

**MORE LOFTIN-WHITE EXPERIMENTS** (See Page 545)

# Popular Wireless

Every Thursday  
PRICE  
3d.

No. 261. Vol. XI.

INCORPORATING "WIRELESS"

June 4th, 1927.



**SPECIAL FEATURES THIS WEEK**

**A British Short-Wave Station**  
**HOW TO BUILD THE "MIDGET" PORTABLE**  
**The Robots of Broadcasting**  
**Operating the "Spanspace" Four**

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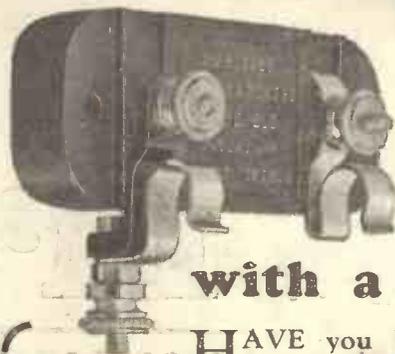
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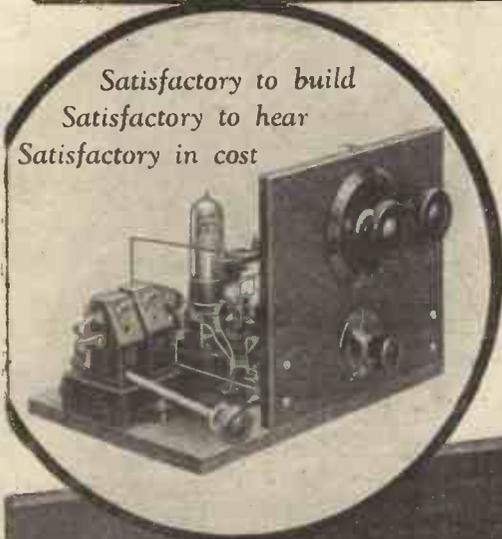
Adv. of the Dubilier Condenser Co. (1925), Ltd.,  
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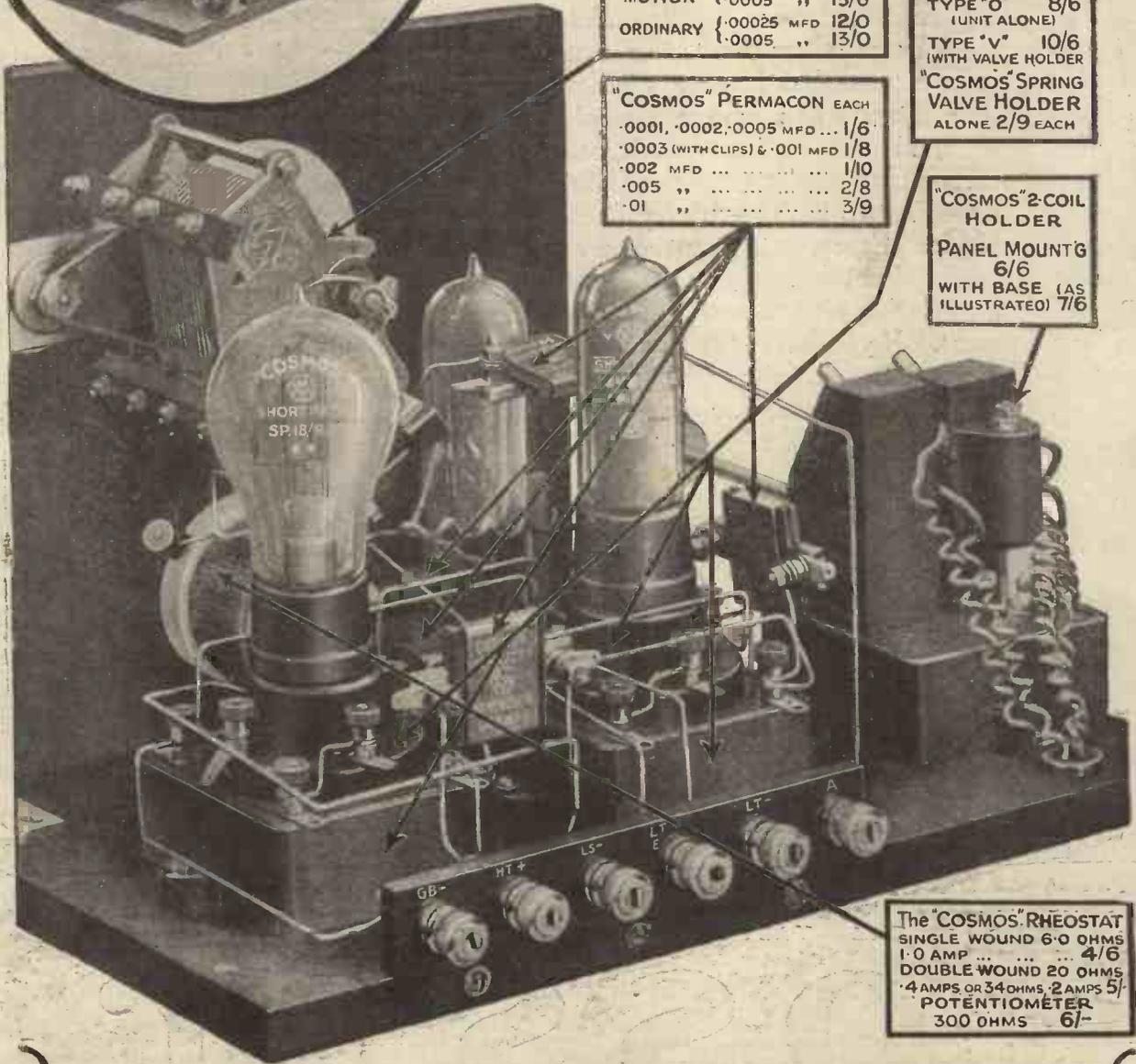
**"COSMOS" SPRING VALVE HOLDER**  
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.0001, .0002, .0005 MFD ...	1/6
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.005 "	2/8
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SINGLE WOUND 6.0 OHMS  
1.0 AMP ... 4/6  
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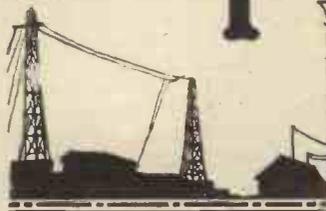
*Cossor Valves are available in four types for 2, 4 and 6-volt Accumulators. Every Wireless Dealer stocks them.*

## The Melody Maker

THE VALVE WITH THE KALENISED FILAMENT

# Cossor

# Popular Wireless



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## RADIO NOTES AND NEWS.

Empire Broadcasting—Musical Fish—Sunday Programmes—As Clear as Mud—Radio and Esperanto—Broadcast Publicity.

### Empire Broadcasting.

THE general demand for broadcasting to be delivered to the Empire from this country cannot be ignored, but is it premature? I know that a Continental firm has relayed 2 L O to the Antipodes on short waves, but wasn't it only a successful "stunt," after all? Nowhere is short wave telephony in more than the advanced experimental stage, not even in America.

### Peaceful Propaganda.

HOWEVER, when the art has reached the stage which the "men who know" consider to be sufficiently good for public service, I hope the matter of Empire broadcasting will receive the attention its importance deserves. Someone has said, "I care not who makes a country's laws, if I may make its songs." A profound remark. A nation's head and hand follow its heart. The most powerful propaganda, the strongest link of Empire, would be broadcasting from Britain.

### The Voice of the Raj.

LET the peoples of India and Africa hear the King's voice; let the exiles from these islands hear the old songs and hymns—ay! and the old jokes—that will do far more than Orders in Council, subsidies, armies and squadrons to keep the ear of the Commonwealth turned to Britain. It ought to be done, instead of building the next battleship. Two and a half million pounds would run the job for years.

### The Drawn Line.

THE numerous offers we have published from people who have old copies of "P.W." to give away have brought from time to time many letters from people asking us to appeal to readers for free wireless sets. I have a letter before me from someone who wants someone else to send him "P.W." each week. Kindness being generally uppermost in man, I have no doubt that all these wants would be supplied, but as I dare not risk curdling the milk of human kindness, I have to heave begging letters—with extremely rare exceptions—into the ordained place. Hospitals and so forth are in a different category.

### Musical Fish.

THE stage-struck goldfish I introduced a week or so back have aroused much interest amongst fish lovers, naturalists and students of the occult. But one reader, who calls himself "Veritas," tells me that four of his goldfish died after hearing a jazz band; the rest, though badly paralysed, being revived by doses of symphony. Well—er—my story was a true one!

### Let's Get a Shop.

MR. GORDON SELFRIDGE, not content with having his name a magnet to our "sisters, cousins and aunts," not to say wives, has a 900-ton steam-yacht, "Conqueror." This has just been fitted with a radio transmitter with a range of 300 miles, a special receiver for news, time signals and weather reports, and another for the reception of broadcasting. "Price ten shillings. Reduced to



The control table in the transmitting hall of the Grimsby Beam Station.

### The Young Hopeful.

A SURREY reader calls my attention to the feat of his son, aged eight, who made a crystal set which really works. He asks if anyone can beat this, and I will gladly referee. My son made a working windmill and also a dredger at the age of six. Does he qualify, or is Meccano barred? But I say! How frightfully aged all this makes a fellow feel.

nine and eleven-three." Hum! I think I have helped to pay for "Conqueror."

### Sunday Programmes.

MOST of us will agree that the Sunday afternoon programmes are generally pretty good, though there is evidently behind them a poetry-reading crank with too much influence. But the evenings  
 (Continued on next page.)

## NOTES AND NEWS.

(Continued from previous page.)

might, I think, be improved by relaying a church service at the normal time so that the musical programmes could begin at 8 p.m. instead of at 9.15 p.m. I believe that such a change would be welcomed also by the old folk and invalids.

### As Clear as Mud.

**I**NDULGENT readers will allow their back writer a little diversion, I am sure, so I pause in my strenuous mental labours to tell you that amongst my weekly batch of clippings I find the following pearl of price, from the pen of one of those experts. He is explaining reaction, and lets fall this: "One coil, the reaction, reacts on the coil to which it is coupled." We have long suspected this. Now we know for certain. The question is, however, does the coil which is *not* the reaction react on the coil which is? If it does, are not both of 'em reaction coils? It's your move.

### More Wireless Wisdom.

**T**HE Secretary of the Post Office is reported to have said in a speech at the Manchester Luncheon Club, "Wireless is only an alternative means of communicating a message, and it must stand or fall on its merits in competition with the older cable system." Well, that goes without saying, but as to "merits," I heard one of the really big men in telegraph affairs say recently that in fifty years' time "there might be a few small cables still working." I have heard the same expert often compare the position of the cable system to that of the stage coach when railways began to spring up.

### Radio and Esperanto.

**R**ADIO, knowing no frontiers, naturally attracts the Esperantist. I do not know whether Esperantists are such because they have no interest in separate nationalities, or because their artificial lingo is easier to learn than French or Kaffir. But they are "digging in" determinedly, and have just engineered the unanimous acceptance by the Union Internationale de Radiophonie of a resolution recommending broadcasting stations to arrange for weekly transmissions in Esperanto. If 2 L O does this I hope it will squeeze it in before 7.30 p.m. I learnt Esperanto once—it's a matter of a week's work—and then failed to find anybody who could talk the rummy stuff.

### The Six "Pips."

**T**HE B.B.C. say that their London tuning note and the six Greenwich "pips" have a frequency of about 1,315 cycles, and, in chamber music parlance, are roughly two octaves above middle E. I repeat this news for the use of piano-tuners. Query: Do piano-tuners read "P.W."?

### Conductors or Performers.

**S**IR HENRY WOOD is going to waggle his baton for the B.B.C. The thing to do is to say "How splendid!" I suppose. How splendid! Unfortunately, however, we cannot hear a conductor. It's the performers we want. How is it the B.B.C. can content Sir Henry Wood and

yet freeze out favourite performers like Squire and De Groot? They and the 2 L O Wireless Orchestra with Mr. Ansell would get on with listeners quite well. Anyhow, it all depends upon those Sir Henry is going to conduct and *what music*.

### Public Auditions.

**I** AM glad to see that my suggestion that the public should assist the B.B.C. occasionally in choosing new artistes has been repeated with enthusiasm by various newspapers up and down the country, and I respectfully submit it to the B.B.C. A public audition by radio once a month might be a useful revelation.

### Belfast's Music.

**W**R. (County Down) writes complaining of the Continental music by "old masters" poured out from the Belfast station orchestra, and wonders whether I can say how many of the "old masters" existed. All of 'em, and they still sting. My view is that music is none the worse for being old and written by a Continental composer, but that a great many of the noises in the programmes were written by people who had no ear for music—Honegger, for one—and ought to have been spring poets or bonesetters.

### Short-Wave Query.

**H**R.K., Huish, Radstock (near Bath), is a crystal enthusiast who specialises in short-wave reception. He observes the work of P C J J, the Dutch experimental station, with a connoisseur's ear; desires to correspond with other readers on his special subject and wants someone to send him a list of short-wave stations. Why

## SHORT WAVES.

There is no truth in the rumour that the B.B.C. has persuaded Mr. Gulliver, the well-known theatrical manager, to broadcast a talk about his celebrated Travels.—"Eve."

We read that a gramophone has recently been invented which reproduces sounds inaudible to the human ear. But our loud speaker has done this for several months now.

### HOUSEKEEPING BY RADIO.

I sweep my house to strains of martial music,  
I wash the dishes to the tinkle of guitars;  
I bake and stew and churn  
And let the biscuits burn  
While I learn the late geography of Mars.  
—"Radio Digest."

"Sir, I would like to marry your daughter."

"What's your occupation?"

"Wireless announcer."

"Take her. You're the first man who ever said good-night and meant it."—"St. John Globe."

There once was a radio fan  
Who said: "I'm an original man;  
I tune in my station  
Without oscillation,  
And there are very few people who can!"

"Whenever I hear on the wireless that it is going to be a fine day I always carry an umbrella."—Sir David Brooks in the "Daily Sketch."

2 L O!

2 L O!

Whispering through the ether all the things we want to know;

They broadcast sounds from London Zoo,

A lady sang a song or two,

But which was which I never knew.

2 L O!

—Yorkshire Observer."

not try 2 X A F and 2 X A D? They will make your crystal stretch itself and are bigger fish than P C J J.

### Try This One.

**O**R what about laying for E H 9 O C a 60-watts short-wave experimental station worked by the Swiss Telegraph Service. It relays the Berne programmes from 20.30 to 21.45 on 32 metres every Monday, Thursday and Saturday, with extra CQ signals for another half-hour.

### Transmitting Note.

**M**R. C. W. ANDREWS, Radio Station 2 T P, late of Wandsworth, has removed to 4, White Horse Drive, Epsom, Surrey.

### Extra Special.

**D**ON'T forget to keep June 7th free for the evening, so that you will not miss hearing Matheson Lang in his famous original part of Matathias, in "The Wandering Jew." It is to be a repeat of the Command performance which took place on May 23rd at Drury Lane. Full of "stars."

### Broadcast Publicity.

**S**OMEONE has recently expressed surprise that no pushing publicist has chartered a ship, fitted it with a broadcasting station, sailed over the three-mile limit and let fly with radio ads. Quite hopeless, thank goodness. No vessel registered here would get the P.O. licence for such work, and I am sure that any foreign ship that tried it would be torpedoed by the combined navies of Europe.

### The Newest Law Suit.

**B**BROADCASTING STATION W P C H is on top of the Park Central Hotel, New York City, and its proprietors are claiming £50,000 damages from the owners of the hotel, on the ground that the hotel electric roof-sign injures the transmission by absorption. One would like to follow the case in detail and to learn whether the hotel people lodge a counter-claim for burnt-out lamps. Bless my soul! I wonder W P C H did not send the hotel a bill for power supplied.

### Kid's Corner.

**T**HE wireless correspondent of the "Daily Telegraph" says listeners will probably agree that the Children's Hour is one of the most interesting features of the programme. Listeners from seventy years of age and upwards might agree, certainly the children would not. I wonder whether my fellow-scribe really thinks that 9,000 appreciative letters out of the 54,000 received by the B.B.C. on this item last year warrant his belief. If he does, statistics are useless.

### This Week's Good Deeds.

**M**R. E. R. BAKER, River View, North Close, Lymington, Hants, has copies of "P.W.," "Modern Wireless," and "Wireless Constructor" for disposal to readers sending postage. Mr. H. Williams, 52, North Road, Ferndale, Rhondda, also has a lot of copies of "P.W." which he will be pleased to send on similar terms, or post free to anyone unemployed or otherwise "on the rocks." Thank you, sirs, both.

ARIEL.

# MORE LOFTIN-WHITE EXPERIMENTS

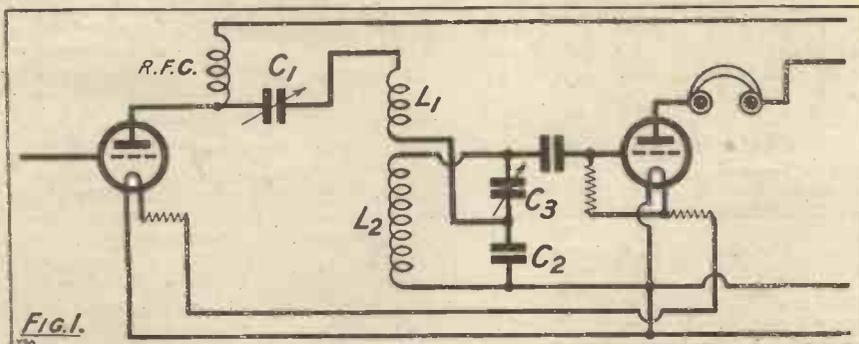
THE Loftin-White circuit, already described in previous articles in "P.W.," lends itself to many experiments, not only in regard to the component parts used, and the lay-out of these parts (which is a most important matter), but also in modifications of the circuit and its use in combination with others. So far as components are concerned in the resistance-controlled reaction method, I have tried a

"I have found several most interesting combinations of the Loftin-White circuit with others, and as these are easily arranged I am sure they will be of interest and value to 'Popular Wireless' readers."

By P. W. Harris, M.I.R.E.  
Editor of "The Wireless Constructor."

combination of the coupling to  $L_1$  and  $C_2$  being such as to give substantially uniform coupling over the whole range for which the coil  $L_2$  is tuned by condenser  $C_3$ .

The condenser  $C_1$ , as previously explained, is the "phase varying" condenser used for controlling reaction due to feed-back. The first idea which occurred to me was to see how a combination of the conventional neutralising circuit with the Loftin-White would work. Such a circuit is shown in Fig. 2, which indicates the split secondary method of neutralisation with a resistance for removing parasitic oscillations, the first valve  $V_1$  being fed through the radio-frequency choke R.F.C. In the Loftin-White coupling the condenser  $C_1$ , in this case, can now be fixed at about .0005 mfd. This value in the ordinary L-W circuit would be too large, and would be productive of oscillation, but as the feed-back is counteracted by the conventional neutralising method this condenser need only serve to pass on the high-frequency oscillations and not to act as an oscillation control. Coil  $L_1$  and the condenser  $C_2$  are then used as before, and the remarks which have been made regarding the Loftin-White coupling apply to this arrangement also.



large number of variable high resistances both of English and American design and manufacture. Certain makes have already been named, and I have now found the Marconiphone variable resistance, 0 to 40,000 ohms model, gives just the right range required, being very smooth and, what is more important, very silent in action, lending itself admirably to this method of control.

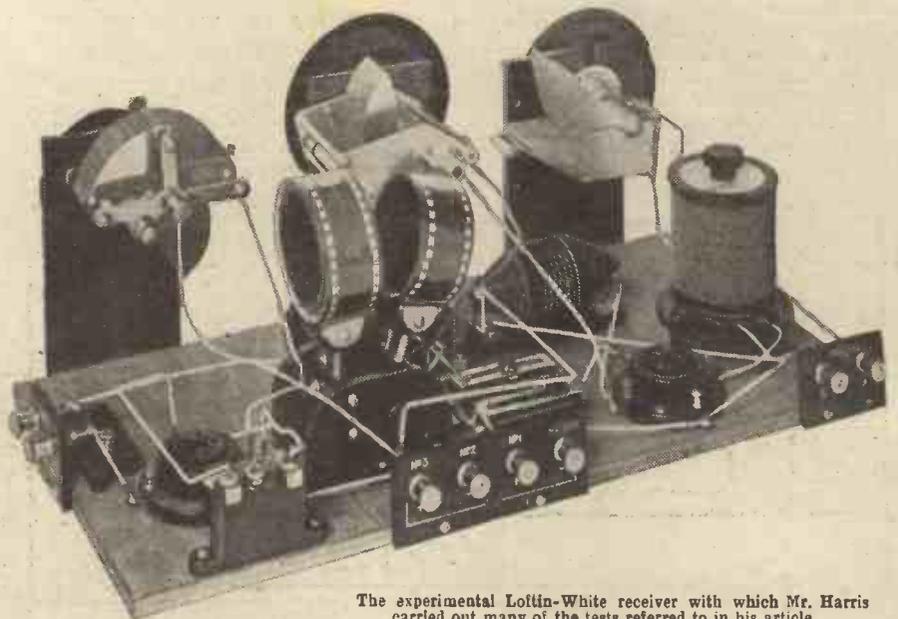
### Some Interesting Combinations.

In the arrangements of components, stray capacities must be particularly guarded against, and although experimental sets on a board can be made to function excellently, it is by no means as easy to combine the various parts in a compact form so as to make a "finished" set. I have found, however, several most interesting combinations of the Loftin-White circuit with others, and as these are easily arranged, I am sure they will be of interest and value to POPULAR WIRELESS readers.

Let us take, for example, Fig. 1, which shows the Loftin-White coupling between two valves, the condenser  $C_1$  being variable and of a maximum of about .0005 mfd., the condenser  $C_2$  a fixed condenser of .003 or .004 mfd., and the condenser  $C_3$ , of a sufficient size to tune the coil  $L_2$  over the

wave-length range desired. The coil  $L_1$  is the inductive coupling coil, and condenser  $C_2$  forms the capacitive coupling, the

(Continued on next page.)



The experimental Loftin-White receiver with which Mr. Harris carried out many of the tests referred to in his article.

## MORE LOFTIN-WHITE EXPERIMENTS.

(Continued from previous page.)

In carrying out numerous tests with the Loftin-White circuit I have been particularly struck by the degree of coupling given by the condenser  $C_2$ , even when the coil  $L_1$  has been shorted. This coupling is very appreciable, and in many cases would serve to give all the coupling we need, although, of course, one loses the advantage of constant coupling given by the normal arrangement.

### Reinartz Reaction.

In many cases, however, very satisfactory results can be obtained—(have we not already had quite good results with the old inductive coupling?) By substituting the capacitive for the inductive coupling here we have no more disadvantages than those given by the single inductive coupling in the older form of circuit. Reaction can

Greater simplicity of wiring and arrangement of parts is possible with this scheme, which has great possibilities. It is, of course, a very considerable departure from the Loftin-White circuit which deliberately aims at obtaining constant coupling, and is really nothing but the utilisation of capacitive instead of inductive coupling. However, many readers will care to experiment with the arrangement to find for themselves whether they

## MEASURING SMALL CAPACITIES AND INDUCTANCES.

A QUICK way of determining the capacity of small condensers is to use one's receiver. Tune up to the local station on one of the circuits and then hook the condenser required to be measured, say a neutrodyne condenser, across the receiver tuning condenser, and then retune. The difference of tune will give the capacity if the maximum value of the tuning condenser is known.

With straight line capacity condensers the capacity would be simply proportional to the difference of scale reading. Thus, suppose the whole 180 deg. were .00025 mfd., 20 deg. difference would represent  $\frac{20}{180} \times .00025$ , or .00003 mfd. roughly; but if the condenser is a .0005 straight line wave-length one of the best things to do is to draw a curve of capacity with scale reading. Five points will enable one to draw the curve.

DEGREES.	CAPACITY.
0	0
45	$\frac{1}{8} \times .0005$ , or .00003
90	$\frac{1}{4} \times .0005$ , or .00012
135	$\frac{3}{8} \times .0005$ , or .00027
180	.0005

Then suppose the local station normally tunes in at 134 deg., and with the condenser to be measured across it comes in at 93. The capacities of these two readings can be determined from the curve, and the difference is the capacity of the tested condenser. Valve capacities can easily be measured in this way.

For those who care to do so, inductances can be measured quite easily if the wave-length of the station is known. Thus, small inductances should be inserted in series with the tuning inductances and the condenser retuned. Thus, wave-length =  $1885 \sqrt{LC}$  where  $L$  is in microhenries, and  $C$  is in microfarads, so that if we know the wave-length and the capacity from the curve, the inductance of the main tuning inductance can be worked out at once. And then with the added inductance  $L_1$ , the wave-length is again  $1885 \sqrt{(L + L_1) C_1}$ , giving us the new total inductance, the difference, of course, being the value we want to measure.

Large inductances can be measured by putting them in parallel with the tuning condenser, the calculation being a little more complex. The basic formula being that when two inductances are paralleled the new inductance  $L_3$  is given by the formula:

$$\frac{1}{L_3} = \frac{1}{L_2} + \frac{1}{L_1}$$

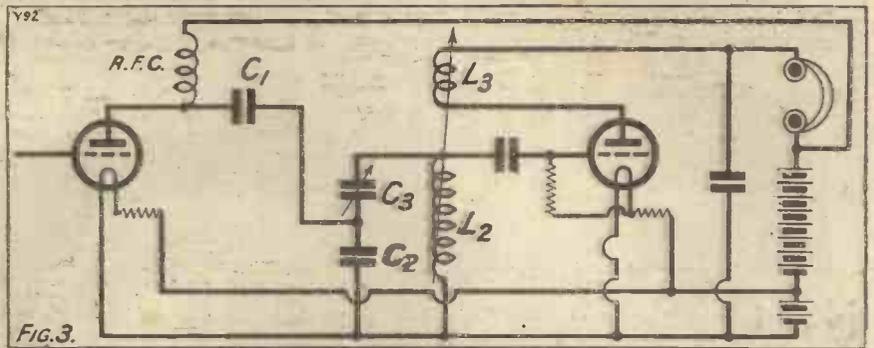


FIG. 3.

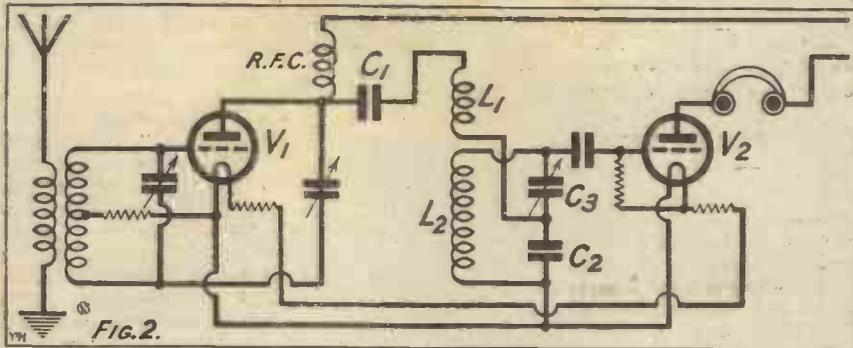


FIG. 2.

now be applied in the conventional way by coil  $L_3$ , which can either be variably coupled to  $L_2$  (Fig. 3) or we can use the generally more satisfactory Reinartz arrangement shown in Fig. 4. Here the coil  $L_3$  is continuous with  $L_2$ , reaction being controlled by condenser  $C_4$ .

The advantage of this arrangement is that existing parts, which are known to work well, can be used, the only slight modification being that condenser  $C_2$  is inserted in series with condenser  $C_3$ ,  $C_2$  in Fig. 4, and for that matter in Fig. 3, is preferably of the clip-in or easily variable type (variable in steps rather than continuously, as it is not convenient to have a continuously variable condenser of so large a value).

prefer it to either the inductive coupling as generally used, or the Loftin-White arrangement, which requires very careful balancing of values to give satisfaction.

Personally, I like the idea as a means of obtaining easily variable coupling with screened coils, without having to alter windings or purchase additional parts. I shall be glad to hear readers' results in this regard.

### FULL DETAILS OF THE NEW LOFTIN-WHITE ONE VALVER

will be published EXCLUSIVELY in "Popular Wireless" at an early date.

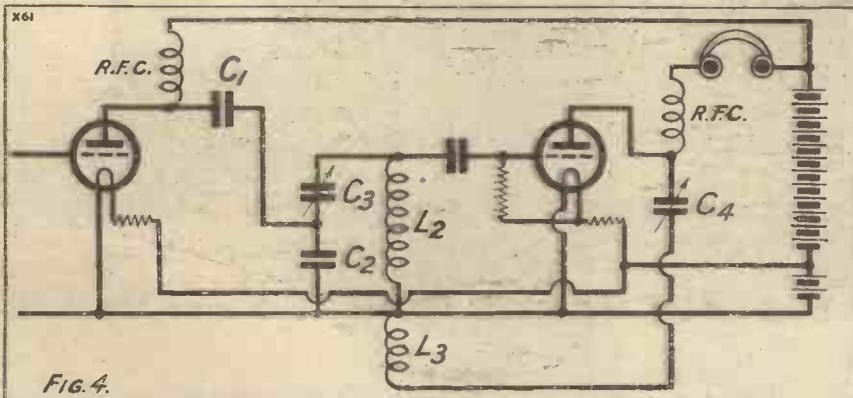


FIG. 4.



# THE "MIDGET" PORTABLE.

(Continued from previous page.)

inserted, and also for shorting a portion of the A.T.I. in order to make certain that the necessary range is covered. No resistors are included, since they would require unavailable space, and as the set is intended to be run on '06 valves taking 2.8 volts, a 3-volt battery is quite safe when connected direct to the filaments. Separate H.T. tappings are provided for each valve. This enables the voltage on the first valve to be reduced for smooth reaction control without having to reduce the voltage on the amplifier valve, which would be undesirable.

A list of the necessary components will

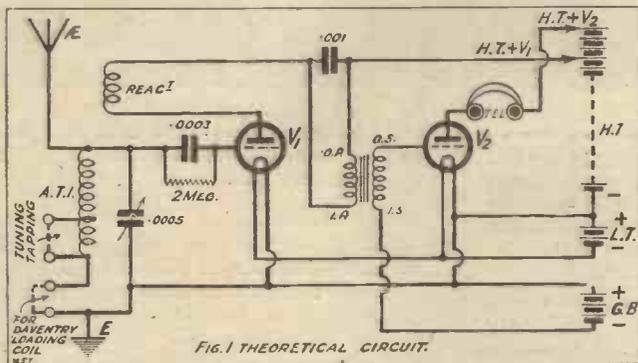


FIG. 1 THEORETICAL CIRCUIT.

be found in another part of the article, and it is as well to gather all these together before work is commenced.

### Panel and Baseboard.

It does not matter if a case of not quite the exact dimensions given is obtained. It should not, however, be any smaller, or it is doubtful if all the apparatus could be fitted in. The valves should be purchased with the other components, as it is necessary to make sure that sufficient space is allowed for them under the shelf on which the coils are mounted.

If a case of larger dimensions than those given in the list of components is employed, the panel should be of such dimensions as



Testing-out the "Midget" Portable.

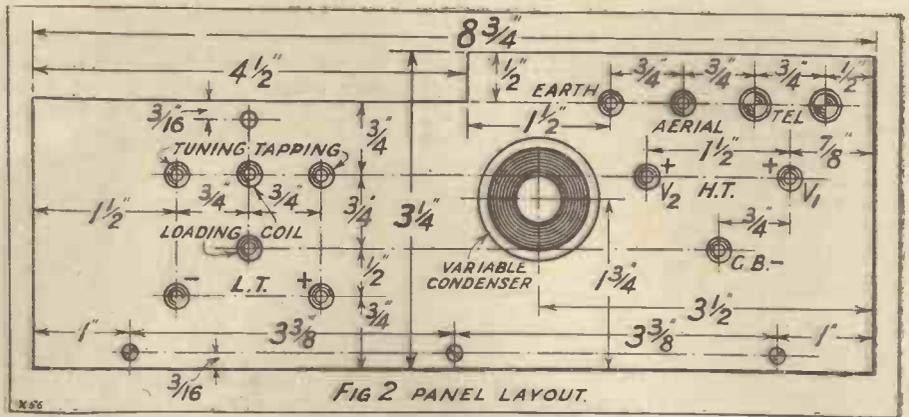


FIG. 2 PANEL LAYOUT.

to just fit in. The length of the baseboard should also be altered to correspond as far as its length is concerned, but the width of 4 1/2 in. should remain the same.

The first part of the construction of the receiver is to drill the panel. In Fig. 2 a diagram of the front of the panel is given. It will be seen that it is necessary to cut a section out in the top left-hand corner. The dimensions of the piece cut out should remain the same whatever the size of the panel. Mark out the panel on the back, and centre punch the points to be fixed on the panel. When this is done tin all the terminal and socket shanks and solder on to each a piece of the 26 gauge wire about 12 inches long. This wire is used for wiring the set, since, as it is not rigid, it prevents the wire from being pulled unsoldered by any jolts the set may

receive while being carried about. The few parts which go on the baseboard are now fixed into position, taking care that the transformer is so placed that it will not foul the variable condenser when this is in place. The panel can now be fixed to the baseboard and shelf by means of four wood screws.

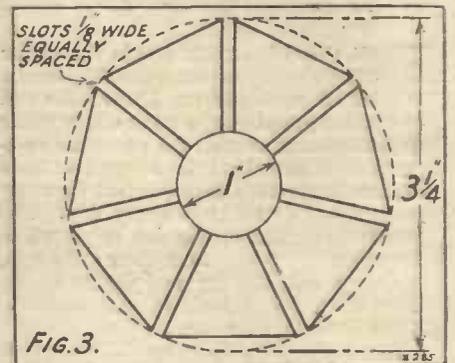


FIG. 3.

where holes are to be drilled. The small holes along the edges which are to take wood screws have to be countersunk from the front of the panel. When the above work on the panel has been completed it may be laid aside for the time being.

### The Coil Platform.

The next step is to prepare the platform for the coils. Fig. 4, used in conjunction with the photographs, will make this quite clear. When the platform is mounted on the baseboard the coil should be mounted as indicated in Fig. 5. The strip of ebonite which holds the reaction coil (which is uppermost) is let into the top of the ebonite knob. This is done by filing a suitable-sized slot in the knob and drilling a hole in the strip of such a size that the 2 B.A. rod can just be forced into it. It will then be found that when the rod has been forced in flush with the top of the strip the whole will be nicely tight. The small bolt which holds the upper coil in place is forced into the ebonite in the same manner. The height of the ebonite knob must not be more than 1/2 in., since this is all that is allowed between the top of the platform and the top of the case.

Now mount all the components which

### The Wiring.

The set is now ready to be wired up. Although there is very little wiring to be

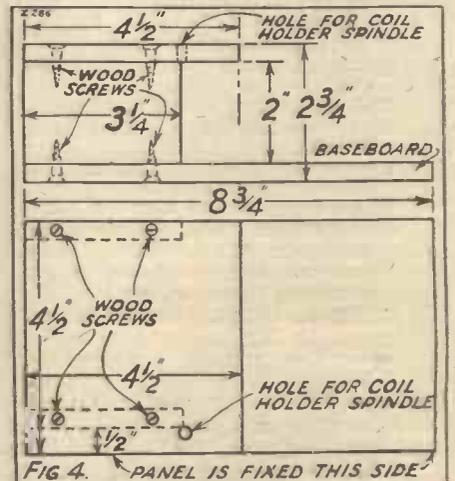


FIG. 4. PANEL IS FIXED THIS SIDE.

done, a little patience will be necessary, since there is not much room to get at the various points where connections have to be made.

(Continued on next page.)

\*-----\*  
 \* THE  
 \* "MIDGET" PORTABLE.  
 \* (Continued from previous page.)  
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In Fig. 6 a diagram of the wiring is given. In this diagram the platform and coils have not been shown in order to avoid confusion; the connections to the coils, however, have been clearly marked. It is

cloth or similar material which is glued into position. These two batteries are connected in parallel—that is to say, the two positives are connected together and the two 3-volt negative tappings are also connected together. The 4½-volt tappings are not required until the 3-volt tappings have fallen in voltage so that proper signal strength is not being obtained from the set.

The flexible wire mentioned in the list of components has to be divided into one 20- and one 30-foot length. The 20-foot

length is used for the earth counterpoise, and is laid on the ground or along the floor according to whether the set is in use out-of-doors or indoors. The other length of flex is fixed across, say, the picture rail or tied to a tree. With the aerial and counterpoise arranged, connect up the batteries, short the two sockets marked loading coil, and tune in the local station. If bringing the two coils together produces a considerable increase in signal strength the reaction is connected correctly. If, on the other hand, no increase or a decrease is experienced on bringing these two coils together, the leads to the reaction coil must be reversed.

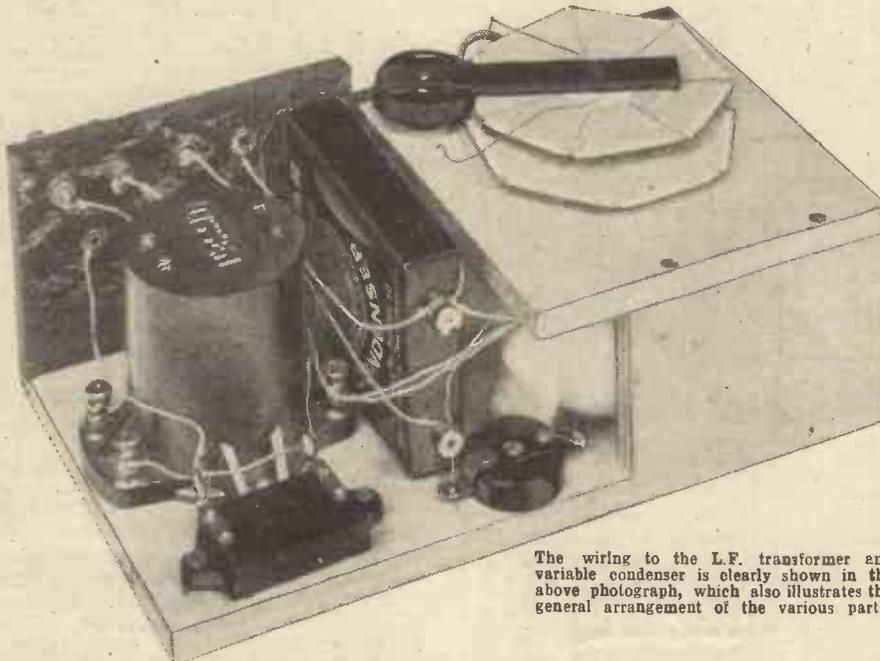
**The Loading Coil.**

If the local station tunes in best with the variable condenser all out—that is to say, turned as far as possible in an anti-clockwise direction—the two sockets marked "tuning tapping" should be shorted, when it will be possible to tune by increasing the capacity of the variable condenser.

A tuning coil for Daventry may be made in the following way. Wind about 150 turns of 28 gauge wire on a former 2 inches in diameter. The wire may be wound in hank fashion, and then removed from the former and bound with tape. When it is desired to listen to Daventry the loading coil is plugged into the two sockets marked for it. Satisfactory reception of Daventry may be made up to about 200 miles.

This portable proved to be very sensitive when tried out in the country. At about

*(Continued on next page.)*



The wiring to the L.F. transformer and variable condenser is clearly shown in the above photograph, which also illustrates the general arrangement of the various parts.

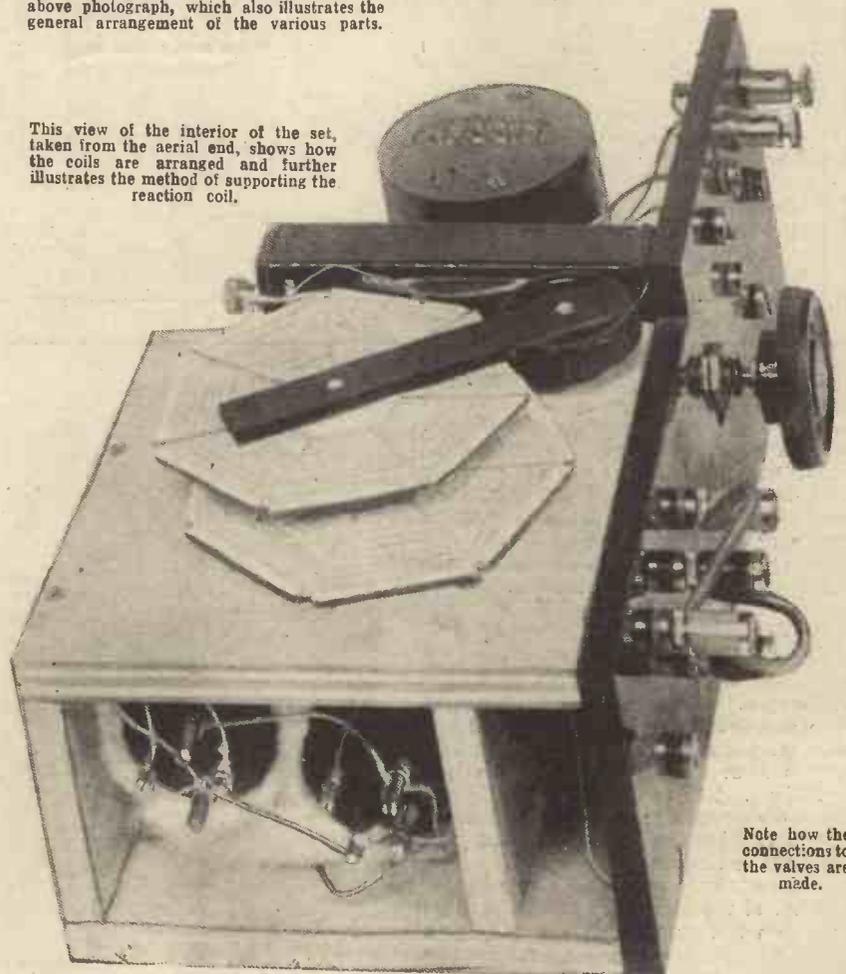
necessary when taking the wires from the coils through the shelf to mark them in some way, so that they may be easily identified for wiring purposes. For the sake of clearness the valves have been shown as if looking at their bases. In actual practice the six wires which go to the valves should be passed through the box in which the valves are mounted and the connecting left until the valves are secured in position.

**Fixing the Valves.**

The valves are fixed in place by tightly packing with cotton wool. Care must be taken to see that the wool is clear of the valve legs. The wires are connected to the valve legs by baring for about two inches, slipping them through the split in the legs and then twisting round and round them. It may be necessary when the set is tried out to reverse the leads to the reaction coil, so these should be fairly long in case this has to be done.

All that now remains to be done is to connect the batteries and pack the set into the case. For this, reference must be made to Fig. 7. It will be seen that there is no fixture made to the case, the whole assembly being held firm by means of a wedge of wood. Fifteen flash lamp batteries are shown in use, but if the case is sufficiently large, more may be used so as to make them fit in tightly. All these batteries are connected together as shown, the long strip being connected to the short one. The two large 4½-volt batteries which are used for L.T. are placed on top of one another, and held secure by being bound with empire

This view of the interior of the set, taken from the aerial end, shows how the coils are arranged and further illustrates the method of supporting the reaction coil.



Note how the connections to the valves are made.

# THE "MIDGET" PORTABLE.

(Continued from previous page.)

12 miles from 2LO in nearly all cases signals from that station were loud enough to be heard with the 'phones held in the hands about two feet from the head. Really loud reception could be obtained with the aerial wire laid along small bushes about two feet high, and it was sometimes possible to hear that the local station was working without any aerial or earth connected whatever.

For indoor reception it was only necessary

set should be tied to the attaché case handle so as to take the strain of the wire off the plug and socket.

### Reception of Daventry.

Satisfactory signals may be obtained with both wires laid along the ground, and running in opposite directions. Possibly this type of system would be better in an open space than one employing a tree as a mast, and surrounded by many other trees which might absorb a large amount of energy. Many interesting experiments which may be made in connection with the pick-up system will occur to the reader, such as using a wire fence for the aerial, or connecting the end of the counterpoise wire to the metal work of a car.

Under most circumstances sufficient reaction will not be obtainable to make the set oscillate on Daventry, so that reception of Daventry must not be expected at too great a distance from this station.

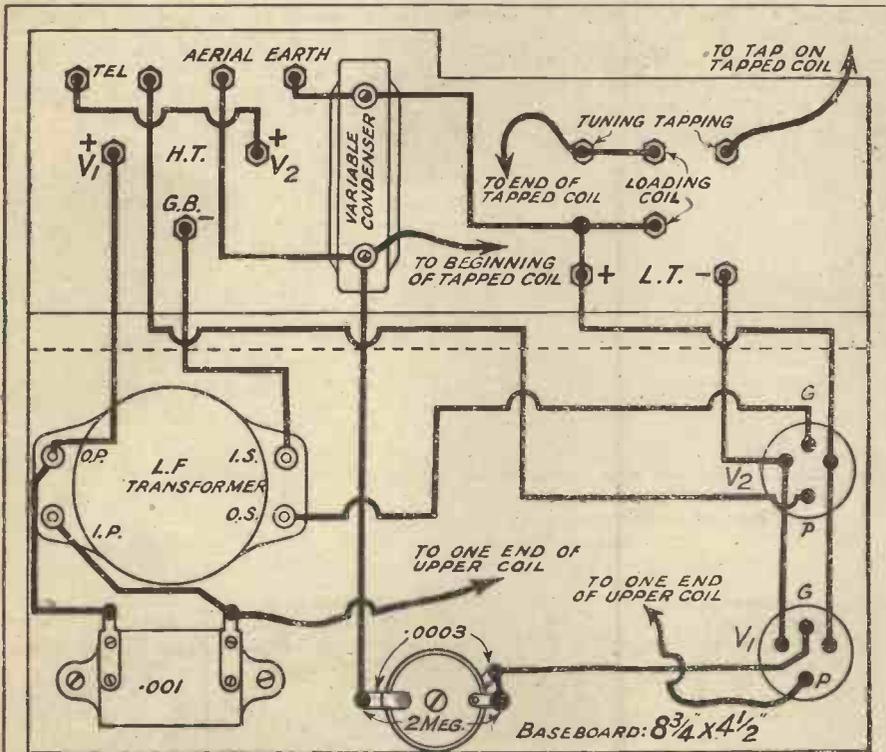
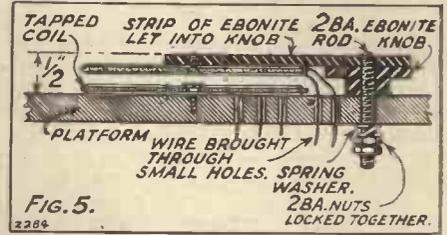


FIG. 6.

WIRING DIAGRAM.

to fix the aerial wire to a picture and lay the earth wire on the floor to obtain signals loud enough to work many pairs of 'phones, or even to give moderate "loud speaking."

Although the set was not designed for long distance reception, it was tried on a good outdoor aerial. Reaction control was very smooth, and many British and foreign stations were tuned in on the telephones at really good strength.

### Aerial Arrangements.

No difficulty should be experienced in arranging some sort of aerial when out in the open. Perhaps the best arrangement is to suspend the aerial wire between two trees, at about a height of 10 feet. This gives a span of 20 ft. with a down lead 10 ft. long. The earth wire should be laid along the ground parallel with the aerial wire, this being the best position for good reception in this case.

If there is only one suitable tree handy, one end of the aerial wire should be fixed as high up it as possible, the wire then going straight down to the set. In this case the end of the aerial wire nearest the

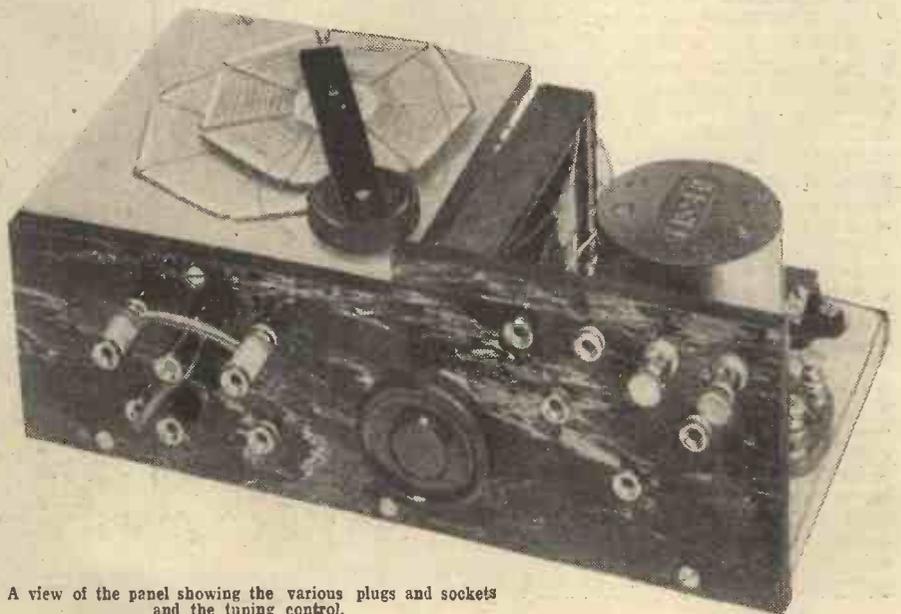
The set will appeal to the man who wants a really portable set which he can take with him when out walking, or when going away for a week-end. The fact that a little more constructional work has to be done than when assembling most sets is not a drawback, and many constructors will welcome it as an opportunity of showing their skill.

Although it is necessary for the design, as described in this article, to be followed in its essentials, there are naturally one or two points where deviations from the original design may be made. For instance, there is no reason why the valves should not be packed in with sorbo rubber instead of cotton wool. There is one other point in connection with the valves which may be mentioned.

When twisting the wires round the valve legs, particular care must be taken to see that no ends are left projecting, and that the wire is bared of insulation only where it is wound round the pins. If these points are not watched, shorts may occur between the valve legs and probably prevent the set working, and possibly cause the valves to be burnt out.

It will be obvious to readers that the actual makes of components used must be followed in most cases since the amount of room available is so little that other makes of components might not fit in. Nevertheless, where the constructor has some parts such as fixed condensers already on hand which can be fitted in, there is no reason whatever why they should not be used.

(Continued on next page.)



A view of the panel showing the various plugs and sockets and the tuning control.

**THE  
"MIDGET" PORTABLE.**

(Continued from previous page.)

A few detailed instructions in connection with Fig. 7 will probably not be amiss. Some hints on connecting the flash-lamp batteries are therefore given.

Now bend the longer strips over about half-way along their lengths so that they make a right angle and their ends will just overlap the short strip of the next battery.

Clean the tops of the short strips and underneath the ends of the long ones with emery cloth, and then heavily tin them. The batteries should now be packed together so that the long strips overlap the short ones, and the connections made by just applying a hot soldering iron to the strips.

available H.T. voltage on the second valve, but about half should be used for the detector valve, although it is best to find the most suitable H.T. voltage for the first valve by trial.

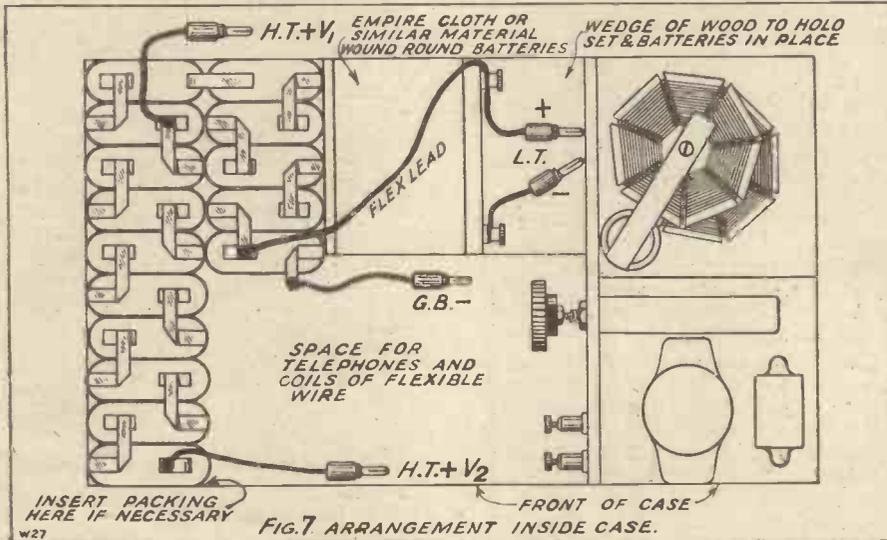
When the set is packed up all battery leads may be left in place except one of the filament connections, which must be removed so as to turn out the valves. This lead must be carefully arranged so as to avoid any possibility of the L.T. becoming shorted. A little care should also be taken to see that metal-work on the telephones does not touch any battery connections.

Sufficient packing should be inserted where marked to hold the batteries quite firm. Also the wedge of  $\frac{3}{8}$ -in. wood must be so cut as to avoid any end-to-end play in the various components. If these precautions are taken the set will stand a large amount of vibration without becoming deranged in any way.

**A Peculiar Effect.**

When using the set indoors with the aerial stretched across the picture rail, and the earth wire just laid on the floor, it was noticed that on disconnecting the earth wire, very little, if any difference was made to the strength of the reception, although it was necessary to retune slightly. It must not, however, be thought, in view of this, that the earth wire is not necessary for indoor reception, since sometimes it had a great effect on volume, seeming to pick up more energy than the aerial wire itself. So in all cases both wires should be tried to make certain that the best results possible are being obtained.

In conclusion, I would suggest to those who are exceptional about portable sets, that they should give one a fair trial, and they cannot do better than make a really light and compact one, such as that described in this article.



**POINT-TO-POINT CONNECTIONS.**

Join L.T. — to one filament leg of each valve.

Join earth to one side of variable condenser, to one loading-coil socket, to L.T. + and to remaining filament leg of each valve.

Join aerial to remaining side of variable condenser, to one side of grid leak and condenser and to beginning of tapped coil.

Join remaining loading-coil socket to one tuning tapping socket and to end of tapped coil.

Join remaining tuning tapping to tap on tapped coil.

Join remaining side of grid leak and condenser to grid of first valve.

Join plate of first valve to one end of upper coil.

Join other end of upper coil to I.P. of transformer and one side of fixed condenser .001.

Join other side of .001 condenser to O.P. of transformer and to H.T. + of first valve.

Join O.S. of transformer to grid of second valve.

Join I.S. of transformer to G.B.—.

Join plate of second valve to one telephone terminal and join other telephone terminal to H.T. + of second valve.

The short strips are positive and the long ones negative. The last battery, on which the negative is free, is used as grid bias, but as grid-bias positive is joined to L.T. + the full  $4\frac{1}{2}$  volts is not applied to the amplifier valve. It is advisable to use the whole



Making a few adjustments while listening to the local station, which was audible with the 'phons held well away from the head.

There is no reason why expensive flash-lamp batteries should be purchased, since those at about four shillings a dozen are quite suitable. First of all remove the waxed cardboard strips from the tops of the batteries, taking care that the two brass strips do not touch each other in the process.

# OPERATING THE "SPANSACE" FOUR

Some further details on the use of this receiver.

By G. P. KENDALL, B.Sc.

I CONCLUDED my notes on the "Span-space" Four last week with a detailed description of the process of neutralising by a simple method which does not require the presence of a strong local station. It is well worth while to carry out this adjustment carefully and accurately, since both the sensitivity of the set and the quality of the reproduction which it will give depend on the correct setting of the neutrodyne condenser, and you should persevere until you are sure you have got it just right.

Next proceed to adjust the voltage on the H.T. +2 terminal to give the smoothest possible control of reaction without loud pops or overlap in the adjustment.

After all these preliminaries you will be ready to search for stations with the assurance that your set is really working at its best, so that there will be no need to fiddle with the neutralising adjustment after stations are picked up (you need never

give satisfactory results with the standard screened coil used; one with a specially large primary would be required for these valves.

The following are some of the suitable types. Valves for 4-volt accumulator: P.M. 3, S.T. 41, Cossor 410 H.F. For 6-volt accumulator: D.E. 5b., D.E.H. 612, S.T. 61, P.M. 5X, Cossor 610 H.F., D.F.A. 4, etc.

For the L.F. stages power valves are most desirable, and one of medium "size" is advised for the first stage, and a "super-power" valve in the last stage for loud-speaker work if your H.T. battery is large enough to stand up to the load.

If a super-power type is used, considerably more grid bias will be needed than the rough value of 9 volts given earlier. The actual amount will vary with the particular valve and the amount of H.T. in use, but if the latter is, say, 150 volts, probably about 20 volts grid bias will be needed. In this it is obvious that a large grid-bias battery should be obtained, and the full amount permitted by the makers' instruction sheet should be applied, to reduce the load on the H.T. battery as well as to ensure the best reproduction.

## Different Primary Turns.

A point which considerably affects the performance of the set is the adjustment of the number of turns on the primary of the home-made coil to suit your aerial. This detail is well worth attention, and I would recommend that a spare primary former be obtained, so that a little experimenting can be done.

The turn numbers given are suitable for an average aerial, and will give good results, but if your aerial is on the small size you should wind another primary with 28 turns, with a tapping of 16 turns, since such a coil will give louder signals, especially on waves above about 400 metres, with only a slight loss of selectivity. If at any time you find you require just that little extra selectivity you can, of course, put the 20-turn primary back.

For a really large aerial, on the other hand, or for one which has a large capacity for some reason or other, an alternative smaller primary of 16 turns with a tap at 10 turns should be made up and used when higher selectivity is needed. In general, you will find that on any particular aerial the larger the primary the louder the signals up to a certain number of turns (which depends on the wave-length of the station being received), while the smaller the primary the greater the selectivity. It is thus desirable to experiment to find a suitable balance between these factors to suit a given aerial, and you will find it quite a fascinating experiment to try.

## With Two-Volters.

To receive Daventry it is necessary to exchange the split primary transformer for one of the higher wave range, and to put a larger size home-made coil in the first socket (the unscreened one). This coil has a secondary winding of 250 turns of No. 28 D.S.C. wire, while the primary contains 100 turns of No. 32 D.S.C. with a tapping at 75 turns. You will find it impossible to wind the primary very neatly with this fine gauge, because a thread is provided on the former, but this does not matter and the wire can be bunched on quite roughly. On these waves, it is scarcely worth while to try different sizes of primary, since a very high degree of selectivity is not needed.

A final point about valves: it has already been pointed out that certain types of valves do not work very well with the standard screened coils, and it should be explained that these are chiefly "general purpose" valves, certain 2-volt types, and many of the nondescript foreigners. Such valves can be made to give more satisfactory results if a coil with a larger primary winding is used, and it is to be hoped that some enterprising manufacturer of screened coils will soon provide us with such a coil as a standard alternative.

One of the difficulties with these valves is that their plate to grid capacity is different from that of the special H.F. types of the 4 and 6 volt ranges, and hence a certain amount of trouble is to be expected in many neutrodyne circuits. This difficulty, however, can be got round quite readily by the simple expedient of connecting a little extra capacity from plate to grid outside the valve—i.e. straight from the plate to the grid terminals or tags on the valve holder. Simply connect an extra neutrodyne condenser in this position, set it to about half its maximum capacity, and then proceed to neutralise with the other condenser in the ordinary.

## THE "SPANSACE" FOUR.

Stations Received During a Test on a Good Aerial, 8 miles from 2 L O.

Bilbao.	Dublin.*
Rome.	Stuttgart.*
Madrid.*	Glasgow.
San Sebastian.*	Manchester.
Langenberg.*	Breslau.*
Munich.*	Barcelona.
Petit Parisien.*	Birmingham.*
Hamburg.*	Leipzig.
Dortmund.	Vienna.
Brussels.*	Copenhagen.
Newcastle.	Münster.*
Bournemouth.*	Dresden.
Oslo.	Zurich.

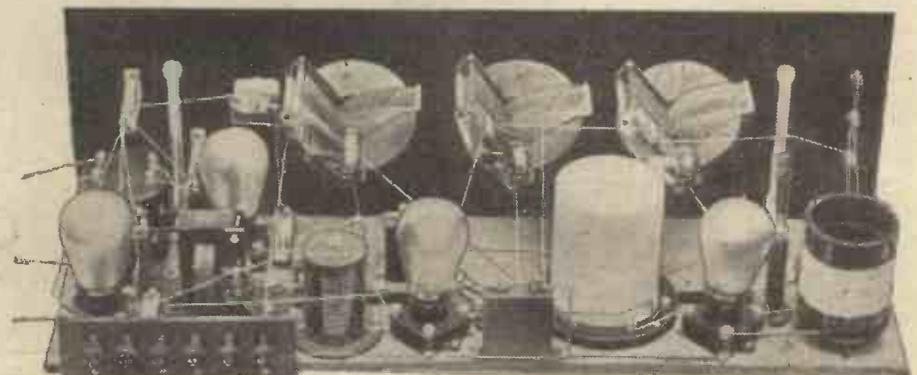
\* Full Loud-speaker Strength.

touch it again unless you change the H.F. valve), and, further, that you can use reaction freely with little or no chance of causing interference with your neighbours.

Searching you will find is quite easy if you keep the set adjusted to the verge of oscillation, the actual process being simplified considerably by the fact that the tuning dials give approximately matched readings.

## Question of Valves.

The question of the valves to use in this set is a vital one, as it is in all receivers employing certain of the more modern types of interval coupling units, such as the standard screened coils, since these were originally designed for certain definite types of valves and do not work well with others. In general, any of the modern dull-emitter special H.F. valves are suitable in the H.F. and detector positions, with the exception that some types of 2-volt valves do not



The "Span-space" Four receiver with valves and coils in position.

THE recent success of P.C.J., the short-wave Dutch station, which has been successfully relayed in Australia on a wave-length of thirty metres, has aroused such considerable interest that the B.B.C. have suddenly had to reverse their policy. People were asking: "Why can't we do it?" when they heard how the Dutch Colonial Minister recently broadcast an address which was audible to listeners in Java and other places.

The B.B.C. have hitherto thrown cold water on the idea of a short-wave Empire broadcasting station, but they have done this because of the very high standard which they always try to live up to. They frankly stated they could not promise a one hundred per cent efficient station. But no one expects a one hundred per cent short-wave broadcasting station. What is expected, however, is a station which would at least make a beginning and which would allow experiments to be made in broadcasting on short waves, say, to Australia, and which, with luck, would be capable of improvement and a higher degree of perfection as time goes on.

It is interesting, then, to note that pressure of public opinion has at last had its effect, and the B.B.C. have officially stated that a building has been selected at Daventry and that a short-wave Empire transmitting station should be ready in about six months.

The value of this station, even though it may not give an absolutely reliable service, will, nevertheless, increase as years go by, for with this station it is legitimately expected that on occasions of great ceremonies, such as the King's birthday, or Empire Day, messages (perhaps by the King himself) may be broadcast direct to Australia and the other dominions, and then relayed to listeners.

**The Time Factor.**

Captain Eckersley has pointed out, and quite rightly too, that the station will be in the nature of an experiment. He promises nothing and guarantees nothing except that, as usual, the B.B.C. engineers will do their best. Captain Eckersley has admitted that the policy has been to wait until a reasonable hope of success was likely before spending a lot of money on a short-wave station and, as he has also pointed out, two things at present stand in the way of a guaranteed successful transmission—i.e. fading and distortion.

These two bugbears of short-wave broadcasting have not yet been overcome, and it may be they will not be overcome until many years have passed. Still, on the evening of May 20th an experiment was made in short-wave broadcasting which was crowned with considerable success. The programme from 2 L O, via Daventry, was relayed on a thirty-two metre wave-length by the Eindhoven Station, in Holland, and it was stated that the programme was clearly heard in Calcutta and in Johannesburg. This augurs well for the future experiments to be made from the new Daventry short-wave station.

Of course there is one big drawback (apart from technical drawbacks) to the policy of building an expensive short-wave Empire transmitter, and that drawback

## A BRITISH SHORT-WAVE STATION.

**The Dutch Relays—A Daventry Short-Wave Station—Why Not Use the Beam?—Stimulating Further Interest**  
By THE EDITOR.

is the differences in longitude of all our Colonies, except South Africa.

For example, our main broadcasting programme in this country begins about eight o'clock in the evening; at Cape Town and Cairo it is about ten p.m. The difference there is not so very great and the time may be regarded as suitable; but everywhere else listeners would find it greatly inconvenient.

**Utilising of the Beam.**

For instance, in Ottawa they would have to listen in early in the middle of the afternoon; the same in Bombay, North Borneo and Perth, Australia, or attempt to enjoy listening to dance music before breakfast in Sydney, New Guinea and Wellington.

These differences make one wonder whether the expenditure of a large sum of money on a short-wave station is really justified at the moment, for there is an alternative solution. That solution lies with the successful co-operation of the B.B.C. with the Post Office, for the Beam stations might well be utilised.

As is well known, the Beam is giving magnificent service with Australia, and although it is being used for public telegraph work it is capable of dealing with a dual service, telegraph and telephone, both being worked simultaneously. There is no doubt about this as experiments recently conducted by engineers have shown that telephony, with telegraphy, is just as successful as telegraphy alone.

It has been suggested that the B.B.C. should make arrangements to hire a Beam station when necessary—say on British Empire Day or the King's birthday, in order

to relay a special programme to the Antipodes. This would mean the saving of a very large sum of money in constructing a special short-wave station for a broadcasting service only; and furthermore, it would mean that arrangements could be made almost immediately to utilise the Beam for broadcasting to Australia

without waiting six months until the Daventry short-wave station is ready.

**An Early Start.**

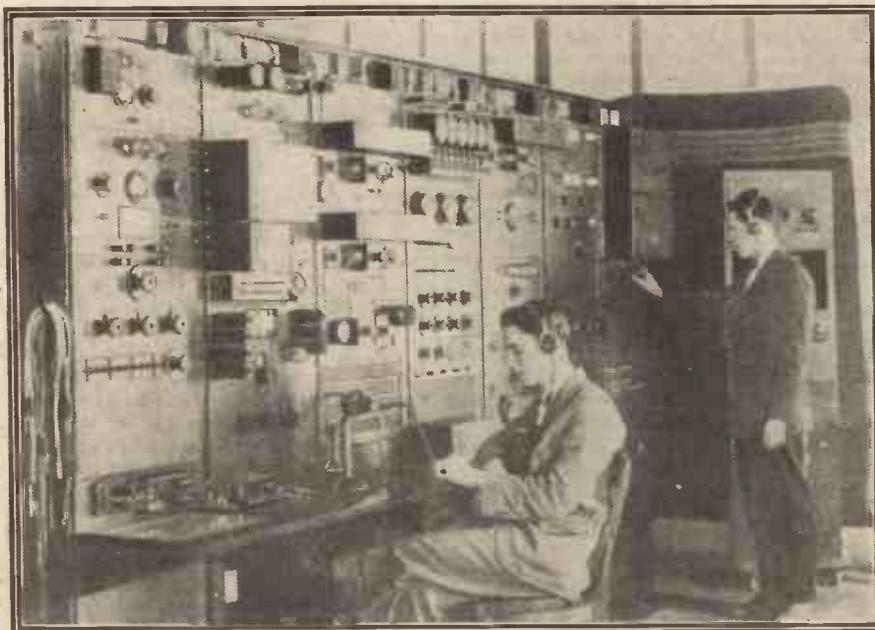
The Beam System is already working between this country and Canada and Australia, and it can be used definitely for the transmission of speech or music provided microphones and other additional apparatus are installed. And, furthermore, the preparations necessary for broadcasting an address, say by the King, would not take very many days, and the commercial Morse service would not be interrupted in the slightest.

As has been pointed out, a working carrier wave of the Beam System can be used almost like a trunk line, and on it can be super-imposed modulations for broadcasting purposes. These would be picked up by stations tuned to their special wave-length and then amplified and re-broadcast by the Dominion wireless stations.

**Helping Trade.**

It seems the best plan that the B.B.C. should, by arrangement, hire the Beam Service from time to time just as the public may now hire Rugby and telephone direct to New York.

However, perhaps the B.B.C. are right in deciding to go all out on their own and erect their own short-wave transmitter. In the meantime, there is no reason why further interest should not be stimulated by the B.B.C. making use of the Beam until their own station at Daventry is completed for it is certain that further experiments would create a revival of interest, which would react favourably on the wireless trade throughout the summer months.



The Power Supply Board at Houlton Maine, where Transocean Telephony is received from Rugby.

## TECHNICAL NOTES

By Dr. J. H. T. ROBERTS, F.Inst.P.

## THE HEAVISIDE LAYER THEORY

A USEFUL INSTRUMENT—TESTING INSULATORS—WHICH SIDE OF THE CONE?

SOME experiments which have recently been made with the Marconi beam system of transmission have thrown light, in a very remarkable way, upon certain aspects of the Heaviside layer theory. It is quite a number of years now since signals were successfully transmitted between England and Australia, and the question was often discussed as to whether it would be possible to transmit a signal completely round the earth so that it could be received at a station in the immediate vicinity of the transmitting station.

By means of the beam system this has now proved to be possible, in fact it was first noticed in an accidental way. The automatic recording machines were found to give duplicate signals indicating the reception of two sets of waves, one, of course, being a short interval of time behind the other. Special experiments were then carried out with the receiver a few miles away from the transmitter, and it was then found that the time-interval between the signals practically agreed with the value which it should have had according to the known velocity of wireless waves.

## Further Experiments.

A similar duplication of signals was observed in Germany on the printed records of the reception of American short-wave stations, and later on with a special short-wave transmitter at Nauen, having a wavelength of 15 metres, signals were successfully sent round the earth and recorded by photographic methods.

## Supports Heaviside Theory.

It was found by these experiments that the time taken for the waves to travel round the earth was a little over 1.7th of a second, which, although almost in agreement with the theoretical value, was not quite accurate. It is now known from other experiments that this discrepancy is due to the fact that the waves do not travel actually along the surface of the earth but partly through the upper regions of the atmosphere. The time taken for the signals to travel round the earth was such as would correspond to the waves having travelled at a height of approximately 100 miles above the earth's surface. It will be clear that they would thus have to travel round a slightly larger circle (therefore greater distance) than if they had travelled actually around the surface of the earth.

These experiments afford a striking confirmation of the so-called Heaviside theory as to the method by which wireless waves are propagated in the vicinity of the earth's surface.

## A Useful Instrument.

A very useful little device which is seldom seen in the collection of the average amateur is a thermo-couple for measuring

a small fraction of an ampere of H.F. current. Such an instrument is, of course, more useful to the transmitting than to the receiving amateur.

A sensitive couple which may be used in conjunction with a small milliammeter is quite easily constructed. A piece of ebonite of any handy thickness and about  $1\frac{1}{2}$  in. by  $2\frac{1}{2}$  in. forms a suitable baseboard upon which two copper wire pillars are arranged, these being bent at right angles to lie along the baseboard and secured by terminals. The vertical parts of the copper wire pillars should be about 1 in. in height. A small piece of metallic tellurium is mounted upon a short length of fairly thick platinum wire, about No. 20 and about  $\frac{3}{8}$  in. in length. This is done by heating



Mr. Geoffrey Gilbey, who was selected to describe the running of the Derby.

the platinum wire to a white heat and then plunging it carefully into the tellurium. The other end of the platinum wire is carefully soldered to the end of one of the copper wire pillars. To the other copper wire pillar is soldered a short piece of fairly fine platinum wire, say No. 30, and this is welded into the tellurium, either by the method just mentioned, or by sparking with a spark from an H.T. coil. A certain amount of practice may be necessary before the joints to the tellurium are properly obtained.

Thermo-couples of this kind may be used for a variety of purposes, and the current-carrying range depends upon the sizes of wire used. As this is a matter which will only be interesting to a limited number of readers, I cannot devote space here to go into it in detail, but any readers who desire further information should write to me.

## Testing Insulators.

A simple test of the insulating qualities of dielectrics or insulators may be made by placing a piece of the material between two tuning coils in a radio-frequency cir-

cuit. The two coils should not be too far apart, and they should form part of a radio-frequency amplifier. The receiver is tuned in and the strength of the signal is noted when the insulator is absent and again when the insulator is inserted between the coils. If there is a marked decrease in the signal strength when the insulator is inserted between the coils it indicates that the insulator is inferior on the score of dielectric absorption.

Another way of testing the insulating qualities of an insulator is to place it between two plates of a condenser which is connected across the main tuning condenser. In this way the placing of the insulator between the condenser plates will influence the circuit to an extent, which depends upon the value of the dielectric constant or specific inductive capacity of the material. Before a comparison can be made it is necessary, however, to retune the circuit to exact resonance. If there is a marked decrease in the signal strength when the insulator is between the plates, the insulating properties are not good. The comparison must be made with the circuit exactly tuned in both cases, and therefore it is not easy to make the test quickly, which means that accuracy is only really obtainable by the use of instruments to measure the relative strengths. The insulating test here mainly refers to the dielectric absorption of the material, and not to the direct current conductivity. The determination of the D.C. conductivity is a much simpler matter.

The foregoing account of this interesting little experiment is from the "Radio World" (U.S.).

## Which Side of the Cone?

Does a cone loud speaker give most volume when the pointed side is facing you, or the reverse? This question, which every amateur can test for himself, has lately been investigated very thoroughly in the engineering laboratories of the Crosley Radio Corporation of America. According to the results which they have obtained, it appears that the majority of single cone types of loud speaker on the market produce greater sound volume to a listener directly in front of the loud speaker when the latter is placed with the point of the cone in the direction away from the listener.

The engineers explain this difference—which is, however, only a slight one—by the fact that the cup-shaped inside of the cone is more effective in transmitting sound-wave motion to the surrounding air than the slanting outside surface of the cone. Consequently, stronger waves are set up by the "inside" of the cone than by the "outside."

## Reflection from Wall.

In addition to this it is often advantageous to place the cone fairly near to a hard blank wall (not a draped wall or a wall covered with any soft of absorbent material) as this ensures that the sound from the back of the loud speaker is reflected forward and so helps the sound which comes directly from the front of the instrument. The effect is, in fact, similar to placing a reflector behind an electric lamp, such as a motor headlight, although, of course, the advantage gained in the case of sound waves is not so pronounced as in the case of light.

# Distributing the Programmes



A view of the rear of the relay rack at the Gloucester repeater station.

During the few years that Broadcasting has been in progress in this country tremendous strides have been made in the development of land-line linkages between the various stations, until now, a vast network of relay lines is available. The methods employed in the relaying of programmes are briefly explained in this short article.  
By OUR LEEDS CORRESPONDENT.

THE opening recently of the B.B.C. "sub-relay" or programme distribution centre at Gloucester, has had the incidental effect of making the Leeds centre the most important in the country.

Before the opening of the Gloucester centre, London distributed "S.B." programmes to ten stations: Daventry, Leeds, Birmingham, Bournemouth, Cardiff, Swansea, Plymouth, Stoke, Nottingham, and its own transmitter in Oxford Street. Leeds distributed to seven stations: Glasgow, Newcastle, Manchester, Hull, Sheffield, Bradford, and its own transmitter. Manchester handed relayed programmes on to Liverpool. Glasgow distributed programmes to five stations: Aberdeen, Belfast, Dundee, Edinburgh, and its own transmitter.

But now Leeds has the largest number of dependent stations, the groups being:

- |                                |                             |
|--------------------------------|-----------------------------|
| <b>LEEDS.</b>                  | <b>GLOUCESTER.</b>          |
| Manchester (and to Liverpool), | Cardiff.                    |
| Glasgow.                       | Swansea (also via Cardiff). |
| Newcastle.                     | Birmingham (and to Stoke).  |
| Hull                           | Plymouth.                   |
| Sheffield                      |                             |
| Bradford.                      |                             |
| Leeds transmitter.             |                             |

- |                    |                      |
|--------------------|----------------------|
| <b>LONDON.</b>     | <b>GLASGOW.</b>      |
| Leeds.             | Aberdeen.            |
| Gloucester.        | Belfast.             |
| Daventry.          | Edinburgh.           |
| Bournemouth.       | Dundee.              |
| Nottingham.        | Glasgow transmitter. |
| London transmitter |                      |

Although the Dublin broadcasting station is not a B.B.C. station, it occasionally relays B.B.C. programmes, by special arrangement, and in that case Dublin is added to the Glasgow group, receiving its relay via Belfast.

A line between Manchester and Stoke links together the Gloucester and Leeds

groups, so that in the event of a breakdown on either the Leeds-London or Gloucester-London "arteries," the other route can be used. It is also useful in emergencies, as, for instance, if Manchester were supplying London with an opera from a theatre and itself transmitting a concert relayed from London. As there are three lines from Manchester to Leeds, that would normally be all right. But suppose one line was very noisy? The second would be required as a control line for the engineers to keep in touch with each other. The third might be used to send the opera from Manchester to London, via Leeds. The concert for Manchester could then be sent from London via Gloucester and Stoke.

### Line Characteristics.

There are three lines between London and Leeds, and Leeds and Glasgow; one between London and Bournemouth, Gloucester and Swansea, Glasgow and Aberdeen, and Leeds and Newcastle; and two lines on all other circuits.

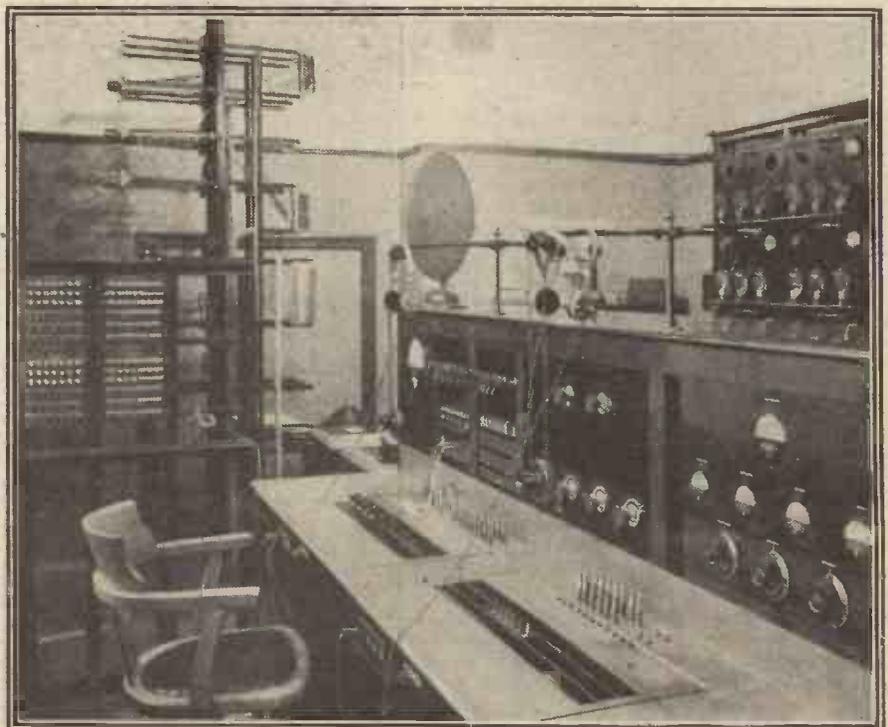
An apparatus for testing and "doctor-

ing" the lines is now being installed at Leeds and will be working shortly. When it is in operation, all lines radiating from Leeds will be regularly tested, their inductance, capacity, and resistance being measured. Graphs will then be drawn, showing the frequency characteristic of each line. It will probably be "hilly." A good line for music has a straight-line characteristic, responding equally well to all frequencies from, say, 50 to 8,000.

### Better Relays.

By connecting the Leeds end of the line to inductances and capacities, it will then be possible to correct the line, so that its characteristic is straightened out by artificial means. Only lines radiating from London are at present corrected in this way.

The effect of this improvement, of course, will be that relayed transmissions—at present a great improvement on those of a year ago—will be better still, there being less distortion or extraneous noise due to the lines.



A general view of the switchboard at the Gloucester repeater station.

# The ROBOTS of BROADCASTING

By A. CORBETT-SMITH.  
(Late Artistic Director of the B.B.C.)

**B**UT why Rosa Dartle? How did that strange woman with the scar—one of the strangest of all the creations of Charles Dickens—come into that dream of mine? What affinity had I with that queer, ill-starred creature with her interminable questions and her hopeless passion for Steerforth?

The rest I could account for. The sinister atmosphere of a great futurist machine, the underground city of the workmen slaves, the soaring tower of Babel with its lofty eyrie in which dwelt the cold, calculating Brain and slave-driver. All this macabre background was "Metropolis," that stupendous though evil film. I had just seen it, and it had frightened me.

## "Do Tell Me."

One cannot disentangle a nightmare. But I remember myself as some odd incarnation of Rosa Dartle, pursuing an elusive B.B.C. in the person of Steerforth down endless passages, roads and lifts, and hurling questions in that queer formula of hers: "Oh, dear me, don't suppose that I think anything! I am not suspicious. I only ask a question."

But the Steerforth was not the graceful gallant of Dickens (you know the odd medley of dreams). This incarnation was a grotesque compound of Miss Mowcher and Uriah Heep of the same story. It fitted along, peering round corners, spying, intriguing, masterful, yet "very 'umble."

"And those five new broadcasting commissioners," I heard myself asking, "what do they do? How do they earn the money we pay them? I only ask for information."

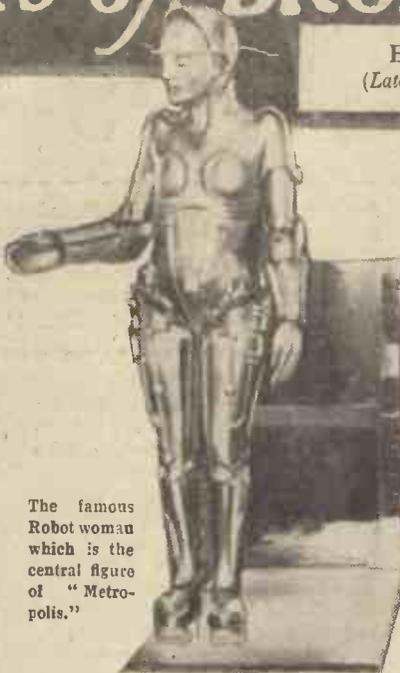
But the Steerforth was flying down a passage. "What can they do?" I called after him. "The one who is a politician and sits at the head? And the other one who is another politician and is concerned with coal mines? Do tell me, somebody. For I am interested in the entertainment of the people, and that is a very difficult problem, is it not?"

## All Mechanical.

But all that I could see were queer mechanical dolls jerking at levers against electric bulbs.

"And another who is a banker, and another who is a retired schoolmaster?" I hurried on. "And another who is a lady to represent the Labour Party? Are these all happily combining, ceaselessly experimenting in new forms of the art? An art which must tax the brains of the most sensitive creative artists in the world. I have been thinking about it all day, and I do so want to know."

A gigantic clock pointed to the hour of



The famous Robot woman which is the central figure of "Metropolis."

new shift of men-slaves, black-robed, leaden-footed, dreary, broken and spiritless, their heads bowed in hopeless dejection.

"Well, now! You really astonish me. Then who is there—am I too curious?—who is there here whom the great radio public implicitly trusts as a friend to give them leadership and sympathy in these dark days of national crises? One, I mean—you won't misunderstand me, will you?—who is skilled to turn those themes into attractive entertainment that appeal to all."

## Without Souls.

The gates of the mighty lift clanged to as the last of the shift disappeared.

"Really? Now that is most interesting. I should never have thought it possible. Machines that look like men! Dear me! So they have actually made them at last. 'Robots,' don't they call them? And they do all the supervision and leading? Wonderful, is it not?"

A shaft of dim light stabbed through the gloom and lit upon a rough, wooden cross. Beside it two slender, upturned hands glimmered.

"But tell me. Yes, I know I seem curious. But by what magic have these 'robots' been given souls? Or have you not yet won that miracle?"

And now I seemed to stand in the topmost tower beside a man who might have been the Steerforth I pursued. And, with

(Continued on page 538.)



Mr. A. Corbett-Smith.

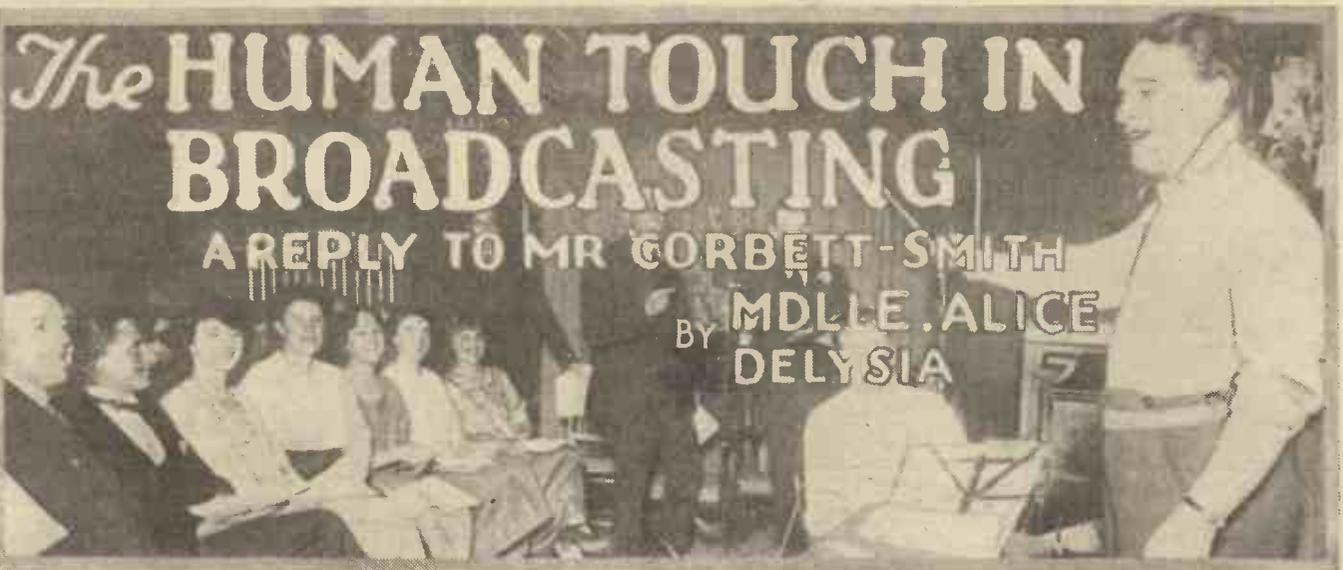
twelve, and a monstrous syren hooted another shift to the machines.

"No? Ah! I only wondered. Of course, they can know nothing about it. Then they will have engaged a staff of brilliant workers? Men and women who have passed a lifetime in the people's service. Cunning psychologists who have closely studied the art of intimate appeal in this popular radio entertainment. Is it not so? But of course it is."

And like shadows there crept past the



A scene from "Metropolis," the famous Robot film. A telephone-television set of the future.



# The HUMAN TOUCH IN BROADCASTING

A REPLY TO MR CORBETT-SMITH

BY Mlle. ALICE DELYSIA

If it has, if there is a soul behind the vast machinery at Savoy Hill, and, further, if it be true that "the voice of the People is the voice of God," then that soul must be doomed to eternal suffering. It would be difficult, indeed, to find another group of people who have had to endure so many jeers and gibes, so much calumny and blame, as has the B.B.C.

The view has been expressed that those whose duty is the provision of our broadcast entertainment work entirely on the Robot principle; that they think of nothing but the mechanical turning out of programmes, regardless of the tastes of listeners, and that a lot of people are installed there in high office who have no qualifications for the positions they fill. In short, there is no "soul" behind the microphone.

### A Colossal Task.

As a regular listener, and as one who has no axe to grind in this connection, I should like to say at once that people who say that the B.B.C. is a dull, uninteresting machine are entirely mistaken. I know of no other institution—certainly no other Government Department—more alive, more sensitive, or more throbbing with nervous energy than this one.

At present we all know that programmes are far from perfect but, as anyone connected with the entertainment world will tell you, the knack of successfully catering for the amusement of the British public—or of any other public, for that matter—is not one that may be acquired in a few months or years.

How well I know that! How well every actor or actress on the stage to-day knows the truth of it! Everyone who has taken in hand the task of trying to amuse their fellow men and women will endorse what I am saying. How well I remember those first heartbreaking years in my early career, when it seemed that success would never be mine at all.

Perhaps the average theatre-goer has not yet succeeded in picking out a "soul" in one of the hundreds of chorus girls he has seen on the stage. But somewhere among that throng there are several souls, latent and as yet unsuspected, which will one day bring their owners to the forefront.

Personally, I think the B.B.C. has made a most wonderful effort. For the programmes I hear in the general way I have nothing but praise. The B.B.C. are making a truly gallant and heroic attempt to please everybody. And at present it must be admitted that they please only a few. But how colossal is the task that they have set themselves!

I have often heard it suggested that some successful theatrical manager should be put at the head of affairs at Savoy Hill. But would he be any more successful than "the banker, the retired schoolmaster, and the lady who represents the Labour Party" (these being the usual gibing terms in which those at the head are referred to)? Far from being a greater success, I very much doubt if he would be one tenth



Mlle. Delysia, the famous artiste, whose impartial reply to Mr. Corbett-Smith appears on this page.

part as good as they are.

A successful theatrical manager is a very clever person, but there has never yet lived a theatrical manager so astute and so super-human that he could please every section of the public simultaneously. The advocates of the putting in of a theatrical man, a man, as they say, with years of experience in the entertainment world, must realise that the successful running of a broadcasting station is very different indeed from the running of a theatre.

### Sorry for the B.B.C.

For instance, your theatrical manager puts on a revue. Very well, he is catering only for that section which likes revue. All he has to worry about is whether his revue is good or not; he is not concerned with those who like Ibsen and Noel Coward. Your manager puts on a Shakespeare play. Provided the production and cast is good, he meets with a chorus of approval from everybody who is a lover of the poet.

Whether or no his play would appeal to those who prefer musical comedy does not matter.

But to the people up at Savoy Hill, all these things matter a great deal. With one or two programmes nightly they have to please every single member of an audience that possesses every known taste in entertainment. Is it any wonder that they meet with a good deal of grumbling? I quite appreciate the points of view of the listeners, but one cannot help feeling a great deal more sorry for the poor wretches at the B.B.C. who are doing their very best to please.

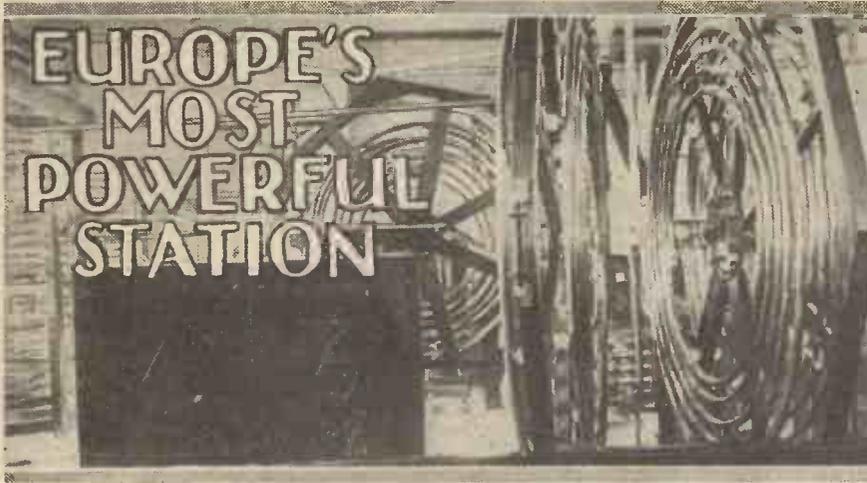
When I don't like most of the items on any evening's programme, I just switch off my set and console myself with the thought that, after all, a good many people are enjoying themselves by listening to them. No reasonable person can expect to have a programme to suit his particular taste every night. If he gets one a week he may consider himself very lucky. Take all the various tastes in the country (and there must be some thousands), divide them by the number of items on a year's programmes, and then calculate how many times in the year each of those tastes may expect to be satisfactorily catered for!

### Progress Towards Perfection.

That the great majority of listeners are pleased with one or two programmes every week seems to me the most striking proof of very special emotional and intellectual qualities behind the scenes at Savoy Hill. The B.B.C. has a soul.

Of course it has one. As in the case of human beings, that soul will come to no harm by being chastened and purged in the fire of criticism, but it is up to everyone who owns a wireless set to see that the fire never gets too hot. There is a danger that the flames may become so large that they will in the end burn up that soul altogether. When that day comes, broadcasting will be finished for good, and then what an outcry there will be!

To talk about the men and women on the board at the B.B.C. being machines, Robots, creatures like those in "Metropolis," is absolutely and completely ridiculous. No machine or Robot could make the progress which they are making daily towards perfection.



A Brief Description of the Zeesen Installation.  
By Dr. ALFRED GRADENWITZ.

THE new broadcast transmitter now under construction for the German postal department is to be the most powerful in Europe, far exceeding, for instance, the output of the Langenberg transmitter which was inaugurated a short time ago. This high-power transmitter will be operated on a long wave (1,250 metres), whereas Langenberg, with 468.8 metres, remains within the usual range of broadcast transmitting stations. This long wave was adopted because the new transmitter is to be substituted for the one daily emitting the "German wave" programme. However, whereas the present transmitter is located in the Koenigswusterhausen radio station, its successor is being installed some distance away, near the village of Zeesen.

The new transmitter is being equipped with the latest improvements in radio engineering, and comprises six water-cooled transmitting valves, each of 20 kw., fed from twelve water-cooled rectifying valves. The valves are of the same type as those used in connection with the Rhineland transmitter.

The station building, of which the raw brickwork has recently been completed, comprises a very impressive façade looking south. It is situated between two antenna towers, about 750 feet high (i.e. of the same height as the Königswusterhausen and Nauen masts), each of which has been braced in three directions. Each tower comprises six spanning foundations, each of which carries two bracing cables into the ends of which porcelain insulators have been fitted. A platform is built at the top of each mast. Sections of the surrounding forest had to be cleared in order to ensure a satisfactory earth.

#### High-Power Transmitter.

The oscillating power of the new transmitter is to be 100 kw. for telegraphy and 40 kw. for telephony, which is about twice as much as the output of the Langenberg station. Apart from its larger transmitting energy it has some additional advantages over the two German high-power transmitters at present in operation, viz., much greater height of antenna masts (750 feet as compared with 320 feet in the case of the Langenberg transmitter), their isolated arrangement and the superior earthing.

Any interference with long-distance

reception will be guarded against by using a long wave-length which, moreover, ensures a greater range than the medium wave adopted for Langenberg. It is expected to open the new transmitting station early this autumn.

### THE ROBOTS OF BROADCASTING.

(Continued from page 556.)

a haggard fever in his eyes, he strained over bubbling retorts, adjusted valves, pressed and released switches with ever-growing despair.

#### Automatons.

Then something in me seemed to snap. And I laughed in derision and mocked him. "Ha! That has beaten you!" I cried. "You with all your brain and skill and scientific flummery. You are beaten. You have crushed your men into machines. They work your levers for you. They jerk to your pulling. *But you cannot give them souls.* For you have not the soul to give them. Like master, like man. You know it. And now the people whom you serve are beginning to know it.

"For a while you have hoaxed the people by the wonder of your invention. But they grow tired of your puppets. They want living creatures of flesh and blood. Men of sensitive human sympathies. You pour out money like water upon this or that mighty entertainment, upon this or that famous artist. You dazzle by your regal magnificence and by the smooth intricacy of your machine. But the heart, the great pulsing heart of the people you have never touched. Nor will you ever

hope to touch it until you find a heart yourself. Until you shall have learned the one supreme lesson of humanity. And that lesson is Love."

#### The Edifice Collapses.

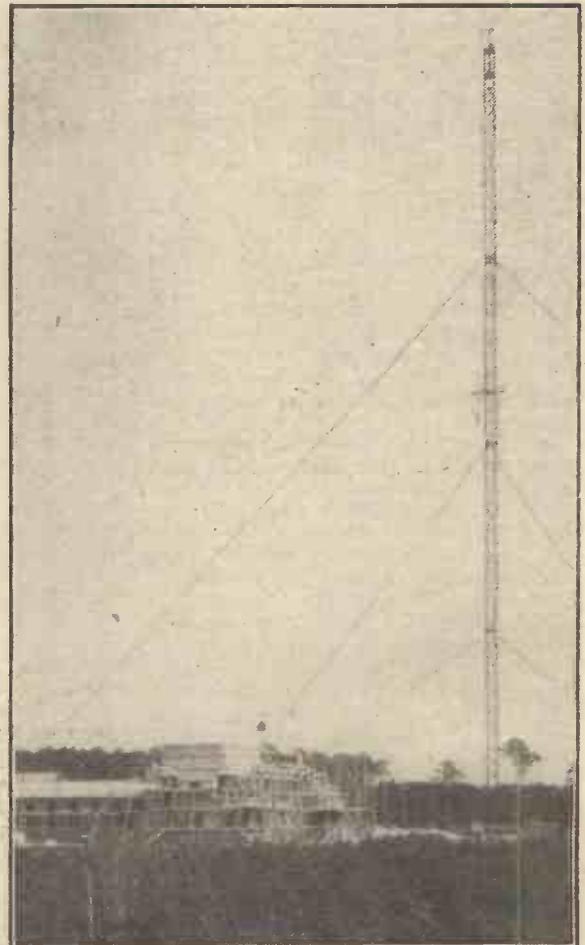
And even while my dream self spoke there came from far beneath, in that grey twilight of the underground city, the sound of roaring waters. A 'robot' manager had swung out of control. The deadly, unhuman efficiency of the creature had crashed down upon a master switch. A swift, jagged explosion had wrecked the reservoir, and the whole vast cemented edifice began to crack, crumble and break away, dissolve in ruin.

But the two upturned hands that shone beside the wooden cross spread upwards, outwards, through the gathering light, until the immensity of them seemed to cover the world.

### CAPACITY REACTION.

IN a Reinartz type circuit the reaction condenser employed does not always permit a smooth and gradual increase of signal strength to be obtained.

Oscillation may occur suddenly and with a very small increase in capacity. This can frequently be remedied by the insertion of a small fixed condenser—about .0002 mfd.—in series between the reaction control and the anode of the detector valve.



The new station buildings at Zeesen, and one of the masts.

# ECONOMICAL FILAMENT CONNECTIONS



IN the early days of broadcasting, before the advent of dull-emitters, the majority of available receiving valves consumed a current of about three-quarters of an ampere at four volts, and sets were nearly always built to take these valves

Showing how the filaments of valves of varying voltage classes can be connected up so that a minimum of current wastage occurs.

By C. E. FIELD, B.Sc.

battery in parallel, instead of in series, thus providing a 2-volt battery of twice the original capacity. This will now last twice as long, each cell will be less heavily loaded, and a negligible amount of power will be wasted.

It may happen, however, that the cells of our battery are permanently connected in such a way that it is impossible to separate and re-group them. In this case we can alter our circuit, and connect the valve filaments in series instead of in

however, by varying the usual methods of connecting the filaments to the battery.

Let us in a few examples consider some of the many possible valve circuits, concerning ourselves only with the L.T. battery connections.

Whatever valves we may be using, we should always be governed in our choice of a filament circuit by two main considerations.

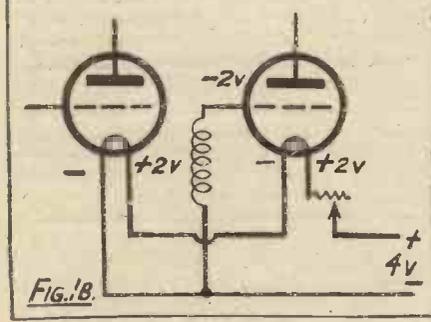
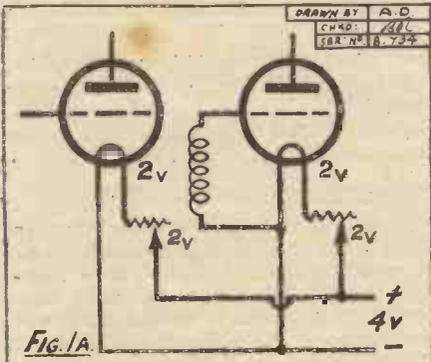
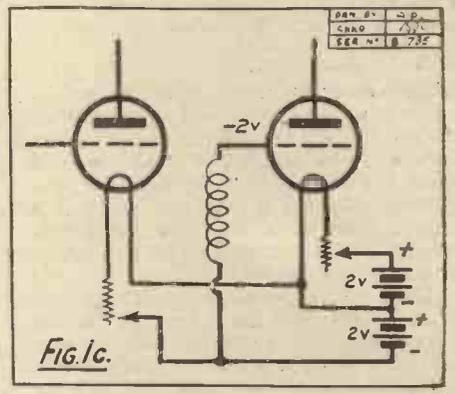
Firstly, we must waste a minimum of power in filament resistances, and where such resistances are necessary, utilise them for grid biasing.

Secondly, we must discharge all the cells of our L.T. battery as equally, and at as low a rate, as possible.

### Valves in Series.

Suppose, for instance, that we possess a 4-volt accumulator, with which we have been accustomed to work two bright valves, and we have now discarded the latter in favour of dull-emitters of the 2-volt type. If we simply replace the old valves by the new, we will have a circuit as shown in Fig. 1a, in which at least half of the power we expend is wasted in the rheostats, for each of these has to absorb half the total voltage of the battery.

The simplest way out of the difficulty here is to connect the two cells of the



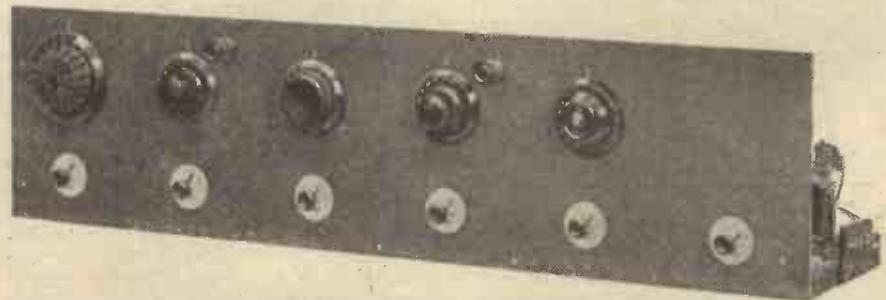
and to work from a four or six-volt accumulator.

Now, however, there is a somewhat bewildering array from which to choose, operating on from one to six volts, and consuming currents varying from .06 to 1 ampere.

### Preventing Waste.

Consequently, the experimenter sometimes finds it difficult to decide upon the most suitable valves and batteries to employ, for he does not wish to be always tied down to using valves of one particular voltage, while at the same time there are difficulties attending the use of differently-rated valves in the same set.

These difficulties can often be overcome,



A six-valve receiver employing a separate filament control for each valve. Note the six filament rheostats.

parallel, two out of the four battery volts then being absorbed by each valve.

### Automatic Bias.

This is only practicable when the currents taken by the two valves are equal, but it is a very convenient method, especially when a small bias is required on the grid of one valve (as, for instance, on a first-stage L.F. amplifier). This is illustrated in Fig.

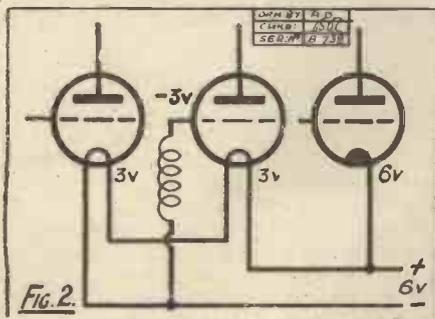
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## ECONOMICAL FILAMENT CONNECTIONS.

(Continued from previous page.)

1B, where it will be seen that a bias of 2 volts on one valve grid is obtained by utilising the voltage lost in the other valve filament, by returning the grid of the former to the negative battery lead, one end of its filament being joined to the L.T. positive.

If the filament currents of the two valves were not quite the same, and it was not possible to join the two cells in parallel, we could in many cases make a connection to the mid-point of the battery, without

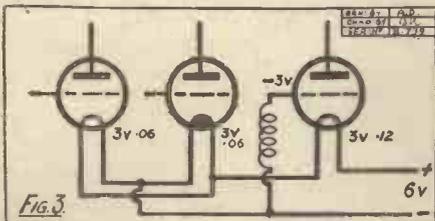


separating them, as in Fig. 1c, and run one valve from each cell, grid bias being obtained in the same way as before.

### With Dissimilar Valves.

When changing over from bright to dull-emitters, we may easily find ourselves with a 4-volt and a 2-volt valve, both to be run from a 4-volt battery, in which case it would pay us not to split up the latter, but to connect the two valves in parallel with a suitable rheostat in the circuit of the 2-volter. If both were general-purpose valves with similar characteristics, and one was required for L.F. work, we should utilise the 2-volt valve for that purpose, obtaining a 2-volt bias on the grid by returning it to the negative L.T. terminal, the rheostat being inserted between that point and the filament.

When a 6-volt accumulator is employed, perhaps to operate a high-amplification, or power valve, or perhaps merely because it happens to be there, having once been necessary, it is often felt that 2-volt valves are out of the question, and that even 4-volters entail unnecessary waste of power in rheostats. With a little care, however,



many efficient combinations of differently-rated valves may be obtained.

For instance, a very economical set, capable of good loud-speaker reproduction, might comprise two 3-volt, .06 amp. valves

as detector and first stage amplifier, followed by a 6-volt power valve. Here we could join the first two filaments in series, three of the six battery volts being absorbed by each, and connect up the power valve in the ordinary way.

A bias of three volts could be obtained on the second valve grid, as shown in Fig. 2, by using the voltage lost in the first filament, and, if circumstances should demand it, rheostats could be dispensed with entirely.

As another example, let us suppose that we wish to operate two 3-volt, .06 amp. valves, followed by a small 3-volt power valve consuming 0.12 amp. from a 6-volt accumulator. If these were all 2-volt valves, the solution would be straightforward, for we could simply connect the three cells of the battery in parallel, to give one large, 2-volt unit.

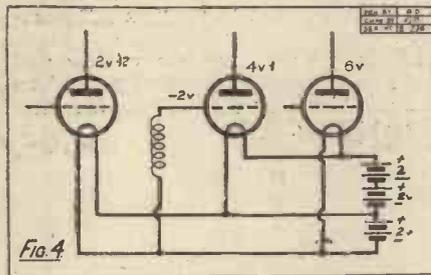
### Further Methods.

We cannot do that in this case, however, for we cannot group our cells into units of 3 volts each.

A satisfactory method would be to join the first two filaments in parallel, and connect these two together in series with that of the power valve. Such an arrangement, which is illustrated in Fig. 3, is dependent upon the current taken by the large valve being equal to the sum of the currents taken by the other two, but if this is the case it provides a very economical method of working.

A bias of 3 volts is obtained on the grid of the power valve, as shown in the figure, but by reversing the battery connections a similar bias could be applied to either of the other two grids.

If we required to supply from a 6-volt



accumulator a 2-volt, a 4-volt and a 6-volt valve, the most economical arrangement would depend upon the respective filament currents.

For instance, if the 2-volt and 4-volt valves consumed equal currents, they could be placed in series straight across the battery.

If their currents were slightly unequal (e.g. 0.1 and 0.12 amp.), then one cell could be devoted to supplying the 2-volter, the 4-volt valve being fed from the other two cells, as shown in Fig. 4. The 2-volt valve could be given a 4-volt bias, or the 4-volt valve a 2-volt bias, if required, as illustrated in earlier examples.

### A Final Instance.

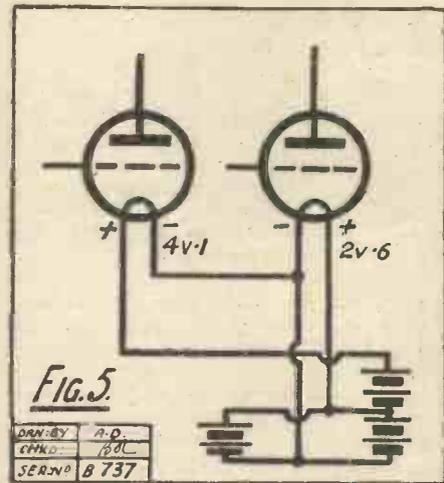
In each case, of course, the 6-volt valve would be connected to the battery in the ordinary way.

It may not always be possible to discharge all the cells at approximately the same rate without considerable loss of power in rheostats, and in some cases a more important consideration is to keep the

current supplied by any one cell within the maximum discharge rate of the latter.

As a final instance, let us suppose that we wish to operate a low-consumption, 4-volt valve, taking a current of 0.1 amp., followed by a 2-volt, 0.6 amp. power valve from a battery of three small cells.

In this case, instead of connecting the three valves across the whole of the battery, and discharging all three cells at a high



rate, a better plan would be to connect two cells in parallel, to supply the power valve, the third being added in series to provide the additional 5 volts for the other valve, as shown in Fig. 5.

### Different Discharge Rates.

Instead of each cell supplying a current of 0.7 amp., the discharge rates of the three are now respectively 0.35, 0.35 and 0.1 amp.

It is evident that there are many other ways in which the L.T. connections to a set may be made, especially when four or five valves are employed, but perhaps the few examples given will serve to show that the conventional method of connection is not necessarily the most economical, and to suggest to the reader some way of meeting his own particular difficulty.

## USING A WIRE TABLE.

By I. K. S.

NO experimenter should be without a wire table. There is such a lot of valuable data in one, that in a year many pounds can be saved by its use. Wire is now drawn accurately, and the resistances given can be depended upon to a fair degree of accuracy. Thus, suppose we require ten ohms of wire to carry a certain current, the wire table will give us about the size which will carry that current. Then we can see how many yards are required, measure them off, and a measuring wheel is very useful when winding coils.

I have a disc of wood with a groove round its edge, and the circumference is exactly one yard. The wire table gives us the resistance for 1,000 yards. My disc of wood has a brass rod through its centre, and it is pivoted on a box with two staples so that I can measure off so many yards and then wind my coil straight from the measuring wheel.

# BROADCAST NOTES.

By OUR BROADCASTING CORRESPONDENTS.

Sir Henry Wood at Work—Welsh Community Singing—Harrow Speech Day—The City to Listen Again—Dominion Day—A Border Night—Artistes' Disaffection Spreads—Sir John Reith and America—B.B.C. Composers' Programme—Plymouth Children's Festival—Cardiff on Crabs.

## Sir Henry Wood at Work.

SIR HENRY WOOD will make his bow to the microphone on Thursday, June 30th, when he will conduct a special symphony concert in London. This will run from 8 to 10.30 p.m. with the normal interval for news and announcements at 9. The early part of June is being devoted by Sir Henry to building up his new orchestra and securing the agreement of Savoy Hill with his various musical schemes for the future. It is understood that the personnel of what was formerly known as the New Queen's Hall orchestra will be added to the Wireless Symphony orchestra to form a new aggregation probably more brilliant and varied than any other of its kind in the world. Therefore, we are at last within sight of the "World Orchestra" about which the B.B.C. has been talking for some time past.

## Welsh Community Singing.

On Monday, June 27th, listeners to Daventry and Liverpool will have the opportunity of hearing community singing in Welsh from a local Eistedfodd near Rhos, North Wales. This is being organised by Mr. Gwynne Williams, the eminent Welsh composer and musician. Mr. Gwynne Williams has long been a stern critic of the B.B.C. He thinks that Savoy Hill has dealt most unfairly with Wales and Welsh aspirations. It is known, too, that he does not see eye to eye with Sir Walford Davies. In fact, some months ago, Mr. Williams gave up the B.B.C. as a bad job and turned his attention to Dublin, where he induced the broadcasters to include Welsh programmes. But there is a report that even Dublin cannot meet the demands of North Wales as interpreted by Mr. Williams. So it would appear that he is trying the B.B.C. again, primarily in connection with the community singing festival at Rhos. In this connection, Mr. Williams has been recounting to a local newspaper correspondent how he put it across Savoy Hill. When he wrote some weeks ago to the London headquarters he was turned down flatly. So he approached the Liverpool Station, and arranged the thing before Savoy Hill woke up to the fact that they had been completely outwitted. Consequently there is joy in the nationalist Welsh camp, and, presumably, corresponding depression amongst the Anglo-Saxons of Savoy Hill.

## Harrow Speech Day.

London will broadcast Harrow Speech Day proceedings from 5 to 5.30 on Wednesday, June 29th. This "O.B." will consist chiefly of songs by the boys of the school known far beyond the view from the top of which is the famous Hill.

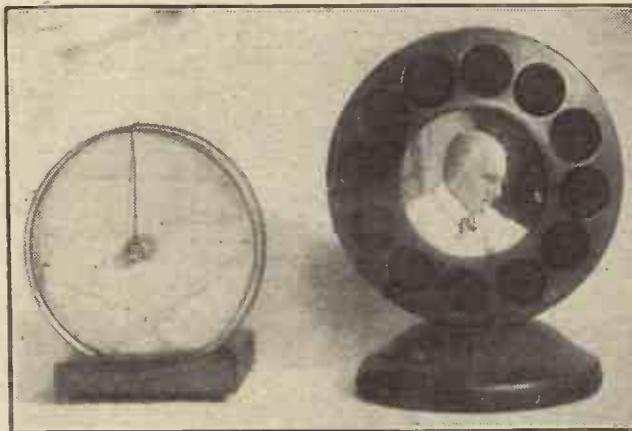
## The City to Listen Again.

During the last week of June the City will be listening-in again. Not since the General Strike has there been any use for

the numerous sets installed in City offices. But the broadcasting of the Tennis Championships has already caused great activity in City tennis circles. The special tennis broadcasts will be given between 4 and 5 on Wednesday and Thursday, June 29th and 30th, and between 4.45 and 5.15 on Friday, July 1st, as well as at frequent intervals during the afternoon of Saturday, July 2nd.

## Dominion Day.

July 1st is Canada's Day. This year it is the sixtieth anniversary of the Confederation of the Canadian Provinces. There will be a broadcast of a special midday service from the Abbey, and in the evening listeners will hear a brief special Canadian programme. An attempt will be made to relay the carillon



Evolution of the Microphone. One of the earliest models, and one of the latest, with the portrait of the inventor.

from Ottawa, but the chance of success is negligible.

## A Border Night.

So generally appreciated was the recent "Highland Night" programme relayed by all Scottish Stations from Edinburgh, that a Border Night Concert on similar lines is to be given on Wednesday, June 15th. The programme will be introduced by Sir George Douglas, Bart., Hon. Vice-President of the Edinburgh Borderers' Union. A particularly interesting item will be the singing of "Teribus," the Hawick song, by James Yule, who has led the singing at the Hawick Common Riding for many years.

## Artistes' Disaffection Spreads.

There are rumours of trouble between the B.B.C. and Sandler at Eastbourne. It is the old money difficulty. It is to be hoped that a settlement is reached. B.B.C. statesmanship will be in disrepute if, for whatever cause, Sandler and his orchestra should disappear from the programmes. Perhaps Savoy Hill has forgotten the significance of the adage that consistency can be overdone. If the financial position

is as cramped as is represented, why doesn't the B.B.C. start to clamour for more money from the Post Office? "Pass the buck" to the P.M.G. would appear to be the wise move.

## Sir John Reith and America.

Some journals have attacked Sir John Reith with considerable bitterness because of his alleged acceptance of an invitation to be present at the opening of the new buildings of the National Broadcasting Company in New York. Curiously enough, there has been no invitation so far to accept. But even if one comes, and the Corporation decide that Sir John is to go, there can be nothing improper in the journey being made, at the cost of the Corporation if necessary. If the Director-General of the B.B.C. is open to criticism it is because he does not go abroad enough.

A visit to America such as this would be of tremendous advantage to the B.B.C. Not only would Sir John's active mind absorb new ideas, but he would feel more concretely the international implications and responsibilities of his medium. Incidentally, we in England might get studios and offices for broadcasting more in accordance with the dignity and resources of the great public service which broadcasting has become here.

## B.B.C. Composers' Programme.

The staff of the B.B.C. includes a number of composers of eminence whose works are occasionally broadcast. Mr. Percy Edgar, the ever-enterprising Station Director at Birmingham, has conceived and is executing the happy idea of putting out a special programme made up entirely of the work of these staff composers. The programme will be broadcast from Birmingham and Daventry on Tuesday,

June 14th. Mr. R. H. Eckersley, head of B.B.C. programmes, Mr. Kenneth A. Wright, Mr. Victor Hely Hutchinson, Mr. R. Chignell, and Mr. Stanford Robinson are among those whose compositions will be given.

## Plymouth Children's Festival.

The annual service in connection with the Plymouth Children's Festival is to be broadcast from Plymouth on Sunday, June 12th, at 6.30. In accordance with immemorial custom, the festival will take place in the magnificent Guildhall at Plymouth. The George Street Baptist Church Sunday School, with which the Festival is associated, has been in existence for 114 years, while the Church itself was founded over three hundred years ago.

## Cardiff on Crabs.

Cardiff naturalists should be interested in a summer series of talks from that Station on the mailed warriors of the seashore, crabs, lobsters, shrimps, and prawns. Professor Tattersall, the lecturer, will deal particularly with how these creatures keep on growing new legs.

**TRANSFORMER v. RESISTANCE COUPLING.**

The Editor, POPULAR WIRELESS.

Dear Sir,—The correspondence relating to the above, etc., in your very valuable paper has been intensely interesting, and I should like to give my quota in this connection. Fifteen months ago my technical knowledge of wireless was about nil. The untrue rendering of various musical items on the many sets I had listened to left me only a visitor to friends' wireless receptions. At last the right one came along, my host was unable to enlighten me as to the kind of set he had got; he and I could only say it was not a crystal. Next day the vendor was visited, and one like it purchased. It was set up in course of time, and my family and musical friends were charmed with the reception. Subsequently we found that it was resistance coupled. I re-heard many of the sets previously listened to; a few were tuned anode and transformer coupled, the remainder H.F. and L.F. transformer coupled. The musical items were terribly twisted, orchestral instruments could scarcely be identified, the tone thin, hard, sometimes reedy, others muted. The short, slight crescendo taken by the orchestra was transformed into a whirlwind. The artists with an armful of an instrument and his E flat bass neighbours in a brass band might have saved their energy—they were not heard. The vibrato (a cruel vice, those days) of the singing voice was given out ten times worse. Transformers treat wavering ruthlessly. One could not get used to these eternal tonal effects; they were unreal, and unnatural happenings to the ear. One writer mentions: "The pain and anxiety of a musician when he switches on his set!" I do not believe that the reproduction of any musical item given by the B.B.C. would cause pain and anxiety to any musical mind, unless he was not well. There are some who show distress at musical happenings—in nearly every case it is affectation or ill-health; it is not the ear, but some de-arrangement requiring attention. A trained musical mind will find plenty to occupy his attention listening to the flow of harmony, melodic progression, the entrance of the subject, its modification, etc., in part writing, the tonal colouring, the rubato and other points of expression, comparing with other renderings of the same item, but let him have all parts—the bottom and the top notes!—you may as well give him a book with some cut off the sides of the pages. Artists playing the double B, the E flat bass, bass trombone, contra bass, bass clarinet, tuba and bassoon, will soon object to play as their efforts are not heard by many listeners.

Faithfully yours,

Kebbot, Ripponden, Yorks.

JOHN GARSIDE.

**ARE WAVE-TRAPS NECESSARY?**

The Editor, POPULAR WIRELESS.

Dear Sir,—In the correspondence for your issue of May 14th, Captain J. D. Hall gives his experience of, and praises for, the "P.W." Complete Eliminator. While fully believing in the merits of an eliminator of this description, I think it hardly a necessary requisite for a properly designed receiver using two screened stages of H.F., as Captain Hall appears to use.

Curiously, I am situated practically opposite to him, my aerial running at right angles to his. I do not know whether this direction makes much difference, but, using a 2-v.-2 receiver, with totally screened coils, I have no difficulty in cutting out 2 L O with a very slight movement of each tuning condenser. Signal strength from London is strong enough for me to receive at full loud-speaker strength on two valves (0-v.-1) with only a frame aerial.

The Complete Eliminator is undoubtedly a useful instrument, but surely its merits are best realised by readers who do not use H.F. amplification. May I conclude by wishing good-luck to your paper? I have built several receivers from circuits noticed therein. My present receiver is adapted from "The Wanderer Five" in "Modern Wireless."

Yours faithfully,

H. FOSTER.

13, Burghley Road, Kentish Town,  
London, N.W.5.**SHORT-WAVE RECEPTION.**

The Editor, POPULAR WIRELESS.

Dear Sir,—Since my last letter to you, I have received many letters from those interested in the reception of short-wave transmission. The majority of these letters were sent direct to me, the others have appeared in "P.W.," and I think my conclusions, as drawn from the whole of this correspondence, would be interesting to those concerned. Taking the letter of Mr. Young first, he should be more careful, read my letter again, and modify his letter accordingly. At present this correspondence is confined to short-wave reception; when I need advice on L.F. amplifiers I will write direct to Mr. Young. The reasons for my previous letter were that I have often seen it stated that 2 X A F can be received any night on the loud speaker. K D K A can be received every night on the loud speaker, using two valves and no aerial, and two valves will bring in thirty or more American and Continental short-wave stations on the loud speaker. 2 X A F at present only transmits on Tuesday, Thursday and Saturday. At the time of my previous letter Thursday was not included; therefore how could they be heard any night? Also my experience with K D K A differed greatly from the above, and lastly I am seriously in doubt as to whether there are thirty or more short-wave stations

**CORRESPONDENCE.****TRANSFORMER v. RESISTANCE****SHORT-WAVE RECEPTION—WET H.T. BATTERIES—ARE WAVE-TRAPS NECESSARY?**

Letters from readers discussing interesting and topical wireless events, or recording unusual experiences, are always welcomed; but it must be clearly understood that the publication of such does in no way indicate that we associate ourselves with the views expressed by our correspondents, and we cannot accept any responsibility for information given.—Editor.

working even at the present time. The experiences of the majority of my correspondents are identical with mine, and the following table will describe them:

K D K A on 14 metres	R4.
2 X A D " 22 "	R8-R9.
Phillips " 30.2 "	R6-R8.
2 X A F " 32.77 "	R7-R9.
K D K A " 63 "	R1.

Of course, by the time this letter appears in print conditions may have altered, and this report may no longer hold good. This report is drawn from the correspondence of all using three valves. R1 can hardly be termed loud-speaker strength. At present I myself use two valves, 2 X A F and Phillips can occasionally be put on the loud speaker; the others are in proportion to the above table. I have one correspondent who claims to be receiving K D K A and 2 X A F on the loud speaker at practically equal strength, therefore we have this correspondent (I am not at liberty to give his name), Messrs. Young and Manly, who receive K D K A on the loud speaker. The remainder have something seriously wrong with their L.F. amplifiers, and I refer them to Mr. Young. Curiously enough, their receivers are only inefficient on 63 metres!

I should like to hear from anyone who receives K D K A on 14 metres; I know of two others—Mr. Love and another whose acknowledgment from K D K A states that his report of K D K A on 14 metres was the first received.

Yours faithfully,

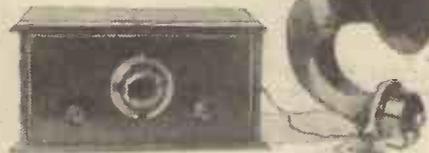
48, Walling Street,  
Bexley Heath, Kent.  
THOMAS CRUNDWELL.**THE GUARANTEED REFLEX.**

The Editor, POPULAR WIRELESS.

Dear Sir,—I am forwarding my results with my Guaranteed Reflex circuit, which I have given a thorough trial over a period of about three months, and the results for a set employing only two valves are extremely gratifying.

The following stations have been received at full loud-speaker strength for a moderate sized room:  
Radio-Paris, Daventry, Vienna, 6 BM, Langenberg (louder than 5 X X at times), Frankfurt-on-Main, Plymouth, Hamburg, Stuttgart, Madrid, and

Mr. Sleep's Guaranteed Reflex Receiver.



Cardiff. Also Newcastle, Manchester, Leipzig, 2 L O, Prague, Dublin, Breslau and others at moderate loud-speaker strength.

On 'phones all the B.B.C. and most of the chief European stations have been logged, some as far distant as Russia (Moscow).

On Sunday mornings several amateur transmissions (telephony) come in clearly.

Re components used, after experimenting with several combinations of L.F. transformers, I find that by far the best results are obtained (for volume, tone and smooth reaction control) with a Marconi Ideal (2:7:1) in the first stage, and a Ferranti A.F.3 in the second (valves used, 2-volt Mullard P.M. and S.T.).

My aerial (single wire T aerial) is about 40 feet high and 40 feet long, the earth wire being 8 feet long, to a buried plate right under the lead-in.

Many of the parts are home-made (including cabinet, loud speaker, geared coil holder, low-loss solenoid coils, valve holders, perikon type detector, etc.).

In my opinion the great success of this type of circuit for DX work is the simple one dial tuning, and the usually smooth working of reaction for a reflex circuit.

Thanking you for publishing such interesting periodicals as POPULAR WIRELESS, "Modern Wireless," and the "Wireless Constructor," all of which I read regularly.

Yours truly,

46, Fisher Road,  
Newton Abbot, Devon.  
R. SLEEP.**A SHORT-WAVE STATION.**

The Editor, POPULAR WIRELESS.

Dear Sirs,—While listening on the short waves recently, I was surprised to pick up a station 10 metres lower than 2 X A F. This was station 2 X A D, General Electric Company, New York, and was, like 2 X A F, a relay of W G Y. Their wavelength is 22'02 metres, and are picked up quite easily compared with the sister station, 2 X A F. Thinking it may interest your numerous readers, here are the details: Reinartz Circuit. Loose coupled aerial coil two turns on 3 in. former, then slipped off after binding. Reaction and grid coils eight turns on 3 in. former, centre-tapped. This station can be received on the grid coil alone, in fact, putting reception on two valves (D and L.F.) at R7, the strength only reduced to approximately R6 on disconnecting aerial coil, and when I put the aerial coil at a distance of one foot away, the result was the same as when coupled at three inches.

Thanking you for your excellent journal, which I have had since its inception.

Yours sincerely,

76, Queen Street, Shaw,  
Oldham, Lancs.  
EDWIN TURNER.

P.S.—I have written to 2 X A D for confirmation and details as to power, times of transmission, etc. When I receive these I will let you have them for your reference.  
E. T.

**WET H.T. BATTERIES.**

The Editor, POPULAR WIRELESS.

Dear Sir,—In order to test the efficiency of Leclanché type batteries, I have just made an interesting test. A new 60-volt battery of the best make was used for the test.

Of the 44 cells, half were taken down, and the sac elements removed and placed in jars with zincs to make up a wet battery. Then the whole battery was connected in series, consisting of 22 cells dry and 22 wet cells. They were connected to a resistance, and the milliammeter started discharging at 10 milliamps. At the commencement of the test the voltage was 65. The current was taken continually for some days, until the voltage of the battery dropped to 35. At this time the wet cells had beaten the dry ones by showing a much higher voltage per cell. On leaving the cells for a week and testing again, they were put on discharge, and the wet battery again showed a considerably greater voltage than the dry, both at the commencement and the end of the test.

This has proved to my satisfaction that the wet battery does have a greater output than the dry. It has the further advantage of being very silent in action, and can be easily kept in good condition by the addition of sacs and zincs as required.

To get the best results, however, care has to be taken in making a good job of insulating the jars to avoid constant leakage.

The electrolyte should be a solution of salammoniac, six ounces; zinc chloride, four ounces, to twenty ounces of boiled water, poured into cells when cold, without spilling.

Yours faithfully,

46, Bernard Street, W.C.  
D. WOODFORD.**BLUE PRINT SUCCESS.**

The Editor, POPULAR WIRELESS.

Dear Sir,—I am taking this opportunity of writing in praise of your blue print circuit No. 19, two valves, detector, and L.F.

I have been a constant reader of "P.W." since No. 1, and I look forward to each weekly publication with as great, or even greater, interest than the earlier numbers of 1922, and the pages are chock full of learning.

I have constructed several sets, but have not had results equally as good, and the fact that seems to make results appear astounding is that the same wood is used for mounting all components and also the panel as is used in making the cabinet. No ebonite or other insulating material. Here are a few results; to give all would no doubt bore you.

Loud speaker: Daventry, Radio-Paris, Königswusterhausen, Hlversum, Eiffel Tower, Warsaw, Rugby (Transatlantic telephone), Cardiff, Birmingham, London, Manchester, Hamburg, Madrid, Stuttgart, Berlin, Langenberg.

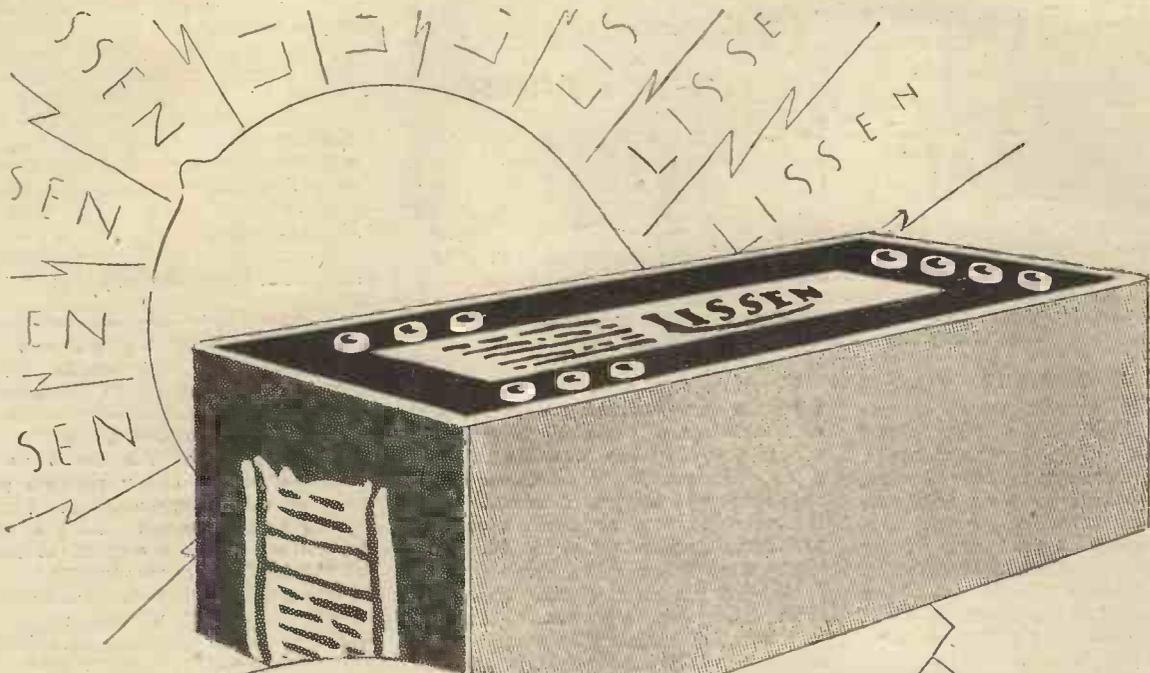
All the above stations usually come in on one valve when using the headphones, and when I switch the other valve in most of the German stations come in—Leipzig, Münster, Frankfurt, and one or two Spanish—Barcelona, San Sebastian.

On two occasions of sitting up into the early hours I logged two American stations, but this latter I cannot guarantee, as conditions vary. The stations I have heard and have not taken trouble to identify are very numerous, and the stations I do not seem to get are the Scottish, but I think I can attach the blame of that to the directional effects of my aerial, which is about 16 ft. to 18 ft. high and runs north and south, the lead-in being at the south end.

I will now conclude, wishing your interesting paper the success in the future that it has attained in the past.

Yours sincerely,

77, Grange Road,  
Stourbridge, Worcestershire.  
A. E. TYLER.



**Practical Points  
about the LISSEN  
New Process Battery**

- (1) It brings a new power smoothness to your loud speaker.
- (2) It offers a stubborn resistance to volt drop.
- (3) Every battery absolutely fresh when you get it.
- (4) The price low enough to bring it within the reach of all.
- (5) You can get it on your way home at one of the 10,000 LISSEN producers. Get one for your week-end radio.

**7/11**

(previously 10/6)  
If more than 66 volts  
are required connect  
two batteries in  
series.

**A SECRET  
BETWEEN TWO  
MEN AND TWO  
BATTERY A**

**LISSEN  
NEW PROCESS  
BATTERIES**

**LISSEN LTD.,**

8-16, Friars Lane, Richmond, Surrey,

Managing Director: Thomas N. Cole.

We know of manufacturers who have on their own tests proved the LISSEN New Process Battery to be better than their own. So anxious have these manufacturers been to know what makes the LISSEN battery so good that they have bought many new LISSEN Process Batteries to take them to pieces; they have analysed them; their research staff has worked on them, they have tried by every conceivable means to probe the secret, but are still none the wiser. Say you were the maker of a battery and you had discovered a formula and a method of making high tension batteries which gave you a clarity of tone in a loud speaker such as no other battery gave, which lasted longer than any other battery, which stood the strain of the longest programme without being affected, because of its large oxygen content, a battery that gave a free and willing discharge of clean, smooth-flowing energy, would you be inclined to let everybody know exactly what the formula was? It is not very likely. And that is precisely why only two men (and they are in the LISSEN organization) and the battery itself know what goes to the making of the LISSEN New Process Battery to account for its remarkable properties. A feature of this chemical combination is that subsequent analysis does not reveal the secret because of the reaction of one chemical upon another. The secret is therefore secure, and is exclusive to LISSEN.

Yet this LISSEN battery has been easy for you to obtain. Price and the LISSEN policy of marketing has placed it within your reach.

This LISSEN battery was first intended for sale at 13/6, and we knew that it would sell at that price on its merits. However, we put into operation a new direct to retail shop policy of distribution which cut out wholesale profits, and made the price 10/6. Then on January 24th, 1927, we took the bold step of asking our retail friends to help us in giving you this battery at a still lower price by accepting less discounts. We made a similar sacrifice in profit ourselves in the hope of bigger sales. We were loth to lower trade discounts, but we felt that the step would be justified by larger sales, at the now remarkably low price of 7/11.

Your nearest dealer has one of these batteries ready for you. Call for it and get it the next time you want a good battery. Call for it in a way which shows you mean to get it—your insistence will be rewarded by a new power smoothness and a new clarity of tone in your loud speaker. If you meet with any difficulty in obtaining it, order direct from factory. No postage charged. Or will be sent C.O.D. by return on receipt of postcard.



# Apparatus Tested

Traders and manufacturers are invited to submit wireless sets and components to the "P.W." Technical Dept. for test. All tests are carried out with strict impartiality in the "P.W." test-room, under the supervision of the Technical Editor, and the general reader is asked to note that this weekly article is also intended to provide a reliable and unbiased guide as to what to buy and what to avoid.—EDITOR.

### THREE EDISWAN COMPONENTS.

THE new variable condensers which come in Messrs. Ediswan's "Precision" range are massively heavy components. Their vanes are fashioned out of hard brass, and their metal-end frames are nearly an eighth of an inch thick. The geared condenser is provided with a small worm gearing which gives a 100-1 ratio, and is very smooth in operation. The condenser is of the straight-line frequency pattern, and its moving vanes are connected to the metal framework. A screening plate is provided, and the dial is of a very substantial character. The whole component fulfils all modern requirements, and is fully to be recommended to our readers. The vernier action is, as mentioned before, smooth, and provides a fine adjustment free from harshness or backlash. The direct drive is equally satisfactory. The .0005 mfd. condenser costs 27s. 6d., and the .0003 mfd. 22s. 6d.

The plain type condenser is fitted with a vernier vane which is controlled by the centre portion of the dial. This variable also is a straight-line wave-length tuning model. In practically all other respects it is similar to the geared model. It has the rather unusual maximum capacity of .00078 mfd., and retails at 18s. 6d.

The third Ediswan Precision component is a geared coil holder of the "three-way" type. The gearing is identical to that fitted to the geared variables in general design, although in this case the ratio is reduced to 24-1. It is a very suitable form of gearing for a coil holder, inasmuch as it is absolutely non-returning and the heaviest of coils are unable to force the holders back by their weight. This geared coil holder is designed for back-of-panel baseboard mounting, and is provided with sufficiently long handles. The knobs are rather larger than is usual, and the whole device can be fixed in position

by means of two screws driven downwards through the ebonite base into the base-board. We particularly like the substantial terminals and the strong and permanently fixed flexible connections between these and the moving coil blocks. The movements are good, and there is not the slightest sign of backlash in the model submitted. It is rather a pity that coil holders are tending to become obsolete now that fixed coil couplings are the order of the day. Anyway, when any amateur requires a three-way coil holder the claims of the Ediswan geared type should not be overlooked at 24s.

### CELASTOID AND CELLASTINE.

British Celanese, Ltd., who will be well known to "P.W." readers as makers of artificial silk, recently sent us samples of their Celastoid and Cellastine, two materials specially recommended for use as panels in radio receivers. The one is black and provided with a highly polished surface, and the other translucent and somewhat similar to tortoiseshell. They are heavy substances, and are claimed to have an absolute stability of quality.

On test we found them to have excellent electrical qualities in every way, in fact, equal to those exhibited by the highest grade of ebonite. The materials worked well, too, and could be cut and drilled and tapped without the slightest trouble.

British Celanese, Ltd., inform us that the material does not tend to change colour or lose its polish with age, and that there is no tendency to warp even when subjected to extreme variations of temperature. And we came to similar conclusions during our tests.

(Continued on page 566.)

## Ashley Radio

# Guaranteed Components for high efficiency Sets.

### JACKS

JACK No. 1, Single Circuit (Open) **1/3**

JACK No. 2, Single Circuit (Closed) **1/6**

JACK No. 3, Double Circuit **1/9**

JACKS No. 4 and 5 for Filament Single and Double Control **1/9 and 2/3** respectively

Positive in action, these Jacks were designed by telephone engineers whose experience in other directions has enabled them to simplify the movements; embody refinements, and to recommend the materials and methods for their construction. Tags are tinned and spread fanwise for easy soldering.

**Guaranteed to be manufactured of materials which have secured the approbation of experts associated with this and other journals Ashley Components can pass any examination with distinction. Cheaper than others they may be, but nevertheless they are a repeated feature in many valuable sets.**

#### VALVE HOLDER

This Valve Holder has been adopted by B.T.H. for their R.K. Loud Speakers, a tribute to its high insulation and anti-capacity properties. Bakelite. **1/3** each.

#### RESISTORS

The modern method of ensuring correct and unvarying L.T. Supply. Obtainable in any desired value for inserting in circuit with any make of valve. Guaranteed accurate to within 2%.

The base is moulded of genuine Bakelite, with nickelled Phosphor-bronze clips, which grip with firm contact but permit of easy extraction.

All Standard values **1/6**  
Base **1/-**

#### STANDARD TELEPHONE PLUG

The neatest finish to any pair of leads. Equally adaptable to spade or pin tags, rigid or flexible wire. **1/6** each

## ASHLEY WIRELESS TELEPHONE CO. (1925) LTD.,

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*If unobtainable mention local dealer and we will send post free.*

**"STEEP SLOPE"**  
*means*  
**STRONGER SIGNALS**

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## New Osram **"STEEP SLOPE"** Valves for 2 Volt Users

You will agree with 'TONE' & 'POWER' that their new 'Steep Slope' 2-volt valves have especial advantages. Not only are the initial and maintenance costs lower, but the 'Steep Slope' characteristics mean stronger signals without distortion, and the low consumption filament is a tremendous advantage for portable sets.

### DEH 210

This valve is ideal for Resistance Capacity Coupled Circuits. The Amplification factor is 35 and gives tremendous volume and perfect purity. Recommended also for Anode Bend Detection.

Consumption 1/10th ampere.

Price 14/-

### DEL 210

A general purpose valve of exceptional purity and remarkable performance. Use it as H.F. Amplifier, sensitive Detector and as L.F. Amplifier in Transformer Coupled Circuits. Consumption 1/10th ampere.

Price 14/-

### DEP 215

The Loud Speaker Valve which has set a new standard for 2-volt users. Sensitive to weak signals, gives ample volume and natural tone, and has low consumption and long working life. Consumption 1/7th ampere.

Price 18/6

OBTAINABLE FROM ALL WIRELESS DEALERS

# Osram

STEEP SLOPE

# Valves

for TONE & POWER

## APPARATUS TESTED.

(Continued from page 564.)

We should imagine that Celastoid and Cellastine will prove popular materials among constructors.

### THREE EFFICIENT CRYSTAL DETECTORS.

The Theta Company, of 256, Brearley Street, Birmingham, recently sent us three of their detectors. They are all well made and are all designed as neat one-hole mounting panel components. The "Siris Major" has a simple screw adjustment, and embodies a very nice piece of iron pyrites. As readers will know, this mineral can be an excellent rectifier, although it is difficult to obtain in a suitable condition. The "Siris Major" detector embodies an excellent specimen, and is both sensitive and stable. When adjusted, the locking collar can be screwed tightly down and the detector will operate for considerable periods without further adjustments in both straightforward crystal circuits and in valve crystal combinations. The price of this detector retails at 3s. 6d.

The "Thetatec" includes a tellurium-synthetic zincite crystal combination, and is slightly more sensitive than the "Siris" although it is quite as stable. This detector retails at 2s.

The "Siris Fixed" is a permanent detector and is provided with no adjustment. It is guaranteed for one year providing it has not been opened, and at the price of 1s. 9d. appeals to us as being an interesting proposition. It operates quite well, and despite the reception of a fair amount of

rough handling given to it the sample submitted to us shows no signs of a diminishment of sensitivity.

### A NEW B.T.H. 2-VOLTER.

Type B.23 (power amplifier); fil. volts, 2; fil. amps., 0.2; amplification factor, 6; impedance, 8,000 ohms. Price 18s. 6d.

This is the first valve of a new B.T.H. 2-volt range to be issued, and the makers inform us that they have pushed the production of this particular type forward in order that a 2-volter suitable for a last stage companion to the B.8 should be available. We are sure that everyone will accord a hearty welcome to every new valve which comes along to extend the range of the makers of the famous B.4. Hitherto, Messrs. B.T.H. have lagged a little way behind in the production of valves of types necessary to fulfil modern requirements in all three voltage classes, but now they are evidently determined to bring their team well up to scratch.

It is interesting to note that the B.23 has a filament consumption between that of the more economical types

and that of the rather greedy 2-volters, and we agree with Messrs. B.T.H. that the compromise is a happy one, all things considered. As a power amplifier the impedance of the B.23 is rather on the high side, but its healthy emission is somewhat of an offset against this. Certainly it operates very well indeed, and can handle pretty hefty inputs without distress. Used with about 100 volts H.T. and between 4 and 6 volts grid bias, it develops an excellent round tone, and does its bit in respect of magnification as well.



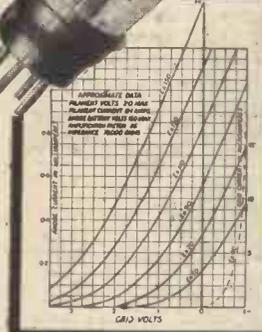
The Prince of Wales opening the White Rock Pavilion at Hastings. A Marconiphone Public Address Installation was used, and the Reisz microphone and Round loud speakers can be seen in this photo.

# NEW MARCONI

## 2-VOLT ECONOMY VALVES

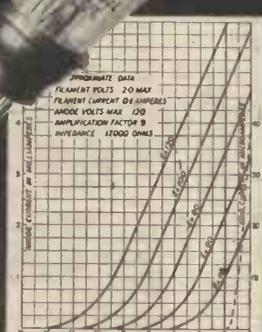


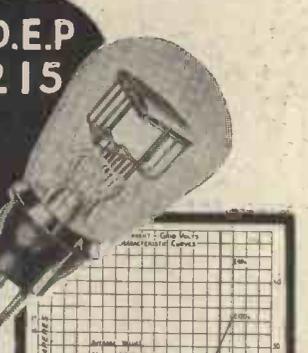
**DEH 210**



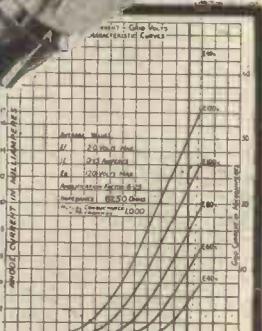


**DEL 210**





**DEP 215**



**DEH 210 Price 14/-**

Filament volts - 2.0 max.  
 Filament current - 0.1 amp.  
 Anode batt. volts - 150 max.  
 Amplification factor - 35  
 Impedance - 75,000 ohms.

**DEL 210 Price 14/-**

Filament volts - 2.0 max.  
 Filament current - 0.1 amp.  
 Anode volts - 120 max.  
 Amplification factor - 9  
 Impedance - 17,000 ohms.

**DEP 215 Price 18/6**

Filament volts - 2.0 max.  
 Filament current - 0.15 amp.  
 Anode volts - 120 max.  
 Amplification factor - 6.25  
 Impedance - 6,250 ohms.

Now, a complete series of Marconi *Economy* valves for the 2-volt enthusiast! Two new valves—the DEH 210 and the DEL 210—to operate in conjunction with that famous power valve—the DEP 215. And users of these valves obtain something even more important than economy in upkeep expenses. They get increased volume, sensitivity, and infinitely purer tone.

*Full particulars sent on request.*

**THE MARCONIPHONE COMPANY, LIMITED**  
*Registered Office* - Marconi House, Strand, W.C.2  
*Head Office* - 210-212, Tottenham Court Road, W.1

# Insist on a Fair Test when choosing a Loud Speaker



WHEN choosing a car you don't test one out on the level and its competitor on a hill. It would not be a fair test—for either. You insist that your trial runs in different cars shall be over the same ground under the same conditions.

Insist on the same fair test when buying a Loud Speaker. Hear various makes on the same Set. Don't compare jazz on one Loud Speaker with oratorio on another—hear them reproducing the same (or similar) music. Above all, don't choose a Loud Speaker on its performance with a super-het. for use with your "two-valver"!

Insist on hearing it with a similar set to your own, or, better still, get your Dealer to demonstrate on your set.

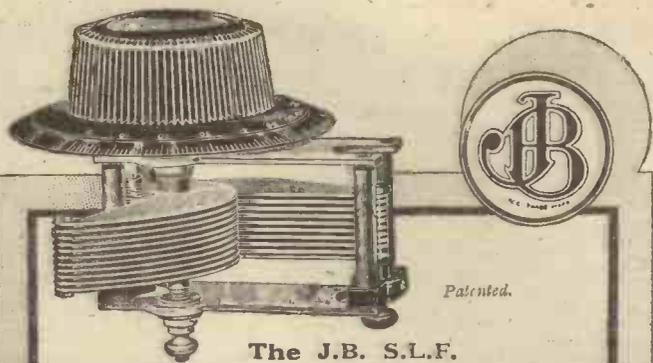
More than likely such a fair test will lead you to choose the Brown. For the Brown tells the truth . . . and, after all, that is all you want from a loud speaker. Isn't it?

Among ten Brown Loud Speaker models is a type to suit every need. Prices are from 30/- to £15 15s. All good Wireless Dealers stock them. Illustrated here is the H.Q. Price £6.

# Brown

—the Loud Speaker that tells the truth

S. G. BROWN, Ltd., Western Avenue, North Acton, W. 3  
Retail Showrooms: 19, Mortimer Street, W. 1.; 15, Moorfields, Liverpool,  
7, High Street, Southampton. Wholesale Depots throughout the Country.  
Gilbert Ad. 8965.



Patented.

The J.B. S.L.F.

## "Final" Condensers

Final in Accuracy, Finish, Appearance, Workmanship. Recommended for the Mullard P.M. Circuits! Chosen by the Experts of the Technical Press for their "Star Receivers."

This is the reputation J.B. Condensers have built up by their rock-like consistency. For Condensers which can be absolutely depended on—J.B. is the name to look and ask for.

The J.B. S.L.F., complete with 4" Bakelite Dial, .0005 mfd., 11/6, .00035 mfd., 10/6, .00025 mfd., 10/- For Short Wave Receivers, .00015 mfd., 10/-.

The J.B. True Tuning S.L.F., complete with 4" Bakelite Dial, 2" Bakelite knob for slow motion device, and fitted with a Double Reduction Friction Drive, ratio 60-1, which completely eliminates all possibility of backlash. .0005 mfd., 16/6, .00035 mfd., 15/6, .00025 mfd., 15/-. For Short Wave Receivers, .00015 mfd., 15/-.

**JACKSON BROS**  
8, POLAND ST - OXFORD ST  
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## JUNE

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"TROMBA" Units give a pure and steady H.T. supply. Work on Leclanché principle. Made in all capacities, in single cells, or complete batteries, new design. Send 1d. stamp for descriptive folders, or 1/- for complete samples of all capacities. Recommended by "P.W." 21st May.

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# RADIOTORIAL

All Editorial Communications to be addressed to The Editor, POPULAR WIRELESS, The Fleetway House, Farringdon Street, London, E.C.4.

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construction of a step-down transformer, for use in lighting the filaments of a four-valve set direct from the mains. Also advice as to the comparative cost and efficiency of such an arrangement."

Frankly, we do not recommend a low-tension battery eliminator in the circumstances. There is no doubt that it is possible to construct such apparatus, but the cost and trouble is out of all proportion to the saving. The only case in which it is worth while is when the constructor has had considerable experience of this kind of work, and is anxious to undertake an admittedly difficult task for the sake of further experience.

If economy and efficiency are the main considerations, a floating battery arrangement is far better. Here a small accumulator is used to supply the filaments, which is charged direct from the mains.

The Editor will be pleased to consider articles and photographs dealing with all subjects appertaining to wireless work. The Editor cannot accept responsibility for manuscripts and photos. Every care will be taken to return MSS. not accepted for publication. A stamped and addressed envelope must be sent with every article. All enquiries concerning advertising rates, etc., to be addressed to the Sole Agents, Messrs. John H. Lile, Ltd., 4, Ludgate Circus London, E.C.4.

As much of the information given in the columns of this paper concerns the most recent developments in the Radio world, some of the arrangements and specialities described may be the subject of Letters Patent, and the amateur and the trader would be well advised to obtain permission of the patentees to use the patents before doing so.

Readers' letters dealing with patent questions, if sent to the Editor, will be forwarded to our own patent advisers, where every facility and help will be afforded to readers. The envelope should be clearly marked: "Patent advice."

## USING 4-VOLT BATTERY WITH 2-VOLT VALVES.

G. V. (Bedford Park, London, W.4.)—  
"My accumulator is a 4-volter, and I wish to use it for a few months with a two-valve set I am making, employing 2-volt valves. I was thinking of putting in a couple of variable rheostats to cut down the voltage, but it has occurred to me that possibly I could connect the two filaments in series, and use the 4 volts across the two. Would this be O.K.? I may say I do not wish to cut the accumulator about as it is not one of those that split up into two 2-volt units."

There is no reason why you should not wire the two filaments in series, and this would be much better than using two rheostats to "cut down the voltage," or tampering with the accumulator. We should be inclined to use a low-resistance rheostat in series as well, so as to allow for the accumulator-voltage rise and fall when the battery has been newly charged.

## Questions and Answers

### WHEN DAD NODS HIS HEAD!

R. J. (High Wycombe).—"You solve a good many problems dealing with big valve sets and distant stations. Can you explain this freak which happened on a simple crystal set, listening to 2 L O? I built the set for my dad to listen-in, and he enjoys it so much that sometimes he gets a friend in to listen too. There are two pairs of 'phones, and the other day he said he couldn't hear properly, so I put on the other pair and listened as well. Sure enough the set kept fading right off, but what surprised me was when I noticed that it always faded when he nodded or moved his head. If he kept perfectly still it was all right, but every time he moved it went off. I looked over the 'phones, and the set, especially connections and terminals, but everything seemed in good going order. Yet I am quite sure that for some reason or other, every time my father nodded the broadcasting stopped. Why?"

Puzzling as such behaviour may appear, it is really a very simple case of a broken connection. The 'phone lead is no doubt old and worn. In any case, its continuity of connection is impaired for what happened was that the slightest movement of the cord separated the two sides of a broken wire that should have been making good connection. When the 'phones were being worn, a turn of the head bent the wire slightly, and either opened or closed this poor connection—all that is left of the original phone flex. The remedy, of course, is new 'phone cords.

(Continued on page 570.)

### REACTION WITH FILADYNE

N. G. H. (Walthamstow, London, E.17).—"In building 'A New Filadyne One Valver' ("P.W." No. 256), I fail to get reaction with the L<sub>3</sub> connections as given. But if I reverse the leads to L<sub>3</sub> the reaction effects are O.K. Is this in order?"

Yes, the coil L<sub>3</sub> should be wound in the opposite direction to the coil L<sub>2</sub>, if the connections as shown are adhered to. When the coil L<sub>3</sub> has been wound in the same direction as L<sub>2</sub>, reaction can be obtained by simply reversing the leads to L<sub>3</sub>.

### THE R.7 CRYSTAL SET.

W. M. (Boscombe, Hants).—"Re the R.7 crystal set. I get fair results, but am up against one trouble. I cannot get 5 X X, even when Bournemouth is closed down. Have tried 150, 200, 250, and 300 coils without result. Perhaps you can help me?"

We should try a rather smaller loading coil, say 125 or even 100 turns. Probably with this you will be able to pick up Daventry, but at you distance the aerial system will have to be efficient to enable you to do so.

### L.T. FROM THE MAINS.

"D. L. S. (Seven Sisters Road, Tottenham, N.) asks several questions relating to the

A GREAT ADVANCE

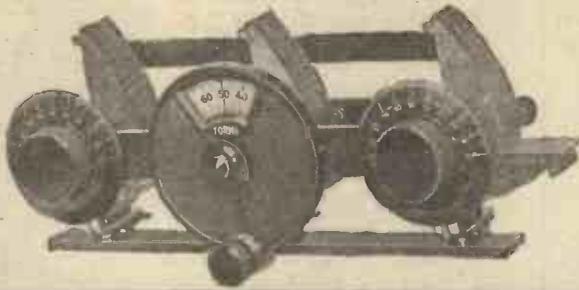


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Manchester: Mr. J. B. Levee, 23, Hartley St.,  
Levenshulme. Phone: Heaton Moor 475.



TWIN-GANG ... £2:12:6  
TRIPLE-GANG ... £3: 3:0  
TUNE with the centre dial until you hear your station.  
ADJUST with the side dials for maximum signal strength.

IT'S SIMPLE!  
IT'S EFFICIENT!!  
IT'S GOOD!!!  
IT'S FORMO!!!!

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These handsome moderately priced cabinets are made in styles to suit any furnishing either to customers own designs or to standard designs as illustrated.

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The M.A.L. H.T. Battery (60-volt 5) is breaking all records for sales, due entirely to the remarkable performance given, in length of life, and steady voltage. Add 7d. for postage.

4/11

FREE.—To Purchasers of goods value £1, a 5/- pocket-knife is given free.

Components by all makers supplied, lists free on request. Ericsson, Igranite, Lotus, Bretwood, Formo, Electron, Jackson Bros., Benjamin, R.I., Brandes, Edison Bell, Marconi, Sterling, Belling-Lee, Watmel, B.T.H., Lissen. Loud Speakers by Amplion, Sterling, Brown, etc.

ACCUMULATORS. 4 volt 60, 17/-; 4 volt 80, 22/6; 6 volt 60, 25/6; 6 volt 80, 32/6. Postage, 1/- each.

POST ORDERS. Goods to the value of 20/- sent post free. Lists of special parts on application. Cash with order or C.O.D.

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- "Triotron" Power Valves ... each 7/6
- 3-volt "Electra" Power Valves ea. 6/6
- 3.4-volt "Electra" Valves, each 4/-
- "Sifam" Double-reading Voltmeters, each 7/6
- Coil plugs on base, ea. 6d.
- "Triotron" Switches, S.P.D.T., ea. 9d.
- D.P.D.T., 9d.
- (China) S.P.D.T., 9d.
- D.P.D.T., 1/-
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- "Easly" Clips for Battery connections, doz. 9d.
- Lettered "Osclim" Type Lamps, any letter ... each 1/-
- 1 lb. reels S.W.G. Wire, B.C.C. 15, 8d.; 18, 6d.; 20, 8d.; 22, 8d.; 24, 9d.; 26, 10d.; 28, 11/-; 30, 1/-.
- Aerials—100 ft. 7/22 hard drawn, 1/11; extra heavy, 2/2; Phosfor, 49 strands, 1/- Electron in stock.
- Rubber Lead-in, 10 yds., 1/- Extra heavy, 2d. & 3d. yd.
- Twin Flex, 6 yds, 9d.; 12 yds., 1/4.
- Insulating Hooks, 2 for 1d.
- Egg Insulators, 2 for 1d.
- Insulating Staples, 4 for 1d.
- Earth Tubes (copper), each 2/3
- Climax Earth Tubes, each 5/-
- Headphone Cords, 1/3 and 1/6
- Loud Speaker Cords, 1/9
- TERMINALS, etc.—Nickel, W.O. Phone Pillar, 1/- doz. 3 for 4d.
- Brass ditto, doz. 10d.
- Nickel Valve Legs, 2 for 1d.
- Stop Pins, 2 for 1d.
- Spade Tags, 6 for 1d.
- Soldering Tags, doz. 3d.
- Ormond Nuts, doz. 2d.
- Washers, 12 for 1d.
- 2 and 4 B.A. rod, ft. 3d.
- Screw Spades, 2 for 1d.
- Pins same price.
- Valve Pins, 2 for 1d.
- Voltmeters, 0/6 and 0/10 ... each 3/-

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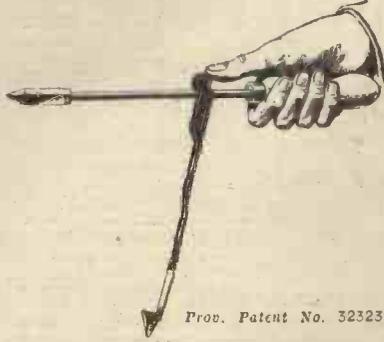
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Do you know that BROWNIE has made it easy for Crystal-Set users to get perfect loud-speaker volume?

Ask any good wireless shopkeeper about Brownie 2-stage Amplifier and write for the Brownie booklet "WIRELESS WITHOUT WORRY." Sent free on request.

BROWNIE WIRELESS COMPANY (G.B.) LIMITED, Nelson Street Works, Mornington Crescent, N.W.1

# Always Clean!



Prov. Patent No. 32323.

The Junit "Peerpoint" Soldering Iron overcomes once and for all the trouble of a dirty iron. Fitted with a tinned sheath, which is removed while the iron is being heated, and replaced for the actual soldering operation, the Junit "Peerpoint" Soldering Iron is at once the greatest boon that has come the way of set constructors.

**Price complete 5/-**

Wire your set with Junit Self-Soldering Wire, as specified in the circuits described in "Radio for the Million." A copper wire of high conductivity, it carries its own supply of solder in grooves on either side. Joints made with Junit Self-Soldering Wire have been known to withstand a pressure of 60 lbs.

Sold in attractive packets, each containing five 2-foot straight lengths, hardened and stretched.

**Price 1/- per packet.**

Write for brochure describing these two unique products.

The JUNIT MANUFACTURING CO., Ltd., "Napier House," 24-27, High Holborn, LONDON, W.C.1.

## RUSSELL'S OSCILLATING DETECTOR



### INCREASES RANGE.

Fitted to any Crystal set in a few moments. Enjoy permanence of Valve-set range & volume. **2/6 FROM YOUR** or **2/9 POST PAID TRADER.** from Dept. P. RUSSELL LABORATORIES, Hill St., Birmingham.

## THE DAILY MAIL

says, in the issue of May 21st: "More remarkable still, there are British valves of good quality turned out by certain firms who do not advertise extensively at quite low prices."

## VOLTRON VALVES

FROM 5/9 have been on the market for the past 12 months, and are giving satisfaction in thousands of homes throughout the country, as countless testimonials prove.



Type.	Price.
202 2 volt 2 amp.	5/9
201 2 " 1 "	7/6
401 4 " 1 "	7/6
601 6 " 1 "	12/-

Above in H.F. Det. and L.F. types.

### D.E. POWER VALVES.

P2 2 volt 2 amp.	9/-
P4 4 " 15 "	10/9
P6 6 " 1 "	12/-

BRITISH MADE.

Refuse any valve offered as VOLTRON unless packed in the triangular box with the printed guarantee. Look for the trade-mark on the valve itself.

At your dealer, or post free, from the manufacturers. Technical Folder Free.

VOLTRON CO., 169, City Rd., London, E.C.1.

## RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 568.)

### ACCUMULATOR SEDIMENT.

"ASSAULT AND BATTERY" (Grimsby).—"I notice that my accumulator has suddenly had a sort of lumpy sediment form at the bottom of the liquid. What is the cause of this?"

Probably the accumulator has been misused. Such sediment is usually due to pieces of the positive plates coming adrift, generally due to overcharging. It is important that these pieces do not touch the negative plates, so we recommend you to get the makers or an expert to attend to the accumulator before using it further.

### DIRECT FROM THE MAINS.

S. T. R. (Manchester).—"I am very interested in the new valve which has a heater element instead of a glowing filament, and I

## THE TECHNICAL QUERY DEPARTMENT

### Is Your Set "Going Good"?

Perhaps some mysterious noise has appeared and is spoiling your radio reception?—Or one of the batteries seems to run down much faster than formerly?—Or you want a Blue Print?

Whatever your radio problem may be, remember that the Technical Query Department is thoroughly equipped to assist our readers, and offers an unrivalled service.

Full details, including a revised scale of charges, can be obtained direct from the Technical Query Dept., "Popular Wireless," Fleetway House, Farringdon Street, London, E.C.4.

A postcard will do: On receipt of this an Application Form will be sent to you, free and post free, immediately. This application will place you under no obligation whatever, but having the form you will know exactly what information we require to have before us in order completely to solve your problems.

want to build an "off-the-mains" set, using a couple of these valves. Have full particulars been given in a previous issue of POPULAR WIRELESS?

No, but a description (with photographs) of a set using two of these valves appears in the May issue of "Modern Wireless."

### THE FILADYNE ONE-VALVER.

"J." (Marlborough, Wilts).—"I am about to build the Filadyne One-Valver described in "P.W." for April 30th (p. 375).

(a) Is there any advantage in using an expensive condenser?

(b) What wave-lengths do the coils described by Mr. English cover—

(1) When anode bias is connected to potentiometer, and  
(2) When anode bias is connected to potentiometer and L.T. +?

(c) How many turns would be required in each of the three coils for wave-lengths above 1,000 metres?

(Continued on page 572.)

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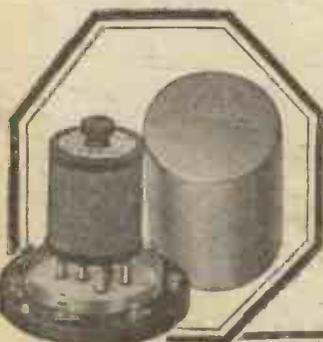
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**RADIOTORIAL QUESTIONS AND ANSWERS**

(Continued from page 570.)

(d) Would two ordinary plug-in coils and a suitably-tapped 6-pin plug-in coil be equally effective?

With regard to (a), fine tuning is essential to get the full results which the set can give, so the better the condenser's mechanical and electrical efficiency, the better the results will be.

(b) The wave-length covered will not be affected by the potentiometer connection. The coils described, together with the condenser, cover wave-lengths between 300 and 700 metres (approx.).

(c) Using the same diameter formers and same gauge of wire, about 250 turns for each coil would be required, with approximately 100 turns of number 30 for reaction, to cover the 5 X X and adjacent wave-lengths. The reaction turns will vary with the valve used, etc.

The extra length would increase the D.C. resistance considerably, so that a valve requiring 2 volts at the filament would be unsuitable with these coils, unless the accumulator's voltage were increased proportionately. As certain "2-volt" valves work well in the Filadync when a filament voltage much lower than two is applied, it might be possible to get good results with large coils when only a 2-volt accumulator is employed, but this is largely a matter of experiment with particular valves, reaction windings, etc.

**CAPACITY LEAKAGE IN H.F. CIRCUITS.**

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Suppose, for instance, that two parallel wires in an H.F. amplifier give a "stray" capacity of this kind, the condenser effect between these two wires may offer an impedance of, say, only 500 ohms to the H.F. currents flowing. Obviously it would be useless to expect these H.F. currents to actuate a transformer, or other coupling device, having an impedance of many thousands of ohms, when the stray capacity between the other wires is providing a comparatively easy by-pass.

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The "stabilising resistance" is an ordinary non-inductive resistance, like that used, for instance, for resistance-capacity coupling. Its resistance should be high, but is not at all critical, and generally is of the order of 100,000 ohms (1 meg.), or more.

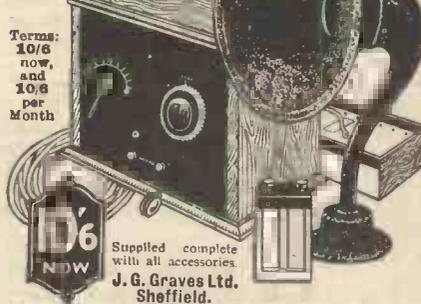
The purpose of the stabilising resistance is to damp out parasitic oscillations. These readily occur in neutrodyne circuits at frequencies other than those to which the set is tuned, but the insertion of the resistance at the point named checks them, whilst not interfering with the ordinary operation of the set.

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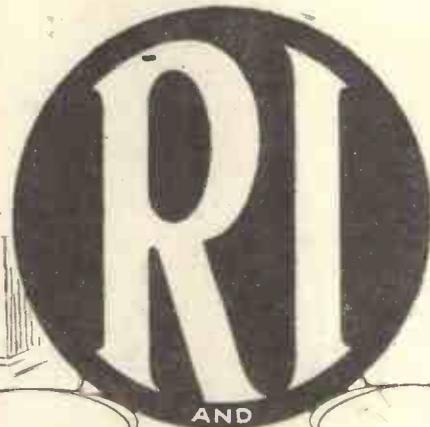
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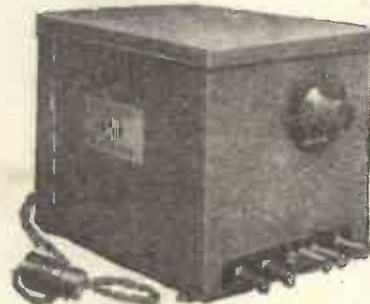
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