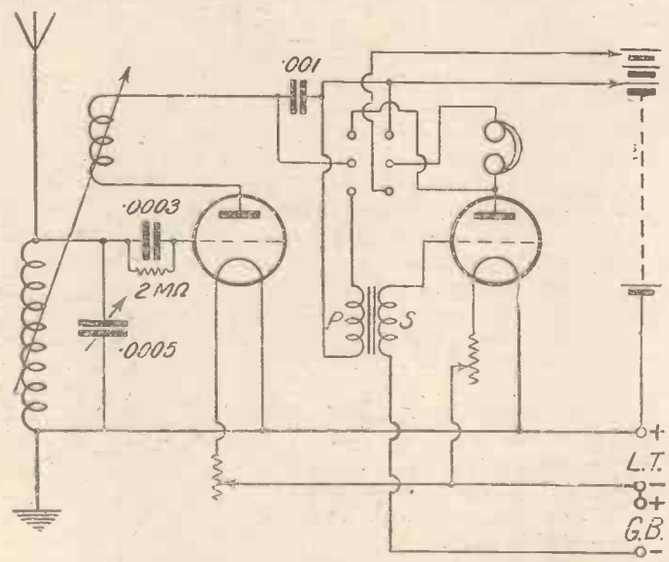
Two-valve Circuit with Switching Arrangement.

Q.—*Will you give me a two-valve circuit, detector and L.F., in which the last valve can be switched out when it is not required? I want to apply separate H.T. voltages to each of the two valves, but I want the switching arrangement to be such that the same H.T. voltage is applied to the detector valve whether it is used alone or with the amplifying stage.—T. P. R. (Dulwich).*

When Asking Technical Queries—
PLEASE write briefly and to the point

A Fee of One Shilling (postal order or postage stamps) must accompany each question and also a stamped, addressed envelope and the coupon which will be found on the last page.
Rough sketches and circuit diagrams can be provided, but it will be necessary to charge a special fee (which will be quoted upon request) for detail layouts and designs.

A.—A suitable circuit is given herewith. A D.P.D.T. switch is used, and the filament of the last valve is turned out, when this valve is not in use, by its separate rheostat.—B.



Circuit Diagram of Two-valves with Switching.

Making a Small Synchronous Motor.

Q.—*I wish to make a simple alternating current synchronous motor. It is required to be self-starting, without commutator or slip-rings, and to work from 230-volt 50-cycle mains, the voltage of which can be stepped down by a transformer. Please advise as to the design of motor and suitable windings.—F. D. (Wandsworth Common).*

A.—As this motor has to be made minus slip-rings or commutator, it will obviously have to be of the induction type, but it is doubtful whether querist's proposals will work out satisfactorily. He suggests building a 4-pole stator with wound salient poles and a phase-splitting arrangement in order to produce a rotating field. The rotor is to take the form of a soft iron drum without windings, the idea being to utilise the eddy current effect in the solid metal of the core instead of in a short-circuited system of copper conductors on the lines of the more usual "squirrel cage" rotor. Efficiency is of no moment, the power required being infinitesimal, and short-time rating permissible, as the motor would have to operate for a few seconds only at quarter of an hour intervals. There are two features, however, in this scheme which would militate against success. One is the presence of localised polar regions on the stator, instead of the more widespread poles produced by the orthodox distributive winding, where the whole inner periphery of the stator is pierced with slots and the coils spread over practically all these slots, instead of being located on definite polepieces. The other reason is the inferior electrical conductivity of the iron core as compared with copper, and its possible variations of electrical resistance, which would lead to very uneven distribution of the induced currents. From the writer's own experiments along these lines for some months past, in the endeavour to produce small alternating current motors with "shunt" speed characteristics, he is inclined to think these difficulties cannot be overcome at a reasonable cost, especially in the case of such very small units. The suggested size for rotor in the present case is only 1½in. The type of motor that would better fill the requirements in this case is probably the "shaded pole" type. A laminated field magnet of suitable size and of the usual proportions associated with direct current work is provided with a deep slot in the centre of each polepiece. A copper band encircles one-half of each pole, one side being embedded in the slot, and ordinary exciting field coils are placed over the poles afterwards. Owing to the eddy currents induced in the copper bands, there is a magnetic lag at the edge of the pole face so encircled, and a transference of the magnetic axis from one side to the other of each pole face, giving the required starting torque. If the armature is a plain strip of cobalt magnet steel with a circular rim of soft iron, the machine will run as a synchronous motor. A suggested size for the armature is 1½ in. by ½ in. wide, the field poles being wound with 2 oz. per coil of No. 24 s. w.g. d.c.c. copper, for current from a 10-volt step-down transformer.—A. H. Avery.

RADIOGRAMS

ALTHOUGH up to the present Turkey has been backward in the development of her wireless system, native initiative has at last been given a free rein, and within the next year it is hoped to put two powerful broadcasting stations on the air. The 20-kilowatt transmitter allotted to Constantinople has already been erected by a French company at Osmanié, and connected by landline to the studio situated in the central post office of Stamboul, some twelve miles distant. Preliminary tests on a power of 6 kilowatts will be made towards the end of February or early in March next. The station will broadcast on a wavelength above 1,000 metres.

A broadcast transmitter, possessing a power of 10 kilowatts, will be erected at Angora, and will serve for both telegraphy and telephony. Its transmissions should be easily picked up in Western Europe, as the site of its aerial lies some 2,800 feet above sea level.

It is reported from Holland that the *Katholieke Radio Omroep* and the *Nederlandsche Christelyke Radio Vereeniging*, which up to the present have supported the Hilversum broadcasting station, have obtained, in conjunction with a political association, the authority of the Dutch Government to erect a 5-kilowatt transmitter in the vicinity of Amsterdam. Although no wavelength appears to have been fixed, it is stated that some 1,800 metres will be chosen. Two large studios, connected to the transmitter by landline are to be built at Amsterdam and Utrecht.

Radio-Forezien, a small station operated by a few wireless enthusiasts at Forez, Ste. Etienne, about thirty-three miles south-west of Lyons, has resumed its broadcasts on 220 metres. For the present, funds will not permit more than one transmission weekly, namely, on Wednesdays at 8.45 p.m. G.M.T.

Sweden has added a further relay station to its broadcasting system, namely, at Boras, in the province of Elfsborg, some thirty-six miles to the east of Gothenberg. It broadcasts on 230.8 metres, with a power of 200 watts.

In order to improve its transmitting plant, the Mont de Marsan (France) broadcasting station has temporarily closed down. When operations are resumed, it hopes to broadcast on higher power and similarly to Radio Toulouse, will include in its evening programmes a relay of foreign transmissions.

In various parts of Scotland, the Women's Rural Institutes, the Workers' Educational Association, and the Miners' Welfare Institutes are arranging for group listening to talks of educational value, such as the new series on "Scotland's Industrial Story."

So far as Scotland is concerned, it is stated that there is not the slightest possibility of dance music being introduced into the Sunday programmes.

High-frequency amplification was explained, with demonstrations, to Aberdeen Radio Society by Mr. D. J. McKellar, lecturer in Electrical Engineering at Aberdeen University.

Mr. G. L. Marshall, station director at Glasgow, who is being transferred at the end of February to fill a similar post at Newcastle, is one of the most highly qualified B.B.C. station directors in a musical sense. In view of the fact that the Newcastle musical director was recently appointed to head office, Mr. Marshall's work on Tyneside will be invaluable. Mr. D. Cleghorn Thomson, northern area director, is to act as interim station director at Glasgow for a period of three months.

Radio Montpellier, a small locally owned private broadcasting station in the south of France, by special arrangement, takes its daily news bulletin from PTT, Marseilles. The Paris Posts and Telegraphs have decided to erect a transmitter at Montpellier of which the power will be some 500 watts.

The new Innsbrueck relay transmitter has been taken over by the Vienna Broadcasting Company, but owing to the fact that the landline to the Austrian capital has not yet been completed, the station, although working nightly, is limited to the transmission of gramophone records and concerts provided by local talent. It is expected that the inaugural ceremony will take place in March. Innsbrueck broadcasts on a wavelength of 294.1 metres with a power of some 400 watts in the aerial. Owing to its favourable geographical position, its transmissions have already been picked up in Northern Germany.

Every Friday evening *PTT*, Toulouse, relays to its listeners the concert broadcast by Bordeaux-Lafayette; on the other hand, the latter takes an entertainment from Toulouse on every alternate Tuesday. Although the transmitting plant utilised by both stations is State property, they are actually owned and run by local wireless associations.

A relay is to be taken of the Chelsea Arts Ball from the Albert Hall on February 24. From box number 49 on the second tier will be heard a running commentary on what is actually taking place with the music of a dance band in the background.

The recital of church choral music from Hurstpierpoint College has been postponed until March 6.

Mr. Fred Bowyer is responsible for a burlesque sketch with music by Cuthbert Clarke to be broadcast from the London station on March 10, under the title of *Our Mr. Lohengrin*!

The B.B.C. has now made arrangements for the transmission of well-known musical comedies. *The Lilac Domino* will be given on February 26 and *Irene* on March 12.

The Royal Command Performance of the Variety Artists' Benevolent Fund will be broadcast in its entirety on February 24 from all stations of the B.B.C. Among the artistes listeners will hear are the following: Jack Edge, Mr. Flotsam and Mr. Jetsam, Miss Mona Grey, the Huxter Brothers, Norman Long, Miss Lily Morris, Debroy Somers and his All-British Band, the Victoria Girls, Albert Whelan, and Wee Georgie Wood assisted by Miss Dolly Harmer in the sketch *The Black Hand Gang*. As some of the items in this programme rely largely on visual effects for their success, in order to help listeners to understand what is taking place on the stage, Tommy Handley, the well-known broadcasting comedian, will give a brief running description of these turns. Although items from a command performance have been broadcast previously, this will be the first occasion on which a *complete* command performance or, indeed, a *whole* performance of any description has been relayed from a theatre. Their Majesties the King and Queen will be present.

People are still talking about the value of the numerous talks that have been broadcast from the B.B.C. stations during recent weeks. An anti-talks enthusiast was getting excited the other evening. "Look here," he said, "what our nation wants is more song, more music. Did you hear Sir H. Walford Davies give his lectures entitled 'Music and the Ordinary Listener'? Marvellous! What we want is more music." But he failed to understand that that series was a series of talks. Simple language was used; the speaker spoke clearly, lucidly; his tonation was perfect; his emphasis good. Talks such as those are worth while. Sir Walford's new series promises to be as good as his last.

BROADCAST TELEPHONY

NOTE.—*In the following list of transmissions these abbreviations are observed : con. for concert ; lec. for lecture ; orch. for orchestral concert ; irr. for irregular ; m. for metres ; and sig. for signal.*

GREAT BRITAIN

The times given are according to Greenwich Mean Time.

London (2LO), 361.4 m. 1-2 p.m., con. ; 3.15-4 p.m., transmission to schools ; 3.30-5.45, con. (Sun.) ; 4.15 p.m., con. ; 5.15-5.55, children ; 6 p.m., dance music ; 6.30 p.m., time sig., news, music, talk ; 8-10 p.m., music ; 9.0, time sig., news, talk, special feature. Dance music daily (exc. Sundays) from 10.30 until midnight.

Aberdeen (2BD), 500 m. **Belfast** (2BE), 306.1 m. **Birmingham** (5IT), 326.1 m. **Bournemouth** (6BM), 491.8 m. **Cardiff** (5WA), 353 m. **Glasgow** (5SC), 405.4 m. **Manchester** (2ZY), 384.6 m. **Newcastle** (5NO), 312.5 m. Much the same as London times.

Bradford (2LS), 252.1 m. **Dundee** (2DE), 294 m. **Edinburgh** (2EH), 288.5 m. **Hull** (6KH), 294 m. **Leeds** (2LS), 277.8 m. **Liverpool** (6LV), 297 m. **Nottingham** (5NG), 275.2 m. **Plymouth** (5PY), 400 m. **Sheffield** (6FL), 272.7 m. **Stoke-on-Trent** (6ST), 294 m. **Swansea** (5SX), 294 m. **Daventry** (25 kw.), high-power station, 1,600 m. Special weather report, 10.30 a.m. and 10.25 p.m. (weekdays), 9.10 p.m. (Sun.) ; 11.0 a.m., light music (exc. Sat. and Sun.) ; relays 2LO from 1 p.m. onwards. Time sig. : 10.30 a.m., 4.0., and 10.0 p.m.

IRISH FREE STATE

Dublin (2RN), 319.1 m. Daily, 7.25 p.m. Sundays, 8.30 p.m. until 10.30 p.m.

Cork (under construction), 400 m.

CONTINENT

Unless otherwise stated, all times are p.m. (G.M.T.).

AUSTRIA

Vienna (Radio Wien), 517.2 m. (5 kw.) and 577 m. 7, con. ; 9.30 dance (Wed., Sat.).

Relays : **Graz,** 357.1 m. (750 w.) ; **Klagenfurt,** 272.7 m. ; **Innsbrueck,** 294.1 m.

BELGIUM

Brussels, 508.5 m. (1.5 kw.). 5.0, orch. (Tues., Thurs., Sat. only), news ; 8.0, lec., con., news.

CZECHO-SLOVAKIA

Prague, 348.9 m. (5 kw.). Con., 7.0 (daily).

Brunn, 441.2 m. (3 kw.). 6.0, con. (daily).

***Koszice,** 300 m. (2 kw.).

*Bratislava, 263.2 m. (500 w.).

*Relay Prague.

DENMARK

***Copenhagen,** 337 m. (700 w.). Sundays : 9.0 a.m., sacred service ; 3.0. con. ; 7.0, con. Weekdays : 7. ; lec., con., news ; dance to 11.0 (Thurs., Sat.).

*Relayed by Soro (1,153.8 m.).

ESTHONIA

Reval, 440 m. (2.2 kw.). 5.0, con. (daily).

FINLAND

Helsingfors, 375 m. (1.2 kw.). 6.10 con.

GRAND DUCHY OF LUXEMBURG

Radio Luxemburg, 1,200 m. (250 w.). **Con.** ; 2.0 (Sun.), 9.0 (Tues.).

FRANCE

Eiffel Tower, 2,650 m. (8 kw.). 6.40 a.m., weather (exc. Sun.) ; 11.0 a.m., markets (exc. Sun. and Mon.) ; 11.20 a.m., time sig., weather ; 6.0, talk, con., news ; 7.0 and 11.10, weather ; 9.0, con. (daily). Relays PTT, Paris, Sat., 9.10-11.0, and weekday afternoons. Testing on 50 kw.

Radio-Paris (CFR), 1,750 m. (about 3 kw.). Sundays : 12.0 sacred service ; 12.45, con., news ; 4.30, Stock Ex., con. ; 8.15, news, con. or dance. Weekdays : 10.30 a.m., news, con. ; 12.30, con., markets, weather, news ; 4.30, markets, con. ; 8.0, time sig., news, con., or dance. Testing on 30 kw.

L'Ecole Sup. des Postes et Telegraphes (PTT), Paris, 458 m. (5 kw.). 3.0, lectures (relay of Sorbonne University) ; 8.30, lec. (almost daily) ; 9.0, con. (daily).

Le Petit Parisien, 340.9 m. (500 w.). 9.15, con. (Tues, Thurs., Sat., Sun.).

Radio L.L. (Paris), 350 m. (250 w.). Con. (Mon., Wed., Fri.), 9.30.

Biarritz (Côte d'Argent), 200 m. 6.0, con. (Mon., Wed., Fri.).

Radio Vitus (Paris), 308 m. 9.0, con. (Wed., Fri., Sun.).

Lille, 1,300-1,500 m. Testing.

Radio-Toulouse, 389.6 m. (3 kw,). 5.30 news (exc. Sun.) ; 8.45, con. ; 9.25, dance (daily).

Radio-Lyon, 291.3 m. (1.5 kw.). 8.20, con. (daily) ; 4.0 (Sun.).

Strassburg (8GF), 222.2 m. (1½ kw.). 9.0, con. (Tues., Fri.) ; 9.20-12.0, dance (Sat.).

Strassburg (Military Stn.), 200.1 m. (15 kw.). Con., 9.0 (Wed.). Testing on var. wl.

Radio Agen, 297 m. (250 w.). 8.30 con. (Tues., Fri.).

***Lyon-la-Doua,** 475 m. (1 kw.). Own con., 8.0 (Mon., Wed., Sat.).

***Marseilles,** 309 m. (500 w.).

***Toulouse,** 245 m. (500 w.).

*Relays of PTT, Paris.

Montpellier, 252.1 m. (1 kw.). 8.45 (Wed., Fri.). For news, relays Marseilles.

Beziers, 180 m. (300 w.). 9.0 (weekdays only).

Juan-les-Pins (Radio LL), 230 m. (300 w.). 9.0, con., news.

Angers (Radio Anjou), 275.2 m. (250 w.). Daily : 8.30 news, lec., con.

Bordeaux (Radio Sud-ouest), 238 m. (1 kw.). 7.25, con. (Thurs.).

Bordeaux (Lafayette), 419.5 m. (1½ kw.). Con., 5.0, 9.0 (weekdays), 2.30 (Sun.). Relays PTT, Paris, 8.30 (Sat.).

Mont de Marsan, 400 m. (500 w.). Con., 8.30 (daily, exc. Sun. and Wed.). Temporarily suspended.

Algiers (N. Afr.) (PTT), 310 m. (50 w.). 7.0-10.0, daily.

Carthage (Tunis), 1,850 m. (5 kw.). 6.30, con., dance.

Casablanca (Morocco), 306.4 m. (3 kw.). 8.30, con. (daily) ; 10.0, dance (irr.).

Fort Ste.-Etienne (Loire) 220 m. (0.3 kw.). 8.45 con. (Wed.).

GERMANY

Berlin, on 483.9 and 566 m. 8.0 a.m., sacred con. (Sun.) ; 11.55 a.m., time sig., news, weather ; 5.30 orch. ; 7.30, con., weather, news, time sig., dance music until 11.30 (daily, exc. Tues.). Relayed on 1,300 m. by Königswusterhausen (1,250 m.) and Stettin (252.1 m.).

Konigswusterhausen (LP), 1,250 m. (12 kw.). 10.30-11.50 a.m., con. (Sun.) ; 2.0, lec. (daily) ; 7.30, relay of Berlin (Vox Haus) con. (daily). 2,525 m. (5 kw.), Wolff's Buro Press Service : 5.45 a.m. to 7.10. 2,900 m., Telegraphen Union : 7.30 a,m. to 6.45, news. 4,000 m., 6.0 a.m. to 8.0, news.

Breslau, 322.6 m. (4 kw.). 11.0 a.m., con., (daily), Divine service (Sun.) ; 4.0, con. ; 6.0, lec. ; 7.30, con. Relay : Gleiwitz, 250 m.

Frankfort-on-Main, 428.6 m. (4 kw.). 5.0 to 5.15 a.m. (exc. Sun.), physical exercises ; 7.30 a.m., sacred con. (Sun.) ; 3.0., con. (Sun.) ; 3.30, con. ; 7.0, lec., con., weather. Dance : relays Berlin. Relay : Cassel, 272.7 m.

Hamburg, 394.7 m. (4 kw.). Relayed by Bremen (400 m.), Hanover (297 m.), Kiel (254.2 m.). Sundays : 7.25 a.m., time sig., weather, news ; 8.15 a.m., sacred con. ; 12.15, con. ; 5.0, con. ; 7.0 con. Weekdays : 6.0 a.m., time sig., weather, news ; 11.55 a.m., Nauen time sig., news ; 1.0 weather, con. ; 8.0, con., dance.

Konigsberg, 329.7 m. (4 kw.). 8.0 a.m., sacred con. (Sun.) ; 7.0, con. or opera, weather, news, dance (irr.). Relay : Danzig, 272.7 m.

Langenberg (Rhineland), 468.8 m. (25 kw.). Relays Elberfeld, Muenster, Dortmund, Cologne (Studio).

Leipzig, 365.8 m. (4 kw.). Relayed by Dresden (294.1 m.). 7.0 a.m., sacred con. (Sun.) ; 7.15, con. or opera, weather, news, dance music.

Munich, 535.7 m. (1½ kw.). Relayed by Nuremberg (303 m.). 10.30 a.m., lec., con. (Sun.) ; 3.0, orch. (Sun.) ; 3.30, con. (weekdays) ; 5.30, con. (weekdays) ; 6.15, lec., con.

Muenster, 241.9 m. (1.5 kw.). Relayed by Dortmund (283 m.). 8.0 a.m., Divine service ; 11.0 a.m., news (Sun.) ; 6.40 news, weather, time sig., lec., con.

Norddeich (KAV), 1,800 m. 11.0 and 3 a.m., weather and news.

Stuttgart, 379.7 m. (4 kw.). 10.30 a.m., con. (Sun.) ; 3.30, con. (weekdays) ; 4.0 con. (Sun.) ; 5.30, time sig., news, lec., con. (daily) ; 8.15, time sig., late con. or cabaret. Relay : Freiburg, 577 m. (1½ kw.).

HOLLAND

Hilversum (HDO), 1,020 m. (5 kw.). Sundays : 10.0 a.m., sacred service ; 2.10, con. ; 4.40, church service ; 7.40, weather, news, con. Weekdays : 4.30, con. ; 7.50, news, con.

Scheveningen-Haven, 1,950 m. (2½ kw.). Throughout day.

HUNGARY

Buda-Pesth (Csepel), 555.6 m. (3 kw.). 7.0, con. or opera ; dance nightly.

ICELAND.

Reykjavik 333.3 m. (700 w.). Con., 7.30.

ITALY

Rome (IRO), 449 m. (3 kw.). 7.30, news, weather, con. ; 9.15, late news.

Milan 315.8 m. (1 kw.). 8.0-11.0, con.

Naples, 333.3 m. (1½ kw.). 8.0-11.0, con.

JUGO-SLAVIA

Zagreb (Agram), 310 m. (500 w.). 7.15, con.

LATVIA

Riga, 480 m. (5 kw.). Con. daily, 7.0. Testing on 15 kw. (1,500 m.).

LITHUANIA

Kovno, 2,000 m. (15 kw.). 6 p.m. (daily).

NORWAY

Oslo, 461.5 m. (1.5 kw.). 6.15, news, time, lec., con. ; 9.0, time, weather, news, dance.

Bergen, 370.4 m. (1 kw.). 6.30, news, con.

***Fredriksstad,** 436 m.

***Porsgrund,** 504 m. (1½ kw.).

***Hamar,** 566 m.

***Rjukan,** 443 m. (1 kw.).

*Relays Oslo.

POLAND

Warsaw (High Power), 1.111.1 m. (10 kw.). 7.30, con.

Posen, 270.9 m. (4 kw.). Testing.

Lemberg, 247.9 m. Under construction.

RUSSIA

Moscow (RDW), 1,460 m. (15 kw.). 4.55, news and con. ; 10.0 chimes from Kremlin.

Moscow (New Central), 1,000 m. (100 kw.). Testing.

Leningrad, 1,010 m. (10 kw.). 5.0.

SPAIN

Madrid (EAJ7), 373 m. (1.5 kw.). Con. daily. Closes 1 a.m. (daily).

Madrid (EAJ4), 375 m. (2½ kw.). 5.0 con.

Madrid (Radio-Madrilena) (EAJ12). Testing on 303-310 m. (2½ kw.).

Barcelona (EAJ1), 325 m. (1½ kw.). 6.0-11.0 (daily).

Barcelona (Radio Catalana) (EAJ13), 460 m. (1 kw.). 7.0-11.0, con., weather, news.

Bilbao (EAJ9), 436 m. (500 w.). 7.0, con.

Bilbao (Radio Vizcaya) (EAJ11), 418 m. (500 w.). 8.0-12.0, con. (daily).

Cadiz (EAJ3), 360 m. (550 w.). 7.0-9.0, con., news. Tests daily (exc. Sun.), midnight.

(*Continued in second colomn of page* 344)

WIRELESS IN PARLIAMENT

From our own Correspondent.

IN answer to Col. Applin, who asked whether a licence was required for each receiving set in use, Viscount Wolmer said that a wireless receiving licence entitled the licensee to use wireless apparatus in the premises occupied by him. One licence would cover any number of sets installed in the same premises for the use of the licensee, his family, or his servants, but any other person occupying a portion of the same house under a separate tenancy desiring to instal wireless receiving apparatus must take out a separate licence. When a licensee ran telephone leads from his set to the house of a neighbour or to any premises other than those in his own occupation for the purpose of conveying broadcast programmes there, a separate wireless licence was necessary for such premises.

Sir W. Mitchell-Thomson informed Mr. G. Peto, that he would not consider the reduction of the licence for crystal wireless sets to 5s. per annum.

Major Ainsworth, asked the Postmaster General, whether his attention had been called to the broadcasting of a regular entertainment by an amateur station at Manchester; and what action, if any, had been taken in the matter, in view of the terms of the licence issued to the British Broadcasting Corporation.

Mr. Grotrian asked whether any attempts had been made by amateur organisations in this country, and, if so, of what nature and with what result, to carry on broadcasting among the different members?

Sir W. Mitchell-Thomson said his attention had recently been called to a case in which an experimental wireless station had been used for the transmission of concerts. The licensees claimed that those concerts were necessary for the purpose of scientific experiments which they were conducting; but he was not satisfied on that point, and he had asked them to discontinue the concerts until the matter had been considered in the light of certain information which he had requested them to furnish.

Mr. Harland asked whether, as the Wireless Telegraphy (Blind Persons Facilities) Act, 1926, did not apply to blind persons who are resident in blind schools, blind institutions, or blind cottage homes, the Government intended to amend the Act so that all blind persons might receive the benefit conferred on other blind persons by that Act.

Sir W. Mitchell-Thomson, said that a blind institution, like other charitable institutions, could obtain permission for the installation of a number of wireless receiving sets under one licence at a fee of 10s. a year, and he did not think such a payment was unreasonable.

Replying to Mr. Hardie, who asked whether blind persons, having paid their wireless licence prior to 1st January 1927, would be given a rebate on the period covered by the licence beyond 1st January 1927, Sir W. Mitchell-Thomson said that the Wireless Telegraphy (Blind Persons Facilities) Act 1926, was not retrospective and contained no provision for the repayment of any part of the fees paid in respect of licences issued to blind persons before January 1st, 1927.

Mr. Duckworth asked the Postmaster General if he would give the attitude of his department towards the new regional broadcasting scheme; and whether there was any hostility to this development of alternative programmes on the part of either Government departments or commercial wireless services?

Sir W. Mitchell-Thomson said that he gave authority to the British Broadcasting Co. last year to undertake experiments with a view of ascertaining whether a regional scheme could be adopted without causing interference between one broadcasting station and another or between broadcasting stations and other wireless stations. The company conducted some experiments and the Corporation were at present arranging to carry out further experiments. The answer to the latter part of the question was in the negative.

Mr. Day asked if an application had been received from the British Broadcasting Corporation for the Postmaster General's permission to grant facilities to this corporation, so that alternative transmission of double programmes could be broadcast either from Daventry or their London stations?

Sir W. Mitchell-Thomson said that permission was granted some months ago for experiments in connection with a suggested scheme of regional high-power stations, one of the objects of which was to facilitate the broadcasting of alternative programmes. The experiments had not yet been concluded.

BROADCAST TELEPHONY

(*Continued from page* 342)

Cartagena (EAJ15), 335 m. (500 w.). 8.30-10.0, con. (daily).

Seville (EAJ5), 357 m. (500 w.). 9.0, con., news, weather. Close down 11.0.

Seville (EAJ17), 343.9 m. (500 w.). 7.0-10.0, con. (daily).

San Sebastian (EAJ8), 346 m. (1.5 kw.). 5.0-7.0, 9.0-11.0 (daily).

Salamanca (EAJ22), 405 m. (1 kw.). 5.0 and 9.0, con. (daily). Closes down 11.0.

SWEDEN

Stockholm (SASA), 454.5 m. (1½ kw.). 10.0 a.m., sacred service (Sun.); 5.0. sacred service; 6.0, lec.; 8.15, news, con., weather. Dance (Sat., Sun.), 8.45.

SWITZERLAND

Lausanne (HB2), 850 m. (1½ kw.). 7.0.

Zurich, 494 m. (500 w.). 10.0 a.m., con. (Sun.); 4.0, con. (exc. Sun.); 7.15, lec., con., dance (Fri.).

Geneva (H.B1), 760 m. (2 kw.). 7.15, con. (weekdays). No transmission on Sun.

HOW YOUR ACCUMULATORS ARE MADE

THE accumulator may seem to be a very simple affair, but for those who make them, and have to guarantee their efficiency under very varied conditions of service, they represent some very difficult problems in chemistry and physics. This was very apparent to the writer on the occasion of a recent visit to the works of Messrs. C. A. Vandervell & Co., Ltd., of Acton, London, who need no introduction to wireless enthusiasts.

The visitor is at once impressed with the orderliness and cleanliness of every department. The operations are so arranged that the work is continuously moving from the first operation of casting the grids to the assembly of the finished battery, inspection, packing and dispatch.

Casting the Grids

The grids are die cast in pairs by the use of ingenious machines situated close to the large furnaces, and pass at once down a conveyor to the press shop, where they are trimmed and flattened in dies, and pass on by means of a conveyor to the pasting department when the lattice work structure of the grid is filled with the active oxides.

Exceptional precautions have to be taken in this department to prevent a poisonous dust arising and the operation is carried out on tables completely covered in by an air tunnel through which about 200 ft. of free air is passing every minute.

Drying and Forming

After pasting, the plates are mounted in trucks and subjected to a very interesting drying operation carried out in large kilns, the entire operation occupying about six hours. An overhead railway now carries the plates to the formation building (*see picture above*) in which boxes of novel design containing acid and electrically connected in circuits are ready to receive the plates; here for about 50 hours the plates are subjected to the action of electric currents which bring about the necessary chemical changes.

Various drying and pressing operations now take place, and the plates pass once more to a revolving conveyor, where they are mounted in jigs or frames and automatically fused into the desired groups by oxygen blowpipes.

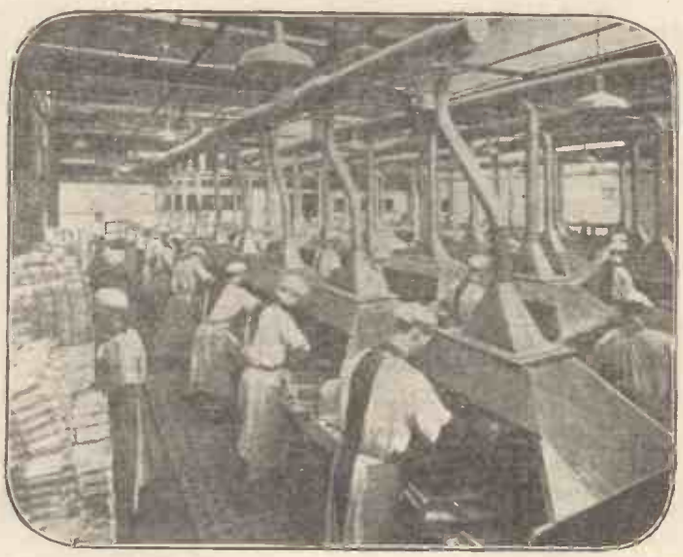
Assembling

The positive and negative sections are now carefully inspected and stamped, and pass on to a short railway, and as they move along, skilled operators insert the separators or rubber insulation between the plates. The partly-assembled units are next mounted in the cases, and this is accomplished during their passage down a long steel band, moving at the rate of six feet per minute.

Whilst the batteries are moving on this band, the cells are sealed and inter-cell connectors are burned on and labels attached. Final inspection is then carried out as the battery moves along a roller conveyor.

The range of C.A.V. batteries specially designed for wireless work is extensive, and comprises high-and-low-tension units of all capacities to meet varied requirements. The long experience of the company is behind all their designs, and every unit turned out is first class in quality and finish.

The Grids are cast in pairs by hand-operated machines.



This is the pasting department with its special system of ventilation.

"SORTING OUT WIRELESS CURRENTS"

(*Continued from page 314*)

short-circuit both the high and the low-tension batteries; but fortunately they cannot.

If we wire a condenser between the terminals of a battery and place a galvanometer in the circuit, we shall find on switching on that the measuring instrument gives a marked "kick" and then returns to zero. This means that at the instant of switching on, a momentary direct current flows to charge up the condenser, after which no current whatever passes.

If an oscillating current is applied to a condenser, one plate is charged alternatively positively and negatively, the other plate receiving exactly opposite charges. There is thus a flow of electrons first in one direction and then in another, the net result being that the oscillating current appears to pass through the condenser. Hence C X, in Fig. 1, allows the unwanted high-frequency impulses to leak away to earth whilst it absolutely prevents a short circuit of the batteries. The combination of the H.F. choke and of the condenser thus sorts out the high-frequency from the low-frequency and the direct impulses making each take the path which we desire it to follow.

Fig. 2 shows yet another instance of the shepherding action of chokes and condensers. V 1 is coupled to V 2 by means of the familiar tuned-anode arrangement. On reaching the point Z, high-frequency impulses have two possible paths, one through the circuit consisting of the coil L and the condenser C, the other through the condenser C X to the grid of the second valve. Since coil L is tuned by the condenser C, it offers a practically infinite impedance to H.F. oscillations of the desired frequency; they are therefore prevented from passing in this direction and travel instead through the condenser Z, which offers very little resistance to their passage. C X also insulates H.T. + from L.T. − and enables us to apply through the grid leak a positive potential to the grid of V 2.

Yet a third case is seen in the plate circuit of V 2 in Fig. 1. Here oscillations on leaving the plate are prevented by the low-frequency choke from passing to the positive terminal of the high-tension battery. They are driven through the condenser C Y to the telephones or loud-speaker, after passing through the windings of which they go to earth. There is no hindrance to the passage of direct current from the high-tension battery, which makes light of the low-frequency choke.

The sorting-out action of chokes and condensers thus enables us to separate high-frequency from low-frequency currents and to bar or pass direct current just as we wish. If it were not for these shepherding actions no "straight" valve circuit could be made to function and the reflex could never have been brought into existence.

R.W.H.

Petit Parisien.—The Paris Correspondent of *The Newspaper World* stated the other day that the Paris newspaper station, *Petit Parisien*, which broadcasts excellent concerts, and which are well received here, was about to close down. Our correspondent in the French capital is informed that there is no truth in the statement. On the contrary further experiments are being carried out to relay America again for the enjoyment of listeners and it was expected that they would be able to put KDKA (East Pittsburg) on the air again on February 22.

A Ridiculous Rumour.—Where it came from we do not know, but there is in circulation a rumour to the effect that the A.J.S. Company (A. J. Stevens & Co. (1914) Ltd.), of Wolverhampton are discontinuing the manufacture of radio apparatus. The Company is very annoyed at the prevalence of the rumour and we are personally very glad to assist in giving publicity to the fact that there is absolutely nothing in it. The A.J.S. Company is very much alive and has in the course of development some very interesting plans concerning radio development.

The "M.C. Three"

SIR,—As it was mentioned in the second article on the "M.C. Three" receiver that you would like to hear constructors' results, I have pleasure in giving my experience. About thirty stations came in with remarkable ease, a slight increase of reaction being required for the lower frequencies. Excepting London, none could be got at loud-speaker strength, though several could be worked up with careful reaction to be audible over a room with an Amplion loud-speaker. The dial readings which were given were presumably on a 3800 dial, and so are difficult to compare with my own. London interfered with stations for a considerable distance on either side.

I tried a smaller aerial series condenser, but the volume was much diminished. I was glad of your hint to connect the grid leak to negative, as I found it impossible to obtain smooth reaction when connected to positive. I may say that I could not quite get the H.F. valve to neutralise out in this receiver. I am very pleased with the delightfully easy and smooth way in which the "M.C. Three" picks up stations.

F. D. P. (Enfield.)

SIR,—A few notes with regard to the "M.C. Three," which I have just built, may be of interest to you.

Within five minutes of completion I tuned in Glasgow, which was of sufficient strength to put on the loud-speaker, and later in the evening I heard about twelve stations (including Birmingham, Bournemouth, Hamburg, Copenhagen, etc.) at loud-speaker strength; of course, there were many more on 'phones.

I was particularly struck by the ease of operation and selectivity. My location is within two miles of 2 L O, and this station went completely out in about 300-; I have never been able to do this before with any set, which, I think, says a great deal for it.

R. S. R. (London, N.W.1.)

Transatlantic Telephony

SIR,—I was interested in the article on "The Transatlantic Telephony: Can it be Made Secret?" First of all, I would like to point out an error, as I have seen the same mistake made in a number of papers. In your article, the Rugby wavelength is given as 1,550 metres. This is quite wrong; the correct wavelength is 5,400 metres. It is also stated that the employment of H.F. amplification is necessary to obtain long-distance interception, as recorded in the Press. May I point out this is quite unnecessary, as I have heard the Rocky Point replies on a large number of occasions on a simple two-valve set (det. and L.F.).

D. S. (Sutton Coldfield).

Coil Winding

SIR,—It is sometimes necessary for the experimenter to wind a solenoid coil having an equal air space between each turn. Unless a threaded former is available, it is a rather difficult matter to space the windings neatly and accurately.

The writer, however, finds the difficulty removed if a reel of very thin cotton is obtained and wound simultaneously on the former with the wire. The coil when complete will thus consist of alternate windings of wire and cotton. When the ends of wire have been made fast and the coil finished, it is an easy matter to unwind the cotton, leaving a neatly wound and air-spaced coil on the former.

J. T. (Renfrew).

Turkey, which is completing its first radio station at Angora, is said to be planning five or more in addition. Spain is taking steps to erect a high-power transmitter on the island of Fernando Po, in its West African possessions, to link them with Madrid. The existing equipment of that station will be placed on the mainland, previously reached only by semi-monthly steamer.

Starting on February 27, the Cardiff Children's Hour will contain a "pets" corner. Mr. Gordon McConnell's "Tom, Dick, and Harry" stories have suggested the idea, and children who have pets will be given advice about them by Mr. Ray Kay if they write to the Cardiff Station.

Extensive use of radio for spreading agricultural information and home economics is reported by the U.S. Department of Agriculture. Thirty-four States are now providing for the broadcasting of extension courses. Fourteen agricultural colleges are operating broadcasting stations with 500 watt power or more, with several other colleges on lower power. Ten States are using commercial stations for regular broadcasting of agricultural topics, and ten other States make occasional use of such stations by furnishing manuscript material for the announcers, or, if opportunity offers, representatives from the colleges do the broadcasting.

Telephotography—the act of sending pictures by wireless—will become a business proposition next month between the stations of Telefunken, Berlin, and the Radia Austria, Vienna. It is now attested that two pictures a minute can be transmitted. Already deeds, bank-notes, cheques, warrants, maps and all other kinds of "scraps of papers" have been transmitted.

Mr. C. C. N. Wallich, station director at Plymouth, has been appointed director of the Calcutta station, and will sail from England on March 4. He will hold the senior station directorship under the Indian Broadcasting Company.

"RUNNING YOUR FILAMENTS FROM THE MAINS" (*continued from page* 316)

manner. Connect the length of flex, to the input terminals of the filament lighting transformer, the other end of these terminals being connected to an ordinary adaptor which plugs into a lighting or heating socket as required. It is very useful in this connection to obtain a two-way holder, so that the receiver may be wired in parallel with an ordinary electric lighting socket. Various types of holder can be obtained, some of which switch off actually at the holder, while others switch off at the main switching point. This, however, is a matter of detail which can readily be left to the individual.

Particular care must be taken, of course, to avoid anything in the nature of a short-circuit when making this connection, as if the connections are not in order, the lighting fuses will blow when the receiver is connected to the mains supply. An H. T. battery should then be obtained and connected to the requisite terminals. Some 60 to 90 volts should be provided for the L. F. high-tension, the detector valve requiring somewhat less, the amount varying from 40 to 60.

Grid Bias

The grid bias must now be connected to the remaining terminals at the back of the receiver. It will be noted that two positive grid-bias terminals have been provided and one negative. This has been done because it will be found better under normal conditions to connect the grid-leak on a detector valve to a small positive potential. With the KL1 valve, as a matter of fact, the grid current commences to flow at a small negative potential, contrary to many of the valves at present in use to-day, so that quite satisfactory results would be obtained by connecting the grid leak to the cathode itself, without any additional grid bias, or even by using a small negative potential, but in practice it was found that a noticeable increase of signal strength resulted by utilising 1½ volts positive potential.

This, therefore, is a matter for the individual to decide, and if he requires fairly good selectivity he should connect the grid leak to a negative potential, whereas if signal strength is a considerable, the positive bias should be provided. In order to try out which is best in the various conditions, the first G. B. + terminal, namely, the one connected to H. T.— should be placed in the 1½-volt socket in the grid-bias battery. The G. B. — terminal should then be connected to —6 or —9, as required, depending upon the H. T. supply to the L. F. valves. Finally, the other G. B. + terminal may either be connected to the positive end of the grid-bias battery, in which case the detector grid leak is 1½ volts positive with respect to the cathode, or alternatively in the —3 socket, in which case it is 1½ volts negative. If the wander plugs used are of the variety which plug one into the other, it is also possible to try the effect of having no grid bias on the detector at all.

With a little trial a position will easily be found where signal strength is good and the reaction control on the regenerative tuner is smooth and easy. Having chosen some particular connection to try first of all, the valves may be inserted in the sockets and the flex leads connected to the terminals on the side of the cap. The adaptor from the transformer may then be plugged in the lighting socket and the set switched on. Adjust the rheostat until the independently heated cathodes are just glowing a dull red.

The potentiometer across the secondary of the filament-lighting transformer should then be adjusted somewhere about the middle point until the hum from the mains is a minimum. Particular care should be taken to keep the hands well away from the transformer itself during this operation, as if the high voltage terminals are touched an unpleasant shock will result. It may be found that the hum does not quite vanish. This is often due to a certain amount of direct pick-up from the mains, independent of the fact that the cathodes are heated by alternating current. Find the minimum point therefore, and then proceed to search for signals, when it will usually be found that excellent reproduction can be obtained without any trace of interference from the mains.

The Range Switch

The switch on the Wearite tuner should be adjusted as follows. It will be found that the switch itself contains a ring on the outside of the moving portion and a small stud at one particular point which is in electrical contact with the ring. Contact with the ring is made by a long spring, while a series of shorter springs make contact with the stud, the actual connections depending upon the position in which the switch is placed. Rotate the switch until this contact stud is under the long spring. The dial should then be set, so that this reads "off."

In this position the whole of the winding is short circuited. As the switch is rotated, so increasing portions of the windings are "un-short" circuited. It will be found that the lower broadcasting stations will tune in on ranges 1 or 2 (2 L. O. tuned in on an ordinary aerial about the middle of range 2). The upper ranges will tune in on stud 3, while Daventry will be found on stud 7.

By suitable adjustment of the filament brilliancy, together with the potentiometer, a setting will easily be found at which good and strong signals can be obtained without any mains interference. When this position is obtained, all that is necessary is to switch the set on or off with the usual electric-light switch.

TRADE BREVITIES

The Linwood range of loud-speakers is illustrated and described in a well-produced leaflet received from Dent & Co., and Johnson, Ltd., of Linwood Works, Linwood, near Paisley.

All the well-known Eelex components are detailed in a pamphlet received from J. J. Eastick & Sons, of Eelex House, 118 Bunhill Row, E.C.1.

L. McMichael, Ltd., of Wetham Road, Slough, Bucks, have pleasure in informing us that they are in a position to supply their well-known "Dimic Four" receivers in Japanese lacquered cabinets.

A large and striking window poster, designed to advertise the new Cossor 2-volt R.C. valve, has been issued to the wireless trade by A. C. Cossor, Ltd., of Aberdeen Works, Aberdeen Lane, N.5.

MUSIC AT THE "IDEAL HOME" EXHIBITION

IT is a tribute to the efficiency of the present-day loud-speaker that these instruments are to be used to provide the music at the forthcoming "Ideal Home" Exhibition. The loud-speakers to be used are the Celestion make, and these will be working in conjunction with the new Super Cliftophone, an electrical gramophone apparatus of recent invention. The particular model selected is the A 3, which retails at £7 10s., and the fact that the instruments will have to be capable of dealing with a large input without blasting speaks well for their general all-round performance.

THE K I THREE-VALVER

FULL constructional details of a three-valve receiver incorporating the new K L 1 valves are contained in a well-produced and lavishly illustrated booklet just issued by the Marconiphone Co., Ltd., of 210-212 Tottenham Court Road, W.1. As a further guide to intending constructors of the "K 1 Three-valver," this firm are supplying, with the constructional booklet, a full-size three-colour wiring plan and layout. The "K 1" receiver takes both H.T. and L.T. voltages from the electric-light mains, and the total power required is under 50 watts. All readers who are interested in this new departure in receiver design should write to the address given, mentioning AMATEUR WIRELESS, and enclosing 6d. in stamps with the application, when the booklet and wiring plan will be forwarded.

"Amateur Wireless and Electrics." Price Threepence. Published on Thursdays and bearing the date of Saturday immediately following. Post free to any part of the world: 3 months, 4s. 6d.; 6 months, 8s. 9d.; 12 months, 17s. 6d. Postal Orders, Post Office Orders, or Cheques should be made payable to Bernard Jones Publications.

General Correspondence is to be brief and written on one side of the paper only. All sketches and drawings to be on separate sheets.

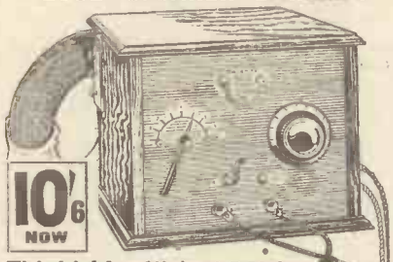
Contributions are always welcome, will be promptly considered, and if used will be paid for.

Queries should be addressed to the Editor, and the conditions printed at the head of "Our Information Bureau" should be closely observed.

Communications should be addressed, according to their nature, to The Editor, The Advertisement Manager, or The Publisher, "Amateur Wireless," La Belle Sauvage, London, E.C.4.

GRAVES

2-VALVE LOUD SPEAKER BARGAIN.



This highly efficient 2-Valve Loud-Speaker Set is the finest wireless value ever offered.

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