

# VALVES AND HOLDERS FOR YOUR SET (See Page 407)

# Popular Wireless

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INCORPORATING "WIRELESS"

June 21st, 1930.

## SPECIAL VALVE NUMBER



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Using Two Transformers.

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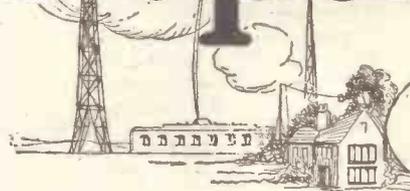
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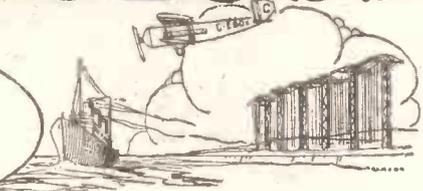
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# Popular Wireless



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**LONG AND LOUD.  
 BELGIAN MONSTERS.  
 TREATING FIBRE.  
 R100 CALLING.**

**PURE VISION.  
 LIGHT AT LAST.  
 A RADIO CRIMINAL.  
 "COUSIN ZZZZZ."**

## RADIO NOTES & NEWS

### Long and Loud !

JUST by way of an experiment a Berlin business man recently got on to the transatlantic telephone and put through a transcontinental call to Los Angeles, where his voice was relayed to two fellows flying in an aeroplane over the city.

"I am speaking to you from Berlin," he said. "Can you hear me?" And those high flyers came back immediately and said: "Don't shout, your voice is perfect but too loud."

Considering he was well over six thousand miles away, I reckon that was pretty cool, don't you ?

### "There She Blows !"

HARPOONING a whale is not what it used to be, for nowadays they call in the aid of radio. The Furness Shipbuilding Company recently built for a Norwegian firm a new whaler named the "Sir James Clark Ross," from which the job will indeed be done properly.

A scouting aeroplane will watch for the whales and will pass on the news of the quarry to small motor launches carried by the whaler. Radio will link the whole bunch together, not only on the job itself, but also the vessel in Antarctic waters to the owners in Europe. So any whale that gets past that radio barrage is going to have a whale of a job !

### Plenty to Choose From.

HAVE you noticed the number of new stations which are reported to be going up ? Since radio began, I never remember seeing quite so many references to new stations or increased power, and it seems to me that if only half of them materialise we are in for a hot time at the end of this summer.

France, Italy, Germany, and Czecho-Slovakia are all planning really big things, and there are plenty of other countries attacking the radio problem with renewed zest.

### British Items from the Continent.

IN particular I like this idea of an International Broadcasting Company, founded by the indefatigable Capt. L. F. Plugge. Hearing that Belgium proposed to put two 50-kilowatt stations on the air within a few weeks, the wily captain hopped over there and arranged for programmes for British listeners to be put on at times when the B.B.C. is not working.

The idea is to give a lot of entertainment with a little advertising thrown in, and personally I think it seems a pretty good one.

### The Belgian Monsters.

SOUTH of England listeners ought to have no difficulty in picking up these Belgium programmes if the power employed is, as stated, to be 50 kilowatts. The two stations should be on the

### WHAT A COME-DOWN !



Once the proud masts of 2 L.O. towering above Oxford Street, they have now been bought by a crane contractor, and here his men are seen dismantling one of them !

air within the matter of a few weeks, one on 338 metres and the other on 502.

Many a disconsolate listener has shaken his head wisely at me and told me that what the B.B.C. wants is a rival, and apparently that—in a friendly way—is exactly what Capt. Plugge and the International Broadcasting Company is going to give them !

### A Matter of History.

DR. W. H. ECCLES, addressing the Institute of Physics on May 27th on the subject of the influence of physical research on the development of wireless, appears according to the "Times" report to have omitted reference to Marconi. That would be bad history were the inventor no longer with us ; in his lifetime it seems a glaring discourtesy—and also bad history. Marconi may not be a physicist of the professional kind with which Dr. Eccles is so familiar, but his researches in applied physics contributed greatly to the development of wireless and, I think, also to the progress of physical science in several of its ramifications.

### Treatment of Fibre.

J. H. (Ripley) kindly lets me into the secret of improving fibre needles, and I gladly pass on the news. "They are simply soaked in creosote and then well baked in the oven." I am all agog to try this, and after I have succeeded in invading the kitchen with the smell I will report further. J. H. confesses to a certain diffidence in writing because, *inter alia*, he thought we all knew the trick. Perhaps there are a few more, who, like "Ariel," are the veriest "learners" in gramophone matters. A staunch defender of the "Titan" is J. H. If statistics of stations picked up are the true measure of a set's virtue, the "Titan" is 100 per cent. better than the "Magic," according to him.

### "R 100 Calling."

OBLIGED to S. K. (Wallasey), who, writing to acknowledge everybody's remarks about "Learning Morse," tells me that he picked up R.100's radio signals on May 22nd. The wave-length was 600 metres ; "continuous wave" transmission ; call-sign, G F A A V. He (R.100) was reporting to G F X. The signals fluctuated so much that S.K. had to chase them on the dial the whole time. Watch out for the airship's transatlantic trips and see what you can do. These unusual hunts provide most interesting pages in the log sometimes ; hence I say again, "Why not learn to read Morse ?"

### The Birth of Telegraphy.

TELEGRAPHY by means of interrupted currents in wires, and the dot and dash method of signalling are twins who were born in October 1832, on board  
 (Continued on next page.)

## NOTES AND NEWS.

(Continued from previous page.)

the ship "Sulby," which sailed on October 1st from Havre for New York. On board was the President of the National Academy of Design, an artist named Samuel F. B. Morse. One day during dinner the subject of electro-magnetism was being discussed, and Dr. C. T. Jackson mentioned that the length of the wire seemed to make no difference to the speed at which electrical effects travelled along the wire.

## Two Momentous Pages.

IMMEDIATELY there flashed upon the mind of Morse the idea that, if that were so, then intelligence could be transmitted instantaneously by electrical means. He left the cabin in the hot fit of inspiration and, as he paced the deck, he got his thoughts into practical shape and sketched the first telegraph layout. The pages of his notebook are still preserved, and on page 25 appears his figure code, a rough sketch of a message being received on a paper tape, a message in dot and dash, and a sketch of a clay tube for covering the wires.

## Pure Vision.

THIS is the most wonderful instance of clear prevision with which I am acquainted. The man did not fumble and grope with a half nascent idea. He went straight to the mark like a guided torpedo. Page 29 contains a draft drawing of a telegraph instrument showing an electro-magnet in position to attract and release a bar, the principle which is used to this very day. Morse was made Professor of the Literature of the Arts of Design of New York University, and he settled down to produce the first telegraph instrument. It was built on a picture frame, with a lead pencil suspended by a pendulum!

## Light at Last.

THE famous Bodleian Library, which was built in the period 1450-1480, contains such priceless treasures that not the slightest risk of fire, however remote, has been allowed and for three centuries not an artificial light has been permitted within its walls. The library has now been equipped with a safe electric lighting installation. It occurred to me that a safe method of illuminating such repositories of irreplaceable objects, would be the use of gas-filled tubes which could be caused to glow by radio operated from outside. We may live to see it done!

## Terrible Radio Criminal!

MR. GEORGE W. FELLOWES, an Englishman, is reported to have been convicted at St. Louis, U.S.A., of operating an unlicensed radio transmitter. He was sentenced to a year's imprisonment and paroled for deportation to England as an undesirable alien. Assuming the report to be correct, the sentence appears to be drastic and the deportation unnecessary and insulting, but we have no knowledge of the use which he was making of the transmitter. If he was working with "bootleggers" or other criminals the matter assumes a very different complexion.

## New Uses for Wireless.

WHAT with gas and aircraft the next war promises to be a horribly brisk affair, and if the use of radio is developed at the same rate as it progressed in 1914-1918, war will be entirely changed except for the killing. In America the Air Force are now able to transmit by radio from an airplane in flight, over a distance of a hundred miles, a picture of a map showing the imagined enemy plan of attack. In Palestine they are honouring the locust with a wireless-equipped motor which reports the movements of the "hoppers."

## SHORT WAVES.

## ON THE AIR.

"Locust swarms broadcast their poisons for miles," says a writer.  
Two L Lo-custs.—"Sunday Pictorial."

The other day a reader sent us a diagram of his set for checking purposes. This diagram was drawn on the reverse side of some music, and the Queries Department have still not come to any definite conclusion as to whether this was intended as a warning, for the title of the music was "Don't waste your time over me!"

Obstinate Wireless Lecturer: "Good-evening, everybody—with the exception of my wife, whom I'll ask to remember that we aren't speaking to each other!"—"News of the World."

Lord Clarendon had been saying the critics had occasionally dealt with the B.B.C. severely. "And wisely," added Lord Gainford smilingly.—"Daily News."

The British Parliament is also giving consideration to the equipment of a special room in the House, with a wireless set and a loud speaker—of the still more inanimate variety.—"Wireless Weekly."

## A RHYME OF THE DAY.

Between the dark and the daylight,  
When father's beginning to glow,  
Comes a pause in the wireless programme  
Which is known as the Children's Hour.

A whisper, and then a silence;  
Yet I know from the nights of yore  
That I'm in for a fairy playlet  
Or a story I've heard before.

Do you think, O B.B. banditti,  
Though the kiddies are in your power,  
Such an old moustache as I am  
Listens-in to the Children's Hour?

I would lock you up in the dungeon  
Where the wicked uncles go,  
But on second thoughts it is simpler  
To turn off the radio!  
"Daily Mirror."

## The Busy Inventor.

THE Report of the Patent Office for 1929 is stimulating and shows that "Ole Man Brains" is still fairly active. Compared with 1927 and 1928 the applications concerned with wireless signalling have increased almost 50 per cent; so also have those for television. The total number of applications was 39,898, the total of fees received was £478,661, and the Department showed a surplus of receipts over expenses amounting to £157,005. An indirect share of that is all the money some of the patentees will ever get out of the inventing business!

## The Southern Cross Again.

CAPTAIN KINGSFORD SMITH, the intrepid lad who winged his way from Australia to England in thirteen days, last year, is on the warpath again. His idea was to hop across the Atlantic from this

side to New York, and he may have done it before these lines are in print. This time the Southern Cross has a second pilot, a navigator and a wireless operator, as well as Captain Kingsford Smith. You ought to be in on this, so listen to the details.

## The Flyer's Equipment.

THE Southern Cross is equipped with a three-valve receiver capable of being tuned from 28 to 2,000 metres, and two transmitters—a short-waver for approximately 33 metres, and a 600-metre set for ships. The call sign allotted to the Southern Cross is VMZAB, and the transmission will be telegraphy, on raw A.C. Most of the communications from the Southern Cross are made on 33 metres, the exceptions being replies to ships on the ocean, to whom the 'plane works on 600 metres.

If you cannot go down on short-waves you might hear some of the messages from VMZAB, but, of course, the real charm will be on 33 metres, where you might be able to follow the 'plane's progress right over the Atlantic. The Air Ministry is going to keep a watch, too, so if Kingsford Smith hasn't already "hopped" keep an eye on the papers for the actual times of kick-off from Curragh, Dublin, and arrival, and let me know how you got on with the Southern Cross.

## "Cousin Zzyzz"!

THE fight for the honour of the last place in the telephone directory continues unabated in the U.S.A. Latest bulletin: Zebediah Z. Zzyz of Manhattan Borough has been defeated by R. Cantarrana Zzyzz and M. W. Zzyzn; the two victors have now to turn upon each other. Chicago's telephone king is Mr. A. Zzyzn—a poor effort, I must say! In San Francisco Pedro Zyxx holds the field but there is a revolutionary movement amongst the Left-Wing in favour of Xantules Xantafulos! Who z the Americans can't assimilate?

## The International Broadcasting Union

THIS organisation, of which Admiral Carpendale is President and Mr. A. R. Burrows ("Uncle Arthur") is secretary, held its annual assembly last month. Twenty-one European nations took part in the discussions. The President revealed that the Union represents 330 transmitting stations serving 22½ million households, or a total of about 90 million people. In addition to its usual work of improving reception conditions the Union is to make a special point of endeavouring to assist in the development of radio-dramatic technique.

## The Nightingale Controllers.

BELIEF that the sun will rise "To-morrow and to-morrow and to-morrow" is sound enough for all practical purposes, though it is not absolutely watertight. The B.B.C., however, appear to consider the nightingale's remarks as a sort of weather which can be relied upon to occur. Witness the serene aplomb of that recent announcement, "The B.B.C. announces that the song of the nightingale will be broadcast next week." Having thus organised bird life and fixed the hours of singing, perhaps the B.B.C. will be good enough to infuse a sense of discipline into the rats and rabbits!

ARIEL.

# MAKING A LOUDSPEAKER SWITCH-BOARD

An inexpensive and easy-to-construct device that enables you to control distant loudspeakers, and to make rapid loudspeaker comparisons.

Designed and Described by the  
"P.W." RESEARCH DEPARTMENT.



IT is a well-known fact that no sooner has the home-constructor completed his latest receiver than a feeling of reaction sets in. He is like an Alexander with no more worlds to conquer.

In fact, very often, it is only considerations of sordid finance which deter him from encompassing the complete demolition of his latest creation in favour of one which is a little "more perfect."

An outlet for these energies is, however, often provided less expensively by the addition of sundry accessories to the newly-constructed receiver. These take many forms, but probably the extension of the receiver's reproductive range to several rooms in the house is the most popular. In other words, the wireless is "laid on" like the electric light to serve rooms other than the one in which the receiver is situated.

## Simple and Sure.

There are undoubted advantages in this arrangement, and an attachment to the set which provides for doing this neatly and simply should prove a very acceptable accessory to the home wireless outfit.

What is required is a means of connecting one or two distantly situated loudspeakers (or sets of headphones) to the receiver without interfering with the operation of the phones or speaker attached to the set.

The little "gadget" about to be described satisfies this requirement very efficiently.

It is provided with a pair of input terminals which are, of course, connected to the speaker terminals on the receiver. These input terminals are in direct connection with another pair of output terminals on the opposite side of the panel. To these is attached the loudspeaker which, for want of a better description, we can call the "main" speaker.

As far as the "main" loudspeaker is concerned, the connection of the distribution panel leaves things very much as they were before, there being an uninterrupted circuit from the L.S. terminals on the set to the speaker itself.

## Quite a Small Unit.

The unit, however, is provided with another two pairs of terminals, and it is to these that the "outgoing lines" to the distant speakers are connected.

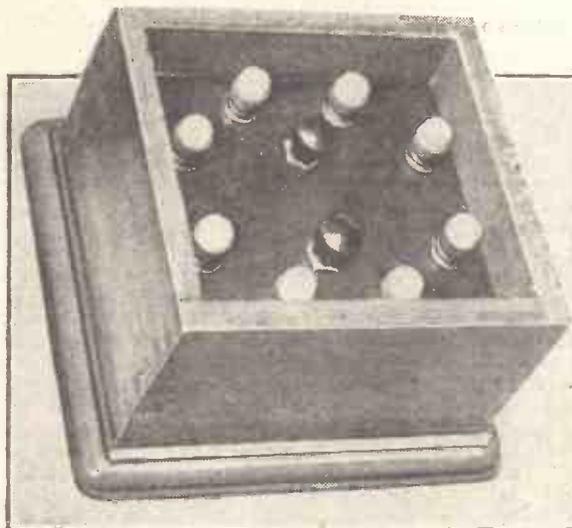
These "lines" may be of ordinary twin flex laid neatly along the walls to the rooms in which it is desired to receive the "relay." Both the pairs of terminals which feed the distant speakers are parallel connected to the output and input terminals.

While, for quality, checking and tuning, it is an advantage for the "main" speaker to be permanently attached to the set, there is no need for the distant speakers to be working always.

For this reason a simple single-way switch is interposed in each distant loudspeaker circuit, so that either, or both, may be switched on and off at will from the set. The attachment is, of course, installed near to the set.

The construction of the distributor is simplicity itself. The panel measures 4½ in. by 4 in. Eight terminals and two ordinary L.T. switches have to be attached to this.

## RADIO "LAID ON"



You can fix this easily-made device to a wall and, with its simple switches, distribute the music to distant loud-speaker points at will.

To arrive at a symmetrical disposition of these components the following details will prove helpful. At a distance of 1¼ in. in from each of the longer edges of the panel draw two lines parallel with each edge. The centre point of each of these lines is found by measurement and centre-punched in the usual way. These mark the positions for the switches.

The input and output pairs of terminals are situated to right and left the switches on the lines already drawn. Their distance from the shorter edge is ¾ in. When the positions for the two switches, and the input and output terminals have been marked, the panel should be turned round and two more positioning lines drawn. These are

1½ in. in from, and parallel with, the shorter edges of the panel.

The "distant" speaker terminals are disposed on these lines, and they are situated half an inch in from each longer edge. This description will be more easily followed if reference is made to the photographs which accompany this article.

## Drilling the Panel.

When centre-punch marks have been made for all the eight terminals and the two switches, suitable holes should be drilled and the components attached to the panel.

In order to simplify wiring, the following point-to-point connections can be adhered to, although it is possible to wire directly from the photographs. In these directions it is assumed that the constructor will work with the panel "long ways across."

## The Wiring.

In this position the two left terminals are the input; the two right the output or "main" loudspeaker; and the two pairs of terminals at either end of the switches are for the distant speakers.

Wiring is now carried out thus:

(1). Top input (left-hand) terminal to top right-hand "distant" terminal to top right-hand output terminal, and to bottom right-hand "distant" terminal.

(2). Bottom input terminal to bottom output terminal, and to one side

of each switch.

(3). Remaining side of top switch to left-hand top "distant" terminal.

(4). Remaining side of bottom switch to left-hand bottom "distant" terminal.

## "Nothing In It."

Thus you will see that there is nothing difficult about the construction of the little unit, which should take you not more than half an hour to construct.

When this small amount of drilling, fitting and wiring is completed all that remains to be done is for the panel to be slipped into the small containing cabinet.

It is convenient to arrange for the panel

(Continued on next page.)

## NOTES FROM THE NORTH. FROM OUR SPECIAL CORRESPONDENT.

MR. E. G. D. LIVEING, the North Regional Director, and Mr. Victor Smythe, who is responsible for drama and for outside broadcasts in the Northern programmes, cannot be accused of lack of courage in their use of the microphone.

While Savoy Hill says, "Cricket matches are unsuitable for broadcasting; no running commentaries on the Tests," the North Regional not only decides to broadcast running commentaries on the Yorkshire v. Lancashire matches at Leeds and Manchester, but conceives a mysterious plan to broadcast the "characteristic noises" of the occasion.

### I.O.M. Relays.

As soon as the Post Office laid a telephone cable between England and the Isle of Man, these Northern officials made plans for relays from Manxland.

There is to be a relay of a Manx choir singing in Grouldle Glen. Mr. Liveing told me the other day that this choir sings in a most picturesque setting—shady foliage and burbling brook. When I asked if they would broadcast the burbling brook, he replied, "We'll do our best!"

Mr. G. C. Beadle, the station director at Belfast is arranging a running commentary on the motor-car T.T. race in Ulster on August 23rd, and this also may be a national event.

The mystery surrounding this cricket match idea (to return to North Regional topics) is due to the fact that, at the moment of writing, tests are being carried out to see if it is practicable. I understand that this was tried out during the match at Leeds on Whit Monday, so by the time these notes are in print listeners will have been able to pass judgment.

There is nothing half-hearted, either, about the arrangements for the relays from northern holiday resorts this summer. These are now being heard every week from such places as Blackpool, Scarborough, Whitby, Buxton, Morecambe and Harrogate.

### Future of Newcastle.

Newcastle and the North-Eastern area possibly have not all the prominence they deserve in the North Regional programmes, but the inclusion of Newcastle in the Northern grouping has always been looked upon by the B.B.C. as a temporary expedient.

Newcastle has kept its individual administration, with its own station director (Mr. G. L. Marshall), whereas the title of Station Director was abolished elsewhere in the North, when the other stations surrendered their individuality and were absorbed into the Regional community.

Now it has been decided that when the high-power station opens the Newcastle transmitter will be retained, and Tyneside listeners are wondering which programme their local station will put out.

The organisation of the Northern Prom-

enade Concerts revealed a courageous spirit. As I write there is every indication that the B.B.C.'s enterprise is being rewarded with abundant success.

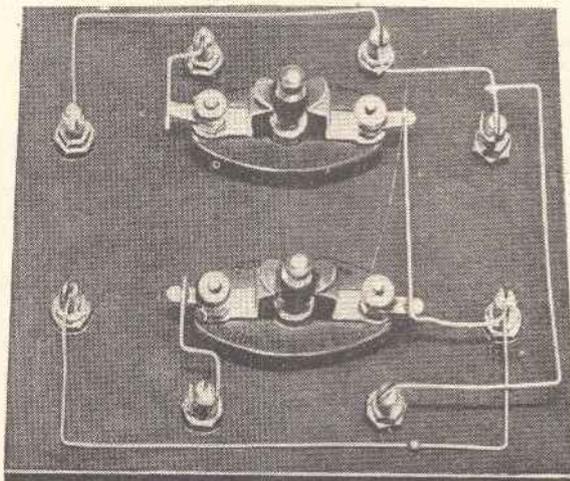
Tickets have sold rapidly, and thousands of copies of the concert syllabus have been applied for.

In fact, the Northern Promenade Concerts are proving a success. Pessimists predicted empty halls, and certainly the idea of running symphony concerts in the summer was pretty daring, but the attendances have been better than the organisers expected. The transmissions have been good, too.

If the B.B.C. keeps to this policy of thoroughness in all that it does in the North, its regional activities will meet with popularity and success. The North-countryman is a hearty fellow.

When he puts his hand to the plough, he is not content until the whole field is well tilled. If he feels that Mr. Liveing's men

## ONE-MINUTE WIRING!



And even if you don't want to break records you shouldn't have to spend a very big fraction of an hour on the task!

are working in a similar hearty spirit, he will back them up.

Which is another reason why Savoy Hill should restrain all temptation to restrict the local powers and activities of its staff in the North of England.

Unfortunately, the B.B.C. remains mysteriously silent about the future of the Northern Wireless Orchestra, although it is generally assumed that the Orchestra is to go, and that in future there will be an Octet.

But the B.B.C. will make no statement, and there is a strong feeling in the North that the B.B.C. is very blind to public taste if it thinks that the problem of providing broadcast music for the North can be solved by organising "Prom." concerts and throwing in a solatium of "light music" by the Octet and relayed from holiday resorts.

\* \* \*

The moving arm of a crystal detector should not be too loose or contact will be bad.

\* \* \*

Do not forget that in the event of a breakdown in an H.F. choke any large tuning coil may be used temporarily as a stop-gap.

\* \* \*

Wires which are joined by twisting together will certainly tarnish in time, and cause lack of volume and possibly cracklin

## MAKING A LOUDSPEAKER SWITCH-BOARD.

(Continued from previous page.)

to be placed about half-way into the cabinet, which should be about three inches deep inside. Small pieces of wood glued into two diagonally opposite corners will keep the panel in place and at the correct distance from top and bottom.

### The Cabinet.

Against the input and output terminals, but above the panel, two holes are drilled in the sides of the cabinet. Through the hole nearest the input terminals, the leads from the L.S. terminals on the set are passed. And through the other hole the "main" speaker leads and "outgoing lines" to "distant speakers" are bunched and passed.

It is a good plan, whenever loudspeakers are to be operated at a distance from the receiver, to employ a choke-condenser output filter in preference merely to connecting the L.S. terminals in series with the plate circuit of the last valve.

The effect of the long loud-speaker leads on quality is minimised when a choke output filter is used. More important still, when a choke filter is used it obviates the necessity for having leads carrying H.T. running all over the house.

In addition to its primary function as a miniature "S.B." switchboard, the distribution panel can be made to serve another useful purpose.

It is often desired to test the reproductive characteristics of two loudspeakers and, to do this, it is essential for the speakers under test to be connected as rapidly as possible to the set.

Owing to the ear's "bad memory" it is not possible to make the change from one speaker to another quickly enough for comparative tests by the ordinary method of hasty connection and disconnection.

### Testing Loudspeakers.

A switching arrangement is really needed so that the speakers may be connected to the set alternately with great rapidity. The distribution panel just described serves this purpose admirably.

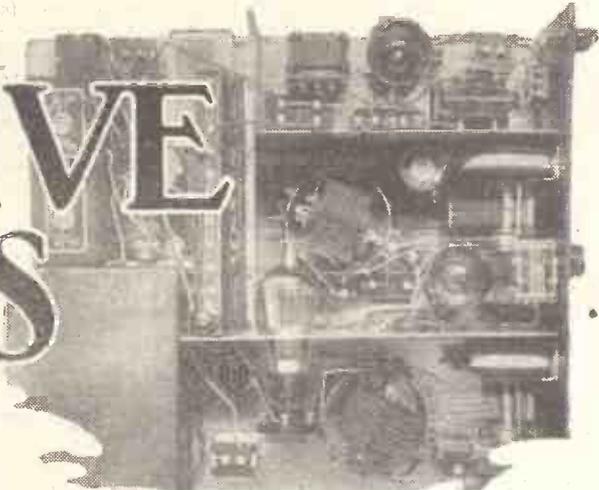
To do this the panel is left connected to the set in the usual way, but the "outgoing distant speaker lines" are temporarily disconnected from their terminals on the panel. Each speaker to be tested is connected to either pair of these terminals instead. The main speaker should, of course, be disconnected.

When this is done it will be found that by operating each of the two switches in turn, either of the speakers can be connected to the set alternately. This can be done so quickly that a very positive comparative test of the quality afforded by either speaker can be made with ease.

# MAINS DRIVE VALVES

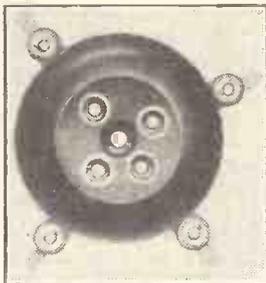
Mains-operated sets are rapidly becoming popular, for they hold many advantages for both the ordinary listener and the home- constructor. The following hints on the use of mains valves should, therefore, be of special interest.

By G. W. EVANS.



If you have a mains-driven set or contemplate building one, you have distinct advantages over your battery-using friends in the question of valves. The advantages are not wideness of choice, because there are very many less mains valves on the market than battery types, but those available are exceedingly efficient.

It is possible with a mains-driven set, with valves of the indirectly-heated cathode type, to get a far higher magnification per stage than it is with the battery type.



One of the Lissens valve holders.

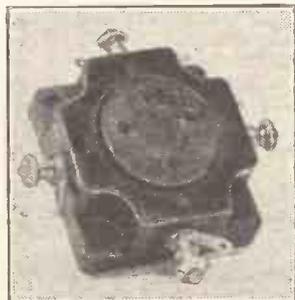
In the case of the directly-heated valves with the A.C. put straight through the filament, very much the same characteristics as the battery types are obtained, but it is with the A.C. indirectly-heated valves that we want to deal with in this article.

### The S.G. Valves.

In the first place if you use a screened-grid stage you will find you have the A.C. S.G. Mazda, which has a magnification of 1,200 with an impedance of only 600,000 ohms. The A.C. S.G. Cossor valve, with mutual conductance of over 2, the Mullard, Osram, Marconi, Tungfram, Vatea, Dario, Six-Sixty, etc., all of which are capable of giving very high magnification, much higher, in most cases, than is possible with the ordinary battery screened-grid valve.

This being the case it behoves any user of mains valves to screen his H.F. stage very completely indeed to make the most of the magnification which is offered to him.

Obviously, if a valve has tremendously great magnification powers, it is liable to



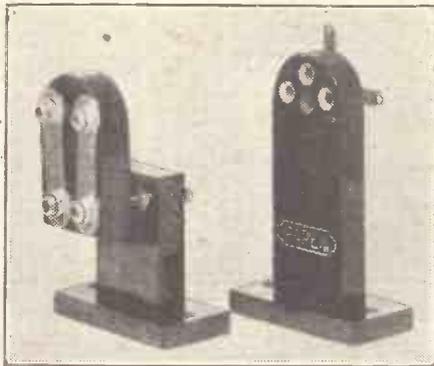
The Marconi four-pin type.

cause instability or feedback if the screening is not properly carried out.

So if you are changing over from battery to mains, do not forget that a little added screening may be necessary owing to the fact that you are going to get very much higher magnification.

### A.C. Detectors.

The A.C. detector valves, too, are also more efficient than the battery types. Here you have to add positive bias for leaky-grid rectification, for in this indirectly-heated valve you have no positive leg of the filament to which you can connect the return end of your grid leak. Consequently, the grid leak has to go to 1½ volts positive on a



The Parex S.G. horizontal model.

grid-bias battery, the negative of which is taken to the cathode. The heater, of course, goes direct to the secondary of a transformer, which is supplying A.C., usually at 4 volts, to the valves.

### High Mag. L.F. Types.

The L.F. stages do not hold out so much choice in the types of valves, but the ordinary A.C. L.F. valves are all suitable here, whilst for the output stages you have the possibility of such valves as the A.C.P., which has an impedance of something like 2,650 ohms and a magnification factor of 10.

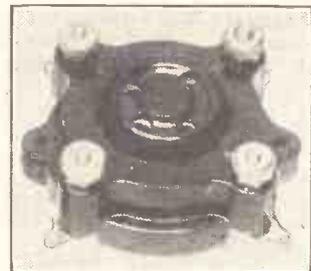
Such a valve has not a very big grid swing, but it will give a tremendous output power for the input, and as a loud speaker valve it takes a great deal of beating.

In the operation of A.C. indirectly-heated valves it must not be forgotten that the cathode must be taken to a neutral point on the L.T. winding of the transformer.

If the transformer is not centre-tapped, then a 400-ohm potentiometer should be placed across it and the slider taken to the cathode of the valve. This is essential if hum is to be successfully eliminated from your reception.

There is also a method of putting a resistance in the cathode lead by which automatic grid bias can be obtained, but there are one or two snags in it, especially if you use automatic grid bias in more than one stage, because a certain degree of inter-valve coupling is liable to occur and instability or motor-boating may result.

In the case of one of the valves, automatic bias can quite well be obtained by means of a resistance in series with the cathode, but in the writer's opinion it is far more satisfactory where several are concerned to use ordinary grid-bias batteries.

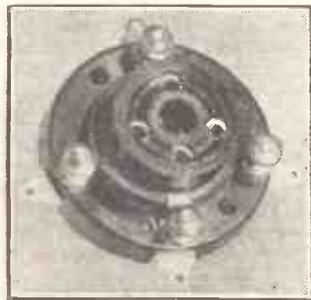


An Igranic product.

### The Heater Connections.

When wiring up the filaments, or rather the heaters, of indirectly-heated cathode valves, or of any A.C. valves, it is essential that either lead covered wire be employed, or twisted flex be used, otherwise pick-up may take place between the heater leads and other connections and thus cause an annoying hum in the reception.

For economy of running there is nothing to beat the A.C. valve, and a well-designed three valver (screened-grid, det., L.F.), using A.C. indirectly-heated valves, is capable of giving you results comparable with those of a really good four-valve battery receiver.



The Trix holder—E.J. Lever & Co.

# THE B.B.C. CHAIRMAN.

By THE EDITOR.

THE selection of Mr. J. H. Whitley as the new Chairman of the B.B.C. must have come as a considerable surprise to the majority of listeners in this country.

So many names have been mentioned, including those of Mrs. Snowden, Lord d'Abernon, Lord Lee, Lord Gainford and others, that the last-minute inclusion of Mr. Whitley's name in the list of possible candidates was, at first, scouted as unlikely.

One of the reasons why Mr. Whitley's candidature was not regarded seriously in broadcasting circles—and, for that matter, in Fleet Street circles—was because he is the Chairman of the Committee which is enquiring into labour conditions in India. Consequently, it was not considered possible that he would be able to accept the post of Chairman of the B.B.C. and still retain his post as Chairman of the Committee enquiring into troubles in India.

Nevertheless, Mr. Whitley has made it quite clear that he will continue to do so, and will thus occupy a dual post. Mr. Whitley succeeds the Earl of Clarendon, who is going to South Africa as Governor General, and we understand that Mr. Whitley will begin his duties right away.

Two years ago he resigned the Speakership, and set a precedent by declining a peerage.

Mr. Whitley's appointment has, nevertheless, created a good deal of discussion. He is a representative of that "Non-Conformist Conscience," as the "Morning Post" expresses it, which has been described as the backbone of Radicalism until Socialism came to the fore, and observers have drawn their own conclusions from this by forecasting that Mr. Whitley's position at the B.B.C. will in itself be a guarantee that frivolity will not receive much encouragement from him.

## Earning His Salary!

Whether this will affect the Vaudeville programmes remains to be seen.

Socialist critics have also pointed out that a post worth £3,000 a year should have been given to somebody not receiving a pension of £5,000 a year, as Mr. Whitley is.

In fact, comment on Mr. Whitley's appointment is rather mixed. A good many papers have platonically remarked that Mr. Whitley is the very man for the job and, to quote the "New Statesman": "There should be general approval of the selection of Mr. Whitley to preside over the B.B.C. The post is not an easy one. It demands considerable tact and common-sense—both qualities which Mr. Whitley has proved himself to possess in a very high degree."

But the "Saturday Review," commenting on the appointment, writes: "The appoint-

ment of Mr. Whitley as Chairman of the B.B.C. is an odd one. The business of the B.B.C. is to entertain and instruct; the business of a Speaker of the Commons is neither. But we must hope for the best: if he cuts short some of the tedious broadcast talks he will earn our gratitude and his own salary."

## Our Best Wishes.

With that latter comment we are in complete agreement, and although we feel that the appointment could have been more

## BRITAIN'S BROADCAST CONTROLLER



A recent portrait of Mr. J. H. Whitley—one-time Speaker of the House of Commons and now Chairman of the B.B.C.—with his wife.

suitably filled by a man more in touch with the wide public and less in sympathy with the B.B.C.'s convinced belief that it is its duty to instruct, educate, and generally uplift its clientele, whether they like it or not, we can but hope for the best, and trust that Mr. Whitley will be a great success as Chairman of the B.B.C.

At any rate, he has our best wishes for the future.

## Exchanging Programmes with America.

Statements purporting to have been issued in New York, which were repeated in the British Press, as to an exchange agreement between the B.B.C. and the Columbia Broadcasting System are inaccurate in many important particulars. It is stated, in effect, that an arrangement has been concluded for the exchange of programmes under which the B.B.C. receives payment, whereas the Columbia programmes are at the disposal of the B.B.C. free. The American Ambassador, General Dawes, is also mentioned as concerned in the arrangement.

In actual fact, discussions took place between the B.B.C. and Mr. Bellows, Vice-President of the Columbia System, on May 16 and 17 last, leading to the acceptance by Columbia of a draft agreement identical with that which has been accepted by the other main broadcasting system in the United States (the National Broadcasting Company). General Dawes took no part in the discussion.

The agreement starts from the fact that no rigid system of exchanging programme against programme will work satisfactorily in practice, the essential being that each party should be free to choose items in the other's programmes purely according to "programme value" for its own purposes. Contrary to the statement issued in New York, it was agreed that (subject, of course, to any rights of third parties concerned) each should have the use of the other's programme items without payment.

Further provision was made for the increasingly frequent practice of sending out for relay events, talks, etc., that are not broadcast in the country of origin. In this case (in which there is obviously no possibility of keeping a balance of favours given and received) the agreement provides that each party shall pay the other a small fee and out-of-pocket expenses for assistance given.

## ABOUT YOUR AERIAL.

One disadvantage of using an aerial behind a picture-rail is that it is too close to the wall, the ideal arrangement being an aerial well spaced away by stand-off insulators.

When an indoor aerial is placed in a hall or passage the leads from this should not be run between the door and the doorpost, as there is bound to be considerable wear at this point.

"Shortening" an aerial electrically by means of a small series condenser to improve selectivity is usually more successful in the case of valve sets with reaction than in simpler sets.

A certain cure for non-selectivity in a receiver is to place an extra tuned circuit between its input and the aerial.

When a tuned coupled circuit is added to an existing receiver, the coupling should be variable by placing the two coils in a variable holder or by placing them well apart but connected through a small condenser.

If the aerial coil in your set is close against the cabinet you may find that an extra tuned circuit, with the coil placed outside the cabinet, will couple quite sufficiently through the wood to give the necessary selectivity.

If your aerial coil is one of the binocular or fieldless type you will find it difficult to couple another aerial coil to this, and a better plan is to use capacity coupling, to give you the necessary selectivity.

When tuned circuits are joined together by means of magnetic coupling the closer the coils are together the greater the coupling will be.

# VALVEHOLDERS

BY A JOHNSON RANDALL



**A VALVEHOLDER** is a simple-looking component, and yet it needs care in design. There are good valveholders and bad ones, and it is difficult to tell from the external appearance whether a particular specimen is one or the other.

It may at first be thought that a valve holder is merely four spaced sockets held in position by a chunk of insulating material.

This is not quite true. In a good valveholder the first essential is that the sockets

should be accurately spaced so that they grip the valve pins and ensure a satisfactory electrical contact.

There are two main types of valveholder. The more common are those designed to obviate microphonic troubles.

Some of you may not be absolutely clear as to what microphonic noises really are.

Well, if you look at the internals of an ordinary valve you will notice that the elements are rather delicately supported on metal pillars and it is evident from a casual inspection of some types that a small shock would tend to produce a vibration of these elements inside the valve.

### Sprung Valveholders.

If a valve (of a certain type) is subjected to a series of small mechanical shocks the positions of the elements tend to change in relation to each other, and there is a corresponding variation in plate current which is amplified up and produces a howl in the loud speaker. This is one explanation.

The cause of the trouble is usually the

\* An interesting short article on a very important component. \*

detector valve, and it is therefore highly advisable to use a sprung type valveholder for this stage. Other valves can also give rise to microphonic effects and since sprung valveholders are both cheap and easily obtained it is common practice to use them in all the stages.

### Dielectric Losses.

They are not essential in the last stage, nor in many cases in the first L.F. stage. Rigid valveholders can be employed if they are available.

There is quite a lot in the design of the spring supports in the case of the anti-microphonic types. The chief function of the springs is to damp out the multitudinous small shocks, or in other words, to alter the vibration period. If the springs are too rigid they will not do this satisfactorily, and manufacturers have given considerable time and thought towards producing something that really does eliminate these microphonic effects.



The Benjamin rigid valveholder and one of the Burton four-socket models.

Then, again, there is the question of dielectric losses. The chunk of solid material which supports the grid and filament sockets of a valveholder is, in the case of an H.F. stage, directly across the tuned circuit, and

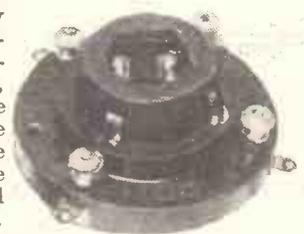
in consequence any losses will reduce the efficiency of the set.

Now on the short wave-lengths, and even on the medium waves these losses can become serious if the valveholder should be one of an inferior quality. The tuning will be flattened and the amplification cut down. So you see that a component in which a poor composition is employed may very easily impair the working of your receiver. The moral is, don't buy cheap foreign components. Choose those of reputable make.

While on the subject of valveholders, there is one point which sometimes causes confusion in the minds of constructors. It is the question of S.G. valve connections. A number of readers write in from time to time pointing out that our diagrams show the wrong wiring to the screening grid and anode of the H.F. valve.

### A Final Point.

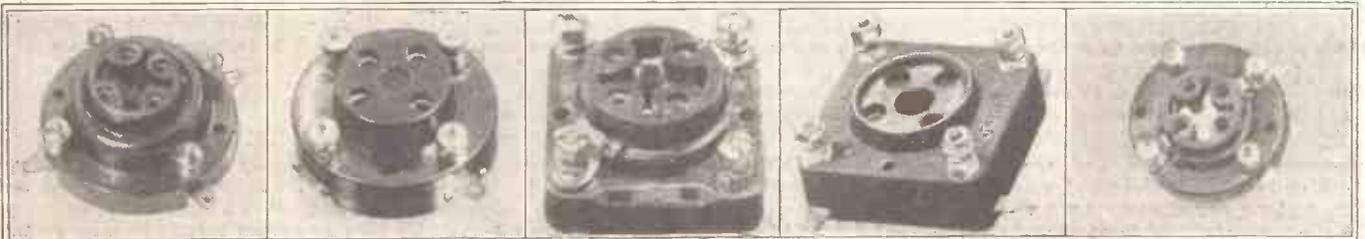
Actually these diagrams are perfectly correct, and these readers are not aware that the screening grid of an S.G. valve goes to the plate pin on the valve base, the true anode of the valve going to the terminal on the top of the bulb.



This low-capacity holder is made by Wright and Weaire.

Recently the special A.C. all-mains valve has been becoming increasingly popular, and manufacturers have turned their attention to five-pin holders. These are mostly of the rigid type, since the robust nature of the A.C. valve does not call for a sprung type valveholder.

## A REPRESENTATIVE COLLECTION OF VALVEHOLDERS



Here we have the Precision, Lotus, Magnum, Formo and Godwinex ordinary four-socket valveholders. For A.C. mains valves the five-socket holders should be used.

## LATEST BROADCASTING NEWS.

## THE KING AND THE PRINCE

HERE AND THERE IN THE PROGRAMMES — ITEMS OF INTEREST—A SEASIDE REVUE

EVERYBODY who can listen at mid-day on Tuesday, July 8th, will look forward to hearing the voice of the King when he opens India House in Aldwych.

The actual ceremony will take place in the library on the first floor, where the King and Queen will sit on special chairs brought from the Foreign Office.

The new building is a magnificent structure, and contains some wonderful marble carving and timber, all of it brought from India.

Two days previously, on Sunday, July 6th, listeners will hear the Prince of Wales when he speaks at the dinner of the National Union of Students at the Savoy Hotel. Both these functions will be broadcast nationally.

### Here and There in the Programmes.

Several stage stars, including Phyllis Neilson-Terry, Betty Chester, Florence Bayfield, Harry S. Pepper, Robert Atkins, and Stephen Williams are to take part in a musical programme which Melville Gideon, the well-known composer and Co-optimist, is presenting at Savoy Hill on Thursday and Friday, July 3rd and 4th. The book is by Austin Melford, a former member of the Co-optimists.

London Regional listeners are to hear Mr. Stanley Baldwin when he delivers the Clifford Lecture on Democracy before the Brotherhood Movement at Coventry on Monday, July 14th.

A speech by Mr. J. H. Thomas to the National Union of Railwaymen's Congress at Manchester on Friday, July 11th, is to be broadcast from the National transmitter.

The Archbishop of York is to preach at the St. Peter's Day service at York Minster which is to be broadcast from the National and London transmitters on Sunday, June 29th. The service begins at mid-day and will last about three-quarters of an hour. The Dean of York, Dr. Lionel Ford, and the sub-chanter, the Rev. H. T. S. Gedge, will also take part.

A running commentary by Mr. H. M. Abrahams on the Athletic Meeting between teams representing the Universities of Oxford and Cambridge and Princetown and

Cornell will be relayed from Stamford Bridge on Saturday, July 12th.

Arrangements have been made to broadcast a description of the final stages of the Shoot for the King's prize at Bisley on Saturday, July 19th.

### Items of Interest.

The next of the series of "My Programmes" for Scottish listeners has been arranged for Tuesday, July 1st, when Mr. Hugh S. Robertson, well-known as the conductor of the Orpheus Choir, as a broadcast speaker and as a playwright, will present his idea of what our wireless fare should really be like.

Listeners will remember that Mr. Robertson recently gave a series of song lectures in which he dealt with the problem of the

survival of Scottish song. Incidentally, Mr. Robertson is mentioned for the B.B.C. Board of Governors if any additions were decided upon. He is an intimate friend of Mrs. Philip Snowden.

The London Gaelic Choir is giving another special programme for Scottish stations only on Thursday, July 3rd. In these days of almost perfect S.B. broadcasts there is no need for the Choir to visit Scotland, so they will perform in one of the London studios which will be connected to the Scottish transmitters by land-line.

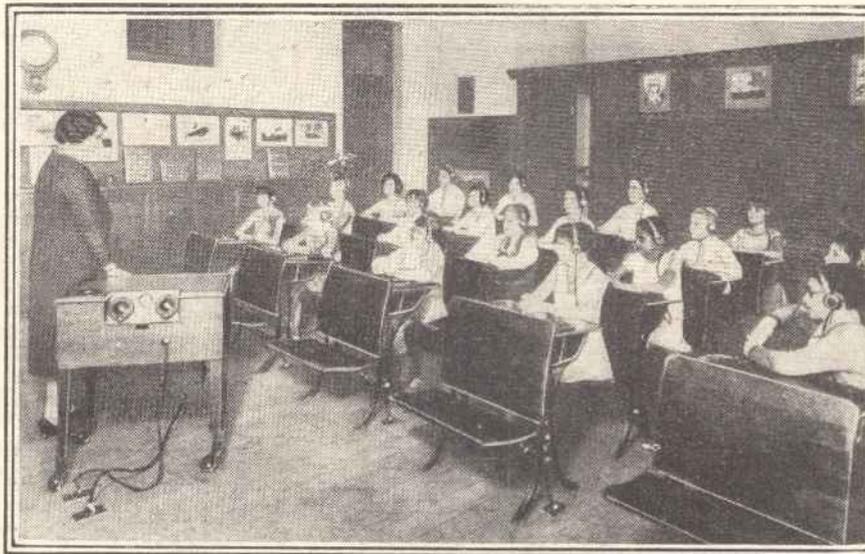
The Madame van Aalst Ladies' Orchestra and the Embassy Six Dance Band, which, as stated in our last issue, are to be broadcast from the Plaza, Dublin, for Belfast listeners, will be heard regularly each week on Wednesdays throughout Northern Ireland

—thus is broadcasting forging a strong link between the North and the South which it is hoped will develop in a wide exchange of programmes in the days to come.

### A Seaside Revue.

A seaside revue entitled "Bored and Lodging," specially written by Graham Squires and performed by Colleen Clifford, Eve St. Clare, Mabel France, Patricia Rossborough, Michael Hogan, Stainless Stephen, Charles Herbert, Albert Daniels and John Rorke will provide a pleasant evening's entertainment for London and Midland Regional listeners on Monday, June 30th.

## AMPLIFIER HELPS SCHOOL-CHILDREN TO HEAR



This is one of the classes of a school for the deaf in California. Instead of relying on lip-reading, each scholar has telephones to hear the teacher, the degree of magnification being adjusted to suit the pupil.

## FOR THE LISTENER.

A Specially Contributed Criticism of Current Broadcasting Events.  
By "PHILEMON."

Who will long be remembered for those wise and witty broadcasts entitled "From My Window."

### Bournemouth.

I SPENT Whitsun night at Bournemouth, at least, at Sir Dan Godfrey's concert there, and highly enjoyed it. Two things attracted me—Elgar's Cockaigne, with its ecstatic gaiety, and Reginald Foort (whom I have long admired as an organist) in the rôle of a pianist.

He played one of Mendelssohn's Concertos with the orchestra, with any amount of dash and spirit. They say that you can always tell the drawing of a sculptor from that of a painter, and Mr. Foort played the piano like an organist, with a certain robust and full-toned quality. The huge audience of Bournemouth holiday-makers enjoyed him hugely.

### The B.B.C. as Grandmother.

"Now, my dears, you are going for a run into the country in the car, and you may

pick a few bluebells, but be sure that you break the stems and do not pull them with their white ends out of the bulbs."

And, "Now, my dears, you are taking your lunch out with you on the Heath, but be sure you don't leave your orange peel or ugly wisps of tissue paper behind you. It writes you down, rather."

I like the B.B.C. in this grandmotherly mood, living as I do in the country, loving the woods and hedgerows, and hating all litter-makers like the devil.

### The Chairman.

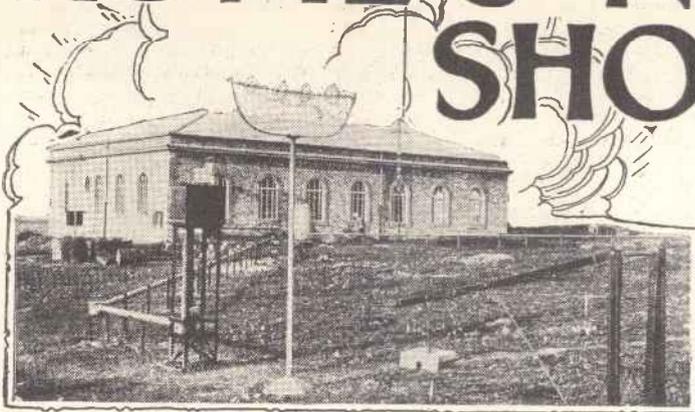
I think the B.B.C. has honoured itself by making Mr. Whitley the Chairman of the Corporation. He is one of the men who is willing to be great in a quiet sort of way.

To his many other talents he adds commonsense and the sense of humour. I do

(Continued on page 420.)

# ROME'S NEW SHORT-WAVER

By our Special Correspondent.



If you have never heard it, you are fairly sure to do so one day, for the Rome short-wave station is being received very well indeed in this country. Read this interesting account of a special "P.W." visit.

"MUSMOLINI is shortly going to see the new 25-metre broadcaster they've put up in Rome," said a friend to me, when I was at Civitavecchia, one of the bright spots on the western side of Italy, three weeks ago.

I learned that the apparatus had been delivered from England (a subtle compliment to us, that!), and that tests had started; so I thought I would pay my visit before the worthy statesman, and made the tiring journey to the outskirts of the capital, where the new station has been erected.

### Italy's Publicity.

Mussolini has personally been interested in this station, because it is part of Italy's "publicity" scheme; it communicates with the Italian colonies by means of a modified Marconi beam system, and pushes out 12 kilowatts on either 25 or 80 metres, as required. The actual transmitter, I learned, had been erected in England, and tested out within a hundred yards of our own 5 S W!

The transmitter building is one of these modern-architecture affairs; very square, barren and cold-looking, with a low, flat roof. It is the aerial which is impressive. There are two V-section masts towering about 200 ft. in height, and roughly 1/16th of a mile apart. There were ladders to the top, but I didn't chance it, thank you!

C. S. Franklin, the radio pioneer, and Marconi's right-hand man, has designed the aerial. It is a dual affair, for there are virtually separate aerials for the wave-lengths of 25 and 80 metres, which will most generally be used.

### The "Lead-Outs."

Out in the open ground are the "feeders" to the aerials—the "lead-outs," as it were. These are two huge copper tubes, one inside the other, the outer one being at earth potential and supported on iron stands. The inner copper tube is the H.F. lead. These tubes connect the transmitter with tuning coils shielded in weather-proof boxes, immediately underneath the aerial masts.

I said that it seemed like running the A and E leads of a receiver close together, which everyone knows is bad.

"But, ah!" said the engineer who was showing me round, and who spoke English some millions of times better than I can tackle Italian, "the tuning coils at the end

of the tubes couple the aerials in exactly correct impedance relation to the feeder circuit; the aerial is thus a pure resistance load on the transmitter, and we get no reflected waves, so the power factor is good . . . ."

I leave it at that!

### The Tone-Changer.

We then went back to the transmitter house. Close to the entrance is the terminal point where the landlines from the studio in Rome connect with the transmitter.

Here is the usual volume and fader control desk, and I worried the engineers until they explained to me the workings of the tone-changer—an ingenious arrangement of chokes and condensers which boosts up the lower tones to make up for deficiencies in the landlines. They are hoping to arrange for better lines shortly.

The special Marconi constant-frequency drive is used to keep the wave-length steady, and it does so very effectively. Before I left, the station was started up for a test—which is carried out with a special valve-wavemeter—and I was able to see for myself that the wave-length, modulation and radiation are rock-steady.

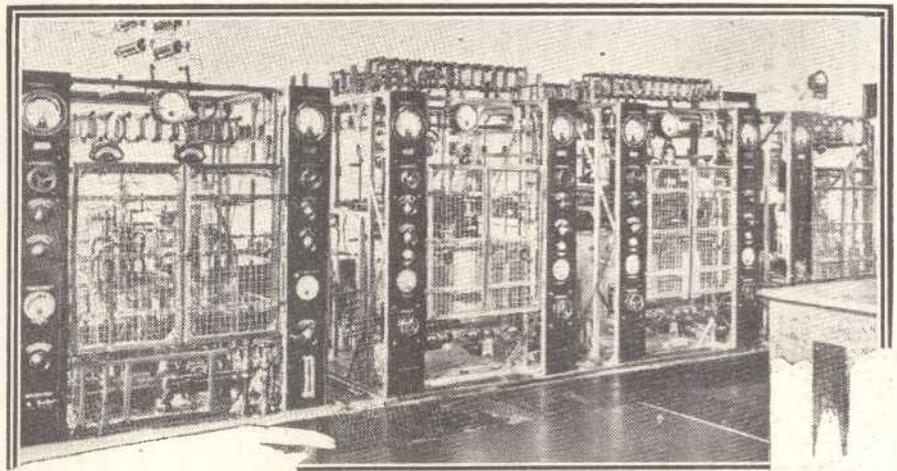
Some of the figures are impressive. Oil-cooled valves are used in the final magnification stage, and the filament current is 50 amperes! The H.T. voltage varies between 6,000 and 9,000 volts according to the depth of modulation required.

The speech modulator (the final valve) is an even bigger job, and it laps up a mere detail of 70 amps. filament current at 20 volts!

### Starting-Up Delays.

There is a great deal of apparatus connected with the oil- and water-cooling of the valves, and it is a matter of about six or seven minutes to get the station working;

## A COUSIN TO OUR OWN 5 S W.



So far as external appearance goes there is a good deal of resemblance between the actual "works" of Radio Roma and those of Chelmsford 5 S W.

There is a good deal of resemblance between the actual "works" of the Rome station and our own 5 S W, which, by the way, is heard very well in Italy. There are four huge brass frameworks carrying the lighter apparatus such as valves, coils and resistances.

The air-dielectric condensers are carried in the centre open part of the frames, and there are ebonite panels at each side which carry the meters, filament controls, and so on.

but once it is in operation the constants of practically every circuit can be seen from the meters, and checked from an innocent-looking control panel.

"Juice" comes from the mains, and at one side of the main transmitter room is a big iron frame (iron can be used for mains work, but brass frames have to be used for the short-wave radio sections), containing a bank of twelve rectifiers. At the side of

(Continued on page 418)

## USING TWO TRANSFORMERS

In view of the Ferranti Advertisement that appeared in "P.W." last week, readers should find this article of particular interest. It completely clears up a point that has apparently lead to a certain amount of confusion.

By G. V. DOWDING, Associate I.E.E.

If you, who are neither scientist nor manufacturer, build a set having two stages of transformer-coupled L.F., it is not advisable indiscriminately to pick two L.F. transformers of the same make and type. That is one of the soundest guiding principles of amateur set construction.

But not all identical transformer types fail to pair successfully. There probably is an increasing number of exceptions. Nevertheless, I repeat, it is sound common-sense to be slightly suspicious of "two of a kind."

### A Rash Statement!

And what is my justification for proffering this advice? Firstly, eight years of intimate contact with the trials and troubles of home constructors, and the benefit of an aggregate post-bag sizing up to some half-million letters. Secondly, some knowledge of the theory of our science. Thirdly, considerable personal experience of the practical side of the business.

And, believe me, the first qualification puts "paid" to dogmatism!

Once a contributor to "P.W." was so rash as to make this statement: "In order to hear the broadcast music and speech it is essential to have a loud speaker or a pair of telephone receivers connected to the output terminals of the set."

He paid the price of dogmatism. He should have prefaced the remark with a "generally speaking," or provided some other such loophole. As it was, the pedants fell upon him.

"The telephone receivers or loud speaker could be connected to interior points of the set," said some. "We've heard broadcasting through the laminations of an L.F. choke vibrating," said others.

All very true. All very, very helpful. I mean that seriously. The pedant is our sentinel, and we are grateful to him for teaching us to generalise where we can't be expansive, and to qualify as hard as possible without invalidating the practical usefulness of statements.

### "Double" Distortion.

And so I make a special point of saying that it is *not advisable indiscriminately* to use two L.F. transformers of identical characters together in one set.

There is no such thing as a perfect L.F. transformer and some transformers are much further from perfection than others. And the most easily-understood reason why it is inadvisable to use two of identical natures is that to do so *might* result in the "doubling" of a fault.

The distortion due to the first transformer *might* be amplified and added to by similar distortion due to the second transformer—this, being coincident, the result *might* be an unpleasantly audible effect. (Remember, a bad L.F. transformer can cause not only

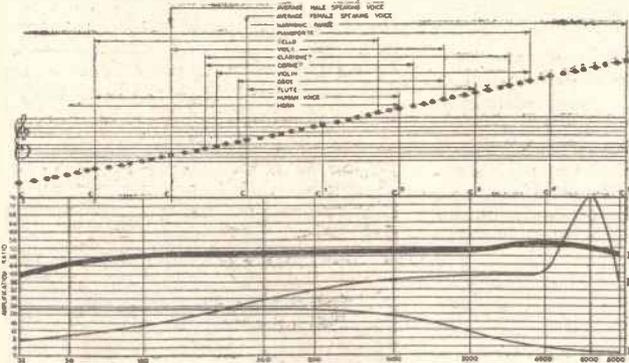
serious frequency, but amplitude and/or wave-form distortion.) Among other things, *practically* all L.F. transformers tend to have decided "peaks" at definite frequencies.

Result, unless very special precautions are taken, an over-amplification of a *band* of frequencies centred by a point in the audio-range determined mostly by secondary inductance and capacity. (It really is a "band"—not *one* particular frequency as is so often stated although, of course, one particular frequency represents the theoretical "point" of resonance—the "top" of the peak.)

Now the amplification achieved by an amplifier embodying two L.F. transformers is *generally* moderately enormous—*comparatively* speaking. And *usually* such arrangements call for careful handling if instability due to unwanted feed-back is to be avoided.

The tendency to instability becomes

## CURVES—GOOD AND BAD



Curves published by the Ferranti people. The black curve illustrates the efficiency of their own product. But note the "peak" in one of the others. And imagine two transformers in one set each having similarly exaggerated faults perhaps even lower in the scale.

greater if one particular little band of frequencies is given much more amplification than any other. Prevention is better than cure. Therefore, one must take every reasonable precaution against coupling-effects, and it is *advisable* to make absolutely sure that the two transformers are not coincidentally "peaking." You go some way towards this if you use two different types, although to do so is not necessarily to ensure an immunity from trouble.

### Unwanted "Compensation"!

Likewise, it is obvious that two transformers identical in make and type need not be electrically similar. They *must* differ *slightly* among themselves. The circuit conditions *might* cause them to differ in their practical results.

But if "pre-set" failings of an interecine character can vary, such variations could quite *possibly* be brought into line by valve

and other circuit conditions peculiar to some particular "hook-up."

You see we address ourselves to a vast multitude of constructors, using every sort of circuit and accessory under the sun. Some have *fine* circuits to build up for use with *ghastly* mains units. Others have old H.T. batteries they simply *will* use up with *fine* circuits shorn of their de-coupling, etc.

And, let me whisper this, some buy *very* good L.F. transformers while others pay three-and-ninepence each for nasty little aliens.

### Minimising Those Peaks.

So far so good. But here comes a *big* qualification. There are manufacturers making L.F. transformers that ought to behave themselves in pairs in most amplifiers.

One stout-hearted concern winds its secondaries with nickel wire. Why? Because nickel has a higher electrical resistance than many metals. But let me quote their own words:

"The secondary winding is of nickel wire, the use of which has rendered possible a coil which is free from resonance peaks at high-frequencies, and therefore does not over-emphasise and "blast" on particular notes." (By the way, supposing it did "blast" on *particular* notes, and *two* of 'em played a duet to that tune in one set!) Resistance tends to "flatten" resonance.

Other manufacturers aim at reducing the self-capacities of the windings of their transformers by ingenious schemes of sectional winding, and so push the peak right up to the utmost heights of the harmonic range, which is so badly treated in the average set that terrific over-amplification might be needed to cause anything but an improved performance.

Yet other manufacturers advocate compensating devices.

But the concrete fact remains the while "peaks" are being flattened or thrown up to 6 and 7 thousand and even higher, there are L.F. transformers, otherwise *maybe* quite good, with pretty little peaks sitting very low down on the piano scale.

Looked at solo, and from a decibel point of view, they may be no mountains. In pairs, they *may* strike an *outstanding* "note"!

I have examined the N.P.L. curves of a number of well-known L.F. transformers (you may have seen one or two). Some of them aren't really as bad in practice as their N.P.L. curves might lead one to believe at first sight, but they give weight to my points.

Around me, as I write, are some two score L.F. transformers of *different* makes. I see about half a dozen that might pair successfully in *any* normal circumstances. The others—? Anyway I would advise constructors to mix the types of makes.



# CAPT. ECKERSLEY'S QUERY CORNER

THE PENTODE'S OUTPUT—SIZE OF SUPER-POWER VALVES—G.B. ON THE VALVE—PROGRAMMES FROM INSIDE THE SET.

Under the above title, week by week, Captain P. P. Eckersley, M.I.E.E., late Chief Engineer of the B.B.C., and now our Chief Radio Consultant, will comment upon radio queries submitted by "P.W." readers. But don't address your queries to Captain Eckersley—a selection of those received by the Query Department in the ordinary way will be dealt with by him.

### The Pentode's Output.

W. A. (Cardiff).—"Will you kindly assist me in regard to the following point. I wish to substitute my existing low-impedance power valve for one of the super pentode class, and am undecided as to the type of output circuit I should adopt.

My aim is not to obtain greater volume but better quality of reproduction from a moving-coil loudspeaker of low resistance. Could I hope to obtain even better quality with a high resistance moving coil, if as I am told, it means I will have to employ an output transformer with the low-resistance coil?"

If you are using a pentode you want a high impedance in your anode circuit. I know of no high resistance moving-coil loudspeaker having a coil of such high resistance that it could constitute a sufficiently high impedance for the output stage of a pentode valve. Thus, a transformer (or choke) output would seem to be necessary in either case. So you see it doesn't much matter if you use a high or low resistance loudspeaker.

### Size of Super-Power Valves.

D. N. W. (Leigh).—"I have recently purchased a super-power valve and note that the glass bulb is approximately twice the size of an ordinary power valve, but yet the electrodes in each case take up approximately the same space. Why should the glass bulb be so large in the case of the super-power valve?"

Your super-power valve has to dissipate power at the anode. The filament of a valve emits electrons. In a super-power valve a relatively large number are emitted and the positive attraction of the anode makes lots of them rush between the interstices of the grid and hit the anode "bang!" The anode gets hot.

In transmitting valves the anode gets so hot that water is made to flow in constant contact with the anode to cool it. Some rather exceptional transmitting valves dissipate as much as 50 kilowatts at the anode!

In glass transmitting valves you can see the anode is a bright-red heat, but this is made of molybdenum and does not damage itself or the hardness of the valve in being so. The point is the anode gets hotter as the power dissipated at the anode due to electron bombardment is greater.

Obviously, if the glass is too close to the anode it, too, will get too hot and crack,

and the solution of the trouble is to make a sufficiently large glass bulb. An H.F. receiving valve anode keeps very cool, it takes so little anode current—but it's a different story when several watts have to be dissipated as in a super-power valve.

### G.B. on The H.F. Valve.

J. M. (Southport).—"Why is it that when I connect a battery of 1.5 volts in the grid circuit of my screened grid valve, so as to reduce the anode current

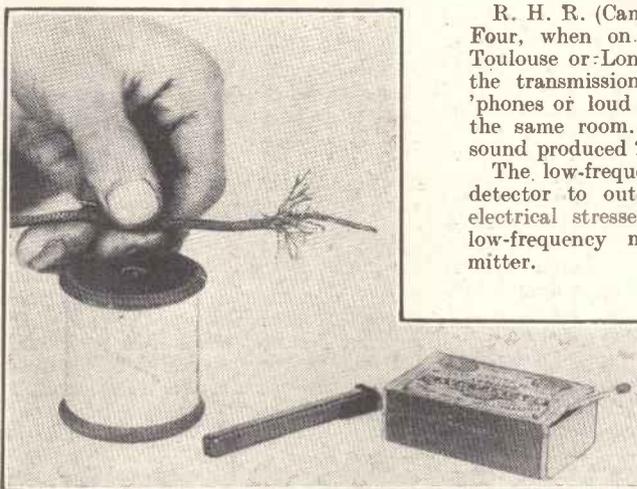
wrong way? All diffidence, but it's worth verifying!

But if the first explanation is right it is, nevertheless, better to have weaker signals undistorted. If, however, you notice no distortion, eliminate the grid bias.

After all, it is for you to decide. Theoretically you ought to have grid bias. Practically, it may not matter.

Again, it may be with no grid bias you are getting a measure of rectification which may pass on in spurious ways to make the signal apparently louder. But if there's no apparent distortion don't worry!

### THOSE UNTIDY FLEX LEADS.



Are YOUR flex leads whiskery at the end? There are many easy ways of getting over this state of affairs, one of the easiest being to use a stick of sealing wax. Heat it with a lighted match, and arrange a nice "blob" at the end of the insulation, covering all the whiskers, and—better still—improving insulation at the same time.

(which I obtain from a dry H.T. battery), a loss of signal strength results? The battery is connected at the "earth" end of the tuning coil, and I by-pass the battery with a suitable fixed condenser.

For your information I may add that the H.T. voltage is 150, so that 1.5 volts should not be too large a potential. An H.F. transformer couples the H.F. valve to the detector."

Obviously the characteristic of the valve is such that it has an effectively steeper slope with no grid bias than with grid bias. This is, in my experience, uncommon, but dare I whisper that perhaps your grid negative has been connected round the

### Programmes From Inside The Set.

R. H. R. (Camberwell).—"In my Magic Four, when on a loud station, such as Toulouse or London Regional, I can hear the transmission in the set itself. No 'phones or loud speaker connected, or in the same room. Where and how is the sound produced?"

The low-frequency part of a set from detector to output valves is subject to electrical stresses in sympathy with the low-frequency modulation of the transmitter.

Thus, after the detector valves the potential across a condenser, or the currents through a transformer, say, are rising and falling in sympathy with the modulation of the transmitter.

If anything is loose mechanically in condensers or transformers, then the varying electrical

stresses produce varying mechanical forces, and the loose things—condenser plates or transformer cores—vibrate in sympathy.

This makes the components talk and sing, and so one hears the programme without the usual reproducing devices. Same way a mains transformer "hums" when connected to A.C. mains.

There's nothing to worry about, but that's the explanation. I take it your loud speaker drowns the noises in the set; but if such noises are unpleasant, try finding out the noisy component and tightening up any clamps that hold it together.

## FROM THE TECHNICAL EDITOR'S NOTE BOOK.

# Tested and Found—?

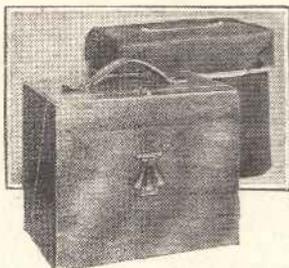


### AN H.F. BY-PASS UNIT.

**M**ANY modern circuits demand de-coupling or by-pass arrangements. In this connection it is interesting to note that Messrs. Wright & Weaire have produced a small baseboard-mounting unit comprising a .01 mfd. T.C.C. condenser, a 500-ohm resistance and the necessary three terminals. The reasonable price of this article is 4s. 6d.

### SIX-SIXTY VALVE AND SET TESTER.

The Six-Sixty Radio Co., Ltd., are selling a set tester at £8 16s. 3d. which should prove of particular interest to radio dealers, experimenters, and service men. The tester embodies three meters and various switches and terminals. There are also flexible leads with plug adaptors.



The Six-Sixty tester and the fabric cover for it which is obtainable.

It is possible very quickly to test a radio receiver or a valve, using for the purpose additional batteries, or even to test valves, using the batteries that are employed for the receiver.

### NEW TUNGSRAM FACTORY.

Owing to the increased demands for Tungoram products in Italy this firm has found it necessary to open a new factory at Milan.

### IMPORTANT PRICE REDUCTIONS.

Messrs. Lectro-Linx, Ltd., have advised me that they are reducing the prices of all their Clix specialities with engraved insulators to the extent of ½d. per unit. This means to say that the same retail prices now apply irrespective of whether the insulators are engraved or plain.

### A GOOD LOUD SPEAKER

The N. & K. Inductor Dynamic Loud-speaker (Farrand system) is something rather new in the way of radio accessories.

It is not of the moving-coil type and, equally, it can hardly be classified as ordinary electro-magnetic. The principle upon which it works is something on the lines of the balanced armature, but the cone drive

has a free travel over quite a respectable distance, and is centred by springs whose natural periodicities are removed from the audio-frequency range.

A lightly anchored cone is used.

The agent for this speaker is A. Brodersen, of Goswell

Road, London, E.C.1. The price is £3 12s. 6d.

On test I must say the instrument did work quite well, and there was a respectable amount of genuine bass.

Mr. Brodersen also sent us a Cortina Extension Ribbon cable for loudspeakers. This is some 30 feet of nice, flat, twin flexible that is wound into a sort of fishing-line reel. There are two connecting points on the reel and two at the end of the lead.

You have therefore an extension of any length up to 30 feet that can be run along to somewhere and wound up again in a matter of a few moments.

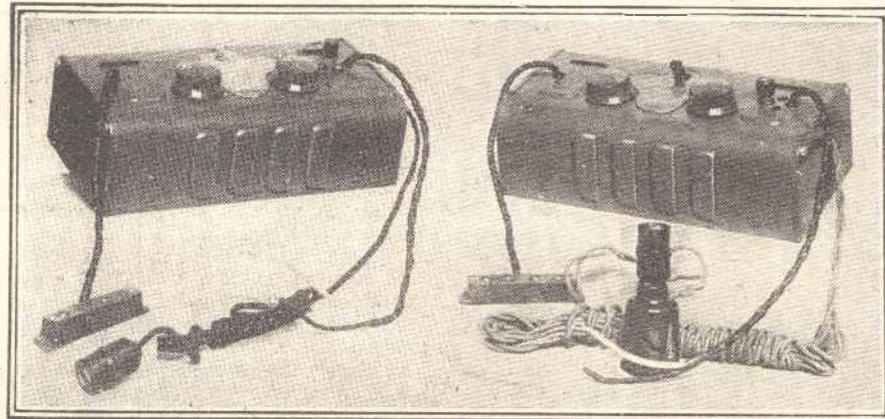
The price of this useful device is 10s. 6d.

### NEW REGENT ONE MAINS UNIT

Portable set enthusiasts should be particularly interested in the combined H.T. unit and Trickle Charger that the Regent Radio Supply Co. has placed on the market. There are two models available. The A.C. model, which is suitable for practically any type of A.C. mains and which is priced at £5 17s. 6d. It has an H.T. output of 120 volts at 15 milliamps. There are two continuously variable tappings, and one power tapping.

By the way, there is a voltage distributor at the end of a flexible extension that makes it possible for you to use the unit with a set that has very short H.T. leads. The L.T. output is in the form of trickle charging current for two, four or six volt accumulators.

The D.C. model is very similar and costs £4 5s.



The two Regentones. The lamp socket connected to the D.C. model (right) takes a lamp resistance for trickle charging.

As you will have guessed, these units are particularly compact and one can be accommodated in the interior of practically any portable in place of the H.T. battery.

The scheme is an excellent one and one that I have frequently commented. When

## When You are Buying—

### (19) SLOW MOTION DIALS.

Some slow-motion dials require several panel holes for their fixing. These make for a rigid holding, but you may prefer the more easily mounted one-hole types.

The better types give you a "vernier" control without making the ordinary direct drive harsh and stiff.

Don't choose a dial providing a very low ratio—you do not want absurdly microscopic movements or station-searching becomes a tedious operation.

Avoid dials that have backlash, looseness, harsh spots or general patchiness in their movements.

A good slow-motion dial provides an even, silky control throughout its whole movement, the vanes immediately and faithfully following each tiny dial adjustment in either direction.

the portable is used out-of-doors the usual H.T. battery and small accumulator can be employed. And when the set comes home again the accumulator comes under the trickle-charging arrangement, while the H.T. battery gives way to smooth, effective mains power.

Of course, an outfit such as one of these handy little Regentones can always be used with any one of many ordinary types of sets that might come into commission.

It really is remarkable how the Regent Radio Supply people have got such excellent smoothing with such a compact, little outfit. We have tested both the A.C. and D.C. models with various sets and found them completely satisfactory in every way.

Readers having mains, whether they run portable or ordinary sets, should make a point of acquiring the literature concerning these Regentones.

I mustn't forget to add that the variable voltage outputs are variable without being unreliable. Once you've got your adjustments just right, and it isn't difficult to get them so with such convenient controls, they "stay put."

# A HIGHER CONDUCTANCE MUTUAL ANY OTHER BATTERY THAN HEATED POWER VALVE

**P. 240  
PRICE  
15/-**

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in all positions your  
set will give a per-  
formance many times  
better than before.*



For a given type of valve the higher its amplification factor and the lower its impedance the better the performance which can be expected of it. The Mazda P.240 has the highest magnification factor for its impedance of any 2-volt power valve. This quality is expressed as mutual conductance and the higher the mutual conductance figures the better the valve.

It can therefore be truthfully claimed that the P.240 is the finest 2-volt power valve on the market—without exception.

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Amplification Factor	. . . . .	7
Anode A.C. Resistance (ohms)	. . . . .	1,900
Mutual A.C. Conductance (MA/V)	. . . . .	3.7

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V.51



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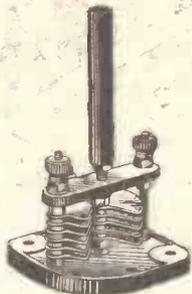
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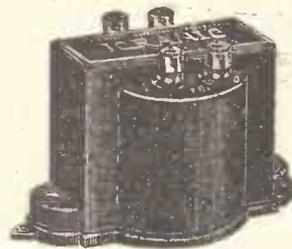


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"F" Type L.F. TRANSFORMER  
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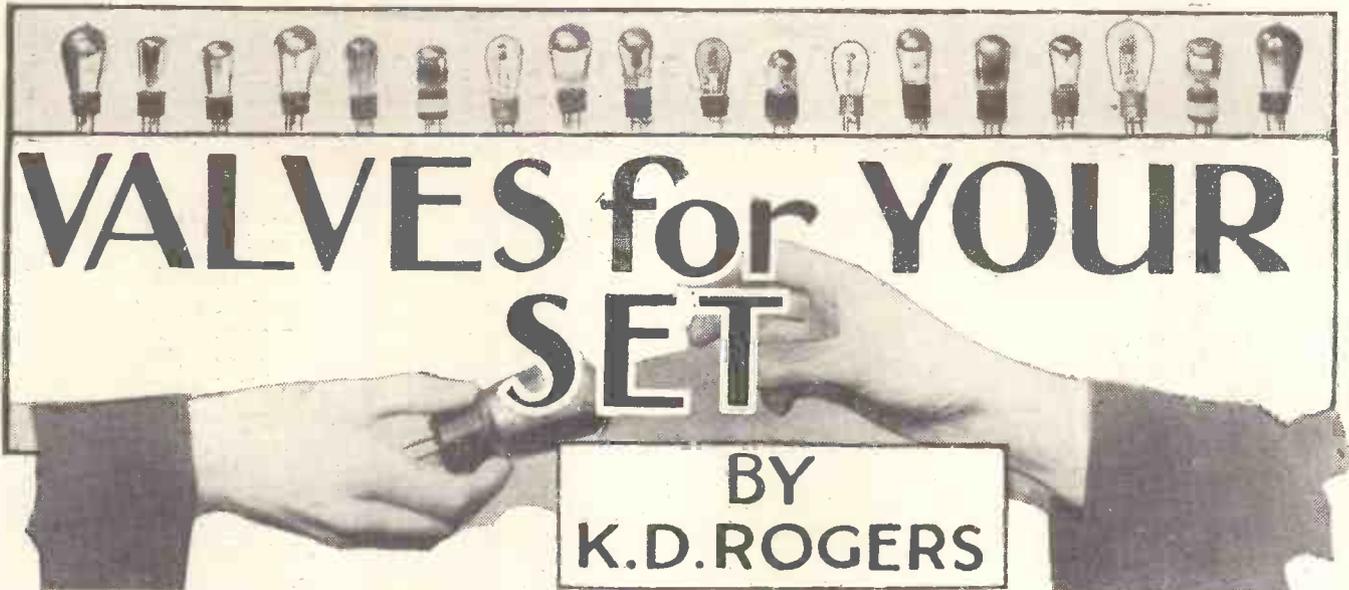
# DARIO VALVES

**DARIO L.F. TRANSFORMER**

A little marvel. Guaranteed for two years. Completely shrouded. Perfectly designed and perfectly made.

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Best way to all Stations



"WHAT valve shall I use?" is a question which is always cropping up among radio set owners. Every time a new set is bought, an old one is altered, or a new valve is placed on the market, the question of which valve is best for any particular job has to be answered.

And it is a question which is not easily answered for oneself, because there are so many valves available which are excellent in design and performance, there are so many duplicate models, and so many "border-line" cases where one valve or one type can fill the bill for another valve, while the results can still be really excellent.

**A Vast Number.**

There are between 300 and 400 valves on the British market, so that it is indeed a difficult job for the average man to decide this problem of which is the best valve. He obviously cannot afford to go and buy several which seem to be suitable, using the best and discarding the others, so he must make up his mind beforehand which he will use, buy it, and stick to it. There is no chance of a trial and error method of choice of valves for others than wealthy experimenters or those closely connected with the radio trade.

Luckily the valves on the British market

Some valuable details for valve-set users are contained in this article on the choice and use of modern receiving valves.

are pretty standard in their performances, and the majority of the valves can be chosen from their catalogue characteristics and relied upon as certain to suit any particular position.

Thus, if you have a set using one H.F. of the screened grid type, a detector, and two transformer-coupled L.F. stages, you can write to any of the big valve firms and they will tell you exactly what combination will give the best results, for any of the well-known firms is capable of supplying you for practically any contingency.

**The H.F. Side.**

If you want a high-frequency valve, all you have to do is to ask for a high-frequency valve that is suitable for your particular set, and you will get the right valve. Moreover, if anything goes wrong with it any of the well-known makes will see that you are looked after, and if the fault is due to the construction of the valve will readily replace it.

If you want a screened grid valve, you only have to ask for a screened grid valve, and you are bound to get one that is O.K. There is no trouble in H.F. or screened grid valves.

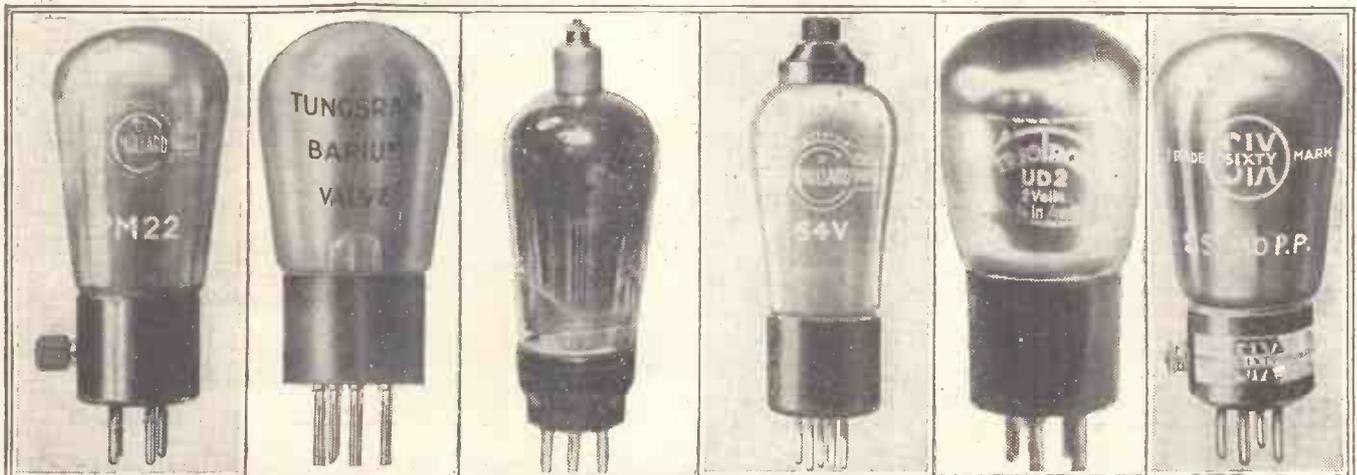
Where a little doubt may appear is on the L.F. side of the set. We will suppose,

*(Continued on next page.)*



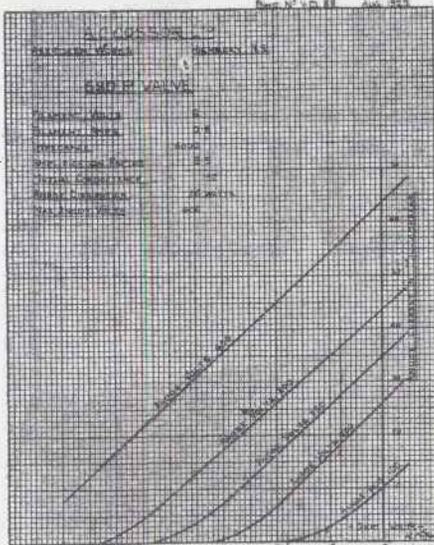
The Loewe 3NF (det. and 2 L.F.) valve, and the interior of the same valve showing the arrangement of electrodes, resistances, and capacities.

**HERE ARE SOME INTERESTING MODERN VALVES**



Reading from left to right, we have the 2-volt Mullard "Pentone," the Tungram Barium valve, the Mazda S.G.215, Mullard A.C. S.G. valve, Triotron detector, and the Six-Sixty 2-volt pentode.

# VALVES FOR YOUR SET—HOW TO GET



Above are the characteristic curves of a Cossor 6-volt output valve, while on the right is an illustration of the valve itself.

for a moment that you are sure about the H.F. side, and that you are a bit worried about the detector and L.F.'s.

Is there any particular golden rule which you may follow in order to make sure that you are going to get the best out of the receiver? Unfortunately there is no golden rule, but it should not be difficult to choose valves that will give you good reception, and perfectly satisfactory results with long life.

### Special Detector Types.

In the detector stage, whether this be transformer or resistance-coupled to the next stage, you can very rarely do better than to use one of the special detector valves such as those made by Mullards, the P.M.2 D.X., the 4 D.X., the 5 X. and 6 D., or else an ordinary good H.F. valve such as made by Marconi, Osram, Tunggram,



One of the many Philips rectifiers.

Cossor, Mazda, Lissen, P.R., Dario, Vatea, etc. An H.F. valve having an impedance of anything from 15,000 to 25,000 ohms is suitable in this stage, while its magnification factor should, of course, be reasonably high. In other words, you will probably find it has a mag. of anything from 15 to 30.

We are dealing in this article with battery valves only; the mains valves are dealt with in another article in this issue under the title of "Mains Drive Valves," so for the battery man there should be absolutely no trouble in finding the right detector.

What about the low-frequency side? This is a little more difficult because there are one or two facts about the circuit which we must have a look at before we can finally decide which valves to use.

In the first stage we have to consider how much input in the way of signal voltage the valve will have to deal with. Then we have

to consider the coupling between the valves, and we also have to consider how much anode current the valve will take.

In the first place, it is obvious that a valve on the L.F. side must be of such a size as to be able to deal reasonably well with the signal impulses without wanting excessive volume controlling when the set is tuned in to the local station. It must handle enough to provide you with sufficient output volume.

Obviously the "strength" passed on to this valve will depend upon the detector and any H.F. which precedes it. If you have no H.F. then the matter is simplified, but if you are using one or two H.F. stages on the local station you are likely to get overloading somewhere in the set unless you are very careful in controlling volume, and also in the choice of your valves.

As a general rule, the first L.F. valve can usually be of what is known as the "ordinary" L.F. type, which has an impedance of anything from 7,000 or 8,000 ohms to 16,000 ohms, and an amplification factor of anything from 10 to 15.

This is where we come up against some of this "border-line" business, for we find here that the special detector valves are often quite useful in first L.F. stages, and you can often use one here. The ordinary "H.F. and detector" valve, however, should not be used in the first L.F. stage unless you are listening to a very distant station, and you want all the amplification out of the set you can possibly get. For local station work the ordinary H.F. valve will be very badly overloaded if it is used in the first L.F. stage.

Now with regard to this stage, there is a point to watch about the impedance of the valve itself, especially as this determines the amount of anode current it will take at a given H.T. voltage.

### Too Much Current.

Most modern transformers will stand up to three or four milliamps with ease, but if you increase this to, say, five or six milliamps, as you might easily do if you use too big an L.F. valve (one of about 6,000 ohms or less resistance), then you will either cause saturation of the transformer core with consequent distortion of your results, or else you will very seriously reduce the inductance of the transformer primary, and by that

means very badly affect the quality of reproduction.

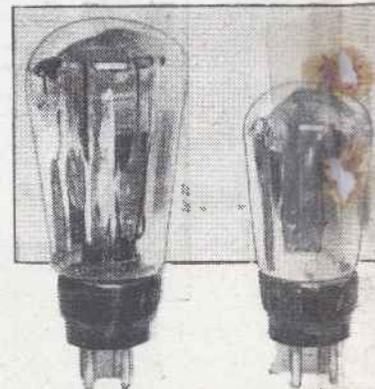
So do not use too big a valve in this stage unless you are out for very big signals, and are working on the local station and requiring tremendous volume for your output. And in such a case shunt feed the H.T. through a resistance, taking the transformer coupling through a large fixed condenser.

### The Last Stage.

The last valve in a set is rather more difficult to choose than the previous one, as you have to consider the signal voltage that is likely to be impressed upon it, and you have to avoid overloading. For instance, suppose you are listening to Brookmans Park only ten or twelve miles away, and you are using a detector and two L.F. stages, transformer-coupled.

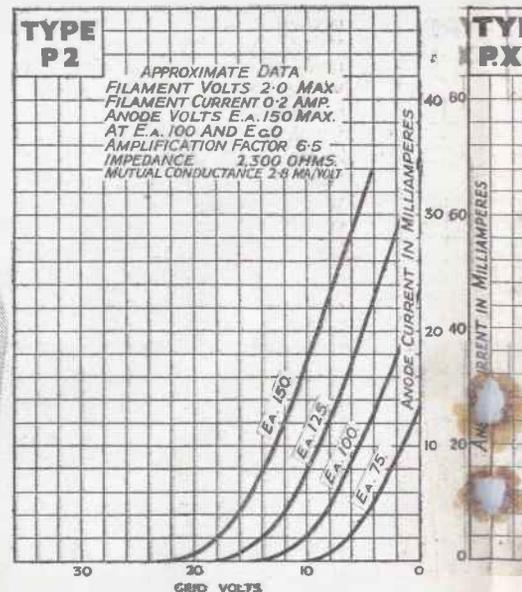
Suppose also you use an ordinary H.F. valve in the detector, and an ordinary L.F., say 10,000 ohms or 7,000 ohms, with a high magnification factor of about 12 to 15 in the second stage. What are you going to use in the last?

Economy of H.T. would suggest that you use a small power valve which by the appearance of its figures shows that it



Three from the large Mazda range of battery valves, the P220, and the P650, a large super-power valve, have also a large range of A.C.

As overloading is one of the most frequent causes of distortion, be sure to choose valves capable of dealing adequately with the inputs you will be giving them.



The latest Marconi and Osram super-power valves. On the left and on the right the P.X.4, a 4-volt "super"



gives quite a high amplification. You could take a valve of 4,000 ohms and find quite easily that it has a mag. of 6 or 7, and this apparently would give you tremendous signals from your

Always adjust the grid bias carefully.

# THE BEST OUT OF THEM (Contd.)



ery valves. The P.225B, valve. The Mazda people mains valves.

speaker. But in practice you will soon find that the power valve has no hope of dealing with the input voltage applied to its grid, and will be overloading almost continually.

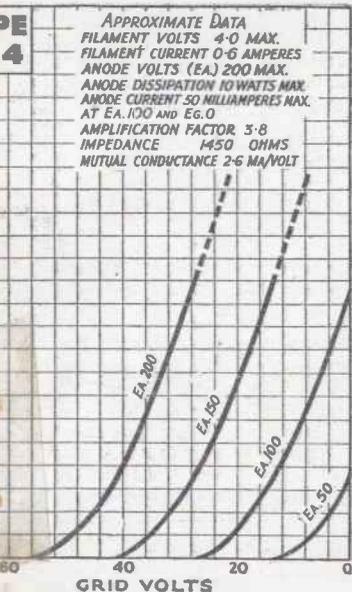
Consequently you would have to detune or volume-control till you cut down strength of reproduction by a very considerable amount. In fact, you would find that you would have to cut down the strength so much that you would be actually getting less

strength from your loud speaker than you could get by using a large super-power valve of the 2,000-ohm type with a smaller magnification factor in the last stage.

You always have to balance up this mag. of the valve with its grid-voltage-carrying power, for obviously you cannot get more than a certain amount out of the valve, the maximum being when the valve is fully loaded.

### Super-Power Best.

If the valve will not carry much load, then you will not get more than a certain comparatively small amount, and in this case that certain amount is likely to be very much less than the maximum amount you



we have the P.2, a remarkable 2-volter, with excellent characteristics.

will get out of a super-power valve which will not magnify your input so much, but will allow you to put more in.

Consequently, if you are to deal with very loud signals, if

you are within, say, 15 miles of a powerful station, and you are using a three- or four-valve set, I would strongly recommend you to use a super-power in the last stage. You must, however, be prepared to supply it with sufficient H.T. current and voltage.

### "Small Supers."

A valve of the P.240 class should do very well in cases where a fair volume is required, or, where slightly less volume is needed, the P.2 should be very suitable. Other valves of this type, such as the P.M. 252, Cossor 220P., Mazda P.220, etc., are also available.

This latter type has an impedance of 3,700 ohms and a magnification factor of 12.5, so that you have to be careful how much you give it so as not to overload it. It has a grid swing of something of the order of 6 volts either side of the bias point.

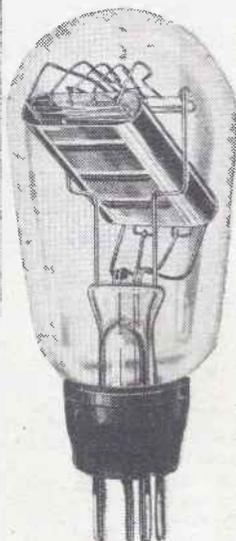
The largest valves are to be found in the 4- or 6-volt series as a rule, so that if you can use these valves you will find it better if you want really big volume. Two-volters, however, are satisfactory for ordinary room strength and general household purposes, and it is only when you want to drive a moving coil speaker at fair volume that you have to use the 4- or 6-volt type in order to get super-power valves capable of dealing with the volume and power required. In such cases, of course, anode voltages of something like 300 or more are also necessary; rather outside the scope of the ordinary set.

You will see, therefore, how very necessary it is to watch that output valve carefully, and in view of the fact that a super-power, or even a power valve, usually takes quite a fair amount of anode current, it is usually advisable to employ a filter output unit to keep the anode current away from the loud speaker windings, and along any extension leads which may be used to the speaker.

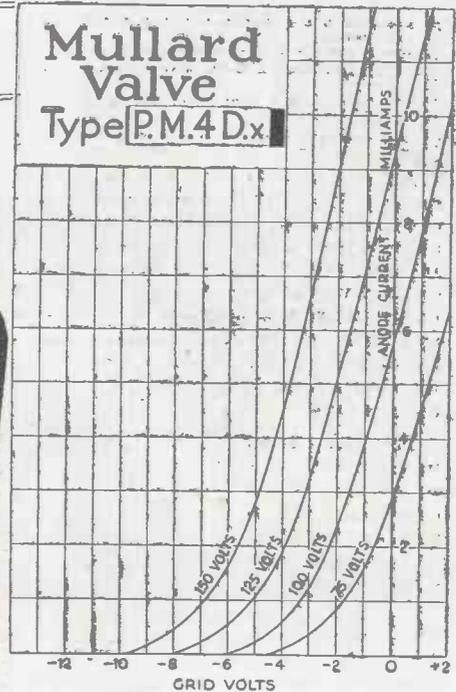
### For Heavy Work.

Incidentally, an output filter often makes a useful anti-motor boating device, but we cannot go into the advantages of that here, as this is purely a valve article.

For really heavy work there are some truly remarkable 6-volt super-power valves; there is the L.S.6A., which has a grid bias maximum of 93 volts and an anode current in the neighbourhood of 63 milliamps at 400 volts.



## Mullard Valve Type P.M.4 D.x



Messrs. Mullard are noted for their special detector valves, of which the 4-volter is shown here.

It nevertheless has a high magnification factor for a valve of that size, something of the order of 3.0, while the impedance is 1,300 ohms. This, of course, is too big a valve for the average set, though those who work moving coil speakers and run their sets from the mains will find it a useful valve.

At max. volts H.T. it dissipates something like 25 watts and takes a filament current of 1.6 amp. at 6 volts. It is, then, as you see, a remarkably "hefty" output valve.

### R.C. Valves and Pentodes.

You will notice I have not mentioned the resistance type of valve, because I am of the opinion that this has rather a limited appeal, and it is only in cases where particularly high magnification is required in resistance stages that these valves are really useful.

As a general rule the best detectors are obtained from the H.F. valves, and the resistance types have rather a small grid swing, so they are not exactly suitable for L.F. amplification stages.

We have so far not mentioned the pentode valve, which has become very popular during the last twelve months. As an output valve for giving high magnification it is, of course, impossible to beat it, for it has remarkable amplification powers, and, incidentally, quite a fair grid swing.



A 4-volt Six-Sixty S.G. valve.

(Continued on next page.)

## VALVES FOR YOUR SET.

(Continued from previous page.)

A 2-volt pentode valve will carry a grid swing of something like 9 volts, either side of the bias point, which is quite a comfortable amount for ordinary small set working. In larger sets it is advisable to use the 6-volt or the 4-volt pentode, which usually has a bigger swing, especially the Mullard 24A. and 24B., and the Six - Sixty 24A., which are extremely useful valves.

The 24A has an impedance of something like 63,000 ohms and a magnification factor of 80, and these three valves are designed for power work. They will work a moving-coil loud speaker at tremendous volume.

There is no doubt we have not heard the last of the pentode yet and that further developments will shortly take place which will give us even larger pentode valves, and even greater power carrying qualities, and even now the A.C. Pentodes are making an appearance.

### For Portable Sets.

Where portable sets are concerned it is very necessary to keep the anode consump-

tion down as far as possible, and here the special Lissen P.T.225 pentode valve proves useful, because it has a low anode current consumption, only about seven milliamps, and an amplification factor of something like 90.

The impedance is 24,000 ohms, and it

is especially designed for the output of two or three valve sets such as portable receivers using H.T. batteries. It has not quite such a big grid swing as some of the larger pentodes, but the magnification powers make it extremely suitable for portables and small sets. In sets such as the "Magic" Two it is very useful.

For those who want a larger pentode there is the super-power pentode—the P.T. 240—with an impedance of only 22,000 ohms and an amplification factor of 45. It has, of course, a larger grid swing than the P.T.225.

### Multiple Valves.

Where portable sets are concerned also we must not forget the Loewe multiple valve, in which two H.F. stages (resistance, of course) can be obtained, or a detector and two L.F. can also be supplied complete in one valve. In this case we have the three stages all in one, which is a very compact way of building up a set.

So much depends upon the valve that it should never be chosen haphazardly, for it is quite possible to ruin the whole operation of the set by choosing a poor valve in any one of its positions.

In all sets designed by wireless journals particulars are given as to the valves to use, and I would strongly recommend readers to keep to that advice. You may say, "Oh, I have got a such-and-such valve, which ought to do quite well," whereas that such-and-such valve may be quite useless, either because its impedance and mag. factor are wrong or else because it takes too much H.T. current or it will not carry the grid swing required; either of which shortcomings is capable of ruining the performance of the set.

A very good deal of the distortion experienced in wireless reception is due to the valves being wrongly chosen, and if you

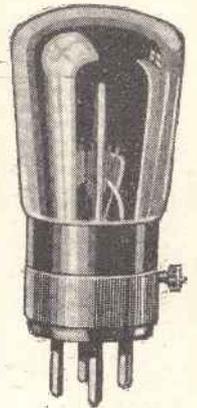
full details of your circuit and the distance from your nearest station.

The valves must carry the input from the local station satisfactorily and then they will obviously be able to deal with distant stations properly. You may not get such magnification of that distant station as you get with a valve of higher magnification, but it is worth while sacrificing a small amount of magnification in order to get the best results from the local.

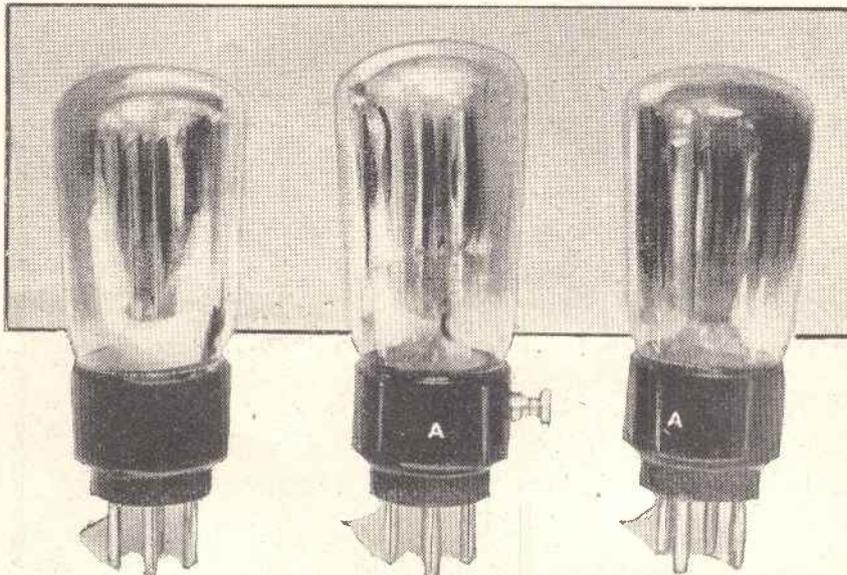
If you are out for distant reception *only* then you can use a valve simply for its magnification powers. If, however, you are out for quality reception, as the majority of people are, and distance afterwards, then it is advisable that you choose a valve especially carefully, and if in any doubt at all write to "P.W." or to the valve manufacturer for advice.



One of the P.R. valves.



The Dario Pentodian.



Some of the Lissen "twos," the HL 210, Pentode (PT 225), and the L 210.

have not a volume control it becomes doubly important that you should choose your valves carefully. If you have the slightest doubt as to the right valve to use, do write either to POPULAR WIRELESS or to the valve maker whose valve you intend to employ, and ask for advice, giving

## FOR YOUR NOTEBOOK.

All plug and socket components, such as coils, valves, etc., should periodically be scrutinised for faulty contacts, the plugs being opened slightly with a penknife if necessary.

When mounting a wave-trap close to a receiver do not forget that the coil in the trap should not couple magnetically with the coil in the receiver.

Magnetic interaction between coils takes place over quite long distances, and a 6-inch separation is usually not too much.

### NOISY RESISTANCES

When an anode resistance is noisy do not scrap it before you make sure that the spring contact at the end of it has not worked loose enough to cause the trouble.

The fewer the number of turns in an aerial or primary coil the sharper is the selectivity obtainable with the arrangement.

It is generally bad practice to use a larger aerial than is required for the station you habitually require to receive.

Before making drastic alterations to an aerial in an attempt to improve selectivity it is a good plan to rig up a temporary aerial of thin wire (such as No. 26) to find which is the best length, shape, and position to obtain the desired selectivity.

Near a high-powered station a thin wire attached to the end of a walking-stick or broom handle fixed in an upstairs window and used as an aerial will often be found to give adequate pick-up and selectivity, besides being much easier to erect and renew than an outdoor full-sized aerial.

The installing of an indoor aerial should be done quite as carefully as that of an outdoor one, just as much attention being paid to insulation.

# Which Mullard Valves for what.

Receiver.	Type.	Valve Position.	Mullard Valves Recommended.
Philips Lamps, Ltd. . . . .	2522	1 2 3 4	P.M.12. P.M.2.D.T. P.M.2.D.X. P.M.22.
Pye Radio, Ltd. . . . .	25-C	1 2 3 4 5	P.M.1.H.F. P.M.1.H.F. P.M.1.H.F. P.M.1.H.F. or P.M.1.L.F. P.M.2.
L. McMichael, Ltd. . . . .	Super Screened A and Super Range Transportable 4	1 2 3 4	P.M.12. P.M.12. P.M.1.H.F. or P.M.1.L.F. P.M.22.
L. McMichael, Ltd. . . . .	Super Range Portable	1 2 3 4	P.M.12. P.M.1.H.F. P.M.1.H.F. or P.M.1.L.F. P.M.2.
Selectors . . . . .	" 32 Attache "	1 2 3 4	P.M.12. P.M.1.H.F. P.M.1.H.F. or P.M.1.L.F. P.M.2.
Columbia Graphophone Co. . .	303A, 303B, 303C, and 303D	1 2 3 4 5	P.M.1.L.F. P.M.1.H.F. P.M.1.A. P.M.1.H.F. or P.M.1.L.F. P.M.2.
Graham Amplion Ltd. . . . .	" Two Screened Grid "	1 2 3 4	P.M.12. P.M.12. P.M.1.H.F. or P.M.1.L.F. P.M.22.
Rees Mace Mfg. Co., Ltd. . .	Gnome	1 2 3 4	P.M.12. P.M.1.H.F. P.M.1.H.F. or P.M.1.L.F. P.M.2.
Kolster Brandes Ltd. . . . .	K.B. Portable.	1 2 3 4	P.M.12. P.M.1.H.F. P.M.1.H.F. or P.M.1.L.F. P.M.2.
Ormond Eng. Co., Ltd. . . . .	Suitcase Portable.	1 2 3 4	P.M.12. P.M.1.H.F. P.M.1.H.F. or P.M.1.L.F. P.M.2.
Ormond Eng. Co., Ltd. . . . .	Cabinet Portable.	1 2 3 4 5	P.M.1.H.F. P.M.1.H.F. P.M.1.H.F. P.M.1.H.F. or P.M.1.L.F. P.M.2.
Ormond Eng. Co., Ltd. . . . .	Screened Grid Transportable.	1 2 3 4	P.M.12. P.M.1.H.F. P.M.1.H.F. or P.M.1.L.F. P.M.2.
Ormond Eng. Co., Ltd. . . . .	Portable Five.	1 2 3 4 5	P.M.1.H.F. P.M.1.H.F. P.M.1.H.F. P.M.1.H.F. or P.M.1.L.F. P.M.2.
Burndept Wireless (1928) Ltd. .	Screened Portable Type No. 1840 and Super Screened Portable Type No. 1800.	1 2 3 4	P.M.12. P.M.1.H.F. P.M.1.H.F. or P.M.1.L.F. P.M.2.
Dubilier Condenser Co. (1925) Ltd.	Westminster Portable Radio Gramophone	1 2 3 4	P.M.12. P.M.12. P.M.1.H.F. or P.M.1.L.F. P.M.22.



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**MONEY-SAVERS AND THE "MAGIC" FOUR.**

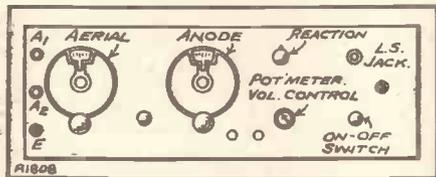
The Editor, POPULAR WIRELESS.

Dear Sir—For several years I have been a dabbler in set-construction and have always been most interested and pleased with the sets which have made your paper so well known and appreciated amongst wireless enthusiasts.

There are one or two small points which I think may be of use to set constructors; they are not my own ideas, I admit, but I have always used them, and thought that others might find them interesting and possibly helpful in cutting down expense.

The first one is this: Although I have built many sets, I have never yet used a terminal strip or terminals, which, in my humble opinion, are sources of both L.T. and H.T. leakage, an extra expense, a source of danger in possible shorting, in fact, an entirely unnecessary evil.

My aerial and earth leads come to two banana plug sockets mounted on the left of the panel; they are easily plugged in or out, and by using a second aerial socket a series condenser can be put in the aerial lead in half a second.



How Mr. Currie arranged his panel with an L.S. jack on the front.

My loud speaker leads always go to a jack mounted on the right of the panel. This enables one to plug in the loud speaker at will quickly, or, if desired, plug in the lead which feeds the loud speakers or 'phones in other rooms.

Speaking about the missing terminal strip and terminals in more detail. It is very seldom that a household wireless set is being moved from day to day, and consequently there is no drawback except to the very inexperienced who do not know anything about the "inwards" of a wireless set in not having a clearly marked row of expensive and beautifully-made terminals.

My L.T. leads are taken into the set as flex, a neat ring made at the end of each lead, the positive going directly on to the L.T. switch and the negative on to the filament terminal of the last valve.

**CORRESPONDENCE.**

**MONEY SAVERS AND THE "MAGIC" FOUR.**

**PRAISE FROM A WIRELESS OFFICER.**

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.

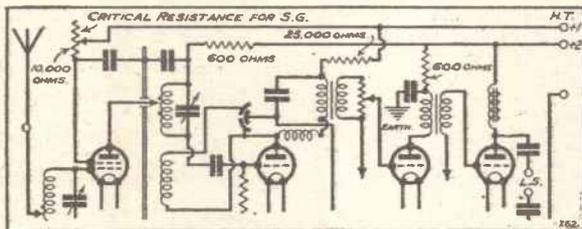
My H.T. leads go directly to the terminals on the transformers, by-pass condensers, etc., as the case may be. The grid-bias leads are short and inside the cabinet, and the H.T. negative lead is taken from the L.T. negative lead outside the set down near the accumulators and eliminator.

Another little point is this: Except in cases where a potentiometer is used (and now this is not necessary since the introduction of grid leaks with terminals) I never use a grid-leak holder; a penny pair of clips screwed on to the valve holder terminals, and your grid leak is held neatly and cheaply and efficiently.

Another useful item for experimenting is this: I usually use a make of valve having a white paper band round the base, and on this I always write the date when purchased, and, if I think fit, where I made my purchase. This gives you an idea as to how your valves are wearing, which valves are the most economical, etc.

I think the day is coming when sets will be built with all the de-coupling devices built in the set and that one's eliminator will be simply a suitable resistance, and a smoothing system.

I am sure that with D.C. mains one is asking for motor-boating, etc., in high-powered sets if one has a row of long or twisted leads coming from the



Extra de-coupling resistances were fitted by Mr. Currie to his "Magic" Four.

set to the eliminator, if all your decoupling system is in the eliminator, and if we put it in the set why have it in the eliminator and multiply your leads?

My "Magic" Four is running well with only two H.T. positive leads (it will run well with one only), but it has extra decoupling resistances in and critical variable resistances as shown.

I hope these few small remarks may be of some slight assistance to others who find a wonderfully interesting hobby and relaxation in wireless set construction.

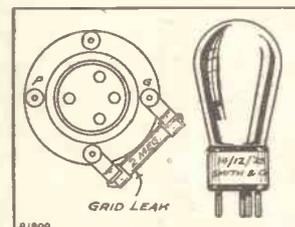
I am, Yours truly,  
DONALD J. CURRIE.

P.S.—I may add that North Wales is a very good testing place for the efficiency of a set.—D. J. C. Denbighshire.

**PRAISE FROM A WIRELESS OFFICER.**

The Editor, POPULAR WIRELESS.

Dear Sir,—Being a constant reader of your valuable paper, and having tried out some of your circuits and obtained valuable tips from your Radioterial



Illustrating two more of Mr. Currie's tips.

Section, and Capt. Eckersley's Corner, I wish to express my appreciation of "P.W." and always look forward to having the next issue forwarded to me. Some of your articles are especially useful and informative to seagoing oper-

ators like myself.

The "Magic" Three I regard as the best yet, and I also add my praise to the long list of your correspondents. In "Ariel's" section of May 10th issue, he asks for help as to the position a Morse key should be, and what gap should be between the contacts.

On shipboard, a Morse transmitting key is always slightly to the right-hand side of the operator. The inside edge of the keyboard being about in line with the operator's right shoulder. Some Morse keys are placed about 9 in. from the edge of the operating table, and some as much as 18 in. to the centre of the key. Personally, I prefer the latter distance.

I measured carefully the distance of the gap between the contacts which I am using at present, and found it to be .011 in. Settings between .011 in. and .016 in. are usually used by seagoing operators, although they are never really measured, but adjusted to suit the hand of the individual operator by trial. Very few British operators rest the arms on the table when sending, but keep the arm slightly bent from the elbow, and send from the wrist.

Wishing your paper every success.  
"SPARKS."  
s.s. "Duddingston," Denmark.

THIS week I have accidentally hit upon a rather strange discovery in connection with background noises which need no introduction to you. I have not altered or interfered with the receiver in any way whatever, but have altered the length of my aerial.

Previously the whole aerial was exactly 21 metres long, the transmitter feeding it directly at the lead-in through the window. The whole length of wire therefore resonated somewhere in the amateur band on about 21 metres.

I have now put up a "Zeppelin" full-wave aerial, the flat top thereof being 21 metres long; and two feeders at the "home" end are each 5 1/2 metres in length (about 16 ft.). For reception these two are connected together and used as an ordinary lead-in, the total length of the aerial now being about 26 metres.

**Reduced Background Hiss.**

Although I am quite sure I have not lost anything at all in signal strength on the receiver, I am prepared to swear that the usual continual background "hiss" has been reduced by 20 per cent or even more. It appears from this that it does not pay, from the receiving point of view, to use an aerial with a natural wave-length too near the frequency to be received.

Naturally, I do so little listening in the

**SHORT-WAVE NOTES.**

By W. L. S.

neighbourhood of 26 metres that any small disadvantages occurring up there will not cause any worry at all.

I was very struck by the improvement in my receiver when I changed over from the ordinary valves to indirectly-heated valves (lit from D.C. for the time being). The mains-heated valves certainly have vastly better characteristics than the ordinary D.C. variety, particularly the S.G., the change being particularly evident in the latter case by signs of instability when the previous valve was rock-stable!

And now I mean to get them going really well on A.C., or die in the attempt.

Mr. Goodwin, of Birkenhead, wrote just too late to catch last week's notes, saying that he heard the editor of the "Australian Evening News" speaking to Miss Amy Johnson's parents early on the morning of May 24th. He certainly didn't lose much time there! The editor was giving Mr. and Mrs. Johnson the news two minutes after the 'plane had landed at Port Darwin.

He also encloses a very nice certificate from W G Y confirming reception of one of their two-way contacts with the "Eletra" (I B D K). The latter by the way, works on 26.6 metres with 750 watts.

The W G Y short-wave stations, according to this certificate, now work to the following schedule: W 2 X A D, on 19.56 metres—Monday, Wednesday, Friday, and Saturday, from 11.10 p.m. till 6 a.m.; Friday, from 9 p.m. onwards; Sunday, from 8.30 p.m. till 5.45 a.m. W 2 X A F, on 31.48 metres—Monday, Tuesday, Thursday, Friday and Saturday, 11.10 p.m. till 6 a.m. All times are given in British summer time.

**News from Calcutta.**

I also have an interesting letter from Mr. C. J. Ford, in Calcutta, making several kind remarks about "P.W." and "M.W." Short-wave conditions out there are apparently not too good lately, and the only reliable station is P H I (Hilversum). Others heard are P L E (Java), K A I X R (Manila), P C J, 7 L O, 2 X A D and Co., K D K A on 25 metres, and sometimes Zeesen on 31 metres.

He thinks screened grid for short waves is a complete failure, and for this reason is looking out for a good super-het. Keep your eye on these columns C. J. F.!



All Editorial communications should be addressed to the Editor, POPULAR WIRELESS, Tallis House, Tallis Street, London, E.C.4.

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 or 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 inquiries concerning advertising rates, etc., to be addressed to the Sole Agents, Messrs. John H. Lill, Ltd., 4, Ludgate Circus, London, E.C.4.

The constructional articles which appear from time to time in this journal are the outcome of research and experimental work carried out with a view to improving the technique of wireless reception. 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.

## QUESTIONS AND ANSWERS.

### CONTROLLING THE VOLUME ON THE "MAGIC" THREE.

W. M. (London, S.W.16).—"When it first came out I took an instant liking to The "Magic" Three, and as soon as funds would allow I made it up, just as described. It's wonderful!

"It's not only the quantity of stations that it gets that I like, but the tone and strength. I am using a "P.W." Mural cone, and all I can say about it is that it is "one of the best."

"Funds being so low I have not been able to buy the extra volume control you recommend, but I badly need it, because the punch

### CAN WE HELP YOU WITH YOUR SET?

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 scale of charges, can be obtained direct from the Technical Query Dept., POPULAR WIRELESS, The 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 to solve your problems.

**LONDON READERS PLEASE NOTE:** Inquiries should NOT be made by phone, or in person at Fleetway House or Tallis House.

on Brookman's Park is terrific. Really, I suppose I ought to shorten my aerial, but I hate to do this as I think that the enormous bag of foreigners I get is due to it being so long.

"Everybody I ask about it says, 'Cut down your aerial' (which I do not want to do), or else 'Buy a volume control' (which I can't). Is there any other way of cutting down the strength on London apart from detuning the set? I find that it no sooner gets away from one station than it brings another one in."

There is one very simple way of overcoming the difficulty, and that is by using some of the apparatus which is already on the set.

You say you made it up exactly as described, and in that case you have an aerial terminal which on one side is connected to a neutralising condenser. This particular little refinement is intended for short-wave work, where it often becomes necessary to "cut down" the aerial by means of a very small series condenser. Fortunately, you will find that if the lead is taken to that terminal instead of to the ordinary one it cuts down volume enormously on the broadcast wave-lengths.

You can easily rig up a quick change-over so as to use this terminal when on local station work, and you will find that altering the setting of the neutralising condenser—in addition possibly to a little detuning—will give you a thoroughly satisfactory volume control without a trace of other stations.

It will be as well perhaps to mention that when used on the short wave lengths the neutralising condenser does not result in a loss of volume.

What it does do is to enable the set to be worked smoothly and satisfactorily with widely differing aeriels, earths, etc. But it so happens that its effects upon the broadcast wave-lengths is to cut down the strength, and as that is exactly what you require we certainly advise you to adopt this method until you can purchase a proper volume control.

### VERY BAD DISTORTION.

J. M. (Reading).—"I have had nothing but very bad distortion, and the set is not worth listening to. There is a low sort of howl in it, and if I change the detector valve for my spare one it starts a steady humming row that nearly drives me silly. What would be the cause of this kind of trouble cropping up?"

The probability is that your trouble is due to faulty battery supply, and as other factors will affect the trouble as well as this, a brief resumé of the likeliest causes of the trouble is given below.

The first thing to suspect is the H.T. supply, so if dry cell H.T. batteries are employed test the voltage with a high resistance voltmeter after the set has been in action for an hour or so. (Even if your battery is a new one it is not certain that it is in good condition, since dry cells will deteriorate if they are kept in stock even though not used.)

Sometimes also one defective cell in a battery spoils the rest of a good battery. If you are using an H.T. accumulator the trouble may be due to a partly run-down cell, or to poor connections between cells or to one of the cells being sulphated.

Perfect cleanliness at all contacts, etc., is essential if the H.T. supply is to be "clean." Where L.F. instability or oscillation occurs when an H.T. mains unit is employed it is essential to see that the unit can supply enough current at the required voltage.

A large set may take 20 to 30 milliamps. from such a unit, and it is no good expecting a small mains unit with an output of perhaps 15 milliamp. capacity to supply the current demanded. Any attempt to overrun a mains unit like this results in dropping the voltage output, which again has a deleterious effect upon quality.

Separate H.T. feed to valves or groups of valves is an advantage, one H.T. tapping being taken from the unit to the H.F. side of the set, another to the detector, and another to the low-frequency side.

Among the more easily-tried remedies for L.F. instability are to ascertain the effect of reversing the leads of the secondary terminals of one of the low-frequency transformers; to earth the core of the

transformer; to connect a .25 megohm leak across the secondary windings of the first transformer; and in the case of resistance-capacity coupling to try reducing the size of the coupling condenser or reducing the value of the grid leak.

Failing this, you may need to insert a de-coupling device on the lines of that recommended in Radiotorial last week.

### SHORT WAVES ON "MAGIC" FOUR.

W. F. (Eastbourne).—"I saw a 'Magic' being run the other night on the short waves, and should like to have a go at it myself. To my surprise, instead of the tuning being dreadfully sharp on both condensers as I expected, one was quite broad, and in fact did not seem to affect tuning much at all.

"Do you think I could get my set to run like this if I made up the short-wave coils, and if so, what sizes should they be?"

Probably you will find that your set will be just as easy to tune on short waves as the one you saw, because it is a common experience that only the right-hand dial is critical, the other being used to give a final touch on occasions to a station which is being received at not quite sufficient strength.

The coils required for the various coil sockets are as follows: For the 30 to 60 metre band plug in a No. 6 in L1, a No. 6 in L2, and a No. 4 or a No. 9 in L3.

Waves above 60 metres or thereabouts will require a No. 9 for L1 and another No. 9 for L2, and either a 6 or a 9 for L3.

### THE 50-METRE AMERICANS.

"KNOB TWIDDLER" (Northampton).—"I am going to concentrate on the American stations just round 50 metres, and should be glad to know a few call-signs and wave-lengths of those which can be picked up in this country?"

Among the important ones are W3XAU on 49 metres; W9XF on 49.8 metres; W2XAL on 49.7 metres; W2XE on 49.2; W8XAL on 49.5; W2XBH on 53; and CJRX on 52 metres.

### TROUBLE WITH THE TUNING DIAL.

P. H. (Glasgow).—"The only thing that is the tuning dial seems to be giving a lot of trouble lately, and strength seems to have

## WHAT DO YOU THINK ABOUT THIS

Looking out for a good portable two-valver, an Erdington reader of "P.W." decided that "The Tiny Two" ("P.W." April 5th issue) was just the thing. So he built it and found it far beyond expectations.

A friend (who had some spare components) asked him to help with the making of another one, and between them they turned out an exact duplicate, but using different components.

Alas! Results were very different. Oscillation the whole time prevented them from using the set, even with the valves and voltages as used on the other set.

### WHAT WAS WRONG?

N.B.—There is no prize for answering this but from time to time we shall give a radio problem (followed the next week by the answer) in the hope that readers will find them both interesting and instructive. (Look out for the solution to above next week.)

The Saffron Walden reader's trouble (outlined last week) was the H.F. choke. The home-made variety was quite O.K. for ordinary wave-lengths, but when an attempt was made to receive long waves the "choke" had insufficient inductance and was tuning with the reaction condenser, causing violent oscillation.

dropped. What is the cause of the readings altering on different days when the station does not alter its wave-length?"

A bad earthing system, in 99 cases out of 100. The probability is that if you examine your earth wire (or the buried plate to which it is affixed) you

(Continued on page 416.)

# 66P A BETTER UNIT



More Blue Spot Units have been sold throughout the world than of any other make, and the opinion of the millions of satisfied Blue Spot listeners is the genesis of the world-wide reputation of Blue Spot units and speakers.

Those who have heard the 66K unit—and it therefore logically follows that they are Blue Spot enthusiasts—must appreciate the obvious difficulty of improving admittedly the foremost unit on the market. It can only be another Blue Spot unit that is an advance on the famous 66K.

Here it is. The new 66P unit! It is the logical development of the famous 66K unit and in its manufacture, proved technical principles and extensive practical experience are incorporated, resulting in a unit which approaches perfection. Owing to the special improved details in design, covered by various patents and obtainable only in Blue Spot products, this unit will give remarkable results.

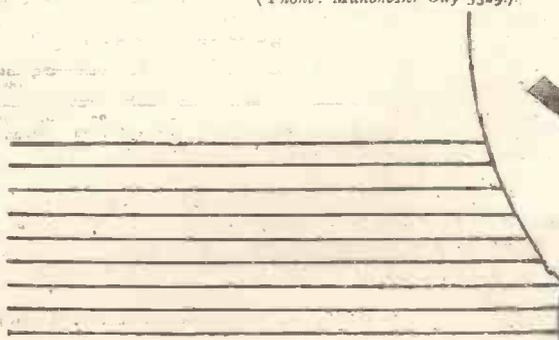
An entirely new method of moving the anchor between the four poles has been adopted, and the precision of adjustment is so keen that it is now possible practically to place the anchor the exact distance from the poles as is theoretically necessary to obtain the best effects as yielded by a magnetic unit under the best conditions.

The noticeable result of this increased sensitivity is the larger range of frequencies obtainable. In addition to the powerful reproduction of the base register with its full beauty, the higher frequencies which largely determine the character of speech and music are also reproduced faithfully.

Blue Spot Power Unit Type 66P ..	27/6
Blue Spot Major Chassis Type 37P ..	15/-
Blue Spot Special Chassis Type 31P ..	10/6
Blue Spot Minor Chassis Type 28P ..	9/-
Permissible D.C. Current .. ..	30 m/a
D.C. Resistance .. .. .	1,000-ohms

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204-6 Great Portland Street, London, W.1.  
Phone: Museum 8630 (4 lines).

*Distributors for Northern England, Scotland and North Wales: H. C. RAWSON (Sheffield and London), Ltd., 109, London Road, Sheffield. (Phone: Sheffield 26006) and 22, St. Mary's Parsonage, Manchester. (Phone: Manchester City 3329.)*



## RADIOTORIAL QUESTIONS AND ANSWERS.

(Continued from page 414.)

will find that poor contact has developed. Perhaps part of the wire is broken, the soil around the plate is dry, one of the joints has become inefficient, or some similar high resistance has developed.

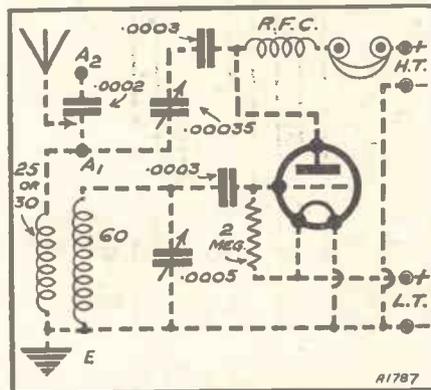
This would cause the trouble you complain of, and when put right you will find that your tuning dial behaves quite normally again.

### THE S.G. VALVE AS OSCILLATOR.

"INTERESTED" (Whitby).—"I should like to try using the screened grid valve as an oscillator, which I understand can be done with very simple apparatus. Where can I get details?"

An article giving a great deal of practical information on this interesting subject appeared in the April issue of "Modern Wireless." It was entitled "A

## POPULAR "WIRELETS" No. 12



The dotted lines above show the connections for the simplified "Reinartz" one-valver (with common aerial/reaction coil) given last week.

### DID YOU GET IT RIGHT?

New Oscillator," and as valves, components, H.T. values, grid bias, and many other practical points have been worked out, we advise you to get this and read the details given.

### SWITCHING-IN THE GRAMOPHONE.

A. W. A. (Chesterfield).—"At present one end of my detector transformer goes to the grid of the first L.F. valve and the other end to grid bias, and I want to put in a pick-up with one end to the same grid bias and the other end to grid by means of a switch, so that I can get radio or gramophone.

"What sort of switch and what connections?"

You need a single-pole double-throw switch and then all you have to do is to disconnect the grid of the valve from the secondary of the L.F. transformer and join the grid instead to the centre terminal on your switch.

One of its outer contacts is now joined up to the secondary (instead of the lead, which went from there to grid), and the other outer contact of your switch goes to one side of the pick-up. The final connection is from the remaining pick-up terminal to grid bias at the point where it goes to the secondary of the L.F. transformer. (This connection of secondary to grid bias is not disturbed, but the pick-up is connected there as well.)

You will see now that when the switch is thrown over to the "radio-gram," the secondary of the L.F. transformer is disconnected at one end so that the grid joins through the pick-up to grid bias. On the other hand, when the switch is thrown in the opposite position the pick-up circuit to grid is broken, and the switch arm restores instead the connections between grid and secondary, thus giving "radio" results.

### STABILISING A ONE-VALVER.

T. F. (Portsmouth).—"I recently altered the set and it has made it rather tricky to handle. As connected at first it used to have the aerial joined to the coil across the tuning condenser, and this was joined to earth, etc. But as I had flat tuning I was advised to take aerial and earth right away from the set and to join these leads instead only to a small coil wrapped round the original coil (not joined to it).

"It certainly gives excellent sharpness of tuning, but what troubles me is that the set is hard to handle and seems to suffer from a lot of self-capacity. It is very trying on foreign stations, and I wonder if I did right in taking aerial and earth off. Is there any way of making it stable?"

It was not necessary to take both aerial and earth right away from the set, connecting them only to the aerial coil, and we advise you to run a short lead from that end of the aerial coil which goes to earth to the old earth terminal on the set. This should overcome your difficulty.

### THE UNWILLING EXPERIMENTER

J. M. (nr. Hastings).—"My wife says she always knew I would go on to short waves one of these days, and although I said, 'No, I am quite content with ordinary broadcasting,' she was right (as usual).

"Went round to a friend's house the other night, heard Schenectady, U.S.A., louder than I get Daventry. Every word as clear as crystal (if you can call an American announcer as clear as a crystal, for he had a true 'talkie' voice).

"But money is scarce, and its got to be a cheap set, roughly hooked up with odd bits and pieces. Do I really need a good tuning condenser do you think, or will an old one do? And what's the betting that I get the Yank stations?"

You'll get America easily enough we are sure, because it's only a question of a little skill and plenty of enthusiasm, and you appear to be possessed of both.

You should have a really finely-adjustable variable tuning condenser if you can possibly afford it, for so sharp is the tuning on short waves that without a slow-motion dial one may easily pass right over a station without noticing it at all.

Otherwise, the short waves are an inexpensive hunting-ground. Two-valvers have a world-wide reach—and even a "one" will get Australia under good conditions.

You can make your own coils, H.F. chokes, etc., and of course, the set itself. ("P.W." short-wavers are known the world over for their repeated successes, low cost, and practicability.)

But build your set carefully. Give the short waves a chance and make sure that contacts everywhere are good.

One factor which by virtue of its interference with smooth reaction is liable to wreck the performance of an otherwise good short-wave set, is careless spacing and screening. For successful results all short-wave tuning coils must be kept away from stray metal. So that even if yours is an inexpensive hook-up make it a really well-spaced one.

### BACK NUMBERS OF "P.W."

J. A. S. (Newbury).—"How much are the back numbers of 'P.W.' and where can I get them?"

Back numbers of 'P.W.' can be obtained from your newsagent, or direct from The Amalgamated Press, Ltd., Back No. Dept., Bear Alley, Farringdon Street, London, E.C.4., price 4d. per copy.

### USING TWO FILAMENTS.

T. F. L. (Long Melton).—"I am not thinking of building it, but I was interested in the diagram (which I enclose) showing a valve with two filaments. One of these appears to be connected to the battery as usual, as you

## TECHNICAL TWISTERS

### No. 15.—RESISTANCE.

#### CAN YOU FILL IN THE MISSING LETTERS?

The resistance of a conductor depends—apart from temperature—upon . . . . . factors. These are the . . . . . of which it is made, the . . . . . of the conductor, and its cross-sectional . . . . .

The resistance varies . . . . . with length, but . . . . . with the thickness of the wire.

Thus a wire two yards long has . . . . . the resistance of one yard of wire, and a conductor  $\frac{1}{8}$  of an inch thick has . . . . . times the resistance of a wire which is  $\frac{1}{4}$  inch in thickness.

Last weeks' missing words (in order) were: Detector; Electrodes; Valve; Loudspeaker, Set; Rigid (or "fixed.")

will see, but the other seems to be doing all the work, since earth and tuning circuits are connected to it. What was the great idea?"

The circuit is one showing the indirectly-heated A.C. valve at work. This type of valve uses a "filament" or, rather, cathode, that is heated not by current run through it—as in the ordinary way—but by being placed in close proximity to a separate heater element.

This element is joined to the mains (not "battery," as you say), but the hum from these does not affect reception owing to the space separating the two elements.

## How do You Get those Foreign Stations?

Anybody with a good valve set, whether a one, two, three, four or multi-stage design, should be able to pick up quite a number of continental broadcasters.

### "THE WORLD'S PROGRAMMES"

A special monthly DX feature in MODERN WIRELESS, will help you to make

The World's Programmes YOUR Programmes.

This remarkable feature is full of valuable station information, practical hints, and interesting data for the station hunter.

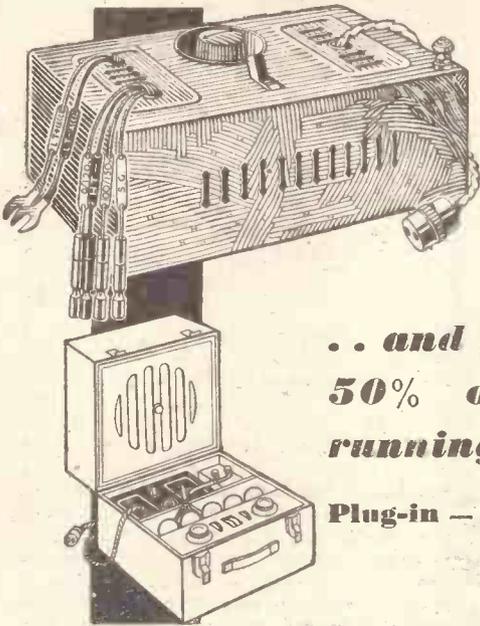
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. . and you save 50% of your running costs.

Plug-in — that's all!

Fit the very latest development in All-British All-Electric Radio—THE "EKCO" ALL-POWER UNIT, specially designed to fit snugly in all Portables but also designed for use with any type of set from one to five valves consuming up to 20 m/a.

All you have to do is slip this amazingly efficient Unit into the space previously occupied by your battery—connect your battery and accumulator leads to the "EKCO" Unit terminals—plug the "EKCO" Adaptor into the nearest electric light or power socket, and then, switch-on—that's all. Fitted in less than three minutes.

MODEL C.P.1. for A.C. Mains combines Trickle Charger and H.T. Unit, eliminating batteries and keeping the accumulator fully charged. Tappings: S.G.; 0-120, 120/150 (100 volts only, if required) . . . £6. 0. 0.

MODEL 1V.20 for A.C. mains, eliminating H.T. Batteries only. Tappings: S.G.; 0-120; 120/150 (100 volts only if required) £4. 12. 6.

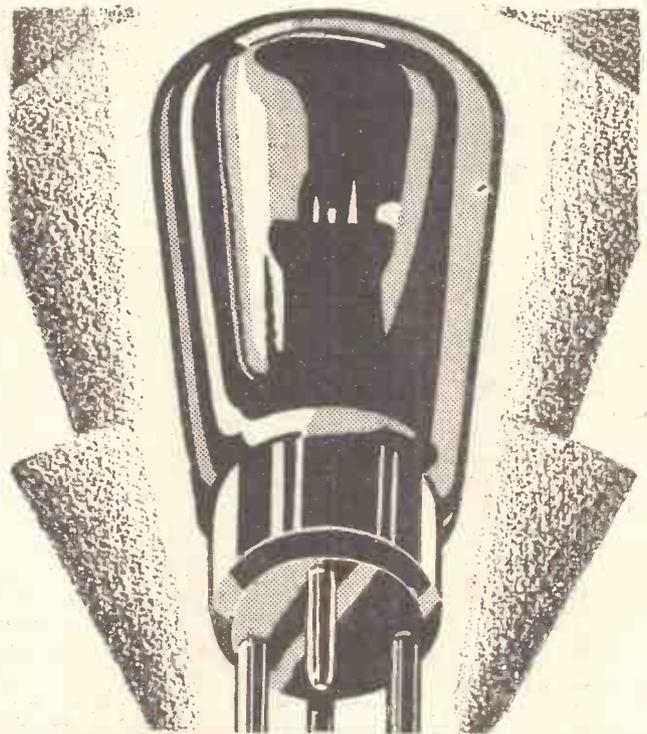
MODEL 1V.20 for D.C. Mains, eliminating H.T. Battery only. Tappings: S.G.; 0-120; 120/150 volts . . . . . £2. 10. 0.

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The filament of colloidal structure in the new Vatea Valve is the very last word in valve design. This valve gives a performance which has never previously been thought possible, and its price is a remarkable achievement. The new Vatea Valve gives not only greatly improved selectivity, but greater volume and incredibly better tone. And look at the prices!

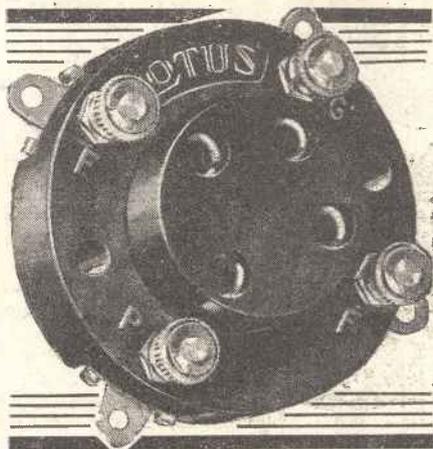
6/- H.F. AND SUPER 7/6  
DETECTOR POWER

Power, 7/-; Screened Grid, 16/-; Pentode 16/-; also complete range of Indirectly Heated A.C. Mains Valves.

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Lotus Valve Holders are acknowledged to be the best in their class. Follow the example of the most famous manufacturers and fit Lotus Valve Holders to the set you are building.

The Lotus Miniature type Valve Holder (illustrated here) is anti-microphonic and measures only 1 5/8" in diameter. Made from the finest bakelite, there is no surplus metal between the valve legs, and the leg sockets are in one piece with the phosphor bronze springs. Price, with or without terminals, 1/3.

Ask your dealer for details of the Lotus 5-pin Valve Holder for A.C. Valves—price 1/3; or send for full particulars of the complete range of Lotus Valve Holders.

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ANTI-MICROPHONIC

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**Liverpool.**

Caution.

## ISLE OF MAN ON THE AIR.

**B**BROADCASTS from the Isle of Man, which were impossible before suitable telephonic facilities between the Island and England were provided a few months ago, will be a big feature of the North Regional programmes at the end of June and the beginning of July.

So well have the authorities of Manxland combined with the officials of the B.B.C. that an Isle of Man Week has been planned, and very interesting it promises to be.

It begins on Sunday, June 29th, when the evening service will be relayed from St. George's Church, Douglas. The Archdeacon of Man will conduct the service, and scores of thousands of listeners will have their first opportunity of listening to the Manx language.

### Historical Play.

To-day practically everyone on the Island speaks English, and the sermon will be in our language. The other parts of the service will be in Manx, which is a Celtic language closely related to the Gaelic of Scotland. The preacher is the Bishop of Sodor and Man.

On the following evening there is to be an historical play dealing with Castle Rushen, a limestone structure, which, despite the fact that it was built 800 years ago, is still in a wonderful state of preservation.

History tells that Robert Bruce captured the castle after six weeks' siege in 1313, and more than 200 years later it was used as a royal residence.

The play, which is to be performed in the Manchester studio, has been specially written by Professor Hamby Hay and Mr. Ramsey Moore, Attorney General of the Island.

It is also hoped to relay several concerts from the Island, including one on Friday evening, July 4th, when the Manx choir under the leadership of Noah Moore will be heard singing at Groudle Glen, the famous holiday resort well known to Lancashire and Yorkshire visitors to the island. Items by the Northern Wireless Orchestra, playing in the Manchester Studio, will be heard between the choral selections.

### A Running Commentary.

Several talks dealing with the island are also included in the week's programmes. There is one at 6 p.m. on Tuesday, July 1, when the Attorney-General of the island will describe the House of Keys, and another at 7 p.m. the same evening, when the Lieutenant Governor, Sir Claude Hill, will give a general account of the past and present history of the Island.

It is interesting to mention that the House of Keys corresponds to our own House of Commons. It consists of twenty-four members who are elected for five years from what is equivalent to our Parliamentary representation as ten constituencies.

Perhaps the most interesting broadcast of the week is that on Saturday, July 5th, when the annual celebration of Promulgating the Laws of the Island passed during the last Legislative Assembly will be broadcast in the form of a running commentary.

This will be radiated from Northern and

National transmitters. The broadcast begins at 11 a.m. and finishes about 12.30, and the occasion is a general holiday in the Island on the date. July 5th is old Midsummer Day.

The broadcast begins with a service in St. John's Chapel, near Tynwald Hill, but previous to this listeners will be told some details of the history and associations of the procedure of one of the oldest legislative assemblies in Europe.

Following the service there will be a procession to Tynwald Hill where, in the presence of the Lieutenant Governor, Members of the Legislative Council, the Government Secretary, the Sword Bearer and other dignitaries, the laws are promulgated and new ooroners sworn in by the first Deemster or Judge.

## RÔME'S NEW SHORT-WAVER

(Continued from page 401.)

these are massive transformers, which buzz merrily when at work, and which step up the mains voltage to the 9,000 maximum needed.

The chief engineer wants to get reports from all over the globe, and he invites readers of "P.W." to send in details of any little experiences they have when picking up Rome. Already a large number of letters have been received, which show that the beam really is getting where it is wanted. Listeners in India, Australia, the U.S. and South Africa all tell of good strength without serious fading, and the engineers are very pleased with the reports, considering the fact that the station has been working only for five weeks.

The radiation direction is such that England should receive a fair proportion of the beam. The actual wave-length used during the tests is 25.4 metres, and so there may be some difficulty about jamming with 5SW, so far as British listeners are concerned.

### Testing The Transmissions.

As I drove out of the station grounds I nearly ran over a couple of engineers who were rigging up a miniature frame aerial on a tripod in a precarious position near the road. I stopped to investigate, and found that they were measuring the purely local field strength, direction, induction and similar matters.

Local listeners may have a rough time of it when the 80-metre wave-length is in regular use, for it will be almost certain to have a "Brookmans Park" effect on nearby broadcast-band coils.

## RADIO REMINDERS.

Before trying elaborate choking arrangements to cure humming noises make sure they are not due merely to the aerial or earth leads being too close to electric light or power wiring.

One dud cell in an H.T. battery can completely ruin its performance, but sometimes good working can be restored by "shorting" the section in question.

When tuning suddenly jumps from one setting to another apparently without any reason at all, the earth connection is generally at fault.

Intermittent signals, clear one moment and weak the next, can often be traced to a coil sitting loosely in its holder.

For all circuits in  
"Popular Wireless"  
use

# WEARITE COMPONENTS

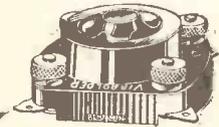
Modern Components for Modern Circuits

## THE NEW COILS (Approved Design)

Coil with Selector Switch, Tuning and Coupling Coil Unit	Per pair	s.	d.
H.F. Chokes	-	6	6
Potentiometers	-	2	6
Volume Controls	-	4	0
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L.F. Chokes, 20-henry	-	21	0
Mains Transformer, Universal Input	-	37	6
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Anti-Capacity Switches, all sizes.	-	-	-
Standard 6 x 6 x 6½ Screening Box (in heavy gauge aluminium), grey finish, 6/6; polished	-	7	6

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Mains Transformer  
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An effective alternative to the push-pull type. All insulated and with indicating dial.

**CLEARER-TONE.**  
The original anti-microphonic valve holder often imitated, never duplicated.



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THE BENJAMIN ELECTRIC, LIMITED,  
BRANTWOOD WORKS LONDON, N.17.

LIST OF P.R. SUPER GOLDEN SERIES.							
4/6	Type	Fil. volts.	Amp.	Imp. ohms.	Amp. fac.		
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	GPR 32	32	.095	12,000	9	L.F.	
	GPR 42	42	.095	40,000	32	R.C.	
POWER 7/6 EACH Post id.	GPR 9	3.5-4	.09	22,000	14.5	H.F. Det.	
	GPR 10	3.5-4	.09	10,000	9	L.F.	
	GPR 11	3.5-4	.09	44,000	41	R.C.	
SUPER-POWER 12/6 EACH Post id.	GPR 17	5-6	.14	20,000	17.5	H.F. Det.	
	GPR 18	5-6	.14	11,000	9.5	L.F.	
	GPR 19	5-6	.14	75,000	41	R.C.	
SCREENED GRID 15/- Each Post id.	GPR 20	2	.15	6,000	7	Power	
	GPR 40	4	.15	6,000	7	"	
	GPR 60	6	.15	6,000	7	"	
SG 25	GPR 120	2	.3	3,000	4.5	Super Power	
	GPR 140	4	.2	3,500	4.5	"	
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2 valves or more sent POST FREE. Matched Valves 1/- extra per set.

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**GUARANTEE.** All valves despatched under guarantee of Money Back in Full if not satisfied and returned within 7 days. All valves are carefully packed and breakages replaced.



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A receiver no longer requires attendant batteries for its power. A mains unit is more reliable, more efficient. Build one to-day

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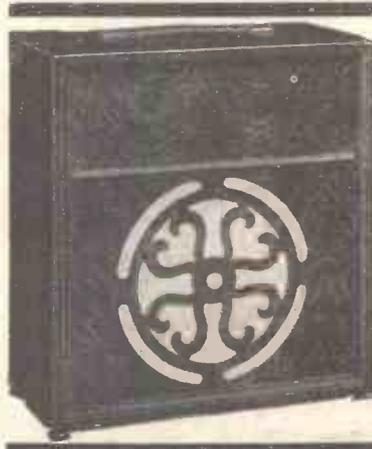
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TYPE W.14.

For all A.C. Mains, 100/250 volts, 50 cycles. Special models for 25 cycles 25% extra.



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### "CARRIER"

Suitable for 3, 4 or 5 Valves.  
Oak 35/- Mah. 39/-

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100 volt H.T. Batteries 10/- each  
60 volt H.T. Batteries 6/6 each  
The Best and Cheapest yet offered. Also send 1d. stamp for the "Leyton" Booklet to:—  
**THE LEYTON BATTERY CO.,**  
305, CHURCH ROAD, LEYTON, E. 16.

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## FOR THE LISTENER.

(Continued from page 400.)

not know how far the chairman can influence such details as the programmes, but can Mr. Whitley arrange to give us a Brighter Sunday?

### Oscillation.

I oscillated between the Canada Club Dinner and the romance of "Aucassin and Nicolette." The dinner was better entertainment than the romance. Viscount Elibank made a delightful speech.

In the romance, Victor Hely-Hutchinson's music was very charming, and the singers were good, but the speaking parts were badly cast, particularly Count Garin and Aucassin himself. And the subtle French atmosphere of this little masterpiece was lost somewhere between the studio and me.

### A Thriller.

I don't know whether it will turn out to be a very exciting one, but it is quite a good idea to get several well-known writers of detective fiction to tell us a story chapter by chapter, each one taking up the baton as in a relay race when his predecessor has finished with it.

Mr. Hugh Walpole will lay the plot; and that is sure to be well done. We used to play a parlour game in the old days rather like this; sometimes it didn't come off, but when it did it was very good.

I hope this joint thriller will come off. It ought to. The men severally are capable enough; it remains to be seen what they are like as a team. The man I don't envy is the last man.

### Jack Kelly.

He should have rested on his laurels. He was first-rate when he told us of a day in a rag-picker's life, but not so good when he described a Whitsun holiday on Blackheath. How extraordinarily difficult it is to repeat a success.

The first one hangs about you and hampers you, or lifts you above yourself and spoils you. Half the world doesn't know when to stop. It is one of the subtlest of life's secrets.

### Gillie Potter.

He threw the rest of the vaudeville programme that night into the shade. He alone had the quality. He is an excellent teller of tales and maker of jokes. He has the exact microphone manner.

He is dry. Charles Tucker started well, "Where there's a will there's always relations," but I get tired very soon of the sentimental songs which seem to be now inevitably associated with jazz music—"The little kiss each morning" type.

But, there, one man's meat is another man's poison. I like them, but in small, rare doses. That night we had quarts.

### The "Homeric."

Was it a fake? Harold Nicolson believed we might think so, and chuckled. He allowed us to overhear a conversation between himself and a friend of his on the "Homeric," a thousand miles out in the Atlantic Ocean.

If it was a fake it was a very good one. If it wasn't, it was one of the most interesting bits of broadcasting in a singularly fruity week.

## TECHNICAL NOTES.

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

TO the great majority of broadcast listeners—at any rate, those who have electric-light supply in the house—there is no doubt the all-mains receiver makes an almost irresistible appeal. It has been a long time coming, because it has taken a good deal of time and experiment to overcome various experimental and practical difficulties.

But now we have all-mains receivers which are not only comparatively inexpensive, but are also perfectly satisfactory in operation, and it is easy to understand why all-mains sets are becoming increasingly popular.

For a long time one of the chief objections to this type of receiver was the presence of the A.C. hum, or the sound of the D.C. ripple, and also it is only comparatively recently that all-mains sets have been made simple and effective in operation. The great improvement in these sets is largely due to the introduction and perfecting of the indirectly-heated type of valve.

### Running Costs.

Curiously enough, however, many people who have not yet tried an all-mains set (and some people who have) seem to have the impression that a set of this type costs a good deal more in electrical upkeep than a battery-driven set.

As a matter of fact, the position is quite the reverse. I say nothing for the moment about the relative first costs of the two alternative types; I am speaking for the moment purely of consumption of electricity or running costs.

### Calculating Consumption.

If you have a 2-valve all-mains set it is probable that the consumption will not be more than perhaps 20 watts. This set would therefore run for 50 hours before it had consumed one unit of electricity (that is, 1,000 watt-hours).

The price of electricity per unit varies in different localities, but where the set is connected on to the electric light circuit (as distinct from an electric power circuit) the cost may usually be taken to be about 4d. or 5d. per unit. If the set is used three hours a night, seven nights a week, you will see that the cost per week (say, 20 hours, that is, 400 watt-hours) is only about half a unit, say, 3d.

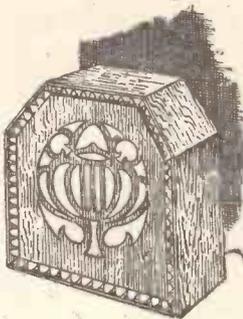
If you are using a 4-valve set instead of 2-valve, naturally the consumption will be higher, but will probably not be twice as much; it may be perhaps 5d. a week, or less than one penny per night. Now compare this with the cost of a new high-tension battery every three to six months, and a low-tension battery requiring to be recharged, say, every fortnight.

I think a very simple calculation will convince you that, so far as actual cost of electrical consumption is concerned, the all-mains set is much the more economical.

### A Simple Comparison.

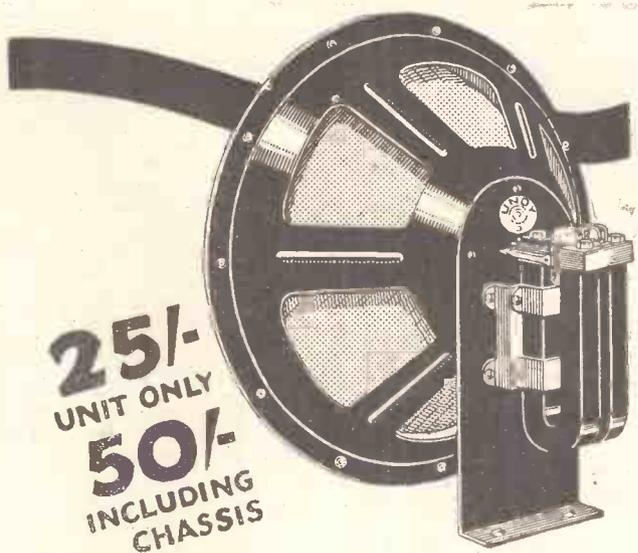
In order to form an idea of the consumption of a set in terms of something

(Continued on page 422.)



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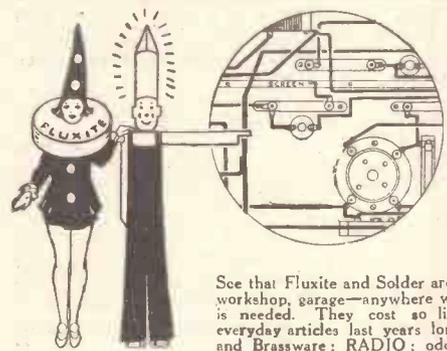
Do not be misled by big words. Anything can be written on paper. Verbose reports about loud-speakers, covering many pages, should not be taken as an infallible guide. Let your ear be the judge. Many loud speakers are offered as being the very latest invention of radio-science. But ask for a demonstration of the "Undy 8-pole Dynamic Unit." This speaker stands alone, ahead of all others as the best. Only the "Undy 8-pole Dynamic Unit" will please your ear. The "Undy 8-pole Dynamic Unit" occupies a unique position owing to the negligible amount of energy it requires, due to its novel design for which patents are pending in all civilised countries. It thus obviates the necessity for expensive, high-power final stage valves, while its reproduction is as rich in volume and at the same time as true to nature even on the smallest set as that of the best moving-coil Loud Speaker. The "Undy" can be used with any final stage valve on the market so that you can utilise your old receiver and valves. Before you buy a Loud Speaker it is to your own interests to hear the "Undy." See that you get an original "Undy 8-pole Dynamic Unit" as many competing makes are offered as being of equal value.

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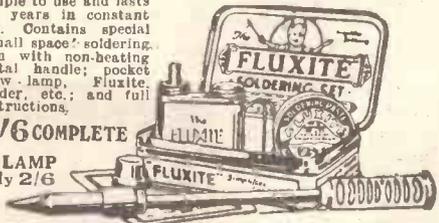
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2d. Red or Black Insulators

**TECHNICAL NOTES.**

(Continued from page 420.)

more familiar, you can think of the amount of electricity consumed by an ordinary 50-watt lamp. The 50-watt lamp will, of course, consume 50 watt-hours per hour, or 1,000 watt hours—that is, one unit—in 20 hours.

This lamp, then, is consuming about twice as much electricity as your 2-valve all-mains receiver, or roughly the same amount of electricity as your 4-valve all-mains receiver.

If an electrically-driven gramophone is used, this will, in the majority of cases, consume rather more electricity than an average all-mains wireless receiver, but even then the total cost of electricity is quite negligible.

**Relative Advantages.**

Even supposing the actual cost of replacements and recharge of batteries with a battery-driven set amounted to no more than the cost of electrical consumption of an all-mains set, the latter would still have the great advantage of convenience and freedom from the need for continual attention. As I have shown above, however, the fact is that in addition to these advantages the mains receiver is actually much less expensive in upkeep than the battery-driven receiver.

I have dealt with this point, which is a very simple one to many of you, because newcomers (or would-be newcomers) to wireless, are often in serious doubt on this point. Probably they get a vague notion that anything connected to the electric light must necessarily consume far more electricity than if connected to an innocent-looking dry battery.

**The Pentode.**

Some people have the greatest hopes, of the pentode type of valve, but opinions differ considerably on the question of its possibilities, and I was interested to notice recently some remarks from Dr. Lee de Forest, the famous American radio engineer, on this matter.

He starts out by saying that the pentode is by no means new. In 1915 Dr. de Forest was working on a five-electrode valve, and he obtained patents in 1916 to 1918 on the pentode and on circuits using pentode valves.

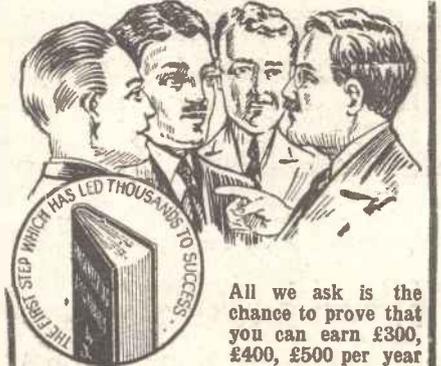
At that time, however, he was ahead of the public demand, which was for a three-electrode valve only. Then came the four-electrode valve into commercial use, and the success of the four-electrode probably led to the belief that the pentode would be an equally great step forward.

"Personally, I have grave doubts on the matter," says Dr. de Forest. "True, the pentode had great undistorted output, and eliminates one stage of high-frequency amplification. But its disadvantages are many. The great crowding of broadcasting stations on the air makes the reduction of tuned circuits, which results from the use of the pentode, a distinct disadvantage by lessening selectivity.

Moreover, the pentode will cost decidedly more to manufacture. The pentode is difficult to manufacture with uniformity, and it is also a difficult valve to handle, since it is liable to cause the receiver to misbehave.

(Continued on page 424.)

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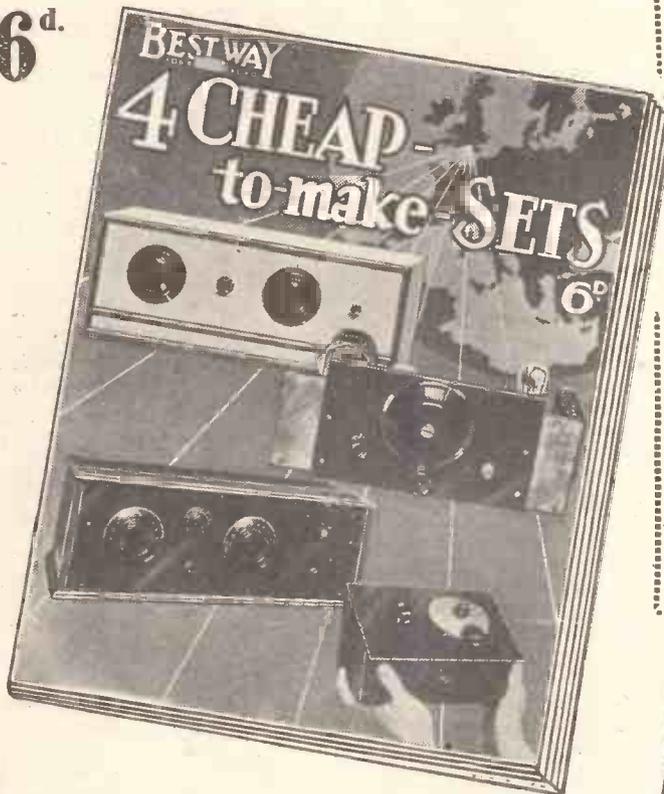
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# TECHNICAL NOTES.

(Continued from page 422.)

"With the growing vogue for portable battery receivers the pentode may still find a place in the sun. But for the present and the immediate future I predict that the pentode will not be any thorn in the side of the regular valve manufacturer."

In view of the opinions of the radio public on the pentode in this country, the above-mentioned views of Dr. de Forest are certainly extremely interesting.

## Acoustical Peculiarities.

Attempts have often been made to design loud-speaker horns on the principle of the cavities of the human ear; this is on the idea that the human ear represents more or less perfection in the way of a sound chamber.

In fact, it has often been stated that the ear is entirely free from resonance or "peaks," and that the response or sensitivity of the ear is uniform over a very wide range of frequencies.

This, however, is not the case, for although the ear is a very wonderful acoustical instrument, even the normal ear is by no means perfect; strangely enough the "normal" ear is not normal at all, but comparatively exceptional.

Perhaps I should express it another way by saying that some people's ears are distinctly better than the average, and therefore we assume that these should be called "normal" ears. The normal ear has many peaks of response and, moreover, varies from day to day and also considerably with age.

The hearing varies also according to the state of health of the individual. It has been found that with advancing years a person generally becomes less sensitive to the higher frequencies above, say, 5,000 cycles.

## Variations of Sensitivity.

Investigations into the characteristics of the ear have been carried out by many scientific experimenters at different times, and "frequency-response" or "frequency-sensitivity" curves have been drawn out.

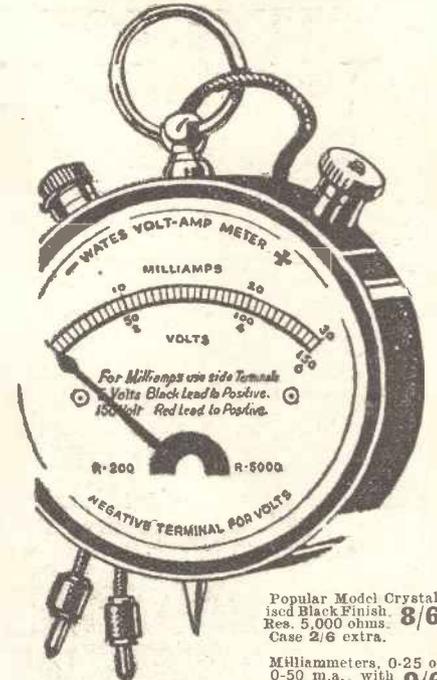
Although these curves differ appreciably according to different investigators, they have certain broad features in common. In particular, it has been shown that the average ear is most sensitive to a frequency of about 2,000 cycles, diminishing gradually as the frequency increases and, more rapidly, as the frequency decreases.

At a frequency of 256 (the middle "C" on the pianoforte) the sensitivity is about three-quarters of the maximum. At 100 cycles it is about half the maximum, whilst below 100 cycles it falls away very rapidly indeed, until most people are unable to perceive, as sound, atmospheric vibrations of less than about 30 cycles.

## PORTABLE SETS.

In case we did not make it sufficiently clear in our portable set review of June 7th, we should like to draw the attention of our readers to the fact that the Amplion Portable, unlike so many other makes, is covered with real hide and not imitation leather. Incidentally, the Marconiphone Model 55 sells for £18 18s. as stated in our review, but the waterproof cover is 12s. 6d. extra.

# INSIDE INFORMATION

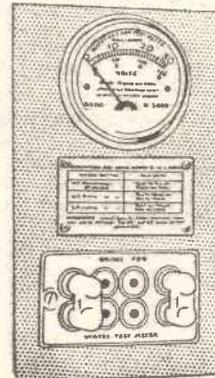


Popular Model Crystalised Black Finish. Res. 5,000 ohms. Case 2/6 extra.

Milliammeters, 0-25 or 0-50 m.a., with Jewel Bearings. 9/6

Panel Model, "3 in 1" meter. Rearrange plugs for readings. 13/9

That is what the wonderful Wates Meter gives you. By the three readings on one dial—volts, H.T., and L.T., and milliamps—the condition of batteries or valve consumption can be seen immediately and the detection of leakage and obscure faults are a matter of the moment. No amateur who wants the very best from his receiver can afford to be without one of these instruments. Reads 0-150 Volts, 0-6 Volts, 0-50 Milliamps. Obtainable from Halford's Stores, Curry's Stores, and all Radio dealers, or direct. Descriptive literature sent free on request.



# WATES "three in one" VOLT-AMP RADIO TEST METER

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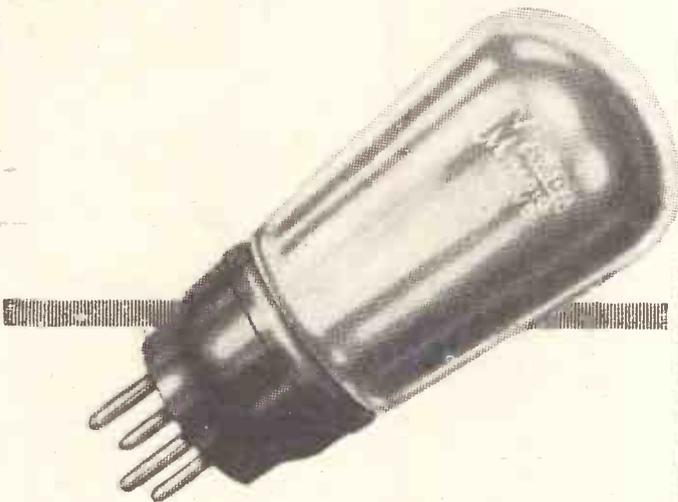
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**H.210**  
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High amplification means additional sensitivity, while the low impedance allows a large signal to be handled without distortion. These facts, combined with its non-microphonic properties, render the Mazda H.210 an ideal valve for all portable sets.

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By  
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DUCON**

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If the utmost amplification is to be obtained from an H.F. Amplifier it is necessary, among other things, to avoid interaction between the grid and anode Circuits on the H.F. side. If screening by means of metal boxes or shields is resorted to, the H.F. losses due to eddy currents will in all probability be unduly high unless the set is built of such dimensions as to be unreasonably bulky.

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*Dubilier Toroids  
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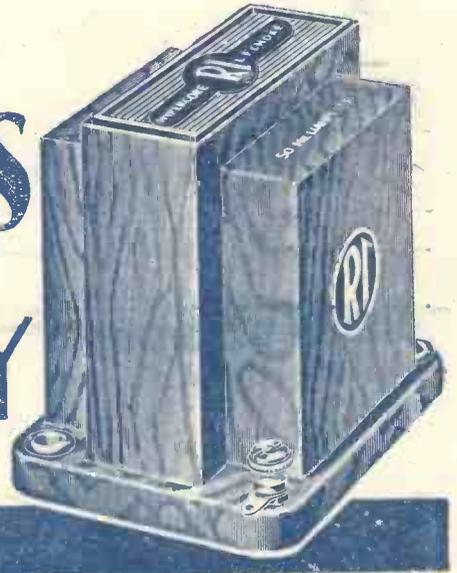
CONDENSER CO. (1925) Ltd.

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# RIGHT STEPS to RADIO EFFICIENCY

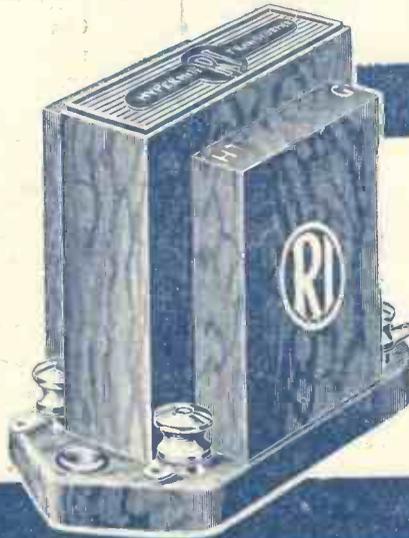
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