POPULAR WIRELESS, August 5th, 1933. REGISTERED AT THE G.P.O. AS A NEWSPAPER

HOW TO MAKE A USEFUL RADIO TESTER

Our International Quality Tests Reviewed

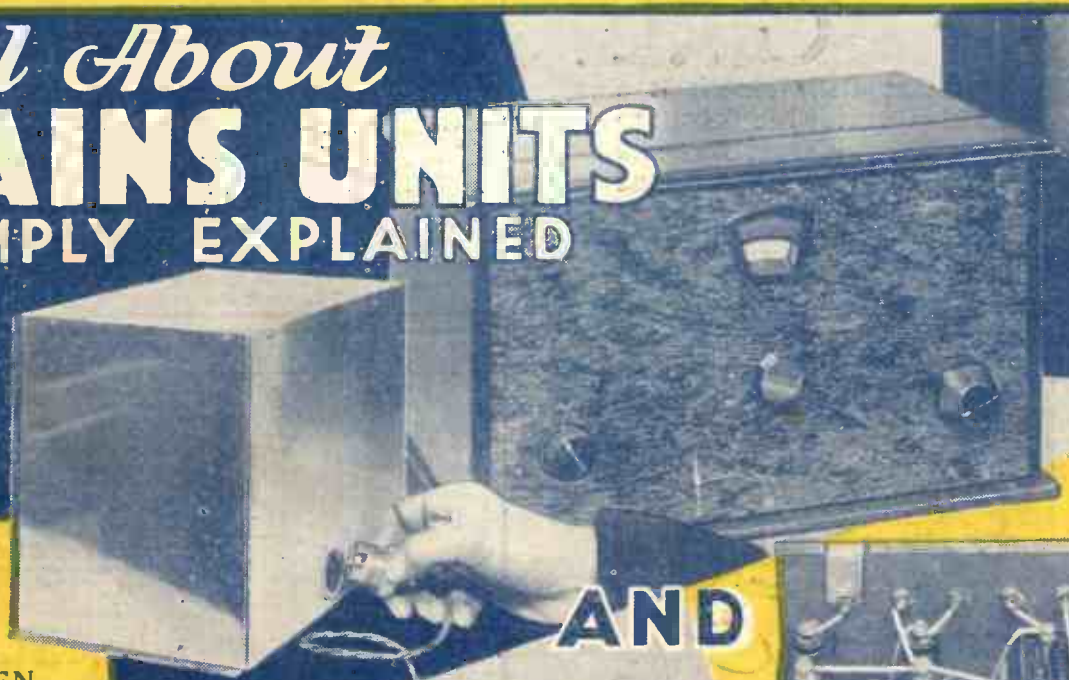
Popular Wireless

SELF-TUNING CIRCUITS

No. 583. Vol. XXIII. August 5th, 1933.

EVERY WEDNESDAY PRICE 3D

All About MAINS UNITS SIMPLY EXPLAINED



AND

HOW TO MAKE ONE For H.T.

A "P.W." DESIGN

Also :

WHEN LISTENERS SLEEP

DECIBELS DECIPHERED

ISOLATING THE PICK-UP

etc., etc.

POPULAR WIRELESS

THE FIRST AND FOREMOST RADIO WEEKLY.

The Paper that Made Wireless Popular

Scientific Adviser : SIR OLIVER LODGE, F.R.S.
Chief Radio Consultant : P. P. ECKERSLEY, M.I.E.E.
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Chief of Research Department : K. D. ROGERS.

QUALIFIED DEALERS
THE TIDWORTH TATTOO
THIS YEAR'S PROMS
REAL ENTHUSIASM
A JAPANESE SENSATION

RADIO NOTES & NEWS

GREETINGS TO ARGENTINE
B.B.C. SUNDAY PROGRAMMES
THE WORLD'S WORST!

In the Public Interest.

THE Wireless League, 12, Grosvenor Crescent, London, S.W.1, is inaugurating a new scheme of great practical importance under which "radio service" men or firms duly approved by the League will exhibit a sign reading, "Approved Service. Repairer to the Wireless League. Officially Appointed."

If the public take advantage of this sort of scheme the "dabbler" will be forced either to qualify himself or turn his energies into directions other than ruining receivers and accumulators.

A Drastic Scheme.

IN Switzerland the Ministry of Posts and Communications has made a regulation, which came into effect on July 1st, that only properly registered dealers will be allowed to sell sets and erect aerials.

These dealers will be licensed only after passing a technical examination. Moreover, not only the proprietors but also the employees must pass the examination, and changes of staff must be notified to the authorities. Every dealer must pay the Administration five francs in respect of each set he installs.

These and other regulations, though logical, are not suited to our taste and genius, but no doubt "get over" on the Continent. But in writing this I think of D.O.R.A.—and blush ever so slightly.

Obituary Note.

I RECORD with regret the death, at the age of 65, of Dr. E. Fournier-d'Albe, a London-born man, educated at Düsseldorf and South Kensington. He was an authority on selenium cells and the inventor of the "Optophone," which transformed the variations of a beam of light reflected from a printed page into musical notes, by means of which the blind can read.

I remember him because he won the Solatium Award in the first Television Competition arranged by POPULAR WIRELESS; and also with affection because of his charming book, "The Electron Theory," which I recommend to your notice.

Art and "O.B."

AT the August 5th broadcast of the Tidworth Tattoo a B.B.C. engineer, for acoustical reasons, will have to follow the massed bands bearing a microphone. So that this sober official on his lawful occasions may not elicit the ribaldry of the crowd or cast a civilian shadow over the martial scene, he is to be hooded and clothed entirely in green.

Probably there is no marked competition for the job; B.B.C. employees of engineer rank do not hunger to appear in public as an Edgar Wallace villain of the Hooded-Terror type. I don't think that Sir John Reith ought to ask a subordinate to do something which he himself wouldn't care to do.

I may be wrong, but that's my idea of controlling staff.

Bilbao will be Calling.

THE projected new broadcasting station at Bilbao, Spain, is to be opened, it is hoped, on September 15th. The premises are completed—they are situated in the Carlton Building—and the apparatus was to have been installed during July.

The preliminary tests should take place this month on 203 metres. By the way, reports of a "super"-station for Madrid, *à la* Russian super-stations, might be taken *cum grano salis*. I do not think that Spain will qualify as one of the mad radio bulls of Europe.

The Queen's Hall Proms.

THESE appear as inevitably as Christmas and tax-demand notes. They open this year on August 12th and end on October 7th, the B.B.C. Orchestra playing at all of them.

Missing these Proms is the only thing that spoils a late August holiday for me. As usual, Saturday will be "popular." On Mondays we shall get Wagner; Tuesdays and Thursdays are left open for miscellaneous programmes. On alternate Wednesdays Bach and Brahms programmes are to be offered; Fridays are sacred to Beethoven.

Once more I say: *Go to Queen's Hall* and experience the "kick" which a great orchestra and a great conductor can supply.

Concentrated "Constructor."

THE "Wireless Constructor" for August is a masterpiece of radio journalism: Up-to-date news and designs, combined with mature advice touched with humour and humanity. It includes a full description of an all-wave three-four—a Victor King product—and "The Modern Midget" Two.

Scott-Taggart discourses from his armchair as funnily and as cannily as ever. In him you have, for sixpence, the radio man *par excellence*, who will discuss a wireless problem and crack a joke, either combined or separately. For radio skill and common sense, humour and frankness, S.-T. is your man.

(Continued on next page.)

ARIEL CONTINUES HIS RUNNING COMMENTARY ON RADIO

Distance No Object.

IN the little township of De Aar, some 500 miles from Cape Town, there lives a man who must be the most enthusiastic radio fan ever.

He wrote to the organisers of the British Radio Exhibition asking them to cable him the date of the forthcoming show, because he was travelling the few thousand odd miles to England to buy a wireless set!

Our technical men are all hoping that this enthusiast will call at the "P.W." stand at Olympia, for a man who will travel thousands of miles on radio bent is a man after their own hearts.

Car Radio Pioneer.

AT a meeting last month of the Bristol Radio Trade Lunch Club Mr. Johnson, of the Bristol Motor Company, Ltd., spoke of his pioneering in car radio in 1923.

His aerial was erected on a bamboo pole which was carried in sections, and took five minutes or so to hoist and connect up. Next he tried two long poles, one on either end of the car—which must have beautified the car! His present installation is, of course, quite unobtrusive. Can any reader claim to have had a radio-fitted car earlier than 1923?

Zionist Short-Wavers.

I READ in the *Era* that the Association of Zionists are erecting a short-wave station in Jerusalem for broadcasting Jewish music.

That's a nasty one for the Hitler chap! Enough to make his swastika turn into an isosceles triangle at the thought of the stuff sweeping, unarrested, across his adopted country. He had better arrest Heinrich Hertz!

Suddenly turning serious, I express the hope that the Association will not take it into their heads to broadcast the Wailing at the Wall during the "rush hour." Once heard, never fully recovered from!

An Eastern Surprise.

I SEE that a Japanese announcer—most punctilious of men—has been getting into serious trouble for impoliteness.

Apparently he was in the middle of an interesting talk, when he paused dramatically, and then, without the slightest warning—*sneezed!* The cultured ladies and gentlemen of Japan could hardly believe their own loud-speakers!

What's going to happen about it I don't know, but I do hope there will be none of that *hari-kari* business. Politeness is all very well, but, after all, a sneeze is a sneeze, and no respecter of microphones.

Naughty, Naughty!

THERE is a lot to complain of in the B.B.C.'s output, and I could write at great length on the subject. But I would never go so far as the *Saturday Review*, who, in complaining that the B.B.C. broadcast only a single act of a Wagner opera, said: "I am certain that the best type of education, if we *must* be educated by these conceited half-wits, is to offer the public the best and to let the public learn to like or reject it."

There are no half-wits employed by the B.B.C., but there are a lot of highly-educated theorists who need to be taught in the school of life.

SHORT WAVES

ATTENDS BY "AIR."

"And what denomination are you?"
"Well, my mother goes to the Baptist church and father to the Methodist. But, speaking for myself, I'm wireless."
"Christian Science Monitor."

* * *

A writer says that the majority of our wireless comedians are not at all funny in private life.
Why the last three words?

* * *

"There are times," says Sir Walford Davies, "when I feel that there is no pleasure comparable with turning off the wireless."
Especially the one next door.

* * *

A heated dispute between two speakers was recently broadcast.
Words over nothing.

* * *

FOR FREEDOM OF SPEECH.

(The final "t" should be sounded in "beret," says the B.B.C.).

. . . From all the shires remotest
And the marshes of the sea
I call the folk in protest
To fight the B.B.C.,
Who send their fatuous orders
That words are so-and-so,
And count themselves the warders
Of a tongue they do not know.

. . . Come out, my child, be merry,
And don't put on your hat,
Put on your scarlet berry,
Pronounced to rhyme like that;
Come out and beard the geezer
Who runs the B.B.C.—
I go to berry Caesar,
And berried he shall be.—"Punch."

"Radio Excelsior."

NOT long ago the Marchese Marconi spoke to Argentine listeners, sending greetings to the three million Italians in the Argentine and the seventy thousand British there. He spoke from the Board Room in Marconi House over the London–Buenos Aires radio-telephone circuit, and his words were re-broadcast by Radio Excelsior, the new 20 kw. station built by Marconi's.

In his address the Marchese stated that he believed Radio Excelsior to be the most powerful broadcasting station in South America, and its aerial, 700 ft. high, to be the highest aerial in the world devoted solely to broadcasting.

Sunday Programme Change.

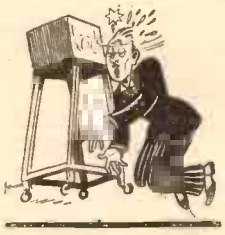
THE B.B.C.'s announcement that after September 17th the silent period between 6 p.m. and 8 p.m. will be appropriately filled sounds good to me unless I dwell, as I do, upon that word "appropriately."

If we are to understand that the matter to be broadcast will be not inappropriate to a day which so many people hold to be sacred, all well and good; but if it simply means that the two hours will be devoted to the B.B.C.'s notions of what the public ought to listen to, then I fear that Chamber Music Charlie and Uncle Uplift have already applied for the vacant time.

I'm not captious; only pessimistic. *Nous verrons!*

It Rains—and It Pours.

A TALE of hard luck from America. A clipping from *Variety* states that one of the best announcers of the N.B.C. was dismissed by that company because he fainted before the "mike."



He was receiving 35 dollars a week at the time, and his wife was ailing. Afterwards he got an announcing job elsewhere, but collided with a motor-car and got a fractured skull as well.

Radio circles heard the sad story and will probably stage a "benefit" somewhere. It only wants "twins" to complete the tragedy.

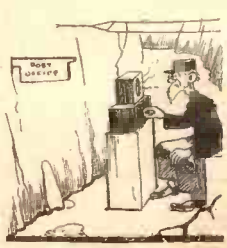
"Class B" Valves.

A READER, whose letter I have culpably mislaid, asked me about the output of "Class B" valves. I understand that the Cossor 240B. has an output of 2·0 watts, and the 220B. an output of 1·0 watt as a "Class B" valve. A Marconi valve, the B.21, will shortly be available, and when used in a suitable circuit should give an output of 1·0 watt.

I hope that this will answer the question; if it does not, I retort that these technical queries ought not to be addressed to yours truly, Ariel—who has long since abandoned technical matters for the more important realm of life, listening and laughter.

Worse than You!

THE postmaster of a town in Colorado, U.S.A., has just recently monopolised the radio limelight by advancing a queer claim—a very queer claim indeed.



He avers that he owns absolutely the worst-situated aerial in the world.

He lives at the bottom of a narrow canyon, 1,000 feet deep, so he is practically buried, to begin with. And now they have put up a generating station, only about 100 yards away from his doorstep.

Whew! Can anybody beat that for bad conditions?

ARIEL.

All About MAINS UNITS

By C. ROBINSON.

Practical notes on the design and use of these important accessories, with brief explanations as to the uses of the various components employed.

MANY constructors who think little of constructing large, ambitious multi-valve receivers apparently consider mains-supply units far beyond them. Yet, providing a few essential precautions are taken and the design of the unit carefully worked out, no difficulty should be experienced.

Suppose, for example, an A.C. mains unit to supply H.T. to a three-valver of the S.G. detector and super-power or pentode output type is required. The anode current of the S.G. valve will be 2 or 3 milliamps., the detector about 2, and the output valve 15 to 18 milliamps.

Three Main Parts.

Therefore the total output required from the H.T. unit will be about 25 milliamps. at 150 volts. This is because 150 volts is the maximum voltage recommended by the makers for these types of power- and screen-grid valves.

An A.C. H.T. unit may be divided into three main parts, and this will assist in making the designing principles clear.

These three sections are the rectifying unit, the smoothing filter, and the various resistances required to provide voltages less than the maximum output available.

Somewhat illogically, we cannot start designing at the rectifying section, but must work back from the output terminals. Really, this is quite logical, as we are arranging the H.T. unit to suit the set, not building the unit first and then trying to find a set which is suitable for it.

A smoothing filter, comprising one L.F. choke and a large fixed condenser, are shown in Fig. 1. The L.F. choke should be of a type having an inductance of 20 or 30 henries when carrying the total H.T. current, which is in this case 25 milliamps.

The smoothing condenser may be 4, 6 or even 8 mfd., the lower values being usually sufficient. Now an L.F. choke of the type to be used will have a resistance of between 500 and 1,000 ohms, and of course a certain voltage will be lost in this choke.

The voltage lost can be determined by multiplying the choke resistance by the current in milliamps. and dividing the figure thus obtained by 1,000. So if the choke used has a resistance of 1,000 ohms, the voltage lost with a current of 25 milliamps. passing will be 25 volts.

Therefore the rectifier portion of the unit must give an output of 25 milliamps. at a voltage not lower than 175. It should be noted that it does not matter if the rectifier gives more than 175 volts.

This is because a fixed resistance of suitable value may be connected in series with the smoothing choke if necessary. For example, if the rectifier gives 200 volts, a 1,000-ohms fixed resistance is wired in series with the choke, as shown in dotted lines in Fig. 1, to drop the extra 25 volts.

Choosing Rectifiers.

The rectifier consists of a valve or metal rectifier, a suitable mains transformer, and a "reservoir" condenser. The reservoir condenser affects the output of the rectifier, and is practically always 4 mfds. for a full-wave valve rectifier.

Metal rectifiers are usually connected in the "voltage-doubler" circuit, and the two fixed condensers used are really the reservoir condensers in this case. Usually these are also 4 mfd. each.

These values of reservoir condensers are for 50 cycles A.C., and if the mains are 25 cycles it will be necessary to double the capacity. Figs. 2 and 3 show the connections of a full-wave rectifying valve and a voltage-doubler metal rectifier.

If a valve rectifier is to be used a type rated to supply a current slightly higher than that required should be chosen, and for an output of 175 volts 25 milliamps. a valve rated at 40 to 60 milliamps. 200 to 250 volts would be suitable.

It should be appreciated that the output from any rectifier is dependent upon the

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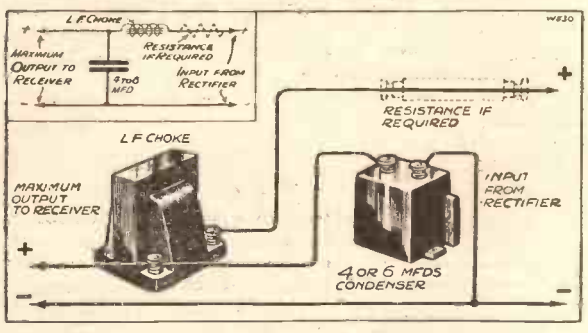
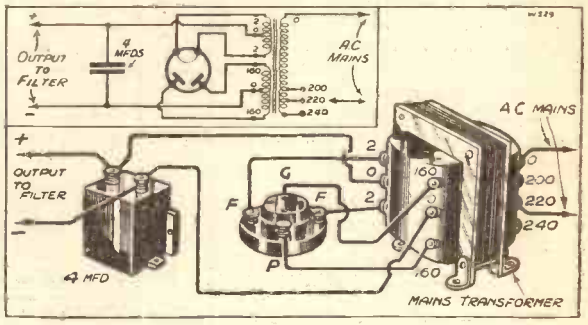


SMOOTHING AND RECTIFYING

Fig. 1 (left) shows the fundamentals of a smoothing circuit. In Fig. 2 (right) we have the circuit and practical arrangements of a full-wave valve rectifier.



HOW TO WIRE A METAL RECTIFIER IN A VOLTAGE-DOUBLING CIRCUIT

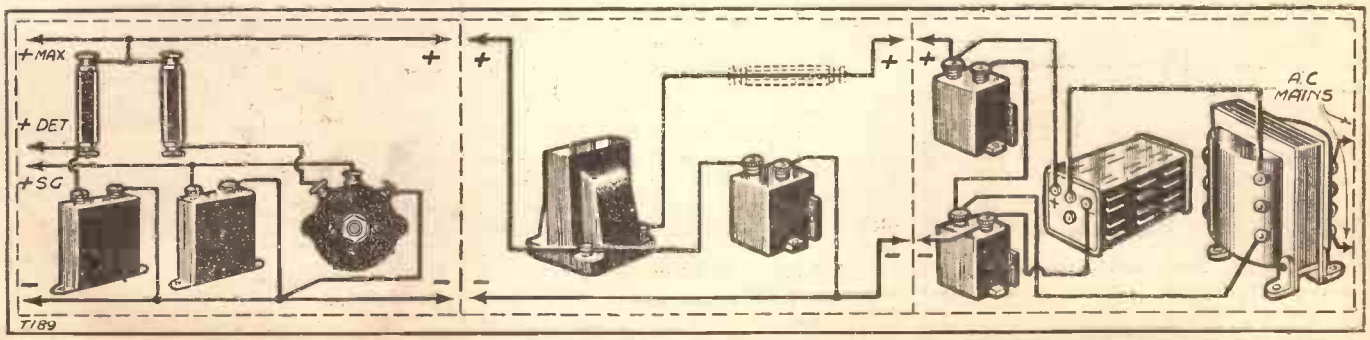


Fig. 6. The metal rectifier is shown on the right (next to the mains transformer), with its two voltage-doubling condensers. In the adjacent (centre) section we have the smoothing filter, with optional resistance for voltage reduction. To the left is the apparatus for voltage adjustment, with the necessary by-pass condensers.

ALL ABOUT MAINS UNITS

(*Continued from previous page.*)

input from the mains transformer. Therefore it is absolutely essential that the transformer be chosen correctly.

The correct input voltage required for a valve rectifier can be easily determined from the valve maker's curves for the particular type chosen, and a typical curve is shown in Fig. 4. It is only necessary to run a dotted line straight up from the required output in milliamps. and another line horizontally from the output voltage.

Where these two lines join is the correct A.C. input to the valve: in this case 160—0—160 volts.

Dropping Volts.

For this particular case the transformer should be rated to give 160—0—160 volts at 25 milliamps. In addition, a winding designed to give the correct voltage and current for the valve filament will be necessary.

If it is not possible to obtain a transformer to give exactly the correct H.T. output, one giving a higher output may be used. For example, 175—0—175 volts would be suitable.

Under these circumstances it would be necessary to work out from the valve curves the D.C. voltage output with the higher input. A resistance may then be connected in series with the filter choke, as described previously, to drop this voltage.

If a metal rectifier is to be used the maker's data should be consulted to determine the most suitable type.

A Westinghouse H.T.6 gives an unsmoothed output of 200 volts 25 milliamps., and this is the most suitable for the circumstances. As our filter only requires an input of 175 volts to give 150 volts output, a 1,000-ohms resistance should be connected in series with the filter choke.

Adjusting Detector Supply.

Several makers supply transformers suitable for use with the various types of Westinghouse metal rectifier, and so it is not necessary to worry further about this. When ordering any type of mains transformer the voltage and frequency of the supply should be stated.

Having decided the details of the rectifying and filter circuits, the positive and negative output may be connected to the receiver. In some receivers provision is made in the receiver to obtain the lower voltages required for the detector and screening grid of the H.F. valve.

If this is not the case an addition must be made to the unit for this purpose. So far as the detector is concerned, the voltage may be reduced by means of a series resistance.

The value of the resistance may be calculated by subtracting the voltage required for the detector from the maximum voltage applied to the receiver. This figure should be divided by the detector current in milliamps.

Using a Potentiometer.

The resulting figure multiplied by 1,000 is the value of the series resistance in ohms. For example, if the detector requires two milliamps. at 80 volts, then 150 less 80 leaves 70; this, divided by 2 and multiplied by 1,000, gives 35,000 ohms.

The screening grid of most modern S.G. valves requires 60–75 volts and only takes about half a milliamp. Actually, the current taken by the screening grid varies with different makes of valves.

VALVE RECTIFIER CURVE

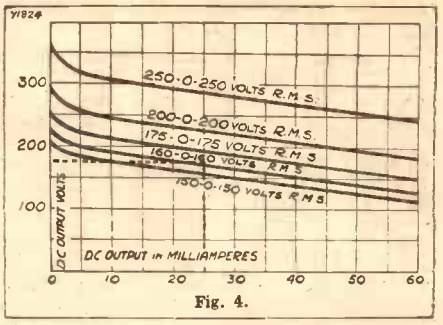


Fig. 4.

This curve shows how a typical rectifying valve operates under various conditions.

OBTAINING DIFFERENT VOLTAGES

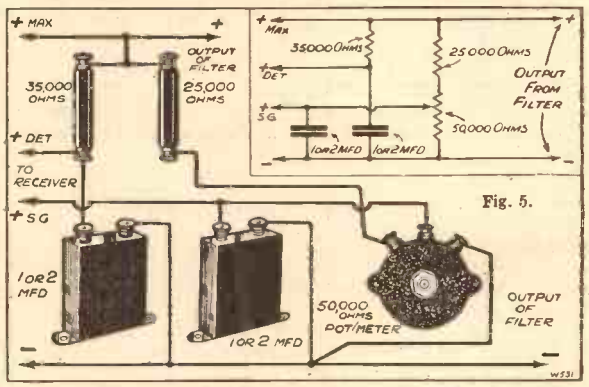


Fig. 5.

Suitable voltages for the detector and screening grid of an S.G. valve can be obtained in this manner, as explained by the author.

For this reason it would not be satisfactory to reduce the voltage by a series resistance, and a potentiometer, preferably variable, should be used. This potentiometer should pass roughly four times the current taken from the tapping.

The correct resistance for the potentiometer can be determined by dividing the current to be taken in milliamps. into the maximum H.T. voltage and multiplying by 1,000. A potentiometer taking 2 milliamps. at 150 volts should have a resistance of 75,000 ohms.

As it is desirable to make the potentiometer variable to some extent a 50,000-ohms variable potentiometer and a 25,000-ohms fixed resistance could be used. This will enable the screening-grid voltage to be varied between 0 and 100 volts.

An anode-bend detector requires a similar potentiometer instead of a series resistance, as it only takes a very small current. It is essential that a 1- or 2-mfds. condenser be used to by-pass the low-voltage tappings to H.T. —. The connections of the detector-series resistance and the screen-grid potentiometer are shown in Fig. 5.

Fig. 6 shows the complete unit using a Westinghouse metal rectifier, the three main sections being separated by the dotted squares.

The design of a D.C. unit is worked out in an exactly similar way to that discussed for A.C. You just regard the two points of the connection to the D.C. mains as the + and — terminals of the reservoir condensers associated, where A.C. is concerned with the rectifying equipment.

AN EXCELLENT ARRANGEMENT

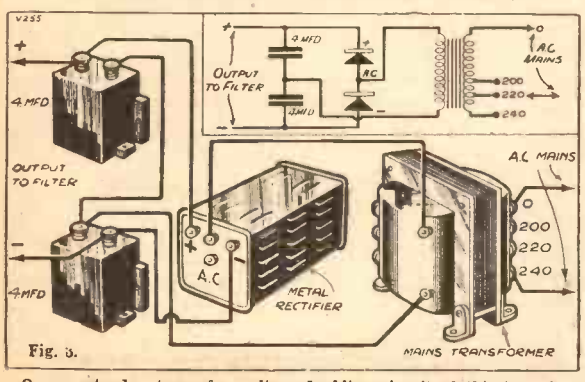


Fig. 6.

One great advantage of a voltage-doubling circuit of this type is that it provides a high D.C. output voltage with comparatively low A.C. secondary voltages.

PREVENTING FRAYED ENDS

A simple solution to one of radio's minor problems.

THERE is a correct way to bind the insulation of a connecting wire with thread to prevent fraying.

First of all make a " bight " in the thread and lay it on the wire as at (1).

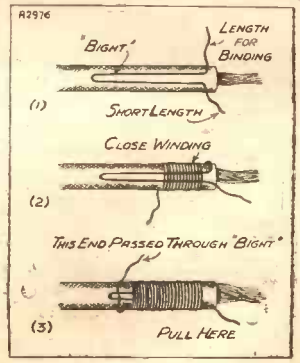
Then close-wind the thread over the insulation and the " bight " as in (2).

When sufficient is wound on to make a neat binding pass the winding end through " bight " and pull the other end (3). The " bight " will then disappear under the binding, taking the winding end with it.

Don't pull the " bight " right through, but cut off both ends when about halfway.

The great advantage of this method of binding is its remarkable neatness. There are no loose ends or knots visible.

Care should be taken not to wind the thread too tightly over the " bight " otherwise it will be difficult for it to disappear under the binding.



Neat and Efficient.

ECKERSLEY EXPLAINS—

—why he thinks "wireless has become a farce"—why the Lucerne Plan will ruin the Regional Scheme—why stations even 1,000 miles apart cannot transmit different programmes on the same wavelength—why . . . . But let Eckersley explain.

I THINK readers of POPULAR WIRELESS should understand some of the implications behind the new European plan of wavelength allocation.

I spent a great deal of time when I was in the B.B.C. working out the theory and practice of broadcasting.

I came to certain definite conclusions, and those conclusions were backed up by calculations and measurements.

These Are The Facts.

In sum, these are the facts:

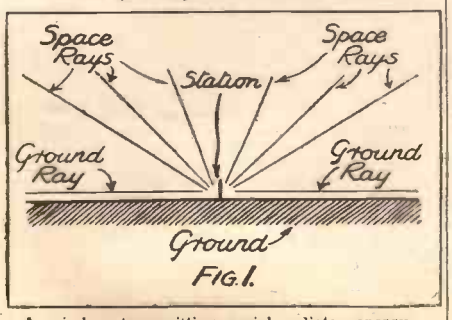
(*a*) A broadcasting station sends out waves, symmetrically around its aerial, the paths of which are indicated in Fig. 1. Some rays travel along the ground and some at a greater or less upward angle. Those which travel along the ground are called ground rays; those which go upward are called space rays.

(*b*) The ground ray is in contact with the ground. The ground is semi-conducting. The waves lose energy in travelling over the ground, and their strength gets less and less the farther they travel away from the station. This dying away in strength is called the "attenuation" of the waves. It can be estimated: the rate of dying away depends upon two things, (1) the length of the waves and (2) the nature of the ground over which the waves travel.

The longer the waves the less the strength dies away with the distance—a long-wave station is stronger for given power, at a given distance from the station, than a medium-wave. The more broken up or mountainous the ground the greater the attenuation—i.e., the more quickly the waves lose strength as they travel away from the station.

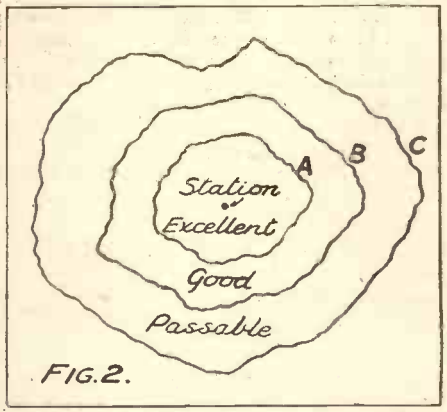
(*c*) The excellence of a communication of any kind depends upon the ratio of the signals you want to hear to any form of interference you don't want to hear. Thus, as you go farther and farther away from the station the weaker the signal and the more interference comes in and the worse the service given. Therefore we can draw lines on a map round a station and say, as a first approximation, that within these drawn boundaries service is passable or good or excellent. We call the area covered "the true ground-ray service area"—or, more simply, the "service area" of the station (see Fig. 2). These lines are not circular, because the ground travelled over gives, according to its varying nature, different attenuations. The service area of a long-wave station is greater than a medium-wave station.

OMNI-DIRECTIONAL RAYS



A wireless transmitting aerial radiates energy in all directions, some following the ground and some going upwards into space.

ON THE MAP



The standards of reception from a transmitter at various localities round it can be mapped into concentric areas.

(*d*) The space rays—those which leave the ground—are not attenuated by the ground, and so do not lose strength so quickly as they travel away from their source as do the ground waves. At night the upper atmosphere reflects the space rays down again (see Fig. 3).

Reflection of Waves.

Now in Fig. 3 we have simplified and considered the ground or direct ray and three typical space rays. At a point "A" the indirect ray is very weak compared with the ground ray. At a point "B" the two rays may be about equal in strength. At a point "C" the ground ray has petered out and only the space ray is effective.

At a point "A" the ground-ray wins, and you have perfect service. At a point "B" the ground and space rays may, according to all sorts of factors, either cancel one another out or help one another, and the strength may go from 2 to 0. Point "B" comes within what I call the zone of intolerable fading.

Concerning Quantities.

At a point "C" there is fading because the upper atmosphere varies its power of reflection. You get fading, but not so much as at "B."

This is why North National (say) in London fades more than Rome (say)—Rome is better because there is no interference between ground ray and reflected ray, only the latter remains.

Now we come to quantities.

A good signal (one which overcomes interference and is easy to deal with) with an ordinary set has a strength of the order 2·5 m.v./meter. But it is found that a 50 kw. station 1,000 miles away may give an average (but fading signal) of the order 2·5 m.v./meter. Rome gives a signal in England (albeit that signal fades) equal to that given by London Regional at 50 miles!

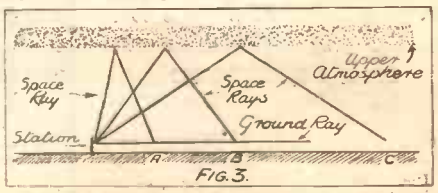
To Avoid Interference.

(*e*) If you put two stations on the same wavelength and they transmit different programmes, then one, to be clearly heard without interference, must be of the order 300 times as strong as the one which shares the wave. Therefore, if Rome were to work on the same wavelength as London, you could only get London clearly where London gave a signal of $2{\cdot}5 \times 300 = 750$ m.v./meter. London gives 750 m.v./meter a few miles only from Brookmans Park; any farther away and it is weaker.

Sharing a wave between London and

(*Continued on page* 634.)

CAUSE OF FADING



At point A the direct ray is stronger than the indirect. At B both are equal, while only the indirect ray is received at point C.

All the interesting news and views of current short-wave practice.

I AM writing these notes "somewhere on the Yorkshire coast," fresh from the contemplation of other kinds of waves than the 10-100-metre variety. The proverbial busman's holiday has again fallen to my lot, and I have with me my portable 5-metre transmitter and receiver.

Any other short-wave listening that I want to do is carried out on the receiver of "mine host," who is an amateur transmitter and short-wave enthusiast.

The first impression that I formed on listening round on this receiver was that conditions up here are not very different from those in London, with the one important exception that the background is much quieter.

Increased Activity on 5-Metres.

On the amateur bands the same things happen that one normally hears in the south, with the addition of a few West Indian and Central American stations that don't seem to find their way to my home aerial.

Five-metre activity is definitely in the atmosphere. "Hams" are finding five metres invaluable for fairly short-distance work that was formerly carried out on the 160-metre band.

The great advantage of five metres for this work is the privacy that is possible. No longer does the amateur transmitter in a small seaside town find that all his remarks to G 6 A B C last Sunday morning were overheard by the whole town!

We have been testing out my portable in a moving car, and find that we can maintain touch with the home station for quite a few miles with no more of a transmitting aerial than two four-foot rods poking out of the side windows.

Working it the other way, by leaving the "home" station running and listening to it whilst on the move, we have already established another unofficial record by receiving clear signals while travelling at 66 miles per hour. And this (needless to say) with the driver's foot hard down and the ignition absolutely unscreened.

The extreme "portability" of these low-powered 5-metre transmitters and super-regenerative receivers is the greatest asset to five-metre work at present. Although our Crystal Palace tests showed that some sort of "DX" will probably be feasible, the future of the wave (as I believe I have said before!) depends largely upon its convenience and simplicity for short-distance portable work.

I visualise a complete combined transmitter and receiver, with battery-power supply, in a case no bigger than that of a portable typewriter. There is no end to the uses of such an instrument.

Conditions, at present, seem to be quite good for waves under 30 metres. I think the 49-metre band is also pretty good, but it is not at its best until the early hours of the morning, when polite holiday makers do *not* disturb their patient hosts and hostesses!

I have not yet found a parallel, on the short-wave broadcast bands, for the rather unusual way in which, on the 21-metre amateur band, the West Coast Americans have been coming over late at night instead of early in the morning. They are usually at their best by about 6 a.m., but this year they seem to have been coming over at almost any time between 9 p.m. and midnight.

Looking for a "Freak."

Can anyone find a "freak" on one of the broadcast bands this summer that might be attributed to the same cause, whatever it is?

How many readers, too, have heard the new American broadcasters, W 2 X C X and W 2 X A L, both in the region of 50 metres? I have only had about three reports on these two stations as yet, and they are all good. I hear, incidentally, that we may expect at least another five of them by the end of the winter.

Short-wave broadcast is apparently going to turn into a game of "U.S.A. versus the Rest."

Weekly jottings of interest to buyers.

FERRANTI, LIMITED, is now manufacturing a comprehensive range of transformers for "Class B" amplification. The audio driver, or "input" types, consist of the A.F.15c at 26s. 6d. and the A.F. 17c at 15s.

On the output side, a choice of three is available. There is the O.P.M.15c at 26s. 6d., the O.P.M.16c at the same price and the O.P.M. 17c at 15s.

I have not yet had an opportunity of trying these new transformers, but I have no hesitation in passing on the news, for to me, at any rate, the name of Ferranti is good enough; "Class B" plus Ferranti should be really good.

Mullard's Rapid Valve Guide.

I have just been examining a copy of the latest example of Mullard literature. It consists of a pocket guide to the leading Mullard valves, and very useful it is, too.

The valve details alone make it very well worth while, but in addition there is included a particularly useful table of valve equivalents from which it is possible to tell in an instant the Mullard equivalent of almost any other type and make of valve.

This is just the sort of booklet that I like to bring to the notice of "P.W." readers, and moreover I propose to make it available through our postcard literature service for I am confident that it will be found very useful.

Just send the usual postcard to us, and we shall be pleased to see that you get a copy. **(No. 44.)**

Representation for Listeners.

If the aims and objects of Radio Mutual Limited materialise (and there is no reason to suppose that they will not), legislation may ultimately make it illegal to install or to operate any form of electrical apparatus which is capable of causing interference with broadcast reception.

Believing that it is only by such legislation that a satisfactory solution to our present interference problems will be found, Radio Mutual aims at enlisting the support of all listeners so troubled.

It intends to press for a similar state of affairs to that which exists in France, Germany, Belgium and Rumania, where legal measures have resulted in the suppression of all forms of electrical interference.

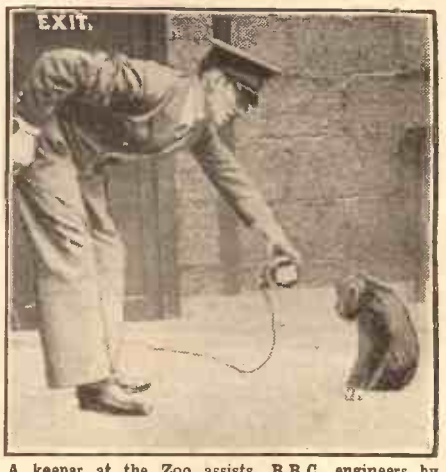
The subscription to Radio Mutual Limited is two shillings a year, and full details can be obtained from 15, King Street, St. James's, London, S.W.1.

Incidentally, their programme is an ambitious one, and aims at much more than just the suppression by legal measures of electrical interference. They hope ultimately to be able to bring pressure to bear upon the powers that be for an all-round reduction of licence fees. A noble idea!

The Pix Invisible Aerial.

Those of you who have experienced the joys (?) of trying to make a piece of wire stay put round a picture-rail (I know, I have had some!) will welcome an introduction to the Pix Invisible Aerial. It happens to be an efficient form of indoor aerial which stays just where you put it.

INTRODUCING MIKE



A keeper at the Zoo assists B.B.C. engineers by taking the microphone to one of the "performers" in the recent Zoo broadcast.

It sounds too good to be true, I know, but it is really very simple. The Pix Invisible Aerial is made in the form of an adhesive tape, and you just stick it in position and forget about it. It *will* stick to curtains and wallpaper, but for reasons of domestic bliss I *do not* recommend that.

OUR POSTCARD SERVICE

Applications for trade literature mentioned in these columns can be made through "P.W." by quoting the reference number given at the end of the paragraph. Just send a postcard to G. T. Kelsey, at Tallis House, Tallis Street, E.C.4. Any literature described during the past four weeks may be applied for in this way—just quote the number or numbers.

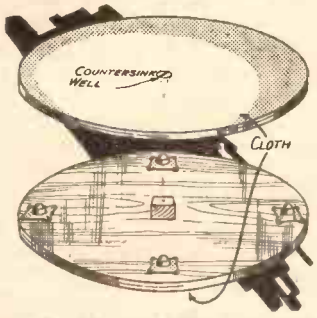
RECOMMENDED WRINKLES

AN "EASY-TO-MAKE" TURNTABLE.

A TURNTABLE is essential for the successful manipulation of a portable.

Here are instructions for making one: Cut two discs 8 in. diameter out of ¼ in. plywood with a fretsaw and smooth up with sandpaper.

Next obtain from Woolworths or local hardware stores four ball castors, the kind which consists of a large steel ball in a socket with four screw holes.



The directional properties of a frame aerial can be exploited with this easily constructed turntable.

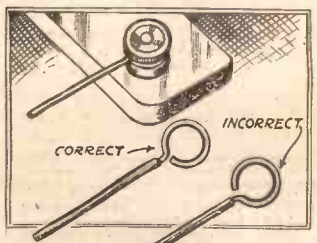
These must be screwed at equal distances round the edge of one of the discs.

Now cut a small block of wood 1½ in. or 2 in. square and ¼ in. thinner than the height of the castors, and screw this in the middle of the disc.

Now bore a hole, and countersink it well, in the centre of the other disc and screw it to the block, making sure it revolves freely. All that remains to do now is to stain the job and cover top and bottom with cloth.

A WIRING HINT.

WHEN wiring a set without the use of solder it is sometimes hard to prevent the wire slipping off the terminal while screwing it up tight. If,



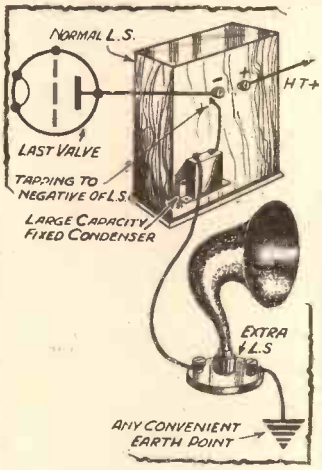
Ensuring "non-slip" connections.

however, the wire is always bent in a clockwise direction (the same way as the screw does up) the wire will be found to become even tighter when screwed up.

EXTERNAL L.S.

MANY people, after investing in a new loudspeaker, do not like to see the old one lying idle, and endeavour to use it as an extension—to a bedroom, for instance. This is a method of connecting up the extra speaker which I find very satisfactory.

A wire is connected from the negative lead of the existing speaker to one side of a large fixed condenser (about 2 mfd.). The other side of the condenser is connected to one terminal of the extra speaker, and the other side of this speaker is connected to any convenient earth point. This circuit is similar to the filter-output choke circuit as used in many sets, except that it utilises the existing speaker as the choke. The two loudspeakers, of course, are working at the same time. The condenser can be screwed to the back of the existing



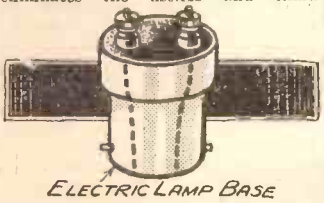
One L.S. acts as a filter-choke.

speaker, and the tapping to the negative lead can be made by sticking a pin through the wire. A great advantage is that the wire from the condenser to the extra speaker can be of very thin wire and as long as necessary, because there is no direct current passing through it.

USING UP OLD ELECTRIC LAMPS.

OLD electric lamps should not be thrown away, but should be broken up and the parts used. The metal base can form a useful plug.

The old lamp should be loosely wrapped in newspaper and a hammer dropped on the bulb part. This prevents the glass from scattering and eliminates the useless and timid



A lamp-base makes an excellent plug.

preliminary taps likely to take place if the hammer is used in a more orthodox fashion.

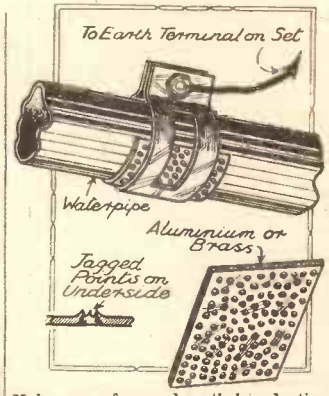
After removing adhering glass the two leads should be cut to a suitable length and connected to two small terminals. The leads are stiff enough to hold the terminals in position while the metal "cup" is filled with the black insulating matter from an old H.T. battery. This substance should be warmed and run into the "cup" in a viscous condition till it reaches the foot of the terminals. The terminals should then be adjusted and the rest poured in hot till the cup is full and the whole left to cool.

An old tablespoon is useful for melting the pitch.

NON-SLIP EARTH CONNECTION.

IT is difficult to make a soldered connection to a water-pipe, when this form of "earth" is being used, and the alternative methods of winding a bare wire round the pipe, or clamping the wire under a collar by means of a nut and bolt, both have drawbacks. The "wire winding" continually tends to "unwrap itself," thus making a faulty earth, and the "collar" is apt to slip on the freshly-cleaned pipe. Here is a tip to overcome the latter trouble.

Obtain a piece of brass, or aluminium, about 1½ in. square and thick. Punch as many holes as possible in this with a stout "three-inch" nail, making sure that the nail breaks right through every time. It is advisable to place the metal on a piece of waste wood before commencing operations. The



Make sure of a good earth by adopting this ingenious expedient.

metal strip will, of course, thus acquire a series of small projecting points on one side. The plate should then be bent to the circumference of the pipe, with the rough side inward. The clamp or collar can now be used in the ordinary way over the plate, but the sharp projections will press into the pipe and ensure a good grip. The actual earth wire is attached to any convenient point on the clamp, or may be "caught" under the collar and plate.

ONE GUINEA FOR THE BEST WRINKLE!

Readers are invited to send a short description, with sketch, of any original and practical radio idea. Each week £1 1s. will be paid for the best Wrinkle from a reader, and others will be paid for at our usual rates.

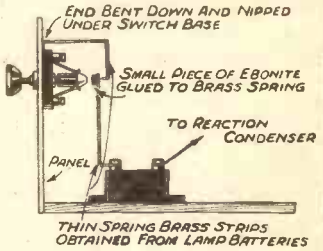
Each hint must be on a separate sheet of paper, written on one side of the page only. Address your hints to the Technical Editor, "Popular Wireless," Tallis House, Tallis Street, E.C.4, marking the envelope "Recommended Wrinkles."

Will readers please note that the Editor cannot, in any circumstances, guarantee to return rejected Wrinkles, and that payment for published hints is not made until ten days after they appear.

The best Wrinkle last week was sent by H. Goodchild, 38, Oxford Street, Strichley, Birmingham, to whom a guinea is being awarded.

SWITCHING A CONDENSER.

THE following is a simple dodge which I have used, with success to obtain adequate reaction on the long-wave section of a dual-range coil. When the wavechange switch plunger is pushed in, it is arranged to switch a



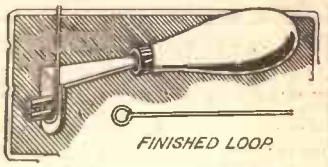
A long-wave reaction tip.

small fixed condenser across the reaction condenser. When the switch knob is pulled out the two brass strips are arranged to spring apart, about ⅛ inch, thus cutting out the fixed condenser.

LOOPING WIRES.

A WIRE-BENDING tool is made as follows:

Get a piece of brass about 3½ in. long by ½ in. wide. Taper one end for wooden handle to fit; the other end is rounded off and bent at a right angle. Two holes are drilled in for studs and tapped 4 B.A., using terminals for studs. The studs are fairly close



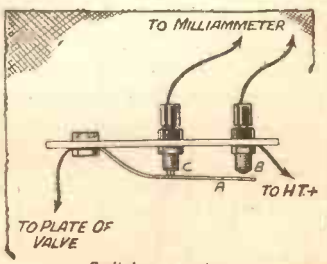
Puts the finishing touch on wiring.

together—only sufficient room for wire to go between. To make a loop, place wire between studs and twist handle with one hand and hold wire with other. You have then made a loop, but it is not finished; Turn tool in opposite direction, which enables a neck to be made, making loop perfect.

A MILLIAMMETER TIP.

THE diagram illustrates how a milliammeter can be switched in or out of circuit without breaking the circuit in doing so. A is a piece of spring brass which is connected to the plate of the valve. B is a wander socket connected to the H.T. positive. C is a wander socket, which is drilled out hollow. Normally A is in contact with B but on putting a plug in C the meter is put into circuit.

(*Continued on next page.*)



Switches a meter.

RECOMMENDED WRINKLES

(*Continued from previous page.*)

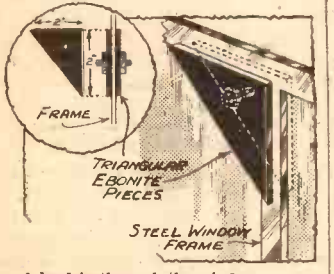
LEAD-IN FOR STEEL-FRAMED WINDOWS

MANY owners of wireless sets are sometimes puzzled as to the best method of bringing a lead-in via steel-framed windows. The following idea will prove neat and effective, and also be firm and weatherproof:

The articles required are two pieces of triangular ebonite, 2 ins. × 2 ins. × 2 ins. (with hole bored through centre of each), and a piece of "lead-in" threaded rod, with two nuts and terminals.

(1) Having selected the pane through which you require lead-in, with glass-cutter cut about 1 in. of corner of pane.

(2) Holding the two pieces of ebonite opposite each other, allowing them to rest on steel frame, pass through both the piece of rod, and with a nut on either side, screw up firmly.



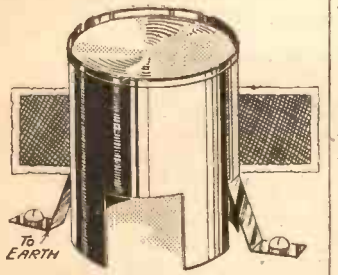
A lead-in through the window-pane can be made firm and weatherproof, as shown here.

(3) Attach lead-in from aerial and to set with terminals, and to make the job weatherproof, fill up the gap between ebonite with putty.

Most listeners will have the few articles required in the "junk box." If not, any wireless stores would supply for a few pence. The same method could be used for earth wire.

SCREENING THE TRANSFORMER

ON bringing my O-V-2 set, with two transformers, up to date, by pensioning-off the 6-volt valves after four years' satisfactory service, and the introduction of one modern transformer in place of a home-made "hedgehog" type, I got very pronounced instability, in spite of an earthed metal base plate, double de-coupling, and an output filter. The fault was eventually traced to interaction between the transformers.



Readers with old-type cylindrical transformers will, no doubt, welcome the practical method of shielding which allows the core to be earthed and will banish any instability.

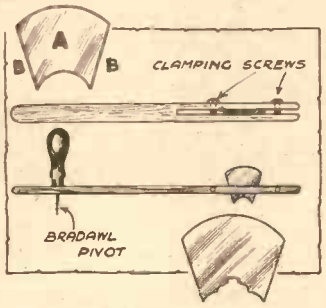
The older one, of a type not now on the market, was cylindrical in shape, with a non-metallic base, and no provision for earthing the core.

A cocoa tin was slit at opposite sides to form fixing strips, and then slit at right-angles to the first position, and two flaps folded inside, to clear the terminals. The height being then adjusted by trimming off superfluous metal, the whole was fitted over the transformer and screwed down, when all instability ceased.

AN INEXPENSIVE FRETMOULDER

HERE is a handy tool for loudspeaker cabinet constructors who favour frets with "planted-on rims."

The rim, in many cases, is the most expensive item of the job, and considering this, those willing to make and use this tool will find it an economical proposition. It enables one to cut



These diagrams show how you can cut your own rim for "planting on" to frets.

and shape a rim at the same time while turning out a perfectly clean job.

The blade (A), pictured to turn out a sectional half-round, should be cut from thin sheet metal capable of withstanding reasonable pressure without bending. It should be attached to a wooden radial arm by slotting the arm and clamping with screws as shown. This arm should be pivoted to the working material to suit the diameter of the rim to be cut.

By working the cutter in circular sweeps and at the same time applying a light pressure a good job will result, if not exactly at machine speed.

The edges of the cutter marked B B are best shaped as a cleaning-off scraper, i.e. burred over, left perfectly flat with sharp edges or sharpened as a knife.

When the material being used is wood, it is advised that the work be eased where possible by taking off the rough with other tools. Should you wish to dispense with a rim and work a mould round the edge of a "clean" circular fret, you will find this tool equally handy. But it must be remembered that the centre to be cut away is cut away or nearly so (according to the mould chosen) by the cutter as the mould is established.

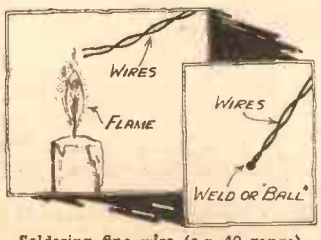
Composite materials of the ebonite class are recommended for rim work on account of having no grain. Plywood, the material often used for cheap rims, is inclined to be awkward material to work.

Finally, if two rims of different sizes are to be cut from a piece of material which necessitates the smaller of the two being taken from the centre waste of the larger, the outer rim must be worked first so that a solid working base for the radial arm is left for the working of the smaller rim.

WELDING WIRES

WHEN repairing or winding transformer bobbins, etc., using fine wire such as 40-gauge, it frequently happens that the wire breaks. It is well-nigh impossible to bare the enamel and successfully solder the two wires together.

Fortunately an easier and equally good method can be employed, this consists of twisting the two wires gently together and applying a match or a candle flame to the end.



Soldering fine wire (e.g. 40-gange) successfully is a well-nigh impossible task. Try this suggestion instead.

The two wires will be seen to run back, and when a "ball" appears the flame should be taken away—the wires are then welded together.

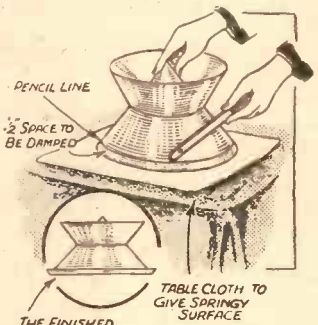
The weld should be covered with a little tissue paper and finally finished with a spot of "Durofix."

A "CLEAR-CUT CONE" REFINEMENT

FOR experimenters who have made this splendid cone, here is a refinement which brings it right up to date and maintains the free edge in its original shape.

Draw a pencil line round cone half inch from edge, and carefully damp up to pencil line, then:

Holding the cone face down (as sketch) on tablecloth (covered with newspaper, of course), press gently at apex and, with the bone handle of a tooth brush, steadily press all round on pencil line, turning cone round and



A perfectly even turn-up of the cone edge is a simple matter, if the above method is used.

round to ensure a continuous pressure all round.

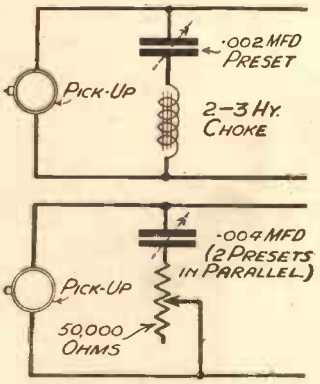
As the edge begins to curl upwards, press harder with handle of brush, and an excellent turn-up is obtained.

IMPROVING HIGH-NOTE RESPONSE

IT is not generally known that by reducing the damping on some pick-ups i.e. "loosening" armature movement, the scratch frequency is raised considerably, with the effect that a higher cut-off frequency scratch filter than is used ordinarily may be used, with the result that high-note response is improved.

The adjustment, which consists of freeing the armature movement, should be carried out until when used with circuits shown below the best results are obtained.

In most balanced armature pick-ups



Adjustment of the preset condensers and the variable resistance in the lower diagram enables varying shades of tone to be obtained.

the end of the armature will be found embedded in a rubber block.

The block should be removed and the cut made by the armature enlarged until armature may be moved with the fingers within, say, a few thousands of an inch from each pole face.

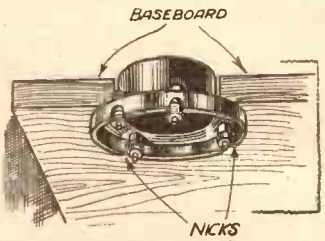
It is not recommended that the inexperienced attempt this, as a pick-up may be easily spoilt by inexperienced fingers.

By adjusting preset condensers and variable resistance shown in drawings various shades of tone and scratch may be obtained to suit the listener.

CHASSIS-MOUNTING VALVE HOLDERS

HERE is a dodge for using existing valve holders on a chassis baseboard.

Take out terminals and pins and



Reversal of the terminals on a valve-holder allows it to be mounted on a chassis baseboard.

put them through the reverse way, so that connections are made underneath. A nick cut opposite each terminal will allow the wire to lie flat.

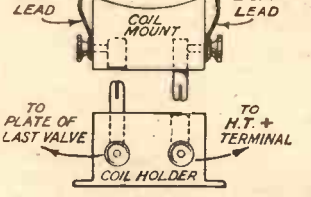
If the hole in baseboard is cut to let the top of the valve holder make a tight fit, the valve holder cannot be seen when the valve is inserted and makes a neat job.

If a metal chassis is employed the tops of the terminals must be insulated from underside of chassis.

PLUG-IN LEADS

THE sketch shows an easy and convenient method of using a spare coil-holder and coil mount in place of the loudspeaker terminals.

It also prevents the mistake of reversing the connecting leads, and simplifies



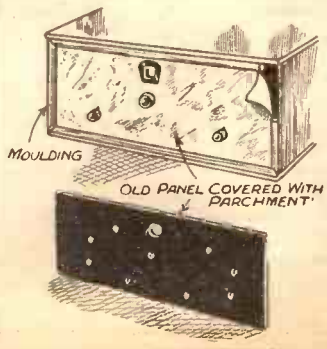
Reversal of loudspeaker and other leads is impossible with this connection.

the removal of the loudspeaker when plugging in the 'phones for short waves.

OLD PANELS RE-USED

EBONITE panels are often discarded owing to having been drilled at various times.

A piece of wax paper as sold as parchment for the making of lamp-shades is cut to the panel size and placed in position; the holes to be used are marked through to the paper and cut out as shown here.



WHEN LISTENERS SLEEP

HOW THE B.B.C. WORKS AT NIGHT

The London transmitting station is visited late at night for a special purpose by our Correspondent, and his account of this exciting trip puts quite a different complexion on B.B.C. engineers' work.

WE left London in a high-powered car late one night recently and speeded along the Great North Road in the direction of Potters Bar.

Our headlights lit up the B.B.C. notice: *BRITISH BROADCASTING CORPORATION—London twin-wave high-power transmission station.* The car swung round the corner and down the long tarmac drive, leading to the main Brookmans Park building.

It was dark and the strange lights of the building made the station eerie. The bright metal work of the transmitter panels is close to the lofty glass windows, and parts of the technical gear of the station could be seen from the outside, lit up by the powerful flood lighting of the main transmitter hall. Coloured indicator lights glowing on some of the panels struck a bright relief.

Feeling of Immense Power.

The wires running to the little white feeder huts, one each side of the station, disappeared into the darkness. The top of each of the four masts was crowned with a red light; a warning to aircraft.

Except for the occasional murmur of a car passing along the main road some distance back, all was still. It seemed to me that there was an uncanny feeling of immense power, and a terrific realisation of the fact that we were standing under the shadow of aerial systems vibrating electrically in tune with thousands of listening sets in this part of the country.

Silhouetted against the bright light in the main listening room above the entrance hall, were the figures of two control engineers. They were, as I found out later, in the "key" room of the whole station. In my first impression of Brookmans Park at night, they were the only signs of movement. Everything else was uncannily still.

A Tour of Inspection.

We went inside and passed through the glass swing doors straight into the transmitter hall. Two men, one in shirt-sleeves, were seated at the little grey metal desks.

The purpose of our visit was explained to the man in charge, and during the quarter of an hour before the day's programme was due to end, my B.B.C. guide took me on a brief visit around the more interesting parts of the transmitter. After the programme was over, Brookmans Park was due to give a special test, in connection with apparatus adjustment, and I had come as a non-technical visitor to see how this out-of-programme-hours test broadcast would be given.

Down in the Diesel engine-room at the end of the station building, two of the huge engines were running. Although these engines are twice the height of a man, they run so quietly that it is hardly necessary to raise one's voice in order to be heard; and this in spite of the fact that three of these engines provide the whole power for the station.

The battery room was dark. The banks of hundreds of big 2-volt cells were being float charged by the 220-volt generators driven by the Diesel engines.

"They have a capacity of about 2,000 ampere hours," said the B.B.C. man coolly, as though he were discussing a midget L.T. battery.

Then on we went through the motor-generator room, past the 15 humming machines, providing high-tension, low-tension and grid bias for the whole station.

Keeping Wavelengths Constant.

"All the valves, with the exception of one, take their 'juice' from these machines," explained my guide. "That one exception is the master oscillator valve which controls the wavelength, and the slightest variation would upset everybody's reception.

"Separate accumulators feed the master oscillator valve in the Regional and National transmitters."

Coloured lights in the motor-generator room and on the main switchboard in the transmitter hall glared at us as we passed through. A fault in any one of the circuits would have been shown immediately by the flashing or extinguishing of one of the coloured globes.

Small rooms just off the main hall, one on each side, could be seen as I stood at the power switchboard. There were engineers at the controls of tall grey panels, very like those I have seen in the control-room at Broadcasting House. The engineer explained that these panels were the amplifiers on the telephone lines which connect the station with the London studios. A loudspeaker in some other part of the building could just be heard above the buzzing of the chokes and the rushing of the cooling water in the transmitter.

". . . . . now closing down. Good-night, everybody. *Good*-night!"

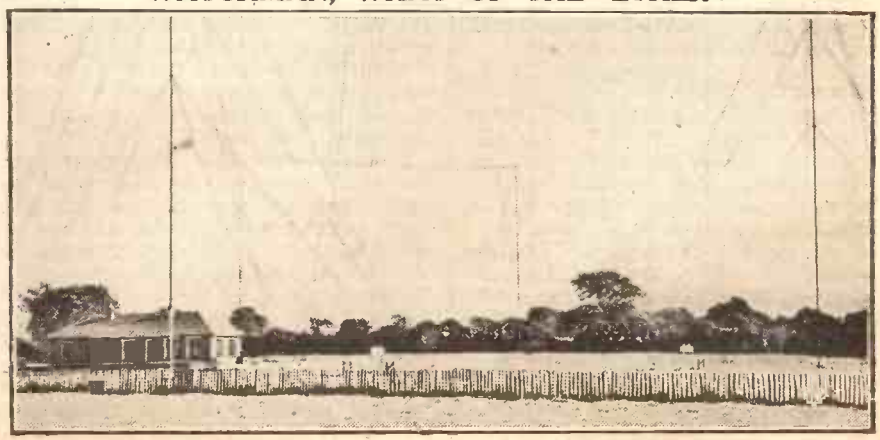
Closing Down.

The engineers rose from their main control desks and started on the laborious circuit of switching. There was to be an interval before the special tests and big transmitters cannot be run just for fun. It took about five minutes to switch off. Timed relays came into action, and after their long experience the engineers went from switch to switch and operated each control just at the right moment.

We went along to the main listening room on the first floor, overlooking the entrance—the little room in which I had seen the control engineers at work when we arrived earlier in the evening.

(*Continued on next page.*)

WATCHMAN, WHAT OF THE—ETHER?



A continual check on ether conditions is maintained by the B.B.C. at its magnificently-equipped listening post at Tatsfield. Among the stations on which Tatsfield keeps a careful watch are those of the B.B.C. itself.

ISOLATING THE PICK-UP

Two useful methods.

By C. ROBINSON.

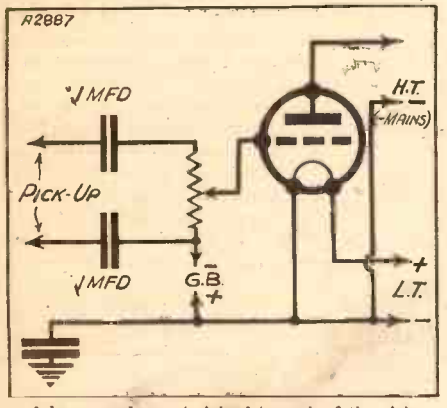
ALTHOUGH precautions are always taken to prevent the user of a receiver which obtains its H.T. or L.T. from D.C. mains receiving a shock through touching any part directly connected to the mains, it is often noted that an oversight has occurred in connection with the pick-up arrangements.

With some pick-ups the terminals are not insulated, and as one is almost invariably connected to the negative main a bad shock may be felt if the terminal is touched, particularly if the positive main happens to be the one which is earthed.

As a safeguard a large fixed condenser should be inserted in series with each pick-up lead before this is connected to the volume-control potentiometer.

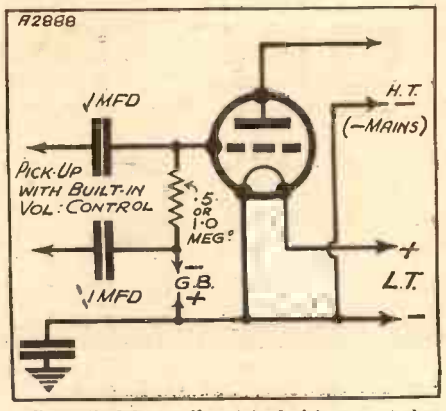
If the volume control is built in the pick-up the condensers should be inserted in the leads, but it will be necessary to connect a ·5 or 1-megohm grid leak across the pick-up leads on the receiver side of the condensers. Examination of the two diagrams shown will make the need of the condensers and their connection clear.

AS A SAFEGUARD



A large condenser is joined in each of the pick-up leads.

WHEN IT IS "BUILT-IN"



The method for a self-contained pick-up control.

A SIMPLE TESTER

For fixing in 'phone leads.

Suggested by a "P.W." reader.

The Editor, POPULAR WIRELESS.

Dear Sir,—Having seen your "earphone testing gadget" in an issue of POPULAR WIRELESS, I think that I can "go one better." The enclosed illustration will, no doubt, be quite clear to you.

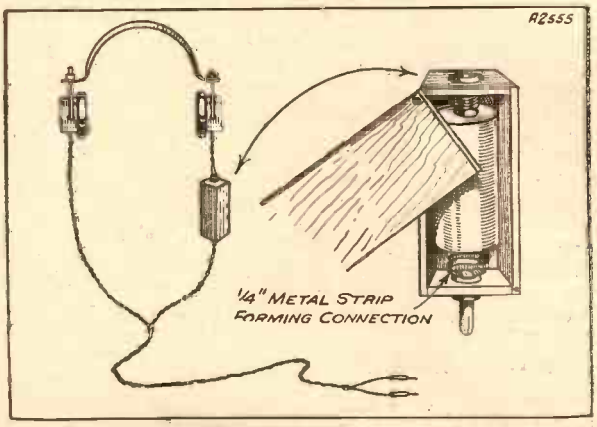
It consists of a small box, 1 in. by 3 in., which contains a small 3d. battery; the box has a socket fitted in one end and a plug in the other—wander plugs suit very well; likewise the headphone leads. When not in use, the headphones can be used in the ordinary way by connecting up the plug and socket in the leads.

The entire outfit costs but a few pence, and is simple to make.

Faithfully yours,
ALBERT WOOLFORD.

Southall, Middlesex.

FAULT-FINDING MADE EASY



A handy unit that should prove extremely useful when tracking down faults in a radio receiver. It is fully described by Mr. Woolford in the accompanying letter.

WHEN LISTENERS SLEEP

(Continued from previous page.)

In one corner is an energised type moving-coil speaker with a suspended baffle in front of it, not touching the edge of the cone. On the control table in the centre of the room (otherwise bare and unfurnished) are three switches on a sloping panel. One changes over from National to Regional.

In one position the other switches connect the moving-coil speaker with the grey amplifier racks downstairs. The engineer can thus hear what is being sent to Brookmans Park along the telephone lines to London.

Brookmans Park Studio.

When he moves the switch in the other direction he connects the loudspeaker with receivers in another part of the building, one tuned permanently to National and the other to Regional. These are switched on all the time the transmitter is working.

At the touch of the keys, the engineer can listen to the National or Regional programme, either as it comes into Brookmans Park or as it is actually received, after broadcasting. A striking fact is that although the "quality" sets are within a hundred yards of the aerials, there is no interfering.

We went along to the emergency studio, also on the upper floor at Brookmans Park, and from which the test broadcasts were to be given. This studio is heavily carpeted, and although at first I thought there was no sound insulation, tapping the panelled walls showed that they were heavily padded at the back.

At one side of this room is the old 2 L O transmitter, the first ever used by the B.B.C., and originally worked in 1922 at Marconi House.

A Midnight Broadcast.

On the other side is a gramophone modified to take one of the B.B.C.-style needle armature pick-ups, and a small table carrying a little receiver, 'phones for tone checking and a volume control. A carbon microphone is suspended above.

When the late-night tests were ready to be given, the long process of switching was started again. Within ten minutes the station was "on the air."

I watched this intricate operation from the little balcony which runs from the emergency studio over the transmitter hall, and I looked down on the gleaming busbars which connect up the separate stages of the two transmitters.

During the tests, the exact nature of which I am not able to disclose, the engineer spoke quite softly and close up to the microphone in the emergency studio. Periodically he turned the knob of the "fader," switching off his microphone, and played through two or three gramophone records.

Adjustments were made on the panels in the main hall downstairs and in an anteroom an official was all the time in 'phone communication with the B.B.C. listening post at Tatsfield. Readings on the Brussels wavemeter, wired up to the B-stage panel on one of the transmitters, were compared with those made at Tatsfield, and the tests went on until an early hour in the morning.

Just as it was getting dawn we clambered back into the car and headed for London, I still feeling thrilled with the night's events, and my acquaintance feeling that he had done a hard job of work!

FAR AND NEAR

Items of interest concerning broadcasters at home, on the continent and "down-under."

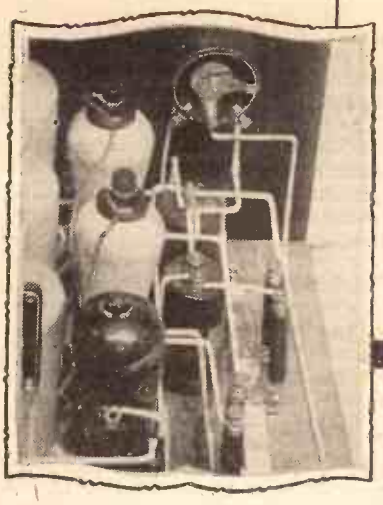
WELLINGTON, N.Z.—The number of New Zealand's licences will reach one hundred thousand before the end of 1933.

* * *

DAVENTRY (Empire Station).—Apart from the regular short-wave broadcasts on directional aerials, Daventry has been sending out daily omnidirectional transmissions from G S F and G S G.

* * *

DENMARK.—Although many power-prunings have taken place as a result of the recent Wavelength Conference at Lucerne, Denmark is to be allowed to increase Kalundborg's power to 60 kw.



SELF-TUNING CIRCUITS

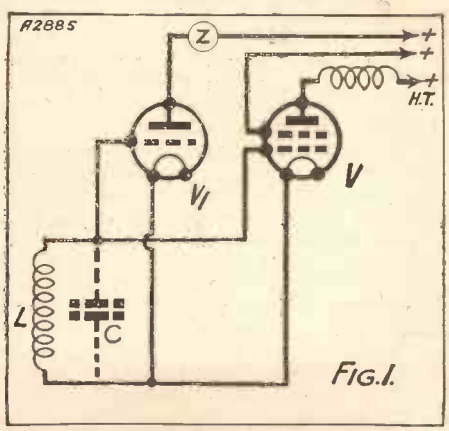
A NEW DEVELOPMENT.

Described by J. C. JEVONS.

AS one turns the dial of a modern long-range set, and hears station follow station in quick succession, there seems to be little call for any further improvement in tuning control. For instance, the "automatic" tuner which brings in a selected station by touching a switch or pushing a button strikes one as a superfluous refinement.

But in point of fact, tuning control is a very "live" issue just now, and is responsible for some of the most difficult problems the modern set-designer has to face. A single-knob control covering several tuned circuits almost always involves some loss either in selectivity or quality, or in both.

THE "MILLER" EFFECT



The value of the (dotted) capacity C follows the frequency change and automatically tunes the input of the S.G. Amplifier.

Taste for Simplified Control.

When the H.F. side of a set first began to pull its weight (i.e. with the appearance of the Neutrodyne and afterwards with the screened-grid valve) everyone was satisfied to use two, or even three separate tuning dials. However, this didn't last long. "Ganging" became all the fashion, and once having acquired the taste for simplified control, the listener demanded it every time, even when the added complication of band-pass coupling came along. And the same applies to ganging the local oscillator of the super-het circuit.

Other complications have also to be taken into account, such as volume control, and local-distance switches to prevent the local station from blasting; whilst, looking a little further ahead, we have the so-called "silent" tuner, which is designed to cut out atmospherics and other unpleasant "noises" when one is changing over from one station to another.

The Perfect "Radio Robot."

Altogether the ideal of single-knob control is getting more and more difficult to live up to, particularly as ether congestion increases, and we look to get the last ounce of efficiency out of the set.

What the final solution will be remains to be seen, but meantime it is interesting to take note of any fresh developments that make their appearance. We have already seen automatic switch and push-button tuning at Radiolympia, and now another advance has been made, which although somewhat limited at present undoubtedly has remarkable possibilities.

It amounts, in short, to designing a high-frequency circuit so that it naturally and automatically tunes itself to any applied frequency without requiring any kind of manual control whatever. At first sight this seems to provide the perfect "Radio Robot" and looks almost too good to be true. As already stated, the new circuit has not yet been fully developed, but within limits it is a true "self-tuner," and one can only wonder how far the principle can be pushed.

The action depends upon what is called the Miller effect. As everybody knows, there is a definite capacity across the electrodes of a valve which in the days before Neutrodyning and the screen-grid used to give a lot of trouble by causing self-oscillation.

Miller's Discovery.

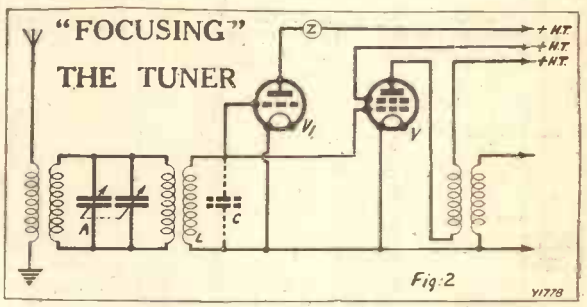
Some years ago an American physicist named Miller discovered that this capacity effect was not the same when the valve was lit as when it was cold. At first sight this is rather surprising, since the capacity would seem to be due to the size of the electrodes and their relative spacing, both of which remain the same whether the valve is working or not.

But Miller found it to be otherwise. Not only does the apparent capacity between the electrodes change, but its value depends upon the kind of circuit used in the output circuit of the valve. In short, the effective grid-filament capacity varies with the effective impedance of the output circuit.

There is one very simple illustration of this. For instance, in a resistance-coupled amplifier there is very little tendency to self-oscillation, but with a choke or tuned-anode coupling (i.e. when resistance is replaced by inductance in the plate circuit) conditions become very different.

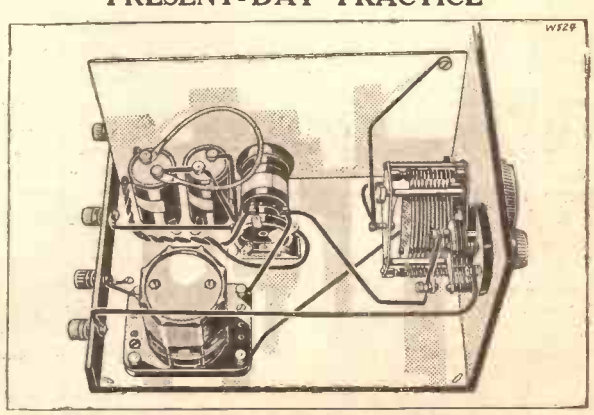
In fact, an ordinary valve becomes at once very prone to oscillate owing to the increase in the effective capacity across the valve electrodes, and therefore in the back-coupling between the input and output circuits.

(*Continued on page* 634.)



How a band-pass circuit is used to prevent the automatic tuner from wandering.

PRESENT-DAY PRACTICE



Despite the popularity of ganging there are still a great many separately-tuned S.G. input circuits, like this one. They would be quite outclassed if automatic tuning on the lines suggested ever becomes popular.

THE MIRROR OF THE B.B.C. By O. H. M.

THE WOMAN ANNOUNCER

Continental Programmes—A Change of Date—Ulster Race Broadcast.

A B.B.C. Innovation.

BEHIND the statement that the B.B.C. has appointed a woman announcer lies a tale of a terrific struggle which has hung in the balance for six years.

I understand that Sir Charles Carpendale was prepared to produce an eligible candidate for a woman announcer as far back as 1925. But the forces of masculinity appear to have hung things up. Anyway, it was not until July 24th, 1933, that the B.B.C. decided to employ a woman announcer in the person of Mrs. Borrett, who, incidentally, is the wife of a naval officer. Good luck to Mrs. Borrett!

Who Rules the Waves?

The B.B.C. has survived the attack on the Post Office estimates, but I am not at all sure that Broadcasting House is well advised in allowing itself to be used, as it certainly was in this case, as the instrument of the policy of a vested interest.

Incidentally, it seems a pity that the B.B.C. does not stand on its own ground, inviting rather than retarding transmissions from the Continent and elsewhere.

I wonder if Sir John Reith and his Board realise that in a very few years the average British listener will have access to programmes originating in most parts of the world under whatever system and with whatever motives they may be supplied. I suggest that there is something definitely silly in the B.B.C. trying to work the "King Canute and the waves" with regard to Continental transmissions.

Also, why should the average listener be deprived of programmes that are good by virtue of contrast?

An American Contribution.

I am glad to hear that Hugh Ross, who directs the Schola Cantorum in New York, is to be invited during his visit to Europe next summer to give a special programme of old American music for the B.B.C. There should be much more of this.

Colonel Dawnay.

I wonder if there is anything in the change of plan which brings Colonel Dawnay into the B.B.C. a month earlier than was intended. Anyway, the fact is that until about three weeks ago Colonel Dawnay was to start on October 1st; now he is to start on September 1st.

More information on this point should develop later.

DECORATIVE CONSULTANT TO THE B.B.C.

A Leeds architect, Mr. J. C. Procter, who has advised the B.B.C. on Broadcasting House, Leeds, and the new Bristol studios.

The Song-Plugging Fiasco.

Dance-band leaders and music publishers are uproarious about the new B.B.C. policy, the ostensible purpose of which is to kill "song-plugging." All that has happened is that the B.B.C. is finding just under £20,000 a year as a subsidy to outside dance bands which are supposed to be under the orders of the B.B.C.

All that will happen, of course, is that the music publishers and possibly the restaurant managements will be saved this amount. No commonsense person could accept the idea that the subsidy as planned would give effective control.

Ulster Grand Prix Motor-cycle Race.

Empire listeners, as well as those to the National and Belfast transmitters, will have an opportunity of hearing part of the running commentaries on the Ulster Grand Prix Motor-Cycle Race, which is to take place on Saturday, August 19th.

The race, which is over a course of 246 miles, made up of twelve laps of twenty and a half miles each, will start at 2 p.m., and the first part of the commentary will be devoted to a description of the first two laps by Major Vernon Brook, who will be at the Grand Stand, and by Mr. H. W. McMullan, stationed at Muckamore Corner. The last portion of the race and the finish will be described at 4.30 p.m.

The event, which is described as the "world's fastest road race," attracts entries from the most famous riders, all of whom are out to be the first to establish a new record lap speed.

Bank Holiday Items.

National Programme.

12.0 Noon.—Organ recital by Tom Jenkins, relayed from the Plaza Cinema, Swansea.

(*Continued on page* 634.)

THE LISTENER'S NOTEBOOK

Frank comments on recent programmes, and on microphone personalities of the moment.

AN Englishman is supposed to be fond of a song. How he got the reputation I don't know. Nor, if this is true, do I know why village baritones share with mothers-in-law (and Mrs. Grundy, perhaps!) most of the Englishman's derision.

All this is by the way. What I meant to say was that the average English listener should find plenty in the programmes these days to please him. Never have I seen such an array of singers of reputations great and small as there has been recently. Two or three times a day, on all wavelengths, we've had singers sandwiched between orchestral or pianoforte items.

Actually these are bad times for singers—that is, if atmospheric interference is in any way widespread. I've been particularly unfortunate of late, being always in the thick of it. It has led me to wonder whether the singers themselves are conscious of the rivalry of the elements.

If they are it is amazing how they keep going. Can't anything be done to harness these crackling monsters? I mean the atmospherics, of course!

* * *

Prominent among the singers is the Wireless Male Chorus. What perfect balance and control they show! By the way, I was rather tickled with the way they labelled a group of songs some few nights ago.

I tuned in expecting to hear a number of rousing, rollicking songs, but instead was treated to a medley of tunes, including a nursery rhyme, a song which the announcer called something rather unusual, and a concoction in a strange jazz idiom. And they called these "Sea Shanties"!

It didn't matter, really, for the Wireless Male Chorus is always worth listening to.

* * *

Incidentally, I'd like to hear them in an hour of the famous Gilbert and Sullivan quartets. I don't know how they would get over the soprano parts, but their "soprano" can soar to great heights.

Perhaps the pièce de résistance of recent singing was Evensong at the Crystal Palace, when four thousand choristers, drawn from the towns and villages of England, sang some gems from the Anglican Church's music-book.

Lovers of Church music are by no means a negligible body, and it is good, in this holiday season, to see them so well catered for by the B.B.C.

* * *

The performance at the Crystal Palace was a brilliant affair, and Dr. Nicholson must have been pleased with the way all had been trained to keep an eye on the baton. This was particularly noticeable in the anthems.

* * *

The length of the programme, representing four hundred years of Church music, may have frightened a good many listeners. In actual fact, the length wasn't felt, owing to the shortness of each individual item. These couldn't have bored even the most fastidious, and their variety was as attractive as the arrangement of them. The compilers of the programme are to be congratulated on this feature, as also are the performers.

* * *

Never has a play pleased me more than "Across the Moon" did, although it *was* a revival. Fortunately, I didn't hear it in the first instance, a couple of years ago. The basis of the story was a well-tried theme, and sentimental to boot, but the sentiment was never allowed to descend to that of the penny novelette. This, I thought, was largely due to the magnificent acting of Richard Bird.

There was nothing of the sentimental ass about him. On the contrary, he played with a vigour that commanded instant respect. And Richard Bird was broadcasting for the first time, too!

* * *

Hermione Gingold played the opposite rôle with equal brilliance. The death scene in the closing stages will long be remembered. Here was great acting!

And the same may be said of the gentlemen who played Julian Simon and Dr. Andrew McGowan. These parts were made the very most of.

* * *

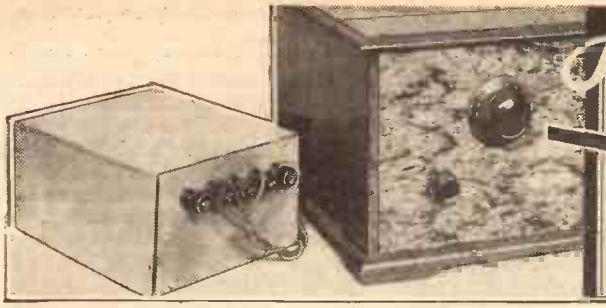
It would seem at first blush that there can be nothing unique in listening to a foreign dance band broadcasting from our own studio. In fact, it seems unnecessary to get a band to come so far for one transmission when it or similar bands can be heard any evening by tuning-in to Radio Paris.

But anyone who listened to the orchestra from the Café Colette will agree that this broadcast was quite a different thing from listening-in to dance music from Radio Paris.

This wasn't due so much to the orchestra itself as to its spokesman and (presumably) its conductor.

In my opinion, he made the broadcast, although the orchestra played a type of syncopation that pleased because it was a change from the familiar

(*Continued on page* 634.)



How to Build A SIMPLE D.C. MAINS UNIT

If you have been working your receiver from H.T. batteries and now wish to try your hand at mains operation, a good way to start is with an easy-to-construct, inexpensive H.T. unit. Where D.C. is "laid on" such a piece of apparatus as described below is peculiarly well adapted to drive an ex-battery receiver.

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

THIS is a unit which anyone can build, and, what is more, anyone can build it without fear. We say this last because constructors who hesitate before embarking upon the construction of mains apparatus do right. It is not the kind of task to be undertaken lightly.

After all, a mains unit or set is a direct extension of the power supply, and it would seem to us that at times some designers seem to forget this, or perhaps they consider that every constructor possesses a fair knowledge of electrical engineering!

It is quite possible to design mains apparatus which all who are prepared to bear in mind one thing can build and obtain safe and satisfactory results. And that is that the apparatus must be built and operated in exactly the way directed.

Obvious? You would think so; but while the majority of constructors might be prepared conscientiously to "follow the book," there are still quite a few who seem to delight in contributing their own twists and turns. This type should avoid mains gear of any description, for it definitely is not the kind of gear for uninformed experiments.

Safety First!

It was in a successful endeavour to reduce mains sets and units to the safety level of battery gear that the now well-known "P.W." "Safe-power" principle was introduced. It is employed in this simple D.C. unit, and accomplishes its purposes without in any way complicating the construction.

Merely by designing the cover of the device so that the connecting socket must be passed through an aperture in it, a state of complete security is achieved. No one can remove the cover and expose the components and wiring *while the unit is connected to the mains.* It simply must be disconnected before it is possible to take the cover off!

However tempted the constructor might be to tighten up one of the unit's component terminals, or make any other such adjustment, without switching the set off, it could not be done providing the cover had been put on before joining the unit to the set and mains.

If anyone tries to do without the cover or ignores our direction, which we will give here and now, that it must always be in place when the unit is in action, then he has only himself to blame if he should receive a shock or blow a fuse.

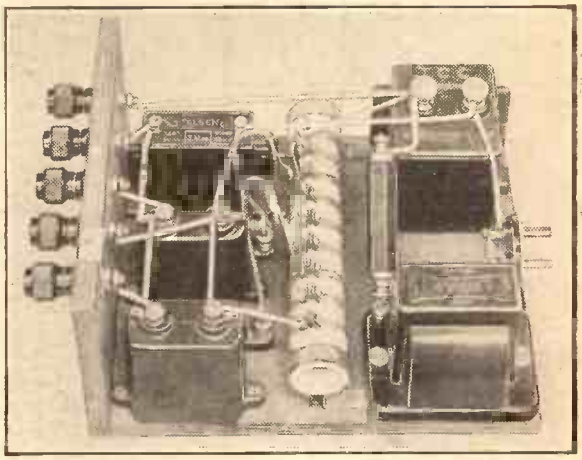
As for the construction of the unit, this is exceptionally straightforward and easy, and is only a matter of screwing the few components on the simple baseboard and wiring them up.

Efficient and Trustworthy Design.

Do we guarantee that the unit will work well? We never in words guarantee any of our designs. It is quite unnecessary to do so. The efficiency and trustworthiness of every "P.W." design are taken for

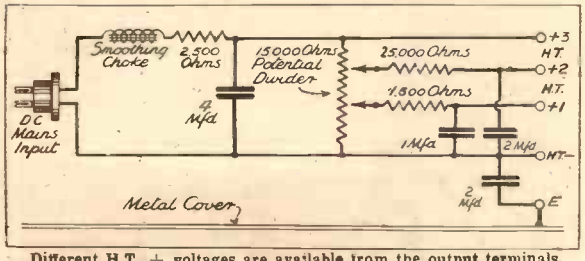
(*Continued on next page.*)

EASY TO MAKE AND WIRE



This is the practical form of the circuit shown on this page. Note how a piece of tin is joined to the earth (nearest) terminal.

SIMPLE CIRCUIT AND FEW COMPONENTS



Different H.T. + voltages are available from the output terminals, and they can be chosen by the positions selected for the crocodile clips making connection to the potential divider.

THE PARTS REQUIRED AND THE MAKES TO CHOOSE

Component	Make used by Designer	Alternative makes of suitable specification recommended by designer
1 Baseboard, 7¼ in. x 6½ in. x ⅜ in.	—	—
2 Wooden panels, 6½ in. x 4 in. x ⅜ in.	—	—
1 Piece of 18-gauge tinned sheet iron, 8½ in. x 14½ in.	—	—
1 Piece of 18-gauge tinned sheet iron, 1⅜ in. x ⅜ in. (see text)	—	—
1 4-mfd. fixed condenser	T.C.C., type 61	Dubilier
1 2-mfd. fixed condenser	Telsen W.226	Lissen, Ferranti, T.C.C., Dubilier
1 2-mfd. fixed condenser	Dubilier B.B.	Igranic, Ferranti, Lissen, T.C.C.
1 1-mfd. fixed condenser	Dubilier B.B.	Lissen, T.C.C., Igranic, Ferranti
1 25,000-ohm resistance with horizontal holder	Graham Farish "Ohmite"	Ferranti, Dubilier, 1 watt
1 1,500-ohm resistance, with horizontal holder	Graham Farish "Ohmite"	Dubilier, 1 watt
1 2,500-ohm resistance with terminals	Graham Farish, power type	Dubilier
1 Potential divider	Igranic 2246/5	—
1 Smoothing choke	Ferranti B.8	—
1 Mains connector	Belling & Lee, type 1042	Goltone, Bulgin
2 Crocodile clips	Bulgin, type C.R.5	—
5 Insulated terminals	Belling & Lee, type B	—
1 Yard of insulating sleeving	Goltone	—
1 Yard of 18-gauge tinned copper wire	Goltone	—
Screws, flex, etc.	—	—

A SIMPLE D.C. MAINS UNIT

(Continued from previous page.)

granted by our multitude of regular readers, and it would be an insult to their loyalty and reveal a lamentable lack of confidence on our own part if we had to "guarantee" our sets to do what everyone naturally expects of them, and that is to perform as well as and possibly rather better than any approximately similar designs.

However, those immediately interested will want to know the technical character of this unit. It is intended for the average three-valver, and, of course, it will serve any normal "two." It will take practically any input. That is to say, it will operate equally well on any voltage D.C. mains from 150 to 230, although its output will obviously vary as with different voltages. Its current output has a maximum of approximately 15 milliamperes.

Concerning Earth Connections.

It cannot be used with A.C. mains, and you must be sure that yours really are D.C. before you build the unit.

The maximum voltage is available at the H.T. +3 terminal, and this is used for the anodes of S.G.'s and power valves. The +2 terminal is for S.G. screens and other somewhat lower voltage requirements, while +1, the lowest voltage tap, is the one to serve as detector.

Having assembled all the components required, the seven-ply wood baseboard and terminal panel can be cut and screwed together.

Use stiff, insulated wire for the wiring, and tinned copper and "spaghetti" sleeving. That is, except for the leads to the two crocodile clips, which should be of rubber-covered flexible wire.

Soldering is not necessary, but the leads should be tightly secured to their terminals.

The cover comprises a three-sided sheet of fairly stout "tin" with a seven-ply wooden backpiece. In this is cut an aperture through which the connecting-socket passes into its plug (which is fixed to the baseboard).

You will find the "tin" quite easy to bend if it is gripped between two pieces of wood whose edges run straight along the line of bending.

A small piece of tin of 1⅛ in. by ⅝ in. in size should be cut, and a hole drilled in one end so that it can be fixed under the earth terminal.

This tin is then bent over the top of the terminal panel, and a hole drilled in this top end so that one of the cover's securing screws passes through it.

By this means the metal cover is connected to earth.

When the unit is in use the earth connection on the set is disconnected and joined instead to the earth terminal of the unit. *It is very important that this should be done.*

You see, if this slight rearrangement of your existing connections were not carried out, it is an even chance that you would short-circuit your mains to earth.

If you glance at the theoretical diagram which appears on the first page of this article, you will see that the H.T. negative terminal of the unit is directly connected to the D.C. mains input and that there are no chokes or resistances in this path—even if there were you would still have to be careful.

Well, it might so happen that the positive wire of your power supply was earthed. One of the two is bound to be, and it is quite likely to be the positive one.

Now if the set were still left joined to earth when the unit was in use you can appreciate what would happen.

H.T. negative on the unit is connected to the negative mains power lead; it is also joined to the H.T. negative terminal of the set, and that will almost certainly be joined to the earth terminal.

And so both your power-supply wires would be earthed, and the least that could happen would be a burnt-out fuse.

No, you mustn't leave an earth wire joined to the set unless you are absolutely positive that the negative is earthed. But even so there could still be trouble, so in either case it is advisable to remove the earth lead from the set.

Selecting Tappings.

When joining up the unit, it should be remembered that it must be connected to the mains the right way round.

So if at first you should hear nothing, try reversing the mains socket. That is, just pull it off and put it back the other way round.

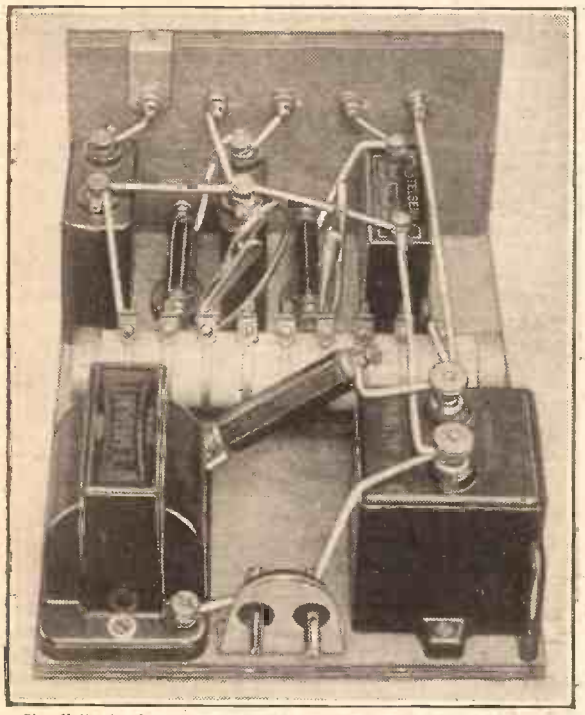
The same effect is achieved by pulling out the plug in the wall or lamp socket and replacing it in a reverse position.

It is impossible in a short space to give detailed potentiometer divider settings for all types of sets and valves.

But you won't go far wrong if you leave the crocodile clip for the +2 terminal on the first or second point on the potential divider from the positive end and the +1 terminal's crocodile clip at an approximately midway position.

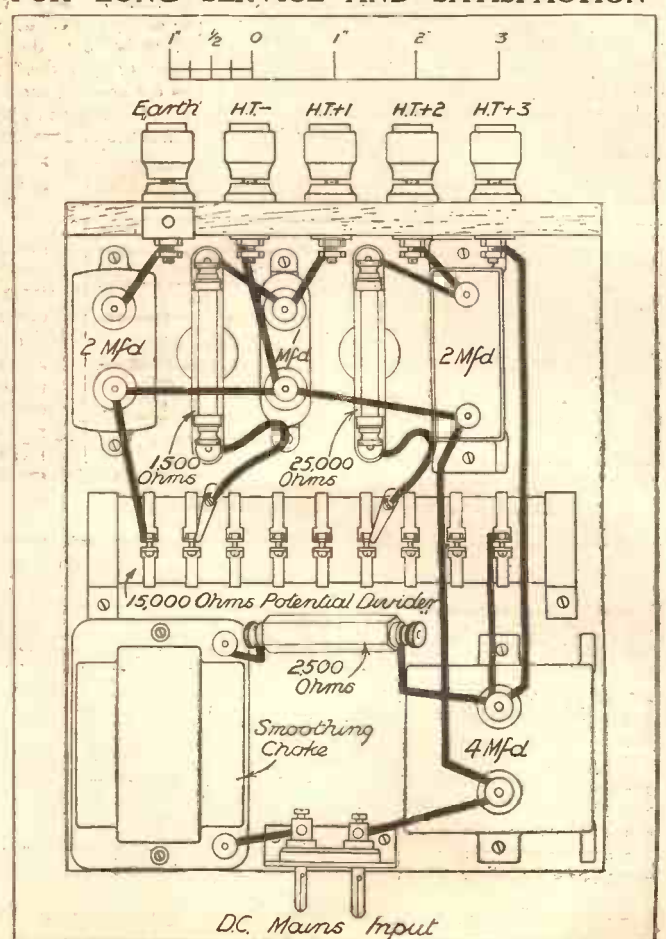
A final "safety first" reminder. You have to disconnect the mains to remove the cover, so don't negative this positive safeguard by re-inserting the mains plug *after* you've exposed the "works."

AN INEXHAUSTIBLE H.T. SUPPLY



Simplicity is the keynote of this practical unit, which carries the guarantee of the "P.W." Research Department.

FOR LONG SERVICE AND SATISFACTION



Here are the full wiring details, together with a scale, which will enable you to follow the layout accurately.

LESSONS OF LISBON

A first analysis of the "P.W." Frequency Tests from CT1AA, Lisbon, on short waves. They were the first International Quality Tests ever conducted, and that they were highly successful is evident from the representative reports dealt with below.

By G. T. KELSEY.

THERE can be little doubt, as a result of our analysis of the C T 1 A A correspondence, that our frequency tests from Lisbon were a great success. Letters have been received from almost every part of the country; and although there would seem to be room for improvement in many of the sets used for the tests, it is true to say that a lot of valuable information has come to light.

Taking an average based on information taken from every letter received, the general level of signal strength from C T 1 A A during the period of the broadcast was in the neighbourhood of R 7, which is just a trifle below our own figures.

Identifying the Offender.

The heterodyne interference trouble was experienced generally, although there were very few cases where it was of sufficient consequence completely to spoil our own transmission. Incidentally the interfering station has variously been described as D J A, W 1 X A Z and the Southern Railway's electric system.

We are reasonably convinced that our own interference was definitely due to one of the British short-wave stations. In any case, we should rather hesitate to blame the Southern Railway!

Concerning the broadcast in general, the only part of the programme which seems pretty generally to have been subjected to bad distortion was the piano music immediately following the frequency tests. The discussions by Sir Ronald Jayne and the one by Mr. Kelsey which followed were received, on the whole, at excellent strength, and intelligibility in both cases was little short of one hundred per cent.

One or two readers, however, appear to have had some fun during the broadcast of the "P.W." record, and Mr. Kelsey has been accredited with possessing a voice that is woolly and "snoozey."

How the Frequencies Were Received.

We can nail down the woolliness to a possible receiver fault, but the term "snoozey" has definitely left us guessing! If the "sn" is a misprint for a "b" we can only assume that the evasive echo effect on short waves has made a reappearance, for otherwise our esteemed correspondent is quite wrong! All the same, his letter, like all the others received, is greatly appreciated, and perhaps one of these days he will let us into his secret concerning "snoozey."

Meanwhile, a word or two about the frequency tests themselves. The information that has been collected is most valuable. Moreover, it does definitely support our contention that, given reasonable conditions, quality reception on short waves *is* possible.

Again, taking the average, all the frequency notes transmitted, with the possible exception of the 5,905-cycle one, were received at fairly consistent strength. The falling off which, quite frankly, we had expected at the lower end of the frequency spectrum was not nearly so marked as we had anticipated; indeed, only two readers failed to hear the 33-cycle note.

Blaming the Receiver.

Of the rest, strength seems to have varied between approximately R 6 and R 8 at this particular frequency, and from 61 cycles to 2,592 cycles the general level was R 8. The most marked discrepancies occurred in the reception of the highest note of the lot, and reports vary from nothing to R 9! But the mere fact that approximately 20 per cent of the reports give the strength as R 6 proves beyond a doubt that frequencies of this order can be received on short waves, and that, after all, was the whole purpose of the tests.

As for those readers who were unable to hear anything at all of the 5,905-cycle

IN THE STUDIO

Some of the important speeches and announcements were made into this microphone, which is in the main studio of the C T 1 A A station.

note, there is only one conclusion to be arrived at, and that is that their sets are at fault. The general conclusion includes, of course, loudspeakers, although frankly there are few modern speakers that have a cut-off appreciably below 6,000 cycles, and surely none that cut off absolutely dead.

In the curve depicting our own results the line rises from R 6–7 at 33 cycles to R 8 at 61 cycles, and from there it remains reasonably constant up to 2,592 cycles. At 5,905 cycles it is definitely down, but the peak strength is still in the neighbourhood of R 6. As a matter of interest, the readings were taken without A.T.B., and with it there is little doubt that the curve would have been substantially flat.

The general standard of reports received in consequence of the broadcast is very high, and the task of selecting the best report has been particularly difficult. It will be remembered that the original "P.W." record which was broadcast from Lisbon was offered to the reader sending in what in our opinion was the best report.

Choosing the Winning Report.

After careful consideration we managed to get the number of "possibles" down to twelve, from which the final selection was made. But there was very little margin of difference between them, and the winner, who is Mr. F. W. Holden, of 29, West Park Road, Smethwick, near Birmingham, can attribute his success mainly to his presentation of facts. We offer our congratulations to Mr. Holden, but we desire also to give special mention to Mr. S. Lee (Belfast), Mr. B. Benham (Northampton), Mr. V. Sparkes (London, S.W.18), Mr. N. K. Batchelor (Coventry), Mr. C. W. Warner (South Woodford), Mr. G. W. Herod (Nottingham), Mr. R. T. Reed (London, W.C.1), Mr. G. A. H. Eckles (Hull), Mr. F. A. Stewart (London, S.W.11), Mr. E. V. Glanville (Dublin), and Messrs. N. J. A. and G. A. Deaton (Wanstead), all of whom ran him very close.

Two Representative Letters.

We should like to be able to publish extracts from many of the letters received, but for considerations of space such a course is impossible. The general tendency is reflected in two letters that we managed to single out from the rest.

Mr. G. Anthony James, of Cardiff, says, for instance, that "the quality during the transmission was quite up to the present-day standards, and I think it equalled that of many of the medium-wave transmitters of the present day." In another letter Mr. L. Klek thanks us for the tests, if only because they show up the B.B.C.'s landlines to the North! Apparently we achieved rather more than we had even dared to hope.

The main thing that concerns us is that the tests were successful; and by the common consent of all those who have written in it has been established beyond all doubt that quality reception on short waves *is* possible. And now we look to the future.

NEWS FROM ABROAD

Recent items of information concerning foreigners new and old.

RUYSSELEDE, BELGIUM.—This is the site of the new Belgian station that has been working on 29·4 metres.

* * *

MONTE CENERI.—This new Swiss station has been making itself unpopular in Denmark owing to its having chosen a wavelength too close to that of Kalundborg.

* * *

BUDAPEST.—This station has received special permission to test on 120 kw. during 1934.

* * *

ALEXANDRIA.—The Palestine authorities have planned for a relay station at Alexandria to duplicate the Cairo programmes.

* * *

EUROPE.—During the next two years no less then fifty-six new broadcasting stations are projected in Europe alone.

THE SATOR POTENTIOMETERS

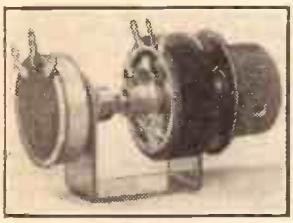
I have often wondered why it is that the practice of providing potentiometers and other such devices with scales appears to have gone out of fashion.

It is true that we are not dependent upon the exact setting of, for example, a volume control for the reception of a station; nevertheless, I find it rather irritating if I cannot easily return to a predetermined position.

Let me explain what I mean. One may make a habit of listening fairly regularly to three or four stations—say, the two locals, Radio Paris and Daventry National.

Now these stations will doubtless come over with widely different strengths, and therefore each will require its own individual volume-control adjustment.

But supposing one wants to leave the set tuned in all ready for one of these stations, how can it be done if there are no scale indications on the volume control at least roughly to guide one? Merely by pure guesswork: an irksome restriction on anyone who likes their volume adjusted to a nicety.



Two types of Sator Potentiometer in gang formation.

We don't want "calibration" closeness of scale marking; the 0 to 10 marking on the Sator potentiometer is perfectly adequate. And it is because this particular potentiometer, which is made by Orion Lamps Ltd., is provided with a knob bearing such a scale that I feel particularly attracted by it.

However, it has other strong points in its favour. For example, though wire-wound, separate large-diameter nickel wires are provided so that there shall be no wear imposed upon the element. This latter is also completely enclosed, and is thus fully protected against mechanical damage, etc.

It is a good component, and I recommend it to constructors. A very wide range of both linear and logarithmic types is available.

The Sator Grid Leak type resistances are equally sound productions.

It is said that in these "the resistance element is not made of the usual carbonised paper, which varies its resistance from day to day, but is so constructed incorporating a special ceramic material that variation in the resistance is absolutely negligible, even with great changes in the temperature . . ."

In case you do not know, "ceramic" pertains to the potter's art. In fact, these Sator resistances are based on a special kind of porcelain material which, being the product of fire, obviously constitute a modern application of Excaliburn principles!

Anyway, on test I found them to be perfectly efficient. They closely adhere to their ratings, and, at 4d. each for values from 100 ohms to 10 megohms and a ·75 wattage, and 5d. for a 1·5 wattage and a similar range of values, they are clearly inexpensive components.

Sator resistances of various values.

NEW BENJAMIN CHOKE

I have just finished writing a reply to an article by Mr. Baxter which is to appear in "P.W." shortly. Mr. Baxter has come to the conclusion that "Class B" is a washout; and although his experience and his arguments both qualify him as a critic whose views demand attention, I am convinced that in this case he is wrong. And I believe I have been able to prove it.

But it is easy to be misled by "Class B" performances. As I have often said, the system necessitates a pretty strict adherence to certain very hard-and-fast rules.

Most of these concern the input and output matching of the "Class B" valve, and it is because the different makes of valves need different treatment in this respect that it is so easy to go wrong.

Even so, I maintain that "Class B" at its worst is hardly likely to give as bad distortion as is occasioned in almost every other battery set by an overloading consequent upon an attempt to achieve a loudness out of all proportion to a defined limit of distortionless output power.

With close matching a really impressive response can be obtained. Matching by ear is hardly satisfactory, though, so one must have something of a guide.

Benjamin provide an excellent matching table with their "Class B" output choke, in which all the different valves are included.

The Benjamin "Class B" Choke.

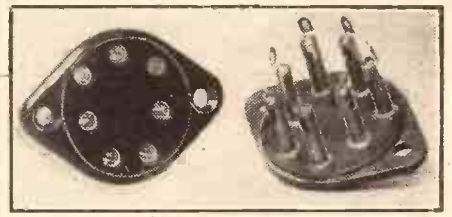
This Benjamin choke is itself a first-class vehicle for precision matching in that it provides for at least seven well-graduated ratios.

Further, it possesses a high inductance, and its resistance is below 400 ohms.

It is by using such components intelligently that "Class B" amplification can be made to give the kind of results that are claimed for it by its advocates.

PREH VALVE HOLDERS

It is mainly in connection with the practical application of the "Class B" principle that we encounter the new seven-pin valve holder. And remembering how seldom one met even a four-pin type in its earlier days of sufficient precision assembly to ensure good contact for each of the valve legs, one is inevitably suspicious about each new example of these "seven-pinners."



The Preh Seven-Pin Valve holder.

But the spacing of valve pins is much more precise now; indeed, I think it is true to say that all the well-known valves are perfect in this respect.

And I find a complementary precision in the British-made Preh seven-pin valve holder, which is a well-made component. It takes a "Class B" or "D.-D. Triode" valve smoothly and with good contact for each pin. This is ensured by the provision of split sockets.

The retail price is 1s. each, and Preh Manufacturing inform me that they also supply four-, five- and six-pin types.

They state: "The soldering tags provided (on their valve holders) are part of the sockets themselves, and consequently no electrical losses can take place at this point."

This is true; but may I remind them that it is our experience that tens of thousands of home constructors avoid soldering, and that they would be well advised to cater for this class with terminal models?

ROUND THE RECORDS

THE gramophone companies are nothing if not topical, and while the rather acrimonious wrangling has been going on in the cricket world about leg-theory, Columbia have got hold of Larwood and Frank Foster (who is supposed to have originated leg bowling in Australia some twenty or more years ago), and have made an interesting ten-inch record.

Some challenging statements are made by the two men, and the record is an interesting adjunct to the Larwood book, "Body-Line," recently published. Col. DB1140.

Another interesting innovation, though not of the same type, is the transference of Duke Ellington, about whom the highbrow dance fans rave so enthusiastically, to Columbia. Whether this change is permanent or not I do not know, but the two latest Ellington discs have appeared in the Columbia lists.

These are. "I've Got the World On a String" and "Down a Carolina Lane," with a second disc containing "Sophisticated Lady" and "Merry-Go-Round." They are to be heard on CB625 and CB591. For those who are in doubt about the constitution of the famous Harlem band, it may be of interest to know that it consists of three trombones, three trumpets, four saxophones and clarinets, piano, drums, double bass and banjo. At the time of writing the band is still in this country, and we may hear it again over the radio. No doubt a great treat for many, but I often wonder how many.

We are getting our fill of "Stormy Weather," as I thought we should, and all sorts of people are recording it. I prefer, so far, the interpretation of the Savoy Hotel Orpheans (Col.), but since then we have to number among the vocal efforts those of Gracie Fields (H.M.V.), Terence O'Brien (Broadcast), and many others.

A Good Piano Number.

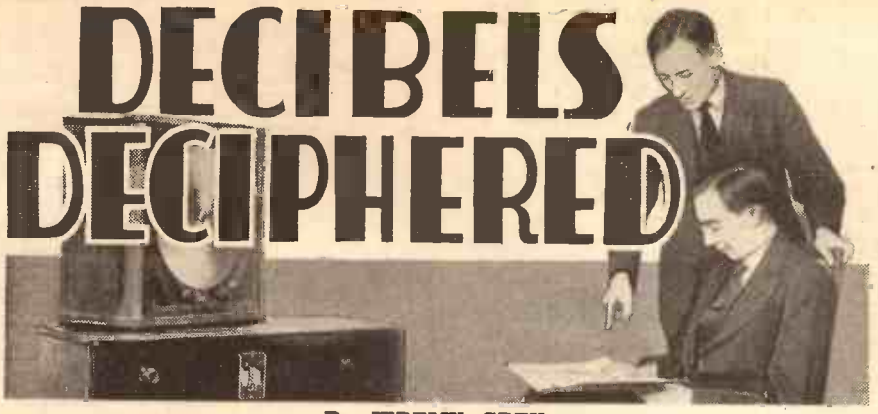
I do not like Gracie in this number at all; it does not suit her, and she does not suit it. O'Brien sings well from the vocal point of view, but his style is too classical for the number.

Morton Downey, however, who has recorded the same number for Broadcast, sings with much more success as regards the style of the piece. His voice is excellent in its light and shade. The other side, "In the Valley of the Moon," is quite different, and also is very pleasing indeed.

Peggy Cochrane deserves a pat on the back for her piano record of "Moon Song" and "Dancing Butterfly." Both are excellently recorded on Broadcast 3329.

K. D. R.

DECIBELS DECIPHERED



By JEREMY GREY.

On seeing the term "decibel" used, many constructors are inclined to turn over immediately and look for something, as they say, more in their own line. But decibels are by no means so high-brow as you may think, and you will find their mysteries clearly revealed in this lucid explanation of the ways in which they are used.

IN these days when broadcasting conditions are more stringent than ever before, and when new technical developments, each claiming to add its quota of improvements to the efficiency of reception are introduced with startling rapidity, radio tends to become more and more amenable to quantitative treatment. It is not sufficient to say that such-and-such a device is better than this or that—it is necessary to know how much better it is.

Thus the new high-frequency pentodes definitely give higher stage gains than any ordinary screened-grid valve; but we want to know to what extent the additional amplification will mean greater volume from our speaker, in order to assess the worth of this latest form of high-frequency amplification.

Applying Manufacturers' Data.

Quiescent push-pull and more recently "Class B" valves give the battery-set owner outputs comparable with those which have long been the exclusive privilege of the all-mains listener—and so comparisons between different amounts of power are beginning to assume greater importance.

It is not easy for the amateur to make the somewhat delicate electrical measurements necessary for accurate quantitative work. That requires the use of a large amount of expensive apparatus usually only available in the laboratory. But it is the usual practice of the makers of good-class components to publish test figures which give all the information needed by the discriminating user, provided he is able to compare this information on a proper and practical basis.

Power and Volume.

It is here that the first difficulty is encountered, because simple comparison of test results does not usually show the true relative value of two quantities. A further step is necessary to translate the readings in terms of performance. To explain what is meant by this statement we will give two simple examples. Do you realise that if you doubled the power output of your set you would most decidedly not double the volume of sound, that, in fact, the improvement in loudness would be only just recognisable? Again, do you know that in order to double the volume you would have to increase the power output to four times its original value?

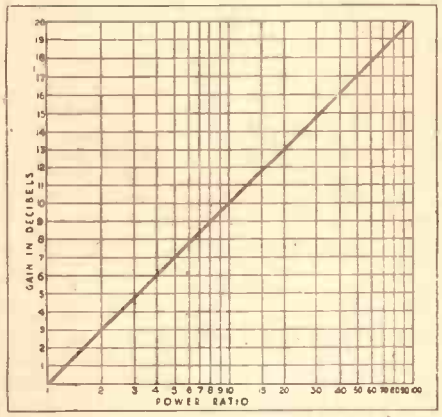
You will naturally wonder how on earth the ordinary listener can make any true comparison between the ultimate performance of two pieces of apparatus if the results of carefully conducted tests appear so confusing. As a matter of fact, it is quite a simple matter once the idea of the modern system of comparison, known as the "decibel" system has been grasped.

Nature's Protective Device.

I want to explain decibels as far as posible without mathematics, but in order to do so I am going to ask you to accept without explanation one or two statements which, I give you my solemn word of honour, are proven mathematical truths, acceptable to all scientists and engineers.

Now let us see exactly what information we have to go upon. First I have stated,

THE RELATIONSHIP



This graph shows the gain in decibels for increases in power. The vertical lines are unequally spaced because the relation of power to decibels is logarithmic.

and the statement has been proved conclusively by experiment, that doubling the output of an amplifier does not double the volume of sound; in other words, the increase of volume is not directly proportional with the increase of power.

It is interesting to know why this is so. The reason lies entirely in the structure of our ears.

If the ear maintained the same degree of sensitivity for all sounds, of whatsoever intensity, the effect of really loud noises, such as thunder, or big artificial noises like that of modern city traffic, gunfire and the like, would probably wreck the delicate mechanism of the ear, and might even prove fatal.

But by a wise provision of Nature, the response of the human ear falls off as the intensity of sound increases, so that a sound having an intensity, say, 1,000 times greater than normal speech, is heard as only 32 times the apparent volume.

Perpetuating an Inventor's Name.

As we have agreed that the audible volume of sound does not vary in direct proportion with the amount of power expended, we must now try to discover in what way increase of power and gain in volume *are* related. This has been done for us by scientists who have performed countless experiments, the results of which have been analysed mathematically.

The investigators tell us that the gain in audible volume is proportional to the "logarithm" of the power ratio. Big words, these, but they all boil down to this, that the acoustic or sound gain compares with the increase in power according to the following table:

Power increased from	Relative sound gain
1 to 10	1·0
1 to 100	2·0
1 to 1,000	3·0
1 to 10,000	4·0

These relative sound gains, in the second column, are termed "bels," in honour of Graham Bell, a scientist whose name is linked for all time with the development of the telephone. But because in radio engineering we seldom have to deal with power ratios as high as 100 to 1, the bel has been subdivided into ten portions, called "decibels."

Sensitivity of the Ear.

Thus, increasing the power output of an amplifier ten times will give an audible gain of 10 decibels, or increasing the power 100 times will give a gain of 20 decibels.

In Fig. 1 is reproduced a graph from which any power ratio can be translated into terms of audio gain in decibels.

We have so far seen that the decibel can be used to express a gain or loss in any apparatus, on what may be termed an audio basis. It now remains to show how decibels can be translated in terms of actual performance.

This is quite a simple matter. The facts are that it requires a gain of approximately 3 decibels to make any appreciable increase in the loudness. This is for the ordinary unpractised ear, of course. Trained observers, such as telephone experts, can often detect differences of two or even one decibel, but for the average listener it can be taken that a gain of about three decibels is the smallest which can be detected.

Making Twice the Noise.

If you refer to the graph in Fig. 1 again, you will see that three decibels corresponds to a power ratio of two—i.e. to double the power—which means that if you double the output of your receiver the increase of sound will be only just noticeable.

Next, you must accept my statement that a gain of six decibels corresponds to about double volume—and six decibels as you will find from Fig. 1 means quadrupled power. This figure is, of course, somewhat approximate.

(Continued on page 633.)

A USEFUL RADIO TESTER

The average experimenter very rarely realises the infinite uses which can be found for the Neon type of lamp. Apart from special uses such as television, it can be employed to test the insulation and continuity of a variety of wireless components.—*From a "P.W." reader.*

THE Neon lamp is sold in various forms, the most useful for our purpose being known as the "lighting" type, normally used for night lights, corridor and staircase lights, and other instances where a dim light is needed. The price of this type is small and it is available for voltages of 200 and over. (It will not light at all under about 135 volts, and so cannot be used on 100-volt mains.)

In this type there are two electrodes, one a disc about ¾ in. in diameter, and the other a beehive-like spiral of wire.

Other forms are the "miniature" and "letter" types—the former a very small lamp used for pilot lights and circuit indicators, and the latter containing stamped letters and figures, used for making up signs for shops, front doors, and similar display purposes.

The Series Resistance.

The lamp is mounted on a standard bayonet cap, which normally contains a high series resistance, for current-limiting purposes. The lamp can be supplied without this resistance to order, but if it be connected directly across the mains in that condition, a surge of current takes place which usually cracks the electrode support and may do further external damage.

On the whole, then, the standard type is safest, but more accurate results can be obtained without the resistance for measurement purposes.

If the testing is always to be carried out in the workshop, the lamp can be a fixture, mounted in a backplate holder screwed to the wall above the bench.

It is better, however, to make a little stand, consisting of a round recessed wood block and backplate lampholder, which can readily be taken about if necessary.

Fixing the Flex.

A length of twin flex, a lampholder adaptor, and two test prods will also be needed. Note that the flex should be a good quality double-vulcanised rubber insulated lighting flex, not the cheap red and black material sold for battery connections.

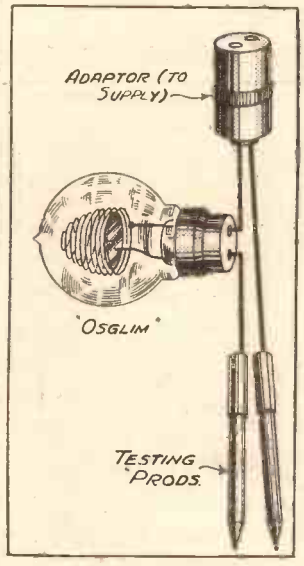
Two diametrically opposite holes should be drilled in the side of the block, and the flex threaded through, a knot being tied at the back of each hole to take the strain off the connections.

A length of about twelve inches should project through one side; the two wires should be untwisted, and the test prods attached.

The necessary length should be left for lampholder use as convenient, on the other side, and the adaptor fitted to this piece.

The backplate lampholder having been mounted on the top of the block and holes drilled for connection, *one* of the conductors in the flex inside the recess is cut, the two ends bared, and connected to the lampholder terminals. The outfit is then ready for use.

To test the continuity of a winding in any component, the test prods are applied to the terminals. A low-resistance winding



EASILY MADE

This is the straightforward arrangement of the lampholder and testing prods described on this page. The actual connections are shown, while to the right the practical arrangement is made quite clear. Note the knots in the flex to protect the connections from strain.

gives a full glow in the bulb; but a high-resistance winding, such as an intervalve transformer secondary will give glow covering a portion of the electrodes only.

Complete disconnection will give no glow at all, but, as explained below, with A.C. mains there might be a small capacity current which would give the nearest suspicion of an indication.

The insulation between different windings of transformers or between windings and earth can be tested by the prods in a similar manner, and also such items as insulating bushes, valve holders, switch bases, and others can have their insulating qualities queried if necessary.

If it should be found that there is a partial glow shown during such a test, the extent of this should be memorised; and if any grid leaks or resistances of known value are available, the prods can be applied to these, until one is found which gives a glow of similar extent to the article under test.

Discriminating Between Values.

With a little practice, indeed, the experimenter will be able to estimate whether the insulation resistance of anything under test is of the order of 2 megohms or 1 megohm, simply by inspecting the extent of the glow.

The Neon lamp will operate satisfactorily on both direct and alternating current mains. There are, however, several peculiarities in its behaviour on either supply.

On D.C. supply it will be found that the polarity applied to the lamp will affect the extent of the glow, owing to the difference in the area of the two electrodes.

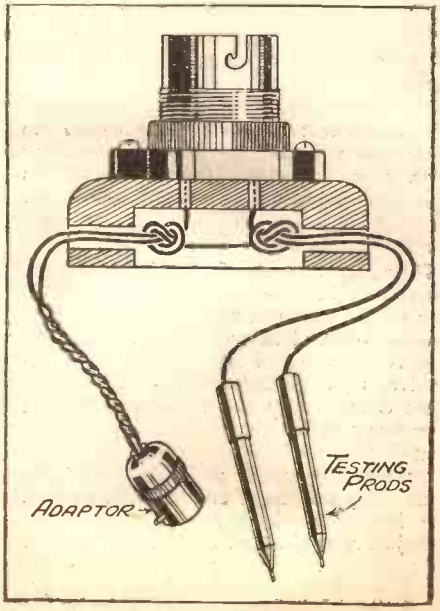
Care should be taken, therefore, to make sure that the same polarity is always used, otherwise results will be confused. With D.C. supply, also, the insulation resistance of fixed condensers can be readily tested as described above.

With alternating current, however, it will be found that a condenser of as small a value as ·0001 will pass sufficient current to give a slight glow in the bulb.

Judging Capacity.

Some glow will then always be obtained when testing condensers under these conditions, and if the capacity is large the lamp will probably glow fully. For this reason, when testing any component with an appreciable self-capacity, a slight glow may be observed even if the insulation is good.

Readers who have A.C. supply available will find that, after a little practice, it is possible to judge the capacity of an unknown or unmarked condenser to within practical limits: for example, whether it would serve for a grid condenser or not.



RADIOTORIAL

The Editor will be pleased to consider articles and photographs dealing with all radio subjects, but 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 Editorial communications should be addressed to the Editor, POPULAR WIRELESS, Tallis House, Tallis Street, London, E.C.4.

All inquiries concerning advertising rates, etc., to be addressed to the Sole Agents, Messrs. John H. Lile, 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 specialties described may be the subjects 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

WHISTLE STOPPED BY USING LOWER H.T.

"WORRIED" (Watford).—"I must say it was an eye-opener for power—I could not go back to the two again with any pleasure. Especially regarding quality. It was better on foreigners than I had ever found before, but it only lasted three weeks before a whistle started.

"Messing about to see what was wrong I found I could cut the whistle out by reducing H.T. So I did so, not understanding why, and next day the whistle started again.

"So I cut down H.T. a bit more, and stopped it, but it restarted once more, and of course the lower H.T. I put on the less power I had, and quality got poor too.

"To cut a long story short, I am now desperate. It cannot be the H.T. battery, as that was quite new—120 volts triple capacity. And I do not know where to look for the fault. Please help."

We are very much afraid that it *is* that H.T. battery, although it was supposed to be a new one.

Can you borrow a similar one just to try?

In all probability you will find that is the trouble. The battery should have lasted very, very much longer than it did and we think that either you had a dud battery, or else you have got a bad short somewhere.

Are you sure no wrong connection or faulty part has led to a constant drain from the H.T., and that no wire or other metal has been placed across the battery terminals by accident?

You may have a bad "leak" in one of the components. And the best test for that is to borrow a sensitive milliammeter, connect it in the negative H.T. lead, and see if it drops right down to zero reading when the L.T. is switched off.

If it does, proving that the set's insulation is O.K., there is every evidence that the fault lies with your present battery, and that it will be safe to use a new battery, which should then have a good long life.

USING AN H.F. CHOKE INSTEAD OF A RESISTANCE.

"CHOKEY" (Leicester).—"On your advice I successfully replaced the H.F. choke with a spaghetti resistance, and thus improved results from my detector valve, For the past twelve months it has been perfectly satisfactory.

"I am now making another set which incorporates an S.G. stage, and wondering whether I can do vice-versa, i.e. use an H.F. choke in place of the 600-ohms resistance which is recommended for the screen of the valve.

"The resistance is the only component to be wired in this lead apart from the by-pass condenser, which is connected at the screen end of it, and we (my friend and I) have been wondering whether the H.F. choke would act all right as the resistance.

"We do not want to put it in and try it out because space is rather scarce and there is a bit of screen to be cut away, etc. But if you think the H.F. choke will be just as good as the resistance, we could do this while the construction is still in the early stages.

"Would it work?"

H.F. chokes are not always interchangeable with resistances in this way. But apparently the purpose of the resistance in the case you mention is just to act as an H.F. choke, in which case a proper H.F. choke would be satisfactory in its place, in all probability.

In many other cases this would *not* be satisfactory because the resistance is arranged to drop the voltage simultaneously, and an H.F. choke in place of it would not have the same effect.

But where, as in your case, a separate H.T. terminal allows the correct adjustment to be made it will probably be quite satisfactory to use an H.F. choke instead of a resistance.

AN EASY METHOD OF REDUCING THE LOCAL STATION'S STRENGTH.

M. B. J. (Hounslow).—"The set is a sheer joy for bringing in the foreigners, and the number of these is simply amazing.

"I find that I can cope with very wide variations in volume by means of the variable-mu adjustment, but there is one station that beats me—London Regional.

"The other London is not so bad, but at night especially I cannot keep the volume down enough with the Regional.

"Perhaps a bigger bias battery might do the trick but there is not really room for this, so I wondered what you can suggest in the way of a simple strength-reducer, for London only.

"I believe it is usual on some of the factory-built sets to use a resistance and switch in the aerial circuit. Can you tell me how many ohms, and the connections for this, if it is a good method?

"My present aerial-to-first-valve circuit is the following:

"Aerial terminal to one coil unit terminal, another pair of terminals on which is earthed. From this unit there also goes a lead to the grid of the variable-mu valve holder, and to one fixed vane section of the tuning condenser.

"In addition there is the lead to wave-change switch.

"Can you say the position of a new resistance and switch to that arrangement, to reduce the volume when it gets too great at night?"

The following alterations and connections should prove adequate for your purpose.

First place an ordinary make-and-break (on-off) switch near the set's aerial terminal, and mount near it a fixed resistance—a "spaghetti" will do—of about 100 ohms. Join up as follows: One side of the resistance to one side of the switch. Next, the remaining side of the switch to the set's earth terminal. And finally, join the remaining side of the resistance to the set's aerial terminal.

That is all the modification required, and it should result in bringing the strength down to the required level, when the switch is "on."

In the off position the new components will be out of circuit, so the set will then operate as before.

CONDENSER BETWEEN FILAMENT AND PLATE IMPROVES RESULTS.

F. Y. (Lincoln).—"Using an H.F. (screened grid), Det. and L.F. set since last February, I have had great satisfaction from it, both in respect of number of stations received and the quality. In fact, it has been more or less the envy of many of my acquaintances who have heard it in action when visiting me.

"The curious part of it all is that being experimentally inclined I happened to be fiddling about with the inside of the set over the week-end when I accidentally made it better than ever!

"Knowing that I could do no damage by 'shorts' with a condenser, I had been joining a ·0001 with flex leads in various positions to see if in this way I could get even sharper 'separation' of foreigners.

"In this I did not make much difference, but suddenly I found I had definitely improved the quality. And I think the volume has gone up as well.

"The actual connections (which are working beautifully, as I write this) were simple enough, and involved no change in the rest of the set's wiring. This is how they are arranged.

"Originally the plate of the detector valve holder was joined, amongst other places, to the top terminal of an H.F. choke, bottom terminal of which was fixed to the L.F. transformer's A terminal. The filament wiring was the usual arrangement, with switch in positive lead.

"The new connection I made added one terminal of a ·0001 condenser to the detector's negative filament terminal. And the other terminal of the ·0001 to the top terminal of the H.F. choke, which as explained was already connected to detector's plate, etc.

"Why should a ·0001 make a good set sound better?

(Continued on next page.)

DO YOU KNOW—

The Answers to the following Questions?

There is no "catch" in them: they are just interesting points that crop up in discussions on radio topics. If you like to try to answer them you can compare your own solutions with those that appear on a following page of this number of "P.W."

(1) If the milliammeter in the plate circuit of an ordinary low-frequency amplifying stage kicks upwards a little on loud passages, does the grid bias need increasing or decreasing?

* * *

(2) To what electrode of the valve is the "plate" pin of an S.G. valve holder connected when the valve is inserted?

* * *

(3) Can a "grid-stopper" resistance be used to advantage in the "driver" stage of a "Class B" set?

HOW IS YOUR SET GOING NOW?

Perhaps your switching doesn't work properly? Or some mysterious noise has appeared and is spoiling your radio reception? Or one of the batteries seems to run down much faster than formerly?

Whatever your radio problem may be, remember that the Technical Queries Department is thoroughly equipped to assist our readers, and offers its unrivalled service. Full details, including scales of charges, can be obtained direct from the Technical Queries 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 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.

RADIOTORIAL QUESTIONS AND ANSWERS

(*Continued from previous page.*)

"I have been so pleased that I passed the tip on to several friends, one of whom says he also gets better results from it. How can such a simple and inexpensive alteration give better reception?"

Apparently you were *not* previously getting the best out of your detector—which easily happens, especially if the H.F. choke is inclined to be "too good," or some small component inefficiency or insufficiency is at work. By joining a ·0001 in the position described you have improved the efficiency of the detector, and thus achieved a greater input to the L.F. stages for subsequent low-frequency amplification.

The condenser also prevents H.F. getting into the L.F. amplifier.

When that happens volume is sometimes reduced, and the quality is always impaired to some extent, so the condenser by-pass has the effect of cleaning up the quality by diverting the offending H.F. currents away from the L.F. side of the set.

You do not say if there has been any effect on the reaction "setting," but even if so this is generally quite easy to compensate for.

WAS IT RADIO TOULOUSE?

E. S. W. (London, W.11).—"I was greatly interested in the old 'Radio Toulouse' station until the time it was burnt down some months ago, and I still have its tuning position marked on my chart.

"Happening to search closely in this part of the dial last night, I was surprised to pick up a station exactly on the Toulouse reading, and although it was not at all clear, I think it said something about 'Toulouse.'

"Anyway, it was in French, which makes me think that the old station may be working again. Is this the case?"

The old "Radio Toulouse" station is not in action again, but at the time it was burnt down there was already a powerful new Toulouse station standing by, waiting for Government permission to open.

After the fire strong representations were made to the authorities to allow the new station to step into the breach, but permission for this was not obtained until last month.

Since then the new station has been operating, but only with a reduced power of 7·5 kilowatts instead of the 60 kilowatts which its owners hoped to employ.

Probably this was the station you succeeded in picking up, as its wavelength is exactly the same as that of the old "Radio Toulouse."

"P.W." PANELS. No. 130. LJUBLJANA.

This Yugo-Slavian station is situated some 760 miles from London, and uses the call "Halo, Radio-Ljubljana."

* * *

Its present wavelength is 574·7 metres. Under the Lucerne Conference Plan it will reduce this to 569·3 metres next January, and if it then interferes with certain other services, it will employ a directional aerial and reduce its power after dark.

* * *

The present power of Ljubljana is 7 kw., and this will not be increased under the Lucerne scheme.

WHAT IS THE FREQUENCY?

T. L. (Sunderland).—"What is the formula for finding the natural frequency of a tuned circuit, when its inductance and capacity are known? (Inductance in henries and capacity in farads.)"

The resonant frequency of an oscillatory circuit LC is found by the formula:

$$f = \frac{1}{2\pi\sqrt{LC}}$$

where f = number of cycles per second.
L = inductance (in henries).
C = capacity (in farads).
π = 3·1416.

THE ANSWERS

TO THE QUESTIONS ON PAGE 632 ARE GIVEN BELOW.

(1) Normally an upward kick indicates that the negative bias is a little too high.

* * *

(2) The "plate" pin of the S.G. valve (opposite the grid) is connected internally to the screening grid.

* * *

(3) No. The resistance of this circuit should be kept low, so it is not advisable to use an extra resistance in it.

DID YOU KNOW THEM ALL?

DECIBELS DECIPHERED

[(*Continued from page* 629.)

You see, all ears are not exactly alike—some are more sensitive than others; besides which, different loudspeakers vary in electrical and mechanical efficiency at different power inputs—but six decibels to double the volume is a good average figure.

The explanation given above should already be of considerable value. It enables you to realise, for example, what effect upon your equipment can be expected by the inclusion of some new improvement.

Detecting Improvements.

Say, for example, it is claimed that the gain when using some more efficient high-frequency amplifier is 1·8 decibels. You will know at once that the improvement will be only just audible, if at all. On the other hand, if in addition to this 1·8 decibel gain you hot up another stage of your receiver and gain a few more decibels, the cumulative result will probably be readily detected.

In addition to this idea of employing the decibel system to the measurement of gains or losses, this useful notation has been applied by telephone engineers to the measurement of actual sound intensity. It appears that an average telephone receiver gives nice comfortable reproduction when fed with 6 milliwatts of low-frequency power.

A Standard of Intensity.

This intensity has been taken by telephone engineers as a sort of standard of volume. Long experience enables these experts to recognise the standard intensity whenever they hear it. Their ears are also trained to detect small differences in sound not appreciable to the average ear, and to assess, in terms of decibels, intensities greater or less than the 6-milliwatt standard.

Thus, a sound which the experienced observer judges to be just a little better than the standard telephone strength he may call "plus 1½" or "plus 2" decibels—or, more simply, just "2 decibels." Louder signals, easily better than the standard, will be "3 decibels," and still louder ones 4, 5, 6 or more decibels.

According to this method of describing sound intensities, reasonable loudspeaker strength would be in the neighbourhood of 20 decibels—probably, but then, different people have very different ideas of what is reasonable volume.

ECKERSLEY EXPLAINS

(*Continued from page* 617.)

Rome would mean that their service areas, instead of being, say, 10,000 square miles in extent, would be, at most, 100 square miles in extent. By sharing waves between two equal-powered stations, even if they are 1,000 miles apart, we cut down their service areas by 100 times!

Moreover, the fading signals (which some people pick up and "lump" the fading) would be intolerably and inextricably muddled.

Now, the new plan of wavelengths has defied these facts and has sought to achieve a paper compromise by sharing waves between stations. Nearly all the British Regional waves are shared. True, they are shared by very low-powered stations, not equal-powered stations. But suppose a 1-kw. station shares with Britain's Regionals—I should say that the true service area boundaries of the Regional stations would be $300 \times 0{\cdot}1 = 30$ m.v./meter.

Greatly-Restricted Range.

This makes the range of the Regional stations of the order 15 miles. The range of the 1-kw. station would be a few hundreds of yards, I should guess! What will happen? Why, the distant foreign station will put up its power tenfold and the Regionals will have to give 100 m.v./meter—occurring at a few miles from the station—to give good service, and we shall have complete chaos.

Moreover, reaching out will be very limited. No one will get the Regionals, if they live more than 15 to 20 miles from them, free from interference.

I should have thought that the great problem of finding enough waves would have been better solved by adopting the 4·5-kc. separation for low-powered and very distant stations.

I suggest that the Regional scheme is about to be ruined. I suggest that wireless has become a farce. The sooner we find new ideas the better.

SELF-TUNING CIRCUITS

(*Continued from page* 623.)

Now the effective inductance in the plate circuit of a valve automatically increases with the frequency of the signal it is handling. It follows that the Miller effect on the inter-electrode grid-filament capacity will also change. One can, therefore, imagine an inductive output circuit so designed as to increase the grid-filament capacity inside the valve on a long wavelength and to decrease it on a short wavelength.

This occurs in the circuit shown in Fig. 1. The input circuit to the S.G. amplifier V is untuned, but the coil L is shunted by a valve marked V1, the plate of which is connected to the H.T. supply through an inductive circuit marked Z. In other words, the coil L is shunted by the grid-filament capacity C (shown in dotted lines) of the control valve V1. Now if the frequency of the signal fed to the coil L is altered, the effective inductance Z in the plate circuit of that valve will also change, and owing to the Miller effect, will in turn vary the effective value of the grid-filament capacity.

In other words, the value of the dotted-line capacity C automatically follows any change in the frequency of the applied signal, and in doing so it automatically tunes the input circuit of the S.G. amplifier V to the received signal.

Of course, without some further control the tuning would tend to adapt itself to several stations at once. To prevent this, it is necessary to use a single pre-selector or band-pass circuit coupled to the coil L, as shown in Fig. 2. This, so to speak, focuses the "self-tuner" on a definite portion of the broadcast waveband, but once this has been done all the subsequent circuits automatically tune themselves.

A Practical Application.

One practical application to be found for the self-tuner is in wired wireless systems of the kind in which broadcast programmes are distributed in high-frequency form (as distinct from being rectified before distribution) from a common aerial and "master" H.F. amplifier to various points, say, in a large hotel or residential flat. Subscribers equipped with "self-tuned" sets can then use local H.F. amplification (to make up for losses in the distributing wires) without having to bother with independent tuning control, because the sets will automatically "follow" every change in the tuning of the master set supplying the service.

MIRROR OF THE B.B.C.

(*Continued from page* 624.)

12.45.—Concert by Northern Studio Orchestra.
1.45.—Gramophone recital of records by the Berlin Philharmonic, London Symphony and Lamoureux, Paris, orchestras.
3 p.m.—John Johnson and his orchestra.
3.45.—Studio orchestral concert.
4.45.—Gramophone recital of "Tunes we all know," presented by Christopher Stone.
6.30.—Trial for the Dunmow Flitch, relayed from the Causeway Meadows, Dunmow, Essex, before Judge Colonel T. Gibbons, D.S.O., Deputy Lieutenant of Essex, and a Jury of six Maids and Bachelors.
7.15.—Reginald King and his Orchestra.
8.0.—"Suitable Songs," arranged and produced by Gordon McConnel.
9.20.—Act II of "Orpheus and Eurydice" (Gluck), relayed from Salzburg.
10.15.—B.B.C. Orchestra (Section E), conducted by Victor Hely Hutchinson.

London Regional Programme.

12.0 Noon.—Whitby Municipal Orchestra.
1.0 p.m.—Gramophone Recital of Act I of "The Mikado," recorded under direction of Rupert D'Oyley Carte.
2.0—Midland Studio Orchestra.
8.0—B.B.C. Orchestra (Section D), conducted by Dr. Adrian Boult.
9.15.—B.B.C. Dance Orchestra.

THE LISTENER'S NOTEBOOK

(*Continued from page* 624.)

U.S.A. or even our own pattern. Why was the conductor's name so shrouded in mystery? Aranka von Major (soprano) was given a publicity that was quite undeserved.

I can't imagine our Jacks, Henrys, and Roys tolerating anything of the sort. Yet Monsieur X. was the life and soul of the band, and gallantry itself to Mme. Major.

I wasn't struck with the songster. She was too casual and indecisive for my liking. But I *did* like their Teddy Brown and his xylophone.

I liked their tunes, too. They weren't "hot," and they smacked of the Boulevard. I suppose it was this national flavour that made their entire performance so palatable.

TECHNICAL NOTES

Some diverse and informative jottings about interesting aspects of radio.

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

Short-Wave Reception.

THERE is no doubt that short-wave reception is increasing in popularity, and will go on increasing. Even now, however, a great majority of radio listeners stick to the broadcast medium and long wavelengths and only have the vaguest idea of what short waves really mean.

I am afraid there is rather a widespread opinion that a short-wave receiver is in some way more difficult to operate than a broadcast set. It is true that certain special precautions have to be taken when dealing with the very high frequencies involved in short-wave working, but these are now all so ironed out that there is really nothing to be afraid of at all.

Adapting a Broadcast Receiver.

As regards distant reception, of course, the potentialities of short-wave transmission are truly amazing. America, Australia, and other distant parts of the world can quite easily be received, and with Empire broadcasting the scope of short-wave reception is still further widened.

It is a comparatively simple matter to make up a short-wave receiver, but if you do not want to go to the trouble and expense, or if you prefer to have a shot at what can be got from the short-wave bands with the minimum of outlay, why not go in for a short-wave *adaptor* which you can use with an ordinary screened-grid type of receiver. There are now several very excellent short-wave adaptors on the market which can be recommended for this purpose.

Condenser Range.

By the way, talking about short-wave receivers, if you have only a .0005-microfarad variable condenser, as used for medium-wave working, and you try to use this for short waves, you will probably find that it restricts very much the range of the dial which you can employ for tuning purposes.

It is much better to use a smaller condenser for the purpose, but if you don't want to go in for another variable condenser you can reduce the capacity by putting a fixed condenser in series with it. For instance, if you put a ·0005-mfd. fixed condenser in series with the ·0005-mfd. variable condenser, you will reduce the maximum capacity of the condenser to half, and in this way you will be able to turn the condenser dial over the whole range, instead of having the range confined to a part only of the available movement of the variable condenser.

Push-Pull for D.C.

Readers who are still on D.C. mains ask whether it is possible to get the same sort of output with D.C. valves as can be got with A.C. valves in the more general A.C.

(*Continued on next page.*)

TECHNICAL NOTES

(Continued from previous page.)

all-mains working. At first sight you might think that the average mains voltage, when this is D.C., would be rather on the low side for a really good output volume, and particularly when you bear in mind that a subtraction from this voltage has to be made where automatic grid bias is used.

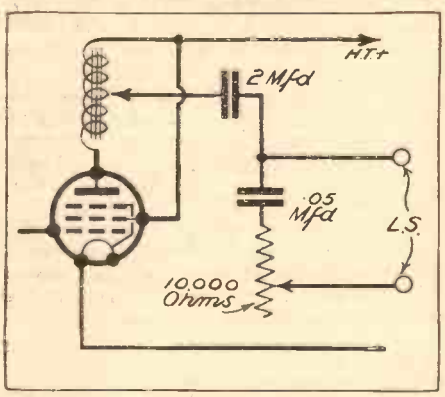
Many people, however, in circumstances such as these, use a pair of power valves in push-pull arrangement for the output, these being preceded by a single stage of L.F. amplification. For the high-frequency end it is best to use a screened-grid stage in the usual way.

The arrangement is very simple, and the only point I should mention is that it is advisable to connect some form of volume control across the secondary of the first L.F. stage transformer.

Pentode Output.

You know that with the pentode output stage, which is now so very popular, you have to take more than ordinary care about the relationship between the valve and the loudspeaker if you want to avoid distortion. It has always been necessary to consider this relationship, ever since we began to

ACROSS THE LOUDSPEAKER.



How the ·05-m'd. condenser and variable resistance are connected.

use receiving sets, and with ordinary three-electrode and power valves for the output stage, but with the pentode it becomes even more important owing to the peculiarities of this particular valve.

If a moving-iron speaker is used you are very apt to get a "tinny" quality of reproduction, owing mainly to the fact that the impedance of the speaker varies so rapidly with the frequency.

Limiting the Impedance.

One of the simplest ways to overcome this trouble is to limit the value which the impedance can reach by the use of a resistance and condenser connected in parallel with the speaker so as to control the tone. For this purpose, with most ordinary moving-iron speakers, a condenser of about ·05 microfarad may be used, whilst for the resistance a value of around 10,000 ohms will generally be found suitable.

If you have a resistance on hand which has a higher value than this there is no harm in trying it because sometimes a higher value gives better results. In any case, it must be a variable resistance or rheostat so you can easily adjust it to find the best value.

The condenser and resistance are, of course, in series with one another and across the loudspeaker. The arrangement is shown in the accompanying diagram.

Band-Pass Adjustments.

When tuning a band-pass receiver you want to pay particular attention to the series-aerial condenser because this may affect the ganging. If it does the aerial condenser should be mounted on the panel or in some other position where it can readily be got at, so that you can adjust it while tuning the set over the whole of the desired range.

You should not, however, interfere with the aerial condenser while you are actually ganging up the other condensers. When you have got them ganged you may find that the series aerial condenser causes some rather peculiar effects.

Sharpening Selectivity.

It will, of course, increase the selectivity of the receiver, but this effect may only be noticed over part of the range, whilst over some other part of the range you may find just the opposite effect, the tuning being broadened.

You may take it as a fairly general rule that if you get this broadening effect it is due to what is known as a double-hump, and this latter in turn is due to the ganging not being correct. It is very important, therefore, to have the condensers accurately ganged if you want to get the desired effect from the series-aerial condenser, namely, to sharpen up the selectivity.

Superhet I.F. Stages.

Somewhat similar considerations apply to the matching up of the intermediate-frequency stages in a superheterodyne. If these I.F. stages are not properly matched this will have an adverse effect on signal strength. In some types of superhet it is possible to adjust the I.F. coils and transformers so as to compensate for stray capacity, such as valve capacity and other capacities in the circuit.

These trimming condensers should be carefully adjusted if you want to get the very best in the way of signal strength out of the intermediate-frequency stages.

Condenser Breakdown.

You are often advised to take special care about some of the condensers in an all-electric set on the ground that these condensers have to stand the full peak

(Continued on next page.)

TECHNICAL NOTES

(Continued from previous page.)

voltage of the mains or the peak voltage of the secondary of a transformer, which may be considerably higher than the voltage of the mains in certain cases. But as a matter of fact it is not only the smoothing condensers which are subject to these relatively high voltages; sometimes quite a high peak voltage is applied to condensers in places that are not at first apparent.

Watch the Choke.

The reaction condenser used in the detector anode circuit, more particularly with power-grid detection, may have to stand up to quite a high voltage since one side of it goes to negative H.T. and the other side to H.T. positive; the fact that one set of plates goes to H.T. positive is apt to be overlooked owing to the connection being made through an H.F. choke and sometimes an L.F. transformer primary.

You will see, therefore, that if this condenser breaks down badly it may mean a shorting, or at any rate a direct connection—perhaps it is hardly right to call it a direct "short"—through the choke and transformer primary, not to mention the reaction coil. The items most likely to suffer are the choke and the transformer winding.

It is important to choose a good condenser for this position, one tested well up to twice the maximum voltage delivered by the H.T. unit.

A Reaction Dodge.

Often you will notice that the reaction on a set is too fierce; in such a case one of the simplest things you can do to get over the difficulty is to use a small variable or adjustable condenser across the detector.

This can be connected between the low-tension negative and the anode of the detector valve. It does not need to be a full-blown *variable* condenser; a *pre-set* condenser meets the case admirably, and for the maximum value of this about ·0003 mfd. will generally be about right. All you have to do is to screw down the pre-set condenser (thereby *increasing* the capacity, of course) and then gradually loosen the screw until you find you get the requisite amount of reaction effect over the whole of the tuning range. Having got things fixed in this way, you do not need to interfere with the condenser any further.

Power-Grid Detection.

In the method of power-grid detection as often used a high anode voltage has to be employed owing to the large value of the resistance in the anode circuit.

This means that you have to employ a supply giving a relatively high voltage, sometimes up to as much as 300 volts, or else you have to use a smaller value for the resistance. If you use a high voltage it means using a somewhat large and expensive battery, or set of batteries, whilst if you resort to the other alternative and reduce the resistance you are apt to lose the advantage of this method.

Avoiding Voltage Drop.

Perhaps some of my readers may not know that the difficulty mentioned above has been very neatly got over by means of special power-grid chokes which have been on the market for some little time; this type of choke gives a high impedance in the anode circuit but gets over the difficulty of the voltage drop.

An inductance of 300 henries is obtainable, the D.C. resistance being round about 3,000 ohms. A choke of this kind will carry 10 milliamperes and its self-capacity is very small; this latter feature is brought about by a special arrangement of the winding, whilst the high inductance is obtained, in very small volume, by the use of special nickel-alloy core of very high magnetic permeability.

I would advise those of you who contemplate going in for power-grid detection to look into this matter, as not only is this component a great convenience, but it will save you a good deal in the way of high-tension battery costs and space.

Adjusting Grid Bias.

Many people adjust the value of the grid bias whilst the set is in full operation; they pull out the plugs from the grid-bias battery and shift them about in order to see which tapping gives the best results.

This is a great mistake, particularly where a power stage is used, and one which may result in the power valve—the other valves as well, for that matter, but particularly the power valve—being damaged, or at any rate suffering a loss in its emission.

I dare say you know that for a given high-tension voltage applied to the anode of the valve, the actual anode current flowing through the valve is considerably modified by a suitable grid-bias voltage.

If the grid-bias voltage is removed—or, I should say, if the connection to the grid-bias battery is broken—the value of the anode current may rise very high, and this is what causes the damage to the emissive power of the filaments.

It is true that you do not as a rule disconnect the grid-bias battery for very long between trying one tapping and another, but it is really a mistake to disconnect it at all whilst the set is in operation.

A PIANO WITH MICROPHONE

Piano design has been stabilised for about 100 years, but the new Neo-Bechstein, which was illustrated on page 594 of last week's "P.W.", introduces a remarkable innovation. It has been installed in the "His Master's Voice" studios, at Abbey Road, London, for the making of records, and the sounds from its strings are amplified by valves and reproduced through a loudspeaker. The tone is similar, in many respects, to that of an organ.

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Another feature of the August number is a section that deals with the reception of foreign stations, entitled

THE WORLD'S PROGRAMMES

The pages of this section contain a wealth of information on distant stations, when to listen for them and how to obtain the best results from them.

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POPULAR WIRELESS August 12th, 1933. REGISTERED AT THE G.P.O. AS A NEWSPAPER

MORE NEW B.B.C. STATIONS

SEE PAGE 652

A Forecast of the Radio Show

Popular Wireless

ARTISTIC AERIAL MASTS

No. 584. Vol. XXIII. August 12th, 1933.

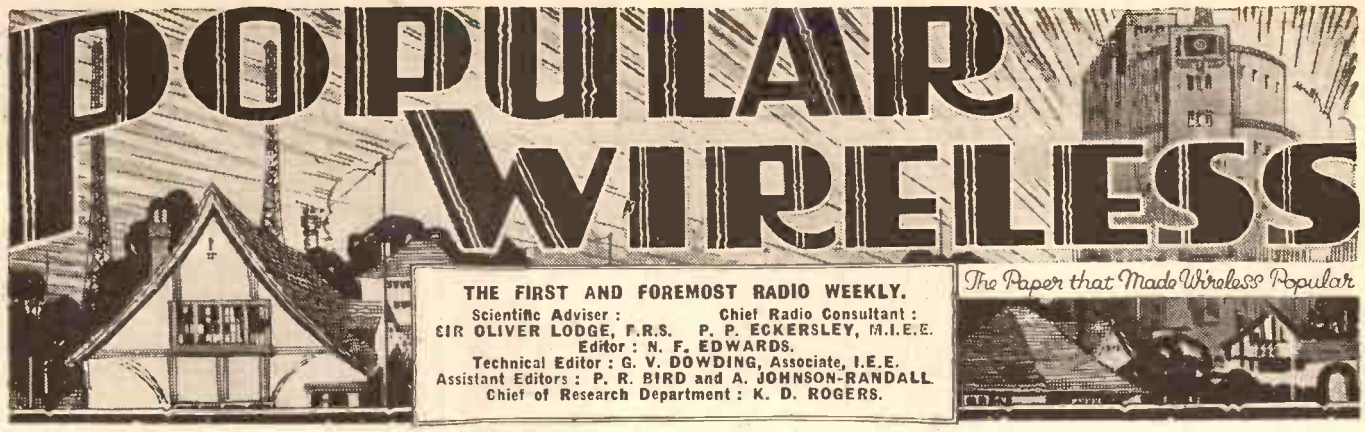
EVERY WEDNESDAY PRICE 3D

Also inside :

Radio in Arctic Areas

The Double-Diode Triode

In the B.B.C. Repair Shop, *etc., etc.*



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RADIO NOTES & NEWS

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EXPEDITING BEER!

A Listener Relaxes.

PHEW! That hot, thundery weather caused at least one listener to lose his thirst for information and to be somewhat indifferent about music, and that one was "Ariel." For me the little electrons oscillated in vain; I was recumbent on my lawn, observing the bees at work, and required neither to receive instruction nor to "suffer the slings and arrows of outrageous" overtures.

When I "listen" I like to do it intellectually, not to have a stream of talks and music as an audible background to a chat with friends or family, or to lull me to sleep over a book and a pipe. In heat waves I do not feel intellectual. I want to watch my beer and birds.

A Scribbler Wakes Up.

BUT I must pull myself together. All round me the great radio world, which is my life's arena, buzzes with toil. Great exhibitions are being organised, factories hum, "radio critics" are fashioning darts for the B.B.C.—much the B.B.C. troubles!—handsome men smoking pipes are being photographed for advertisements of receivers, and Eric Maschwitz is far afield, chasing talent.

The bees have clocked off and the birds are deserting the garden with their beaks full of daddy-longlegses for the babies. A tinkle of teacups far up the garden sounds as delicious as "the horns of elfland faintly blowing." Let's go and sample the new raspberry jam, for the Radio Exhibition is calling—next week.

Poly-lingual Radio.

AT Stockholm, as I write, the great World Power Conference—electrical power—is sitting, and power engineers from all parts are reading or hearing papers on aspects of their profession, mathematical, practical, economic, governmental, and so forth.

An ingenious radio-telephone is being used in connection with these proceedings, by means of which, provided interpreters are available, transmission is effected simultaneously in several languages, each language being allocated a special wavelength. The corresponding receivers are set respectively to the "tune" of each transmission.

Radio Ads. Discouraged.

I UNDERSTAND that, on account of complaints to the French authorities that French stations are being largely used for broadcasts of English interest by the commercial sponsors of certain programmes, there is a probability of "Radio-France" ceasing those light programmes which for many people made a welcome change from the B.B.C.'s Sunday output.

On general principles I am not sorry about this; the thin end of the wedge of the commercial exploitation of broadcasting has been coming too near home for my liking. Better the B.B.C. than "Boocher's Best Candy."

37,000 Musicians in One Concert.

GRAMOPHONE lovers will gloat when they hear about the concert which H.M.V. provided for the delegates to the World Petroleum Congress at its opening reception at South Kensington. Music of over twenty nations was played by an electric gramophone, and it is estimated that music by 37,000 musicians was heard!

The records were selected from that wonderful library at Hayes which contains a copy of every H.M.V. record made since 1897, representing almost every language and dialect in the world. Indian nose-flutes and African toe-harps contributed to the concert.

American Correspondent.

IF this should meet the eye of Mr. R. A. Pierson, 5406, Winthrop Avenue, Chicago, Illinois, or of one of his friends, he will learn that, in response to his request for English correspondents, a Bromley (Kent) man wrote to him in May and has since sent him radio journals, enclosing his card—all of which has brought no reply or even acknowledgment from Chicago.

Now, Mr. Pierson, the next move is yours, please.

Rural Radio in Italy.

THE Italian Chamber of Deputies has decreed the establishment of a rural broadcasting organisation for the purpose of spreading general culture and also rural instruction.

A committee representing the Government, the workers, and the radio trade has been formed, and the "trade" will be approached in regard to the necessary supply of receivers. Rural nights: Marconi and macaroni.

Duke Ellington.

A KENSINGTON reader takes me to task very severely for my reference to tom-toms and hullabaloo in connection with Duke Ellington's band, and because I drew my conclusions from a three-quarters of an hour broadcast.

We must agree to differ. My correspondent, who is evidently a "hot-number" enthusiast, should not, however, read into

(*Continued on next page.*)

ARIEL CONTINUES HIS RUNNING COMMENTARY ON RADIO

my words any criticism of the *execution* displayed by this band, which, I suppose, must be superior, else the band would not have achieved its popularity. I simply do not like the pieces which I heard it play.

Swiss Broadcasting.

DURING 1932 the number of licence-holders increased by 81,000, making a total of 231,397. It is estimated that the radio listeners of Switzerland amount to about 700,000 out of a population of 4,000,000, which is roughly the same proportion as obtains in Great Britain.

If the yodellers and goat-herders did not oppose radio, doubtless radio would flourish even more in Helvetia, where a licence costs 15 francs.

Artificial Atmospherics.

JUST imagine! The Post Office received over 20,000 complaints of electrical interference with broadcast reception during the period April 1st, 1932, and March 31st, 1933—nearly 1,700 a month. The P.M.G. estimates that he will spend £51,000 on fighting man-made static this year—say £2 10s. per complaint.

In view of these figures no man can justly say that the Post Office is not facing up manfully to the evil—at the expense of the taxpayer.

New Television Device.

DR. V. K. ZWORYKIN, a very well-known American research engineer, speaking before the Institute of Radio Engineers last month, described a new principle which, he claims, will render unnecessary all mechanical parts, scanning discs, motors, sources of light and optical systems previously used for television.

The new invention, the Iconoscope, contains an artificial eye consisting of 3,000,000 photo-electric cells in a space of 20 square inches, each cell being visible only under a microscope. This is the transmitting part, and the receiving part is called the kinescope, the chief element of which is a cathode-ray tube.

A Job for the Duke.

A *DAILY MAIL* correspondent reports that native chiefs in the Upper Congo region have asked the Governor to instal a radio transmitter there. But this must not be taken as a sign of a yearning for culture. Far from that!

The explanation is that there is an increasing scarcity of tom-tom players (due to the increase of American dance bands, eh?), and the natives are sinking into melancholy.

The chiefs think that a tom-tom might be thumped before the microphone and be reproduced on radio receivers in the villages, thus bringing back to brooding Africa some of its erstwhile gaiety.

Jubbo Le's Me in For Trouble.

IN my last wrestle with my Jubbo problem I referred to piano-tuners as hypercritical. It seems that thereby I shot an arrow into the air which descended into a piano-tuner named Stewart, o' Glesca.

That worthy ("I bear a king's name," quo' Alan Breck Stewart) tells me, in revenge and kindness, that the following are useless for house reproduction: (1) any instrumental ensemble above a sextet; (2) any choral combination above a quartet; and that piano-tuners will be privileged persons in a paradise abounding in harps.

Despite all this, what piano-tuner would be worth his salt, or parritch, were he not hypercritical? R. R. S. (Glesca), I thank you for defining the scope of the B.B.C.

SHORT WAVES

A competition was held at a London fête to discover the man with the loudest laugh. The winner was presented with a permanent seat at the B.B.C. vaudeville studio.—"Punch."

* * *

A Watford resident says he has three chairs which go back to George III. We've got a wireless set which will go back to its makers if the instalments aren't kept up.

* * *

First Housemaid: "Is the professor absent minded?"
Second ditto: "Is he? Why, last night when the baby cried he twisted its nose to eliminate the static."

* * *

"Is it not time the word 'wireless' should be changed?" asks a contemporary. Quite time, and not only the word either!

* * *

Amateur Scientist: "Sorry I can't join you, old man. My wife has gone to her mother's, and I promised to sit at this television transmitter every night until she returns."—"Punch."

* * *

Engine Driver (demonstrating home-made set): "Yes, I made it all myself."
Candid Friend: "There's no doubt about that, old man. It whistles at every station, just like the down mail."

"P.W." on Top of All.

SOME weeks ago I said that during my holiday I would place a copy of "P.W." in an unique position in the British Isles. I gave a clue, but nobody guessed right.

I now have to report that a copy of "P.W." was fastened by me to the ruined observatory on the summit of Ben Nevis, the highest mountain in Great Britain, 4,406 ft. high. So "P.W." has yet another claim to be on top of all other radio papers.

I only hope that there is no competition, for if some competitor should plant itself on Mont Blanc I can see myself being ordered to join the Everest Expedition.

Failure of a Photograph.

ALTHOUGH the weather had been blazing sunshine during my ascent of Ben, I found it cold enough on top to maintain two feet of snow. Immediately I arrived the sun was obscured by black clouds, so that I was glad to huddle up in my alpine cloak while I bolted a few sandwiches.

When it came to photographing the famous copy of "P.W." in its exalted position I found three of my fingers completely numbed; this made focusing tricky work, and I am sorry to say that I doubt whether the picture is suitable for reproduction. However, I have given the Editor a print as evidence.

Broadcasters, Be Cautious!

PEOPLE *are* so literally minded! I find a warning to prattling broadcasters in the story told by Fred Stone, a popular U.S.A. broadcasting humorist.

He tells how, when he first broadcast, he remarked, at the close of a Chinese song, that listeners might send him their laundry and he would have it washed. The dire result was that he had to pay a laundry bill of 26.50 dollars.

Some joker sent him a cuff from California—and he was in Chicago!

Transmissions to Schools.

HAVING received the syllabus of the broadcasts to schools for 1933–34, I am bound to take my usual tilt at this time-and-money-wasting irruption into the stern business of fitting the younger generation to earn a living.

Your child may have his arithmetic lesson docked in order that he may hear a lecture on "The Tokugawa Shogana" or "From Ordeal by Battle to the Police-Court." His teacher may probably have to stop explaining to him how to work out percentages in order to provide time for him to listen to talks on "Watching the Earthworm," "Pairing Birds" or "How to Stand and how to Sit."

It's high time that this tragic comedy was stopped by the competent authority.

Beer by Radio.

THE U.S.A. is really far more interested in beer than in such a *dry* matter as economics. Even radio has been enlisted in the cause of ensuring a prompt delivery of the bottles which quench thirst, but which do not easily inebriate.

A New York brewery has set up a fleet of 100 ten-ton trucks fitted with short-wave radio sets; these trucks cruise around and deliver as ordered by the transmitter at the brewery, until their stocks have gone, thus saving time and petrol and preventing impatience on the part of dry New Yorkers.

ARIEL.

WHAT YOU WILL SEE AT The WIRELESS EXHIBITION

FOR the last two or three months the radio industry has been feverishly working behind sealed and guarded doors. Two hundred or more factories have been transformed into bustling hives of secrecy.

And now, at last, this highly sheltered activity is about to reach its climax.

Next week at Olympia the British public will have the opportunity of seeing ten thousand and one secrets simultaneously disclosed.

A Wonderful Display.

There are cynics who maintain that one exhibition is just like any other, and that this yearly forgathering of forces at Olympia is nothing but a periodic display of current models.

But although there have been many previous radio exhibitions, each with its major and minor surprises, we are of the opinion that this year's show will transcend all its predecessors.

New circuits, new components, new accessories and new prices will all combine to create an unparalleled display.

We have been privileged to share to a large extent the confidences of the majority of the radio manufacturers concerning their plans, and so we are in a position to give a complete and authoritative summary of the new apparatus and new policies which will be introduced at Olympia.

However, to tell the whole story now would be an unfair anticipation of the events.

Therefore we shall confine ourselves in this article to a general survey which, we trust, will serve to whet the appetites of readers and make them eager to visit Olympia, or, if that is impossible, to do the next best thing and read all about it in POPULAR WIRELESS next week.

Stand No. 11.

First, a few words about our own contribution to the show. We are making a very special effort this year, and we confidently believe that visitors will consider our stand worth any journey to visit.

We regard the exhibition as the one golden opportunity in the year to get into really personal contact with our readers.

So we not only make a practice of providing interesting exhibits for them to examine, but also staff the stand with experts capable of dealing with any radio queries which might want unravelling.

You can come along and discuss any aspect of home radio with us without placing yourself under any obligation whatever, and, needless to say, there are no fees to pay.

You Will be Welcome.

Even if this is the first number of "P.W." you have ever purchased, do not hesitate to take advantage of our offer on that score. Old friends will be very welcome, but we do not discriminate, for we always hope in the course of time to transform new readers into "regular subscribers." And this by constantly improving the contents of "P.W." and by maintaining unflagging interest in them.

As to the actual exhibits on our stand this year, we propose to say nothing now, except that they will form an exhibition in themselves, and that, among other things, original models of all the many important set designs described in "P.W." this year will be on view.

We fancy that those who, faintly or otherwise resembling the above-mentioned cynics, go to Olympia expecting little but a kind of glorified version of any present radio-shop window are going to have a pleasant shock.

Basically Novel.

They will find that in literal truth the face of radio has undergone a marked change.

The new sets look new, both as regards their appearances and their technical specifications.

It must be admitted that in the past it has once or twice happened that many of the "show-release" receivers have been nothing much more than slight modifications of previously current designs.

But this year a great proportion of the sets shown will be basically novel in conception.

There will be many more battery sets than hitherto. It was obvious to all informed critics that the industry had concentrated too much on mains apparatus.

The result was that, while the market became flooded with A.C. and D.C. gear, the battery user was seriously neglected.

For the Battery Man.

Anyway, at this year's show the battery man is raised to parity with those who have access to power-supply mains. Indeed, we are inclined to consider that battery sets constitute the major attraction at Olympia: if not in mere numbers they certainly do in technical interest.

For example, it is many years since there has been introduced such a revolutionary development in reception technique as "Class B" amplification, the system which enables a battery set to achieve "mains output" with an astoundingly economical demand on the H.T. battery.

A large number of sets will appear at Olympia with "Class B." But it must not be thought that Q.P.P., born only a few months ago, is dead. Far from it; it is to be revived at the show in such a way that will convincingly prove its virility.

It won't be quite the Q.P.P. with which readers are no doubt familiar, but an up-to-the-minute revision of the scheme having

(*Continued on next page.*)

HIGHLIGHTS OF RADIOLYMPIA

OPENING DATE	*HOURS*	*CLOSING DATE*
AUG. 15th	**11 a.m. to 10 p.m.**	**AUG. 24th**

"CLASS B" IMPROVEMENTS—THE HEXODE—AUTOMATIC CONTROL OF VOLUME—PORTABLES AND MIDGETS—MULTI-MU VALVES—IRON-CORE COILS—PERMEABILITY TUNING—PRICE REDUCTIONS

THE FIRST FOR CONSTRUCTORS!

Among the many noteworthy exhibits at Stand No. 11 is the First Cathode-Ray Television Viewer for constructors, the cabinet for which is here shown in course of construction in the "P.W." Research Laboratories.

WHAT YOU WILL SEE AT THE WIRELESS EXHIBITION

(Continued from previous page.)

very definite advantages and a worthy rival of what we know as "Class B."

There will be a considerable number of super-heterodyne sets on view, and you will find some of them to be simply breath-taking combinations of circuital and operating advancement.

The Hexode valve makes its first appearance in this country in this connection. With this new multi-electrode valve the oscillator and modulator functions are accomplished within the one envelope without there being any undesirable interactions of the processes.

Automatic volume control is another innovation which prominently figures in these modern supers, but it will also be met in numbers of the "straight" sets.

"Shadow tuning" is a feature that makes its bow to the British public, although this ingenious invention is being applied in a variety of manners.

This is one of the things every visitor should make a very special point of examining, because it is something that can be appreciated by the eye and does not necessitate a technical concentration of thought for its beauties to be realised.

There won't be so many midget sets on view as has been predicted. But there will be some, and no doubt they will occasion attention in view of the ingenious compression methods adopted.

More Portables.

Rather more portables are making their appearance than at the last show, and here again "Class B" is prominent. Indeed, there is little doubt but what "Class B" amplification has given added life to the portable.

One of the most potent arguments against this type of set has been that it could not compete with the portable gramophone, quality for quality, in robustness of sound production.

With "Class B" all the volume needed for the widest of open spaces is provided, and it is not necessary to have heavy and bulky H.T. batteries.

Valves constitute one of the most attractive elements of the exhibition. No longer do they require artifices in their presentation in order to command visitors' attention. Gone is the time when there were only three different types—H.F., Det. and L.F. and Power—and a wearying duplication of makes.

Valve Developments.

Nowadays the valve comprises the keystone of numerous circuit novelties. To mention only a few of the tubes which, both for their construction and potentialities, deserve special inspection, there are the variable-mu S.G., the multi-mu pentode, the "Class B" and Q.P.P. types, the Hexode, the double-diode triode and double-diode pentode for automatic volume control, and the all-metal valve.

There will be hundreds of these special new valves displayed, and ample opportunities to examine them at close quarters. It is an opportunity not to be missed, for they are marvellous pieces of work.

Even those whose knowledge of mechanical and electrical matters is slight will be amazed that such compacted medleys of intricacy can be manufactured by mass-production methods.

Many Problems To Solve.

Equally, experts will admire them the more knowing as they do the problems that require solution, and the precision of design and assembly required to render the feat possible.

Minute fractions of an inch, dimensions that by comparison make a cigarette paper seem thick, must be worked to without deviation in order to retain a workable fixation of characteristics.

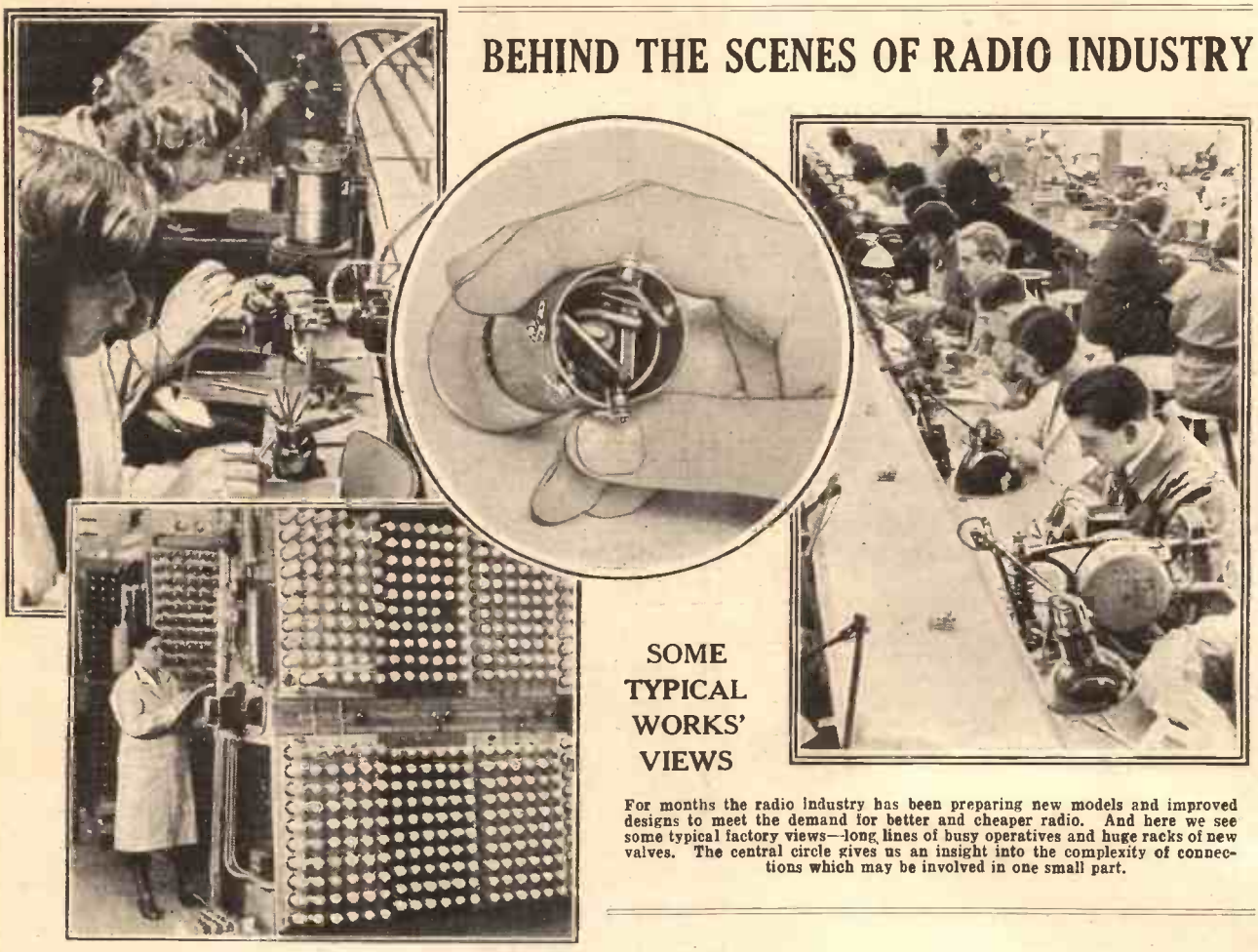
Tremendous Advances.

But reserve a measure of admiration for the ultra-modern loudspeakers on view. Think of the crude, trumpet-like devices of yesteryear when your eyes fall on moving-coil models of a quarter and less the price.

Nowhere has there been greater advancement than in the progress of the loudspeaker. It would seem that the whole gamut of the arts and sciences has been focused on it in the successful attempt to

(Continued on next page.)

BEHIND THE SCENES OF RADIO INDUSTRY



SOME TYPICAL WORKS' VIEWS

For months the radio industry has been preparing new models and improved designs to meet the demand for better and cheaper radio. And here we see some typical factory views—long lines of busy operatives and huge racks of new valves. The central circle gives us an insight into the complexity of connections which may be involved in one small part.

WHAT YOU WILL SEE AT THE WIRELESS EXHIBITION

(Continued from previous page.)

bring perfection of sound reproduction within the reach of all.

However, there are not likely to be any great loudspeaker surprises at the exhibition; in view of the present pitch of perfection attained and the really extraordinarily low-price levels maintaining, it is hardly possible that there could be.

Nevertheless we must hasten to add that several manufacturers are introducing new models, incorporating new ideas that everyone contemplating the purchase of a 'speaker should make an effort to inspect.

Iron-Cored Coils.

And now we come to components. It is going to be a grand exhibition for the home constructor. We hardly know where to start in telling him what he is to have placed before him.

Iron-cored coils? Yes, we think these top the list. Undoubtedly it is to be an iron-core year for the man who "rolls his own." We see no alternative; we don't think there is need for an alternative.

But those who think an iron-core coil is merely a spiral of wire with a lump of metal in the middle of it are due for an eye-opener.

We will leave it at that!

Permeability Tuning.

At the time of writing we have no definite news as to whether manufacturers will have permeability tuners sufficiently advanced in production to exhibit. They will show them if it is humanly possible, and it is an item to be looked out for as you stroll around.

Permeability tuning is coming: in a great wave that may sweep all before it. That is common knowledge; but what we don't know is whether the wave is going to be weeks or months in coming!

On the other hand, that all-conquering "Class B" is here in all its glory. We have already referred to it several times; it seems to pervade every aspect of radio.

The constructor will be confronted by it at every turn. He will see "Class B" converters for adapting existing sets; "Class B" chokes and transformers; yes, and special H.T. batteries for "Class B" sets.

Variable condensers form some of the prettiest of all the exhibits. There is nothing, electrical or mechanical, that is more pleasing to the eye and more pleasant to handle than a well-made variable condenser.

And what a variety of types there are! Drum drives, disc drives, gangs and singlets. Stationary, full-view scales and scales that move. Every taste and requirement catered for in a dozen different ways.

Complete Units.

Then there will be a number of "packs" on view: complete bandpass tuning units, complete with matched coils and condensers and switches, all ready to drop on to a baseboard and requiring the addition of only a few other components and wires to form a first-class set competitive in performance, and very competitive in price, with the best of de-luxe commercial sets.

As to the smaller items, there is so much deserving of notice among the new potentiometers, fixed condensers and other such components that we have no space to detail them this week. But in our next issue you will find them all given the prominence they merit.

And when you note the prices of these new-season's components you will marvel at the value-for-money bargains radio offers to-day: prices that represent an absolute rock-bottom level that could only be reached by virtue of large-scale production on the most scientific lines.

So keenly are this year's components priced that it is inevitable that any movement of raw-material costs will be reflected almost at once.

Therefore, as there is already an upward trend in these "commodities" (they may never reach such a low level again), it is clearly advisable to buy everything you may want as soon as possible.

We believe this is generally realised, and for that reason Olympia may be the greatest buyers' exhibition yet. It is a pity sales are not permitted, for if they were it would probably become the world's greatest shop!

Anyway, it is at least a shop-window—a very entrancing shop-window, with the glass removed and all the goods exceptionally well displayed. Additionally, there is a vast entertainment aspect, every stand vying with all the others to give the most intriguing and informative display.

On top of all that there is the B.B.C. exhibit—the great concert hall where radio stars will make personal appearances—and many other alluring attractions.

Yes, the "Show" is certainly a magnificent event: it always has been since the very earliest years of broadcasting; but it grows and grows in size and quality of content, and, without any exaggeration at all, we can honestly say that this year it will be better than ever.

A Variety of Designs.

Radio enthusiasts of every grade and description will find plenty to interest them. Those who are merely listeners and know nothing about the technicalities of radio, and do not want to know anything about them, will be able to enjoy the show nearly as much as the most enthusiastic "fan."

They will be able to see sets built into an infinite variety of cabinet designs conforming with every type of furnishing.

And we are sure they will be amazed at the progress radio has made even in the last year in this respect. Walnut, oak and mahogany, all the popular woods, are represented in such a way that proves Britain has retained her mastery of the cabinet maker's art, and that it has been enthusiastically and artistically recruited in full strength to radio.

Really Durable.

They will also see whole cabinets cunningly moulded in that modernistic material, bakelite: non-warping, as tough and hard as metal and as soft in lustre as the various high-grade woods it is made to imitate.

And they will be able to marvel at the manner in which the controls of the most advanced and powerful of sets have been brought to within the handling powers of the inexpert.

As for the home constructor, as we have already indicated, he will be absolutely in his element. With his knowledge of the whys and wherefores of wireless, Radiolympia will be to him a wide-open volume of delights.

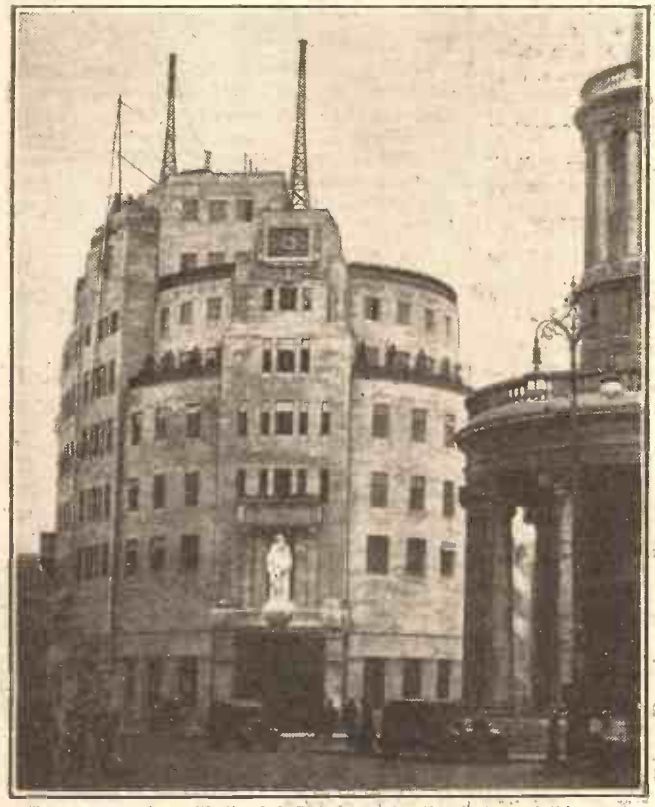
It is his chance to explore the whole intriguing world of radio.

Some of the sets may look rather similar to the uninitiated, but to the knowledgeable they will be the most diversified of objects.

It has been said that there are one thousand and one different ways of arranging a four-valve circuit. We believe this is an underestimate.

Anyway, the home constructor at Olympia will be eagerly peering behind the panels of the hundreds of sets on show in an attempt to arrive at averages of circuital dispositions.

WHAT THE B.B.C. IS DOING



Close co-operation with the B.B.C. is one attractive feature of this year's Radio Show, and Broadcasting House is to take many of its variety and revue programmes direct from the huge concert hall at Olympia.

Short-Wave Notes By W.L.S

A weekly chat by our popular expert, dealing with 5-metre reception and many other interesting aspects of current short-wave practice.

MY busman's holiday is drawing to a close, and I must confess that I am not particularly enjoying the idea of settling down again to a staid existence in London. "Radio run riot" has been the order of the last few days, particularly in connection with five-metre work.

On a recent Sunday three cars might have been seen pulled up in the main street of a small Yorkshire town. From a café opposite the respective owners watched with considerable amusement the antics of the local residents.

One car was unashamedly "non-radio." The next attracted attention by virtue of a fishing-rod poking up at the rear, with a queer-shaped aerial going down through the sunshine roof to the business end of some remarkable-looking five-metre gear.

Five-Metre Freaks!

The third car was equipped with a contraption that would have delighted the heart of Mr. Heath Robinson. A transmitter reposed in the dicky seat, with two "quarter-wave" aerials poking out therefrom. The said aerials, being some four feet in length and not particularly rigid, were anchored on various bits of string tied from the dicky to the front doors.

"The Birdcage," on the move, was a sight for sore eyes, particularly when the operator got into the dicky and nearly strangled himself between quarter-waves and clothes-lines.

But these various contraptions all worked, and the two radio cars kept in touch with one another while actually driving along, although the I.C.W. transmission from "The Birdcage" was only maintained by keying a buzzer with a tyre lever.

We have come across several freaks in connection with five-metre work. Just as some of the Surrey transmitters have found it impossible to work from Blackdown to Hindhead—a distance of three miles at the most—although they could maintain communication from Blackdown to the Devil's Dyke, a matter of thirty-five miles, so we find three miles the absolute limit in some places.

"It Seems All Wrong."

Readers who know Sledmere memorial, near Driffield, will realise that this spot should be ideal for ultra-short-wave work. Yet a perfectly good transmitter on the highest part of the ground could not be heard on five metres for more than half a mile in each direction.

As soon as I have finished writing these notes I am going back to Sledmere to search for snags, because it seems all wrong. The mobile receiver camped out on several hills from which it could actually *see* the car on which the transmitter was mounted, and yet couldn't hear a sound of signals.

The receiving party made a precipitate return, being convinced that the transmitter had broken down; but they found everything operating to schedule and someone actually in the act of calling them.

The Home Station.

Our headquarters, unfortunately, are very near sea level, and the home station, therefore, has not much of a range. Three miles out of the town there is a long, gradual ascent, at the top of which signals and telephony are R9, but as soon as the receiver goes down over the brow of the hill everything disappears.

On the next hill, somewhat higher and two miles farther on, there is not the slightest trace of anything, although the smoke of the "home town" can still be seen. "Quasi-optical" waves seem to become truly optical in their behaviour when they are started off from a low-lying spot.

So much for five metres. On the other bands nothing of particular note has been happening, and conditions seem to maintain their mediocre level. In Scarborough I heard one of the 49-metre Americans at 9 p.m., which seems a bit early for this time of year, and may indicate an improvement in the reception level.

Some Interesting Letters.

J. B. M. (Glasgow) reports extra-good stuff from Radio Maroc, Zeesen and Moscow, which doesn't look as though the D X has been very good up there.

H. N. (Wallingford) reports reception of a commentary on the arrival of the Italian armada at Chicago, relayed through W 8 X K. He wants identification of a station near 40 metres, giving the call "Americano Espano," received at midday.

Tidiness Pays.

The same H. N. wants a cure for hand-capacity effects, which still trouble him, although he has taken all the known precautions against them, and has gone farther still with extension handles and the like. I should suggest, H. N., that you pull the set to bits and rewire it with the components in slightly different places. It may be one of those unfortunate freaks that we sometimes meet.

The time seems to be opportune for me to point out that untidy wiring is definitely *bad* in almost any short-wave set. Long, straggly loops of wire, whether in the important parts of the circuit or not, can cause untold troubles. I have recently brought up signal strength 100 per cent on a friend's receiver, simply by taking everything off the baseboard, cleaning it and rewiring, without altering the position of a single part.

A short-wave set should always look nice, inside and out. It may not really matter, but, on the other hand, it *may*, and the chance isn't worth taking.

It seems, also, to be definitely worth while to dismantle a short-waver once in a way, simply for the purpose of cleaning the components. All my sets have deteriorated slightly by the end of a year, if not considerably before that. Sets should be worked with the lids closed, as dust is the greatest enemy of all, particularly if the constructor of the set is a bit clumsy with his soldering flux.

What About It?

Perhaps someone will work out the average number of miles that a set can cover before it needs decarbonising!

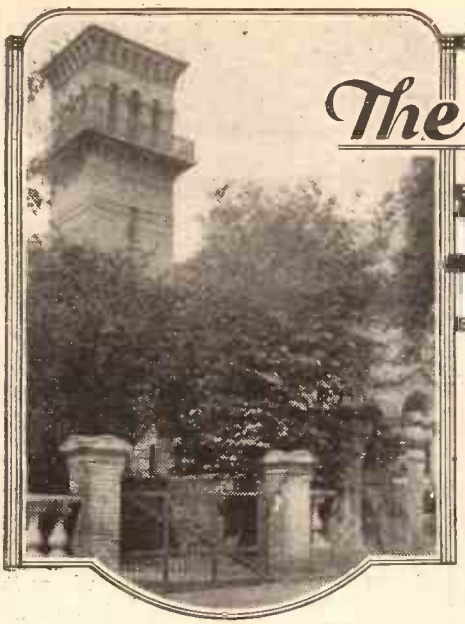
Incidentally, many short-wave enthusiasts look with derision on sets housed in cabinets. Apparently they don't realise that the chief merit of a cabinet (if it is kept closed) is the way in which it "dust-proofs" a set.

Another point that is not always looked after is the rigidity of the front panel with reference to the baseboard. If the slightest movement is allowed to occur here, the pressure of the operator's hands on the dials may easily cause a small change in frequency by shifting one of the wires leading back from the condensers to the coils and valve-holders.

Many so-called hand-capacity effects are really due to "sloppiness" in the wiring.

NAVAL SHORT-WAVE EXPERTS

The British Navy has taken very kindly to short-wave wireless on account of its low-power long-distance possibilities. Here are some of the wireless operators of H.M.S. "Hood" busy on receiver construction.



The B.B.C. REPAIR SHOP

Our Special Correspondent pays a visit to the B.B.C. research laboratories at Clapham and describes how a competent staff of engineers is constantly engaged in improving the technique of broadcasting.

THE other day, at the special invitation of a Broadcasting House engineer to whom I had been complaining that the Research Section hides its light under a bushel, I slipped into the car and went down to investigage the Clapham Research Station.

"What happens at Clapham?" has long been a leading question. The people at Clapham are quiet workers. The Press is not usually informed of developments there. The only certain fact was that the famous Avenue House was the hiding-place of the Outside Broadcast van when it was not out on business, and that all the new Outside Broadcast schemes were born in King's Avenue, Clapham.

No Need for Secrecy.

So there was a natural raising of eyebrows when the B.B.C. took over a new house for research in Nightingale Lane, in the same district. People asked what new plans the "hush-hush" engineers were contemplating.

I see no reason why there should be any secret about the Clapham research work, especially as it is of such vital interest to all listeners.

The "powers that be" behind the Clapham activities include Messrs. H. L. Kirke, Howe and Walker—Walker, that is, of the old amateur transmitting days, who had a once-famous amateur station and a world-heard call-sign.

Many of the B.B.C. junior engineers are put through their paces at the Research station, too.

Seven-metre Research.

The Avenue House branch of the Clapham Research is still nominally the B.B.C. Transport Headquarters, but actually a garage near Broadcasting House has been acquired, and that is where most of the engineers and Outside Broadcast vans spend their few idle days.

New circuits are worked out at Clapham for the seven-metre apparatus, the Tatsfield short-wave relay receivers and for the ordinary station control panels and amplifiers. Pep is put into old sets, and as a general rule all faulty gear is put right at Clapham, especially if the breakdown is a technical one.

B.B.C. valves are always tested before being put into sets or amplifiers. They cannot risk a sudden filament breakage or a loss of emission in a valve in the control-room, and so each valve is ticketed with a tag showing its date of test, the result, and the date when it should be changed.

Special Valve-testing Panel.

This work is done at Clapham, where a special valve-testing panel has been built for the job. It is not a tricky job, nor does it come strictly under the heading of research; but it is vital, and helps the B.B.C. to keep its breakdown time down to less than 1 per cent.

When a technical fault is spotted in a set or an amplifier it is replaced by its duplicate ("two of everything" is the engineering motto in the control-room) and the faulty job is sent to Clapham.

New Types.

The actual snag is put right, but, what is more important, the research engineers get to work, and if it is a fault in design that has caused the breakdown, then the experts build a new type without that particular weakness.

The work of Kirke, Howe and the others ranges from the design of new speech amplifiers and Outside-Broadcast control apparatus to special sets for seven-metre work and television. The actual sets for the seven-metre checking were designed *and built* at Clapham. Sometimes only the original hook-ups are planned there, and then contractors make up the duplicates.

New ideas? Clapham is budding with them. For years the Outside Broadcast engineers carried banks of high-tension accumulators for their amplifiers. Simply because the local mains supplies were said not to be reliable in every case.

The batteries were reliable but bulky. It appeared ridiculous to have banks of batteries in places like the Queen's Hall. Mains-driven amplifiers would do if one could be designed to give huge amplification without hum.

Mains-driven "O.B." Apparatus.

A few years ago the engineers were seen outside the Langham hotel carrying a huge coffin-like box. It was one of the new mains-driven "O.B." amplifies. Needless to say, it was designed at Clapham.

Some of the Clapham-designed sets are not unlike the outfits of the average listener. After one Boat Race the Research Engineers set themselves the task of building a new short-wave receiver for picking up the broadcast from the launch "Magician."

It is just a good amateur short-waver. It is a four-valver, having one screen-grid stage, a leaky-grid detector, a resistance-coupled intermediate stage and a power-valve transformer coupled to the standard microphone amplifier. It uses a variable-mu valve with hand-operated bias control from a 10-volt battery. There are ganged pre-detector volume controls to cut down fading.

It is typical of the Clapham designs—simple, with no "frills" that the German engineers would add, but just sufficient for the job in hand.

Captain Eckersley designed a volume-indicator known as the "slide-back," or, even if he was not the actual designer, he

(*Continued on next page.*)

A JOB FOR BOTH HANDS

Behind the control panels at Broadcasting House there is an intricate mass of wiring which often requires examination. The engineer employs an ingenious inspection lamp, which keeps both hands free.

PUTTING A FINISH ON YOUR CABINET

A simple method of giving a professional appearance to home-made radio cabinets.

FROM time to time receivers and other pieces of wireless apparatus have been described in POPULAR WIRELESS which require special cabinets to house them. On all such occasions full details of how to make the cabinets have been given, but the question of finish has usually been left to the constructor's discretion.

No Skill is Needed.

The problem of giving any woodwork a presentable finish has, for most people, only one solution—french polishing. In the opinion of the present writer, however, french polishing is no sort of task for the novice. Really satisfactory polishing by this method calls for a degree of skill only acquired after considerable experience. While ability to french polish may be regarded as a valuable asset to any handy man, few wireless enthusiasts are likely to have the time to educate themselves in its methods.

Fortunately, however, there is one method of polishing woodwork, admirably adapted to the treatment of wireless cabinets which requires no skill at all. The process is known as wax-polishing.

Superior Results.

In the opinion of many people, the finish obtained by wax-polishing is far superior to that given by french polishing. The effect can best be described as an exceedingly rich, eggshell gloss quite unlike the (to some people) "showy" appearance of french polishing.

The preparation of the polish is simplicity itself; the only ingredient required being ordinary yellow beeswax and turpentine. If economy is a consideration, passably satisfactory results may be obtained by substituting good quality paraffin wax for the beeswax.

Beeswax is sold in cakes, and this is shredded, as finely as possible, into the "turps"—about a pint or a little more for a medium size cabinet. The wax takes rather a long while to dissolve if the turpentine is cold. Heating accelerates the process, but great care is needed, as turpentine is very inflammable. Enough beeswax should be dissolved to make a product about the consistency, when cold, of butter on a hot summer's day.

Apply With Cheap Brush.

Having prepared the polish, apply it to the job with a cheap painter's brush. Be *fairly* liberal and distribute the polish as evenly as possible.

All that is now required is friction—and plenty of it. The friction is applied in three stages. First of all, a piece of very coarse rag is employed, and with this the job is rubbed briskly until some suggestion of a polished surface begins to manifest itself. You can rub any old how, no skilled manipulation of the rubber being required as in french polishing.

Like Polishing Boots.

The next stage requires a brush of the type used for polishing one's boots and shoes. The brush is, in fact, manipulated exactly as if one *were* polishing a leather boot. Most readers will be familiar with the method—those who are not can probably afford to pay for their cabinets to be polished. The brushwork is continued until a real polish is achieved.

APPLYING THE "MIXTURE"

'Turps' and beeswax are the simple ingredients of the polish, which may be applied by means of a cheap painter's brush.

Finally, the surface is made as bright as possible by rubbing with a piece of clean dry linen or similar material.

As stated before, the whole process requires no skill whatever, but it *is* hard work. Each of the three stages required calls for considerable energy expenditure. There is, however, nothing critical in any of them, and it is perfectly feasible to stop at any time for a rest, or you can leave it until to-morrow if you feel that way about it.

IN THREE STAGES

There are three stages to the process. Rubbing with a coarse rag, brush-polishing and "finishing off."

It is, naturally, essential before starting to have the wood properly smoothed, as with all other methods of polishing. There is, though, no need to employ "fillers" or, in fact, to prepare the wood in any way apart from smoothing with glass paper.

The finish may be applied to any wood, the most suitable being oak, mahogany, and woods stained black to resemble ebony.

May Be Stained Any Colour.

Of course, the work may first be stained any desired colour before polishing. It is preferable, but not essential, to employ a stain which does not itself contain turpentine.

A supreme advantage which wax-polishing enjoys is that, unlike french polish, it may be "revived" at any time by the simple expedient of repeating a second time the initial polishing process.

In fact, there is no limit to the number of times a piece of woodwork may be re-wax-polished. The appearance improves with each successive polishing until, finally, a surface is achieved which, in the case of good oak, will have a life of literally *hundreds* of years.

T. B. S.

THE B.B.C. REPAIR SHOP

(Continued from previous page.)

was the first man to perfect the slide-back system for broadcasting. There are still slide-back controls on the Regional Station control desks.

One day it was realised that they were not quick enough to indicate sudden changes of volume.

A Meter for Volume.

Clapham was asked to do better. The engineers were busy for months. The Broadcasting House Chiefs had said "give us a meter which indicates nothing else but volume, which shows the actual volume by the needle reading, and which is not sluggish in action. Give us a meter which we can put anywhere in the microphone chain without upsetting results."

Successful Instruments.

At the end of the research a gadget was produced which used five valves and had pentodes in push-pull! The programme people sniffed at it, and said that it would cause trouble through being too complicated.

Clapham replied by putting the meter and its amplifier through rigorous tests. It came out with flying colours, and now *every B.B.C. amplifier stage has one of these volume indicators;* five-valve amplifier, special meter and all. What is more, they never give any trouble. Just another job from Clapham!

The Research Station has nothing to do with rest. The Kirke brigade is always busy!

TRANSMISSION ITEMS

Some interesting notes on broadcasting.

At the recent North American Wavelength Conference in Washington the most ticklish question was that of stations just over the Mexican border employing high power that swamped the neighbouring U.S. stations' service areas.

* * *

When the Lwow (Poland) station has an official announcement to make it warns listeners of this by the roll of a drum.

* * *

For indicating times of transmission it is usual to dispense with "a.m." and "p.m.," and use instead the figures 00 to 23 to indicate from midnight to eleven p.m., followed by two other figures giving the number of minutes. (Thus the times 8 a.m., 12.20 p.m., and 11.45 p.m., would be given as 08.00, 12.20, and 23.45 respectively.)

ECKERSLEY EXPLAINS-

I PROPHESY that this year's Radio Show will be well worth a visit. I think the industry is making real progress.

What are the bugbears, more or less, of present-day technique? I should say: (1) Interference of all kinds; (2) fading of distant signals; (3) lack of fool-proof operation; (4) difficulty in achieving really worth-while quality; (5) difficulty in making an apparatus that, to look at, is æsthetically satisfying; (6) expense; (7) reliability. These classifications are not necessarily made in the order of their importance. Let's see what has been and what probably will be achieved.

(1) Interference. Messrs. Kolster-Brandes have produced a type of aerial which eliminates or minimises local inter-

This week our Radio Consultant-in-Chief assumes the rôle of prophet where the Show is concerned. He reviews the present bugbears of design and discusses the schemes in use for overcoming them.

ference. This is a remarkable step forward. But, be it noted, inter-station jamming and atmospherics and oscillation interference will always be with us.

(2) The fading of distant signals is inevitable, but many sets this year will compensate for much of the trouble by the use of automatic volume controls. These have two great advantages in that, if it is getable, any station will come in with equal strength whatever its distance away. This helps under (3). But do not forget that, if a station fades right out (and they often do), no A.V.C., no clever design, will be able to minimise or get over the poor reproduction resulting.

Most Popular Set.

(3) Fool-proof operation is enormously helped by automatic volume control. The superheterodyne principle enables the performance of the set to be equal, at all wavelengths tuned to, to a greater degree than if straight condenser tuning is used. But I am sure we shall see methods introduced, if not now, then later on, which will give an equal facility for the "straight-tuned set" not using the superheterodyne principle. But illuminated and labelled scales and automatic volume control give any user who is not a moron what may really be termed a fool-proof set.

Mains operation eliminates a lot of trouble, and no firm will market sets which do not comprise a mains-operated model unless they deliberately want to forgo a large part of the market. I should say one of the most popular types of set will contain automatic volume control, a clear and labelled scale, the superheterodyne principle, all-mains operation, while the whole will be contained in one cabinet, loudspeaker and all.

The Triumphant Moving Coil.

(4) Quality. Undoubtedly quality is improving; but, alas! it's bound to be more "commercial" than artistically pleasing so long as selectivity is a *sine qua non* of successful operation. I have said once, twice, thrice and a hundred times that so long as the European plan neglects the fundamentals of technique, so long will quality be less satisfying than it might be. It looks as if we are going to say good-bye to the moving-iron type of loudspeakers in all but the cheapest sets; the moving coil has come to stay.

(5) Appearance. Here is a marked improvement. I used to inveigh against the shoddy and shapeless appearance of wireless sets, with their knobbly little handles, concealed scales, mediocre finish and general lack of proportion. Many makers will be showing models which are a real advance on past practice in this respect.

(6) Cost. Here, too, there will be notable changes, particularly, perhaps, in regard to what you get for your money. Sets between £14 and £16 will give you a refinement of result undreamed of a year or so ago. If the shallowness of a pocket makes this sum look frightening the buyer will forgo luxury rather than essentials.

(7) Reliability. The typical set of the show will be an investment for a long time, not a temporarily working bag of tricks which is for ever getting out of order. Valves have longer lives, and components are better made. Even here I think there will be a potential advance on past practice.

It is one of the satisfying things in having a reputation for outspoken criticism that, when one praises, there are no doubts as to one's sincerity. If what I have seen is typical of the show as a whole my praise to the industry will remain unstinted.

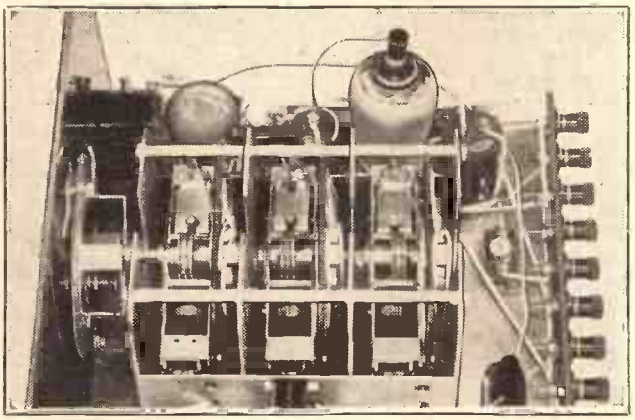
Cheaper and Better Components.

From the point of view of one who would rather make up sets at home than buy them ready made, I think—no, I am sure—that the home-constructor, too, should visit the show and be encouraged. All these advances in complete set design would not have been made without similar advances in component efficiency.

Valves, for example, if more complicated, give one an enormous enhancement of facility. I saw a valve the other day with seven plugs plus the anode connection! A double-diode pentode it was. Marvellous range of A.V.C., good D.C. to A.C. efficiency, nice high impedance—as a detector it looks like pure jam!

Variable condensers are cheaper, better made and easier to match. All components, in fact, will be cheaper for given performance, and many components will give a much better performance. Look forward, then, to "P.W.'s" new designs!

A REVOLUTIONARY TUNING DEVELOPMENT



"Look forward, then, to 'P.W.'s' new designs!" says Eckersley, "because many components will give a much better performance." "Popular Wireless" sets always lead in the use of the latest components in set designs. For instance, permeability tuning, a feature of the show, was employed in the "Nu-Tu" shown above, which was described in "P.W." for July 8th.

Don't Forget.

And at last, at long last, do not forget to go to the show. No informed radio technician can afford to stay away. Perhaps I may modify my opinion of the general level after I have seen all the sets, but I do know that the star sets alone will be worth seeing. In any case, I hope there won't be any policemen's helmets!

And a last word, don't forget to visit Stand No. 11 where you'll see the POPULAR WIRELESS sets which will be as interesting as any in the Show. Moreover the "P.W." technicians will be there to put you right on technical matters.

THE LISTENER'S NOTEBOOK

These frank jottings on B.B.C. programmes have won a name for their impartial upholding of an average listener's point of view.

Sometimes they are complimentary—because the programme deserves it. Sometimes they are caustic—for the same reason.

Always they are impartial, interesting and constructively critical.

THE B.B.C. seems fond of advertising the beauties of our green and pleasant land. One can recall a number of talks—some running into series—within the past few years on this topic.

What is the object of these talks? Is it to foster hiking and to bring British youths into line with their German cousins? Is it to attract the foreigner—particularly the foreign student—to our shores?

Or is it vanity or a legitimate pride in our homeland that makes the B.B.C. want to talk about it?

If none of these things, then it must be that the B.B.C. knows that the "British Isles" is always popular with British listeners, and so supplies the needful.

* * *

It seems only right, then, that Mr. A. G. Street should be discoursing on "Country Ways and Country Days" at the present time, and that Mr. Filson Young should undertake another of his imaginary trips across England. Most people are on holiday.

This year they are staying at A; last year they were at B; and next, they contemplate going to C. The sum total of these A's, B's and C's represents all the resorts and holiday haunts of the country.

Listeners love to hear these spoken of, especially by expert holiday-makers. Such talks bring back pleasant memories, besides keeping alive a national pride in our heritage.

* * *

Monsieur X, of the Café Colette orchestra, was *the* microphone personality recently. He fascinated me because he seemed to possess those very qualities of a Frenchman that appeal to me so. His language fascinated me, too. His apparent sincerity and gallantry—well, I needn't go on.

In striking contrast we have had Eddie Pola doing the same job as Monsieur X, but how differently! Pola didn't fascinate me. True, he amused me—but only for a time.

If "America Calling" (how tempted one is to correct this to "America Caterwauling"!) is typical of radio programmes across the pond—well, who wants to go across the pond? The penalty of the sponsored programme is too awful for anything, since the sponsored programme must have the services of an Eddie Pola.

* * *

Of course, the fact that the show was just one impersonation after another by British radio artistes doing their normal stuff means that American entertainment isn't entirely *verboten* in this country. But mercifully it is only sparingly dispensed.

Concentrated American items, as in "America Calling," are all right once in a way, but the B.B.C. can be relied on, I hope, to see that Eddie Pola isn't given too much encouragement.

* * *

It is amazing how these artistes all sing the same type of song in the same way. There is snap about their melody kings and queens—I'll grant that much; but the seriousness of the straight love-song—the sort of thing Al Bowlly sings—is really comic. Too frequent listening-in to gramophone recitals, at home and abroad, had given me my fill of Bing Crosby so that he didn't come as a novelty.

* * *

And we can't keep on laughing at Amos 'n Andy. The slow-thinking nigger amuses for a time with his drollery, but, as I say, one can't go on being amused when he doesn't say anything really funny. It isn't national prejudice that makes me compare American humour with British, only to come to the conclusion that there is no comparison.

Again, when one laughs at the American's pronunciation of "futile" and "fragile," it isn't the full-blooded laughter that's likely to end in tears, but—well, it isn't a laugh at all, really.

* * *

The "Road to Ireland" was a very informative talk, full of historical fact and legend. I don't know that I care for that car-engine accompaniment. It isn't a touring-car, anyhow, and it thus defeats its own purpose.

Of course, the road from London to Holyhead is a long one, and to mention every bit of legend associated with it is quite out of the question. But I think Mr. Filson Young might have aimed at a more even distribution.

By 8.5 p.m. (the talk began at 8) Mr. Filson Young's romantic traveller had reached Fenny Stratford, and long before 8.30 he had crossed the

(*Continued on page* 664.)

CUSHIONED CONTROL

This American control engineer found that the continual readjustments necessary in broadcasting resulted in shiny elbows—so he uses a cushion on the table!

NEW VALVES.

THE DOUBLE-DIODE TRIODE

Some facts about the possibilities of a very interesting innovation in valve design.

ONE of the most versatile valves ever produced, from the point of view of the number of circuit variations that can be weaved about it, is the double-diode triode, the Osram example of which we have just been putting through its paces in the laboratory.

As you probably remember, the D.D.T. (as it is called for short) consists of two valves in one envelope. There is a common cathode for the two sections, but while at the lower end there are two anodes and no grid (for diode rectification), at the upper end there is another anode and a grid for normal triode amplification. The valve is designed, of course, for use on A.C.

Both sections are screened from each other, so that there is no interaction between the two, and we can use the valve in a number of ways. One of the primary reasons for its design is the use of diode rectification, to avoid detector overloading and consequent distortion, while the use of the diode section for A.V.C. as well must not be overlooked.

SEVERAL USES.

On test the valve acts excellently in many capacities, though the various modes of applying A.V.C. with it naturally vary considerably in their effectiveness. One of the best methods seems to be to use the two diodes as full-wave rectifier, and then to employ the triode part for ordinary "signal" detection.

This results in plenty of potential for the automatic volume control with sensitive rectification, and a certain amount of amplification where the detector is concerned. Something has to be sacrificed, of course, and this is the purity of reproduction that could have been obtained if diode "signal" rectification had been employed. Instead, the results are comparable in purity with those obtained with a normal leaky-grid triode detector.

Those who want A.V.C. *and* diode "signal" rectification can use half-wave rectification for A.V.C. using one diode, and the other diode to give half-wave rectification for programme reproduction purposes. Again, full-wave rectification can be arranged for the "signal," and A.V.C. tapped off the resultant potentials developed.

AUTOMATIC VOLUME CONTROL.

The automatic volume control obtainable from the double diode-triode can be either of the direct or delayed type, the latter being very much more satisfactory from the point of view of sensitivity of distant reception. In this case the A.V.C. diode is biased, so that it does not commence to apply any checking voltage to the H.F. stages until the incoming impulses have been amplified to a certain strength, which is predetermined by a simple resistance adjustment.

There are so many variations that can be made in circuits associated with the D.D.T. valve that it is impossible to give but a brief idea of its possibilities here, though there is one use of the valve which should appeal to home constructors who do not worry about automatic volume control and its intricacies, but who are concerned with pure reproduction and economy of set construction.

This is the employment of the double-diode triode as a half- or full-wave rectifier with no automatic volume control, and as the first L.F. amplifier in the set. In this case the volume control is carried out by hand, by means of multi-mu S.G. or pentode valves, and the fact that the D.D.T. valve has both diode and triode in one envelope enables a valve to be cut out of the circuit, with obviously increased economy.

IMPROVED QUALITY.

Diode rectification is well worth while from the point of view of purity of reproduction; but it is purely rectification, and a valve used thus will not amplify at all. Consequently, with this type of detector we have to have one L.F. valve extra to that required when we use a triode or tetrode rectifier. The double-diode triode fills both bills at once.

The Osram D.D.T. takes the normal 4 volts and 1 amp. of heater current, and has excellent triode characteristics. The slope is some 2·2 milliamps. per volt, while the impedance is 18,200 ohms. This gives an amplification factor of 40. The price is 15s. 6d.

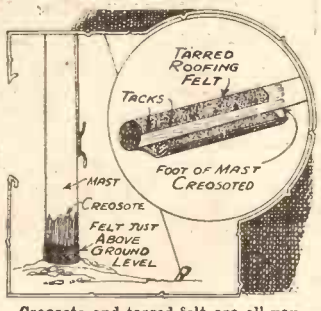
TWO VALVES IN ONE

The triode section represents an ordinary valve, whilst the double-diode section has numerous possibilities for rectification and so forth, as explained above.

PROTECTING YOUR MAST.

IN cases where a "tabernacle" is not employed, and the mast buried directly in the earth, it is as well to take some precautions against "rot." First creosote the "foot" of the mast, painting up the "stump" end until a point is reached where the creosote will be well above ground level when the mast is erected. Then take a piece of ordinary tarred roofing felt, and tack one side to the end of the mast, as illustrated, with small broad-headed tacks. Wrap the felt round until you have a small overlap and tack down the remaining edge. If there is an odd piece of felt to spare, cut a circle a little larger than the diameter of the mast-end, and tack this on before "stepping" the mast. Finally, see that a little "collar" of the felt protrudes above ground level when the mast is in position.

IT PREVENTS ROT.

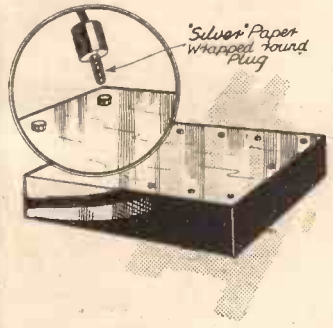


Creosote and tarred felt are all you need for this.

CURING LOOSE PLUG CONTACTS.

A BADLY-FITTING H.T. battery plug often constitutes a source of considerable annoyance, and the well-known "match-stick trick" is at best a precarious way in which to obtain a good contact. Use, instead, a strip of the "silver paper" in which chocolate is wrapped. Wind this firmly about the pin of the high-tension plug to the desired diameter, and gently twist it into the battery socket until the contact is quite right.

USE SILVER PAPER.



A simple expedient to prevent crackles due to loose H.T. plugs.

AN EMERGENCY DIAL.

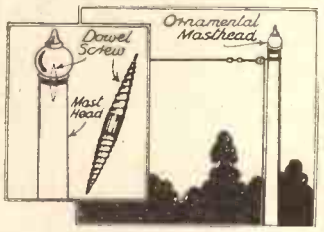
IN the course of experimental work the need is often felt for an accurately marked semi-circular dial scale. This may be extemporised by laying a transparent celluloid protractor on a piece of "gas-light" photographic paper, exposing to light and developing and fixing in the usual way.

When dry the "print" should be trimmed and cut to fit over the spindle of the component to be calibrated.

ORNAMENTAL MASTHEAD.

THE old-fashioned type of cornice pole, with heavy, carved ends, is no longer in favour for house decoration, but it is worth while rescuing one from the lumber-room in order to embellish—and protect from the "weather"—the head of the mast. The ornamental head will be found, as a rule, to be a separate piece of wood, held to the cornice pole by a dowel screw. Remove the head with the screw, if possible, and all that remains is to screw it into position on the mast-head. A good coat of varnish will help to preserve it and add to its appearance.

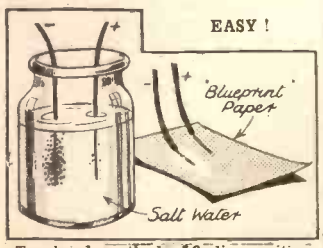
IT IMPROVES APPEARANCE.



A cornice pole in the lumber-room often provides the ornamental mast-head.

DETERMINING POLARITY.

WHICH lead is the positive? This question may arise in connection with unmarked accumulators, dry cells, or mains output. The sketch shows two quick methods of answering it. Fill a jam-jar with water, add a tablespoonful of salt, and immerse both leads. The negative "feed" will soon identify itself by the mass of small bubbles which will gather around it. The other method, which is quite as simple, is to obtain an old blue print and press both leads firmly on to a blue patch. The negative lead will quickly "bleach" the print at the point of contact.

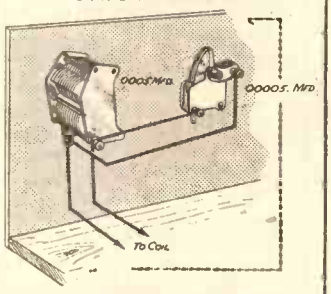


Two handy methods of finding positive and negative leads.

AN IMPROMPTU VERNIER.

OCCASIONALLY it is desired to use a slow-motion condenser for tuning when no vernier dial is available.

FOR FINE TUNING.



If the leads are kept short this is an excellent idea.

Under these circumstances one of the ·00005-mfd. series-aerial condensers which are now so popular can be pressed into service in the manner shown. It is wired in parallel with the main tuning condenser and, while the latter is being used, is left with the vanes half-way out. When fine tuning is required the main condenser is set as near as possible to the required station, and tuning is then completed with the ·00005 condenser. Owing to the fact that the capacities are ·0005 and ·00005, a movement of 10° on the small condenser is equivalent to a movement of 1° on the large condenser, giving a ratio of 10 to 1.

ANODE TESTER.

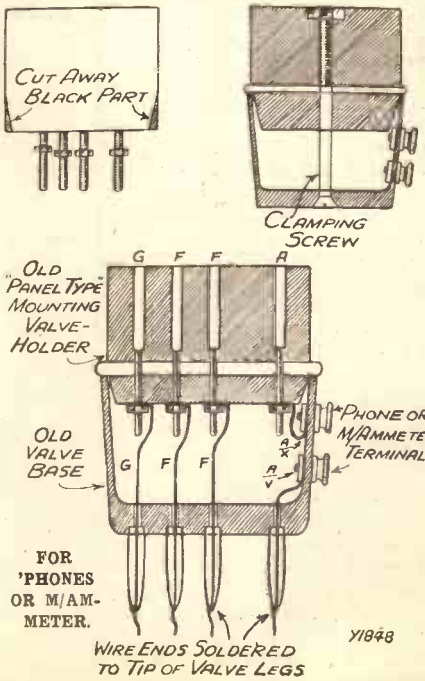
NEARLY three years ago I made an anode tester, and the enclosed sketch is how I made it. Get an old-type panel-mounting valve holder and a valve base, chip and cut away the bakelite.

Drill hole through the old-type valve holder in the centre of the four sockets, also one in the valve base, and then countersink it for the screw head. Drill two holes in the side of the valve base, and fix two small terminals in them.

Attach wires to the screw pins on the old-type valve holder, and then pull them through the legs of the valve base and solder them to the ends and cut off.

Get a "clamping screw" and pass it through the holes in centres of the holder and base; the hole in the old-type valve holder can be "tapped" to the same size as the screw pin or the top half drilled a little larger to allow a nut to sink in.

Afterwards cover over or fill in with a little pitch or cobblers' wax. This has proved to be a most useful gadget.

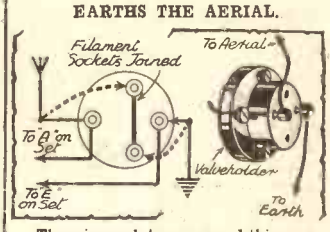


A PLUG-IN SWITCH.

A SIMPLE method of earthing the aerial when a switch is not available is by means of an ordinary four-socket valve holder. Short-circuit the filament sockets, as shown in the sketch, and take leads from the grid and plate sockets to the aerial and earth terminals respectively on the set.

Two small plugs (of the grid-bias battery type) are then connected, one to the aerial lead, and one to the direct earth lead. In order to earth the aerial it is only necessary to "plug in" to the "filament" sockets for reception to the "plate and grid" sockets as illustrated.

EARTHS THE AERIAL.



There is much to commend this very simple method of earthing the aerial when the set is off.

REMEMBER—

"CRACKLED" reproduction with Q.P.P. is extremely likely to be due to mis-matching of speaker load to output valve's impedance. The speaker manufacturers are best able to help you.

(*Continued on next page.*)

ONE GUINEA FOR THE BEST WRINKLE!

Readers are invited to send a short description, with sketch, of any original and practical radio idea. Each week £1 1s. will be paid for the best Wrinkle from a reader, and others will be paid for at our usual rates.

Each hint must be on a separate sheet of paper, written on one side of the page only. Address your hints to the Technical Editor, "Popular Wireless," Tallis House, Tallis Street, E.C.4, marking the envelope "Recommended Wrinkles."

Will readers please note that the Editor cannot, in any circumstances, guarantee to return rejected Wrinkles, and that payment for published hints is not made until ten days after they appear?

The best Wrinkle last week was sent by Mr. L. Milnes, Irfon Cottage, Garth S.O., Brecs., to whom a guinea is being awarded.

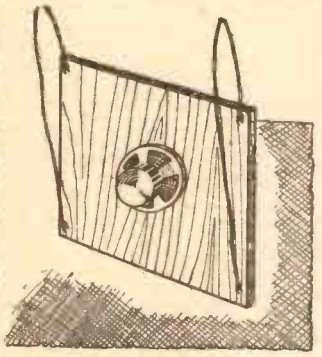
RECOMMENDED WRINKLES

(Continued from previous page.)

SUSPENDING A BAFFLE.

WHEN suspending a baffle across the corner of a room, it is often difficult to find the exact point at which the chain or wire should be fixed to the baffle in order to obtain a good balance. This is due to the weight of the speaker being behind the baffle.

This can be remedied by obtaining four strong " screw eyes " and screwing



Obtaining a perfect balance with a hanging baffle.

them into the back of the baffle, one near each corner. Then get some strong picture wire, and cut two suitable lengths, fastening the two ends of one piece to the two left-hand eyes, and the two ends of the other piece to the two right-hand eyes, as shown.

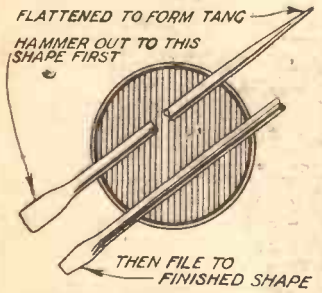
The speaker is then suspended from the two loops thus formed, the wires being twisted once round the supporting nails or picture-hooks.

It will be seen that by adjusting the wire on either side a perfect balance can be obtained, especially if the nails or hooks are so arranged that they are towards the corner and not directly over the speaker.

A SCREWDRIVER FOR SMALL SCREWS.

A HANDY screwdriver which will be found very useful for tightening small screws, such as grub-screws, in condenser dials, etc., can be made in a few moments.

Obtain a stout steel knitting needle from the domestic needlework basket and heat one end to a good bright red, and then hammer it out roughly to the required shape, slightly larger than the finished tool will be. Now return to the fire once more, again allowing it to



A knitting-needle forms the " raw material " of a home-made screwdriver.

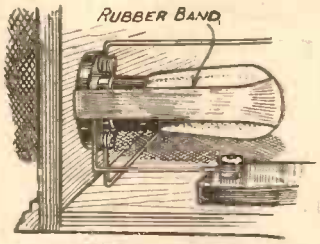
attain red heat, and then let it cool slowly by placing in the ashes under the fire grate.

When cool, the steel will be quite soft and workable, and the forged end can now be filed to the size and shape required. It will be advantageous to file the end to a nice fine edge which will enable the screwdriver to manipulate screws whose slot is too narrow to accommodate the ordinary screwdriver.

Before re-hardening the tool, the opposite end can be heated and flattened out to form a " tang " which can then be driven into a piece of wood or small file haft to form a handle. All that now remains is to harden the business end, and this is accomplished by heating to a bright cherry red, and plunging into clean cold water.

MOUNTING VALVES IN CABINET.

MANY constructors have, through lack of space in a cabinet, their valves mounted perhaps as shown in sketch.



Protect the valve with a rubber band.

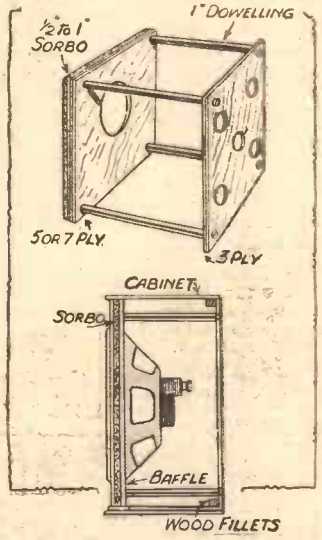
In time there is a tendency for the valves to work loose, and maybe a damaged valve is the result.

To remedy this, slip a band of rubber, an inch strip of inner tubing is ideal, under the valve holder, and when the valve is in slip this over the valve, which will then be held firmly in place.

Incidentally this is often a good cure for a microphonic detector.

LOUDSPEAKER FRAME.

IT is oftentimes found, when fitting the baffle-board of a loudspeaker to the inside of a cabinet, that the front is too thin to allow the baffle-board to be screwed to the same. It is possible, of course, to glue wooden fillets to the front of the cabinet and then screw the baffle-board to these. I have,



" Sorbo " packing prevents loudspeaker " boom."

however, found the method as shown in the accompanying sketch to be a much better one.

The " Sorbo " packing gives a little when the back is screwed on, provided the pieces of dowelling are cut to allow for this, thus making a very firm job, which is, of course, essential with a loudspeaker. The packing will also absorb some of the " boom " which is usually prevalent with a boxed-in speaker.

It is then quite an easy matter, when it is desired to take out the speaker, simply to unscrew the back, when the whole thing will take out in one piece.

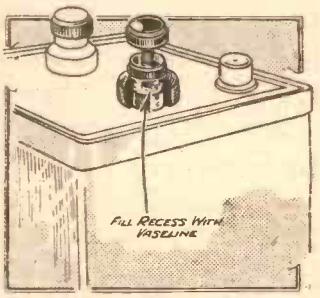
A TERMINAL HINT.

CORRODED terminals are one of the most common causes of crackling and faulty reception, particularly so if they happen to be accumulator terminals.

The usual method of preventing trouble with accumulator terminals is to smother them with " Vaseline," but the constant removal of the L.T. lead, when the battery requires charging, soon wipes this off and the terminals constantly require greasing at fairly frequent intervals.

An examination of the accumulator terminals will show that in the majority of cases the bottom part of the terminal consists of a thick washer which is threaded and screwed down on the terminal shank until it locks. If this washer is unscrewed, with the aid of a pair of pliers, it will be found that there is a recess underneath. This recess should be slightly over-filled with " Vaseline " and the washer tightened up again. The surplus " Vaseline " can then be removed or smeared lightly over the rest of the terminal.

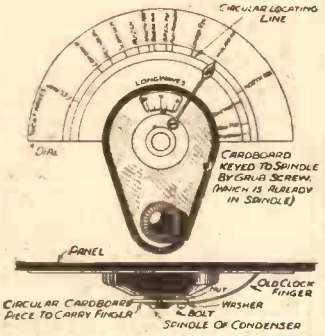
It will be found that this dodge will preserve the terminals far better than the more usual method, and, once done, is much cleaner.



Permanently clean terminals are the reward of adopting this " dodge."

CLOCKING THE STATIONS.

I AM sending you particulars of a simple station-finder I made recently. The diagram is pretty well self explanatory. The particular condenser used in my case was a Formo. An old clock finger, preferably the large hand, because the end is flat, was obtained and fixed, as illustrated, to a circular piece of cardboard, which in turn was keyed to the spindle of the



" At a glance " tuning by a simple dial modification.

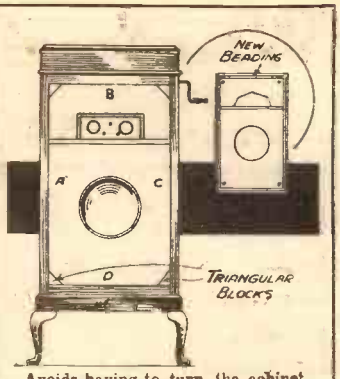
condenser by a grub-screw. The dial, consisting of fine white paper, was pasted round the outside of the original condenser dial. The stations can be marked as located around the dial. In my case I had the outside circumference for medium waves and the inner for long. The set incorporated a push-pull device.

ADJUSTING THAT RADIOGRAM.

HOW often does an enthusiastic amateur shift his cabinet to get at the back of it when requiring to make adjustments, and also to remove accumulators!

Many types of radiogram cabinets may be treated as shown for convenience. Neatly cut out the whole front panel along the sides a, b, c, d. To this fix a suitable beading, so that it is now a good push to fit in again. Next screw a triangular block in the four corners of the cabinet to which the front panel may be screwed.

If the set be fitted with banana plugs and sockets and fairly slack leads it can easily be drawn forwards to make any adjustments by this method.



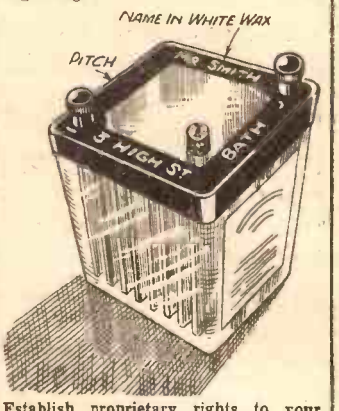
Avoids having to turn the cabinet round to look at the " works."

Also by setting the speaker baffle back on new battens fixed to the side of the cabinet, room may be made for accumulators and H.T. batteries at the front, for those who do not use the mains.

FIXING NAME TO ACCUMULATOR.

ON top of your accumulator will be found a small margin of pitch. This makes an ideal place to affix your name and address permanently.

With a small sharp screw driver, mark the pitch deeply, similar to engraving.



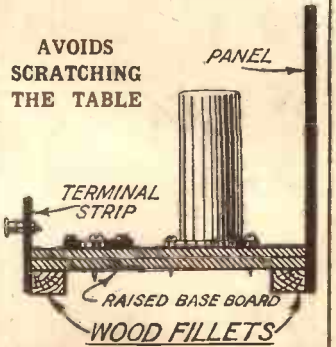
Establish proprietary rights to your accumulator by this method.

Next place a small piece of white or yellow wax in an old spoon. Melt and pour over the words. When cool, scrape off surplus wax.

Your accumulator will now have the name and address fixed against loss and proof against acid.

RAISING THE BASEBOARD.

IT is often found that screws that fit the baseboard components snugly are too long to stop from coming through the other side. Such an awkward situation can be overcome by raising the baseboard as in sketch.



It won't matter if screws protrude through the baseboard if it is raised on wood fillets.

This also serves to make a thicker edge for the panel of terminal strip to be screwed against.

What's this chap's circuit?

—whatever it is, the new Screened Pentode was designed for it.

He may have the oldest type of circuit. He may have the latest. He may have designed his own circuit, or it may be the outcome of the scientific researches of a vast radio organisation. It may be a three-valve, four-valve, five-valve A.C. set — but *whatever* it is, if it now employs one or more screened grid valves this new Mullard Screened Pentode will plug into it.

That is one of its great advantages. Not only does all the Power of the Pentode design of valve come into the first stages of the set, but all those old doubts which have always arisen when contemplating new valves — all those old "special circuit" pitfalls, are overcome. Ask your dealer about it. You remember the difference it made to your speaker stage when Mullards first originated the Pentode — so now plug in a Screened Pentode and bring Pentode Power into the early stages — bring your old receiver up to date.

TYPE V.P.4 Price 17/6 **TYPE S.P.4 Price 17/6**

ASK T.S.D. Whenever you want advice about your set or about your valves—ask T.S.D.—Mullard Technical Service Department—always at your service. You're under no obligation whatsoever. We help ourselves by helping you. When writing, whether your problem is big or small, give every detail, and address your envelope to T.S.D., Ref. C.M.N.

VISIT US AT STAND No. 71

V.P.4

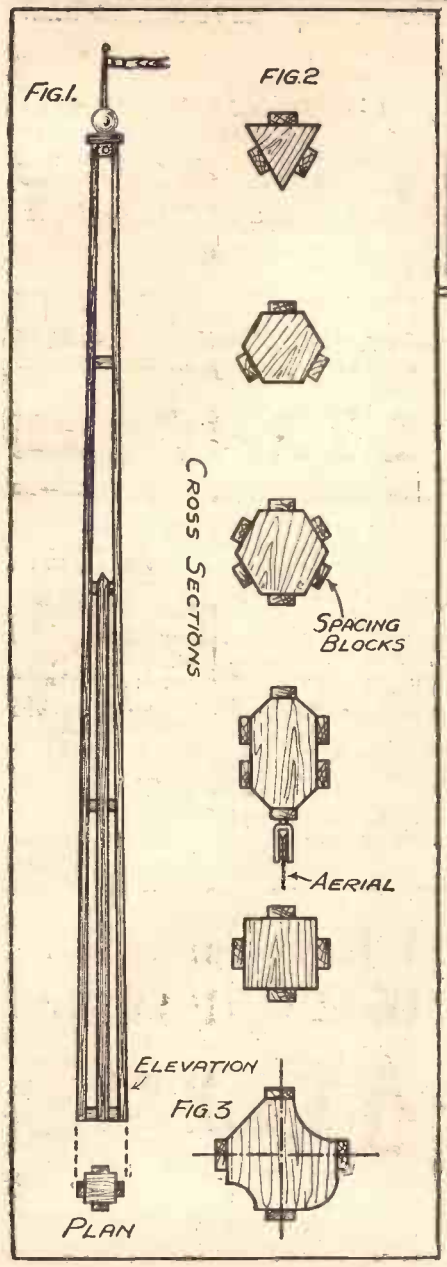
S.P.4

Mullard

THE · MASTER · VALVE

The Mullard Wireless Service Co., Ltd., Mullard House, Charing Cross Road, London, W.C.2

Arks



A novel method of constructing a strong and pleasing-to-look-at mast from lengths of 1½-in. by ¾-in. wood. The material is inexpensive, and the simple work is described—

By A. TREW.

THE form of aerial mast set out below is suggested as a means of making those useful objects pleasant to see while not involving great outlay; masts of this kind, in fact, can be easily constructed by an amateur.

Instead of the round pole, the mast proposed is built up of ordinary straight, sound tile-battens fixed to central spacing blocks, put at regular intervals in its height.

A Skeleton Frame.

The usual tile-batten is 1½ in. by ¾ in., and can be bought in lengths of some 12 ft. at only, say, 3/- per 100-ft. run, so that the material is cheap enough. It can be built up in the mast in such a way as to form a kind of skeleton frame, light and open so as not to present large surfaces to the wind and at the same time form an object of some artistic pretention, agreeable to view. The spacing blocks can be made of odd bits of deal. The drawings of the proposed system of mast construction given explain themselves, as the method is very simple; thus, Fig. 1 is a general elevation. to a small scale; Fig. 5 gives details of a mast at various levels; while Fig. 2 shows plans (or cross sections) of the mast, showing various forms it can take, according to the height of the proposed mast and the shape of the intended cross-section of it. It also shows the regularly spaced blocks to which the battens are nailed, and, too, presents methods of design for a three- or four-batten mast, the larger number of battens being, of course, for the higher masts.

It will be seen here that the sides of the mast incline inwards towards the top at a suitable slope. The spacing blocks will therefore be smaller towards the top of the mast. Fig. 4 suggests how the joints are to be made if more than one length of batten is needed to make up the higher masts; they can be either "butted" or "lapped" at the ends, and secured to spacing blocks at and near the required joint.

Ornamental Spacers.

The top of the mast could be capped, and a ball and finial, or vane, added if desired.

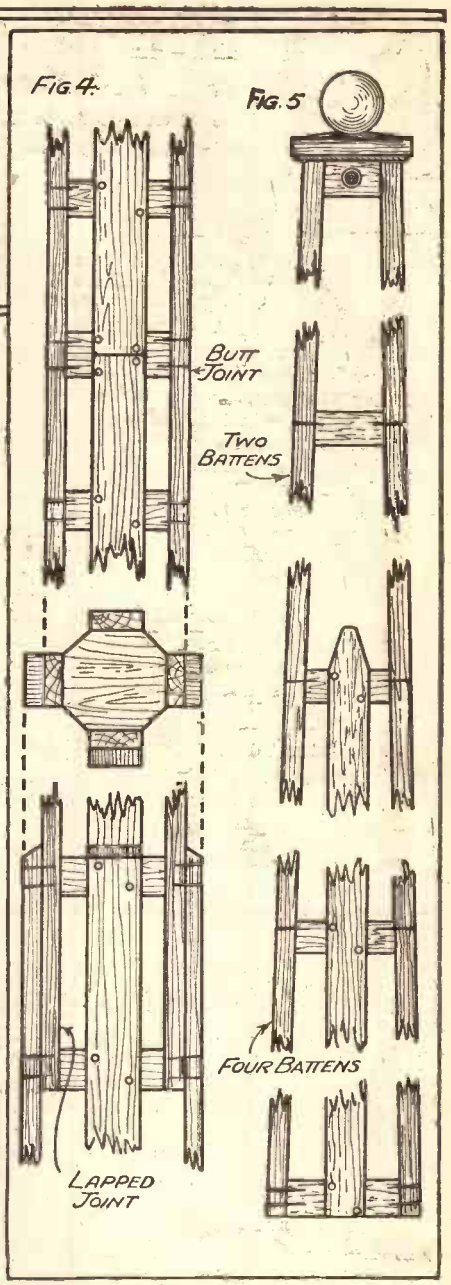
It should be noted that it is not necessary to run all the battens up the full length of the mast, and some of them would stop at a suitable spacing block, and be finished off with a pointed top to improve appearances—see Fig. 5. The battens can be used as purchased, or, if a better finish is desired, they can be wrought. The spacing blocks, also, could be cut to ornamental shapes, as shown in Fig. 3. For preservation the battens, etc., could be, as the lengths are cut, or when the mast is made up, coated with some wood preservative, or, if the parts have been wrought, painted white or finished in aluminium.

It is presumed that the mast, when finished, is to be fixed to a wall or other solid structure, with wrought iron staples, otherwise the mast can easily be secured in some other way at the ground level according to the particular case.

The aerial wire, etc., can be attached to the mast in the usual manner, and, should further firmness in the mast be required, stay wires can be added as in the larger class of flagstaffs.

From an actual mast 19 ft. high, made in the mode described, it has been found that the assembled structure is light, rigid, and of pleasing appearance.

Should anyone adopt the above-described system of mast construction, the result will also be satisfactory in every way in appearance and use.



STATION INFORMATION

LUCERNE.—Among the interesting facts that emerged at the Lucerne Conference was this: that the total number of existing and projected European broadcasting stations is 232.

* * *

PLYMOUTH.—The earth system at the Plymouth station consists of 21 plates, each 8 ft. by 3 ft., buried to a depth of 9 ft. in a semi-circle of 25 ft. radius, in the yard outside the transmission-room.

* * *

LAHTI, FINLAND.—The new wavelength to be used by Lahti next year is 1,145 metres.

* * *

RUMANIA.—The "Radio Romania" station has been allotted the wavelength of 364·5 metres when it comes into action next year.

THE MIRROR OF THE B.B.C. By O. H. M.

MORE NEW B.B.C. STATIONS

The Return of Percy Scholes—At the Show, etc.

THE B.B.C. plans for re-arranging wavelengths consequent upon the adoption of the new wavelength plan are now taking shape. With the opening of Droitwich the various Regional transmitters will shed their National waves for the benefit of new stations in those parts of the country at present inadequately served.

It seems certain that there will be new stations at Inverness and in Norwich and that Newcastle will maintain its own wave. Another effect of the changes which will not be so popular locally is the probable synchronisation of Plymouth, Bournemouth and Newcastle.

A great struggle has been going on about the future of Plymouth. On the one hand, there has been the eager aspiration of Mr. E. R. Appleton, West Regional Director; while on the other was the steady pressure of the London Headquarters. The latter has won.

Lady Snowden Active.

Those who thought that Lady Snowden's influence on broadcasting would cease with her withdrawal from the Board of Governors were sadly mistaken.

Lady Snowden is more keenly interested in broadcasting than ever before, and with the signal advantage of being able to criticise both with independence and authority.

Much will be heard from her, both in print and on the public platform.

Musical Homes.

The return to the microphone of Mr. Percy Scholes will be an event of lively interest to that large body of listeners who still remember his stimulating and pleasant personality in the early days of the B.B.C. This time Mr. Scholes will undertake a series of programmes entitled "Musical Homes."

The intention is to depict the early lives of certain composers in their own domestic environment, making them creatures of flesh and blood rather than classical abstractions.

Szigeti.

British listeners can look forward to at least one rare treat this autumn when Szigeti, the distinguished Hungarian violinist will give a special recital conducted by Failioni, of Budapest.

An American Cheerio.

The B.B.C. is considering the relay from the United States of the famous "Cheerio" hour, which is broadcast regularly by the N.B.C. It owes its origin to Charlie Field, great friend of ex-President Hoover's and a noted American idealist.

It will be interesting to sample what the American regard as "encouraging" programme material.

B.B.C. at Olympia Radio Show.

Here is some further information about the variety programme and the revue which are to be presented in the specially-constructed theatre and at which audiences of about two thousand people will be able to attend in the National Hall. On the opening day, August 15, the variety programme will be given from 6.30 to 7.45 p.m. and the revue from 8.25 to 9.40 p.m. On other days during the run of the Exhibition the revue will be given in the earlier and the variety programme in the later period. The revue and each variety bill will be relayed in the National and Regional programmes on Friday, Saturday, Monday and Thursday, August 18th, 19th, 21st and 24th respectively, and all or part of the programmes given each evening will be rebroadcast in the hall by means of an amplifier designed by the B.B.C. and feeding a number of loudspeakers.

This apparatus may also be used for feeding current programmes to Olympia for demonstration purposes, over a land-line connecting Broadcasting House with the Exhibition.

At the time of writing these notes the cast of the revue is not complete, but Anona Winn and Paul England are among the artistes so far engaged. The show is being devised by John Watt and Harry Pepper, and that is quite sufficient to ensure its success.

(*Continued on page* 668.)

DRESSED FOR A BROADCAST REVUE

The summer-time costumes of these artistes were not worn for comfort, but were rendered necessary by the fact that their turn was televised by the B.B.C.

Weekly jottings of interest to buyers.

IN the construction of most H.F. types of sets these days a sheet of copper foil is required over the baseboard. One would hardly call it the ideal way of doing the job, for, apart from the difficulty of fixing, the foil is apt to show every finger mark.

Necessity is the mother of invention. Here was another little problem to be overcome, and to Messrs. Peto-Scott goes the credit for having found a way out by the introduction of an entirely new and patented process for the treatment of baseboards.

Peto-Scott "Metaplex" baseboards are as easy, in fact easier, to work with than the ordinary baseboard covered with foil. Moreover, they *do* look respectable.

A New Process.

I am afraid I must not give away the secret of the processes involved, but at least I can tell you that they are ordinary plywood baseboards sprayed with "that little something that some others haven't got."

These new Peto-Scott metallised baseboards are quite efficient in use, and you can solder on to them in just the same way that you can on foil. They have a sand-blasted aluminium appearance, and the prices are quite reasonable.

R. & A.'s Well-guarded Secret.

Rumour has it that a bombshell of the first magnitude is about to be dropped on the wireless world by our old friends Reproducers and Amplifiers at Wolverhampton. Perhaps I know sufficient about it to know that the rumour is not without foundation.

At any rate, they have had the equivalent of sentries with fixed bayonets on the doors of their labs. for some months past, and that sort of thing isn't usually done for the fun of it.

However, to avoid all risks of my being "bumped off," perhaps I had better say no more about it at this stage except to suggest that if you are contemplating the purchase of a new speaker, it might be worth while to wait for another week until

(*Continued on page* 664.)

THE UNIVERSAL THREE

FOR A.C. AND D.C. MAINS

PLUG IT INTO ANY 200—250-VOLT MAINS

IT is doubtful if the mains receiver of the future, unless of particularly powerful type, will incorporate a mains transformer, even though it is intended for use on A.C. supply mains. It will have a rectifier for the H.T., but the heaters of the valves will be fed with "pure" mains power without any interposition of a step-down filament transformer.

Indeed, the valves will either be of the full-voltage, mains type or they will be fed in series with the mains supply with a barreter or breakdown resistance in circuit. Sets with these valves will be of the universal type, for they will operate equally well on either D.C. or A.C. mains, without the slightest alterations in the circuit or the method of attachment to the supply.

Saving in Cost.

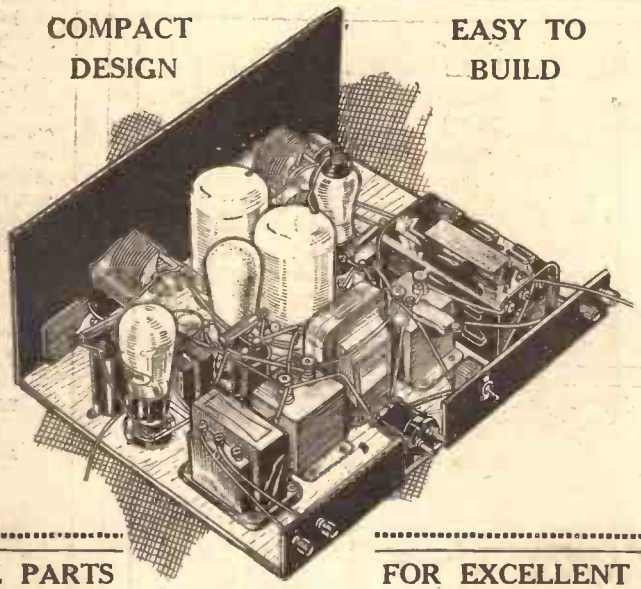
This will introduce a great saving in cost of construction as well as size of the design, while the operation should be no more expensive. The fact that the sets will be available for either D.C. or A.C. will widen their appeal and usefulness by a very great extent.

Unlike the ordinary all-electric receiver, the "Universal" Three can be used on either A.C. or D.C. mains without the smallest readjustment or re-arrangement being made. It is thus the ideal receiver where the mains supply is liable to be altered or in cases where a move to a new district is a possibility.

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

COMPACT DESIGN

EASY TO BUILD



ONE MODEL FOR BOTH TYPES OF SUPPLY

Though everybody admits that the type of set we have outlined will undoubtedly be the set of the future, it does not appear to have been recognised that there is no need to wait for the future before the ideal can be put into practice. With the low-consumption D.C. valves now on the market it is possible to build a universal mains set right away, as we shall show in these pages.

There are plenty of suitable mains valves of the low-current heater type that can be pressed into service on such a design, and in the set whose details we shall give you here we have used the well-known ·25-amp. valves made by Marconi and Osram.

Circuit Details.

The circuit chosen is a straightforward one, utilising an ordinary screened-grid valve followed by a leaky-grid detector and a transformer-coupled L.F. amplifier. The circuit arrangement is shown in the theoretical diagram, where it will be seen that the first coil is one with a separate aerial winding, not an auto-coupled arrangement.

(Continued on next page.)

USE THESE PARTS FOR EXCELLENT RECEPTION

Component.	Make used by Designer.	Alternative makes of suitable specification recommended by designer.
2 ·0005-mfd. tuning condensers	Polar No. 2 S.M.	Utility, J.B.
1 pair matched screened dual-range coils	Telsen W.287	—
2 4-mfd. fixed condensers	T.C.C. type 80	Dubilier
2 2-mfd. do. do.	Dubilier 9200	—
1 ·25-mfd. do. do.	Telsen small type	—
1 ·1-mfd. do. do.	Telsen small type	—
1 ·005-mfd. do. do.	Dubilier 670	—
1 ·0001-mfd. do. do.	Dubilier 670	—
1 ·0003-mfd. differential reaction condenser	Telsen type W185	Polar, J.B., Ready Radio
1 1-megohm grid leak with wire ends	Dubilier 1 watt	Goltone, Lissen, Igranic
1 30,000-ohm resistance with terminals or wire ends	Graham Farish "Ohmite."	Dubilier
1 1,000-ohm do.	do. do	do.
1 600-ohm do.	do. do.	do.
1 350-ohm do.	do. do.	do.
1 10,000-ohm wire-wound potentiometer	Igranic 2235/6	Lewcos, Varley, Watmel
1 L.F. smoothing choke	Lissen L.N.5301	Ferranti, R.I., Wearite, Varley

Component.	Make used by Designer.	Alternative makes of suitable specification recommended by designer.
1 screened H.F. choke	Graham Farish H.M.S.	Bulgin, Telsen, Wearite
1 L.F. transformer	R.I. "Difeed"	Lissen, Varley
1 output transformer	Ferranti O.P.M.8	—
3 five-pin valve holders	W.B.	Telsen, Benjamin, Lissen
1 double-pole on-off switch	Bulgin type S88	—
1 combined mains plug and ·5 amp fuses	Bulgin type F.15	—
1 metal rectifier	Westinghouse H.T.7	—
4 terminals	Belling & Lee type R	Goltone, Clix, Bulgin, Igranic, Eelex
1 mains resistance	Bulgin M.R.5	—
1 panel, 16 in × 7 in.	B.R.G.	—
1 "Metaplex" baseboard, 16 in. × 12 in.	Peto-Scott	—
1 cabinet to suit above	Peto-Scott	—
1 terminal strip, 5½ in. × 2 in.	B.R.G.	—
1 terminal strip, 8½ in. × 2 in.	B.R.G.	—
5 yards insulating sleeving	Goltone	—
7 yards 18-gauge tinned wire	Goltone	—
Flex, screws, etc.		—

THE "UNIVERSAL" THREE

(Continued from previous page.)

This is most important, for the aerial and earth terminals of the set *must* be electrically (from a D.C. or A.C. point of view) disconnected from the "earthed" points of the receiver. This is essential if the set is to be completely immune from such aggravating things as live earth or aerial terminals, a state of affairs that will exist when it is used on D.C. mains with positive earthing or on normal A.C. supply mains.

A Question of Capacity.

It might be argued that the ·005-mfd. condenser in the secondary to earth circuit might render the passage of A.C. to the aerial and earth possible, and thus nullify the statement that the primary winding of the coil is free from mains potential. This might be the case if the condenser were large enough, for if it were of the order of 4 mfd. or so it would undoubtedly pass quite a considerable A.C. current, though it would be a complete stopping device for D.C.

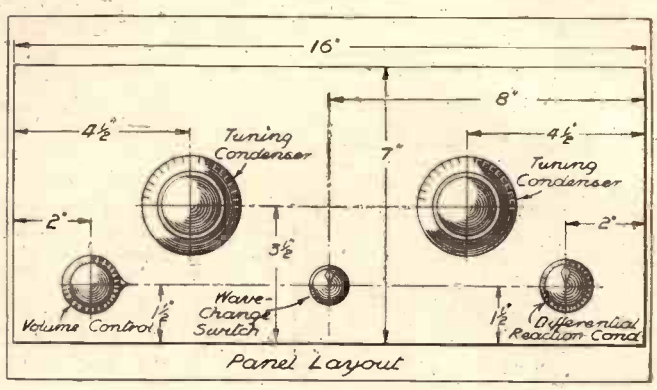
Being of the order of ·005 mfd., however, the reactance of the condenser is high, and negligible A.C. passes through it, though from an H.F. point of view it is of ample size and constitutes practically a dead short. The secondary of the coil is connected across the grid of the S.G. valve, whose output is coupled to the detector through a normal H.F. transformer scheme.

This is done both in the interests of selectivity and of simplicity of construction, for it allows the moving vanes of the tuning condenser to be at earth potential without any need for series condensers or shunt-fed circuits.

AN EFFICIENT LAYOUT

Despite its universality, the set has no complications, and its simplified layout and easy handling can be judged from the well-balanced panel.

The wiring diagram below further illustrates the comparative simplicity of this remarkably efficient receiver, which is designed to work on any 200/250-volt mains, whether of D.C. or A.C. type.



Panel Layout

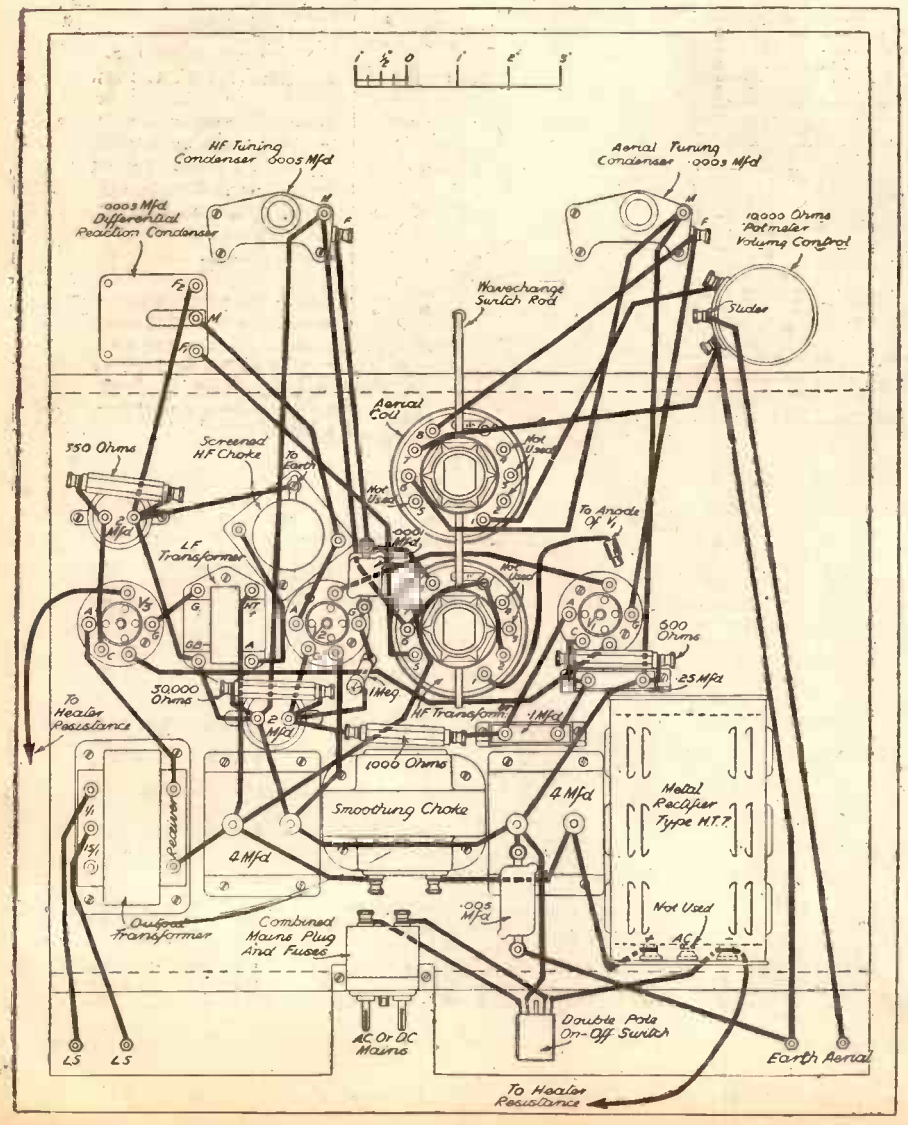
Differential reaction is applied from the anode of the detector, which is in turn coupled to the output valve through a transformer. This latter should be chosen to be able to carry a reasonable anode current without serious loss of primary inductance, for with the possibility of the set being operated on mains of only 200 volts we cannot afford to lose any potential through shunt-fed transformer resistances.

Concerning the Rectifier.

The anode circuit of the set is fed from the mains through a dry rectifier, which can be left in position whether the receiver is on D.C. or A.C., or can be short circuited or left out for D.C. operation without affecting the results in any way.

The smoothing choke should be left, and the decision concerning the use or not of the rectifier on D.C. must be left to the constructor. If he is likely to change over from D.C. to A.C. in the near future he might as well use the rectifier at the start, and he will have to make no alterations at all when the mains change their character.

The mains resistance that is connected between the set and the mains is retained, no matter what the supply system, though if the rectifier is done away with the 4-mfd. condenser that is shown connected to the junction between the rectifier and the smoothing choke can be omitted.



VALVES AND ACCESSORIES WE RECOMMEND

VALVES.—S.G., Marconi or Osram D.S. Detector, Marconi or Osram D.H. Output, Marconi or Osram D.L.

ACCESSORIES.—Aerial and Earth Equipment. Electron "Superial"; Goltone "Akrite"; Radiophone "Receptru" down lead; Graham Farish "Filt" earthing device; Bulgin lightning switch.

LOUDSPEAKERS.—W.B., Ferranti, R. and A. Marconiphone, Blue Spot, Rola, H.M.V., Epoch, G.E.C., Atlas, Ormond, Celestion.

Heaters in Series.

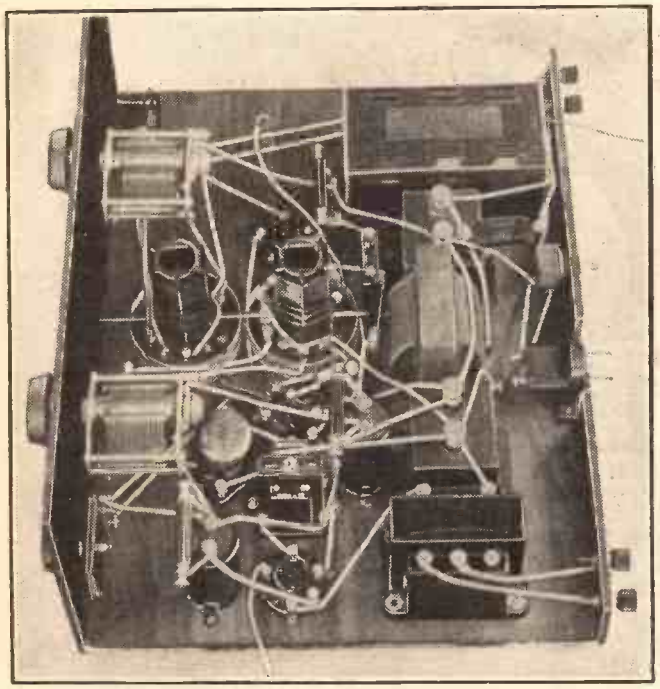
The heaters of the valves are connected in series, and it is important to note that the detector valve is the last of the chain. In other words, it is wired so that one side of its heater is at the negative end of the mains supply. This is not only important where the mains are D.C., for it is advisable to have the detector heater at "earth" potential, no matter whether the mains are D.C. or A.C., though, of course, the question of mains polarity does not come into it where the A.C. type is concerned.

A mains plug with combined fuses is used for connection between the set and

(Continued on page 656.)

THE "UNIVERSAL" THREE

(*Continued from page 654.*)



the mains, the resistance being connected by a couple of conveniently lengthened flexibles to the points in the set shown in the diagrams. It should be noted that this resistance must be so placed that it will not be too confined with regard to air space, for it gets quite hot, and the heat must be dissipated.

A convenient place is on the back of the cabinet, the latter not being pushed close up to a wall or cupboard, but allowed to remain fairly well out in the open.

Mains Switching.

The mains switch on the set at the back breaks both poles of the mains, and thus completely isolates the interior of the set when in the off position. This makes it quite safe to carry out any alterations to the wiring or connections to the heater resistance while the set is connected up, so long as the switch mentioned is "off."

The operation of the set is perfectly normal, the two tuning condensers working independently of one another. There is thus no ganging or trimming to be done, and the aerial circuit potentiometer volume control is obvious in action. Reaction is normal; in fact, the "Universal" Three is as easy to handle as the simplest of battery sets, though it will give all the advantages of mains drive.

Preliminary Tests.

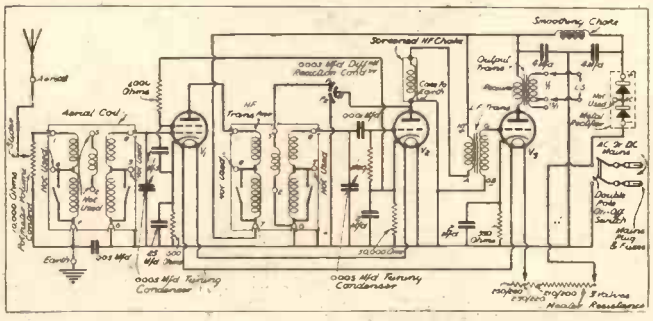
The normal time for the valves to heat up (one of the most annoying things in mains radio, in our opinion) will pass after switching on, so that before trying the set it will be necessary to wait half a minute or so to see if it is "alive." This test is essential when D.C. is employed, for in this case the polarity of the mains counts, and the mains plug must be inserted the right way round.

The quickest method of testing for "life" is to switch on and off quickly (after the set has warmed up), listening for clicks in the loudspeaker. Another method is the use of reaction, plops in the speaker denoting that all is O.K.

If the set seems dead try reversing the mains adaptor that plugs into the electric light or power socket, and listen again for the results of the same tests. On A.C. this procedure is not necessary, for we are not concerned with any need for polarity: the dry rectifier corrects that for us. In the case of D.C. it cannot assist; it merely passes the unidirectional current when it is in the correct direction, and completely stops it when it is wrongly applied.

NO MAINS TRANSFORMER

is employed in this design, which features a dry metal rectifier that is permanently connected for both A.C. and D.C. The ingenious circuit arrangement by which this is made possible is shown below.



THE THREE VALVES

have their heaters connected in series, and are supplied with current via the special resistance shown in the foreground.

Note that there is only one mains input plug for either A.C. or D.C.

Before we end this description we should like to say a few words about the fuses used in the "Universal" Three. These are contained in the combined mains plug and fuse box, screwed on the back of the baseboard, and as supplied by the makers the box normally contains two 1-amp. cartridge fuses. These are of rather high value for the set in question, for the heaters of the valves take only ·25 amp., and the H.T. circuit a mere 28 milliamps. Thus the 1-amp. fuses do not really protect the set in the circumstances.

Choosing the Right Fuses.

The best thing to do is to specify ·5-amp. fuses with the holder if the component is to be bought from the manufacturers direct, or by post from a dealer, while if the mains plug is purchased over the counter the dealer should be asked to change the fuses for the ·5-amp. size.

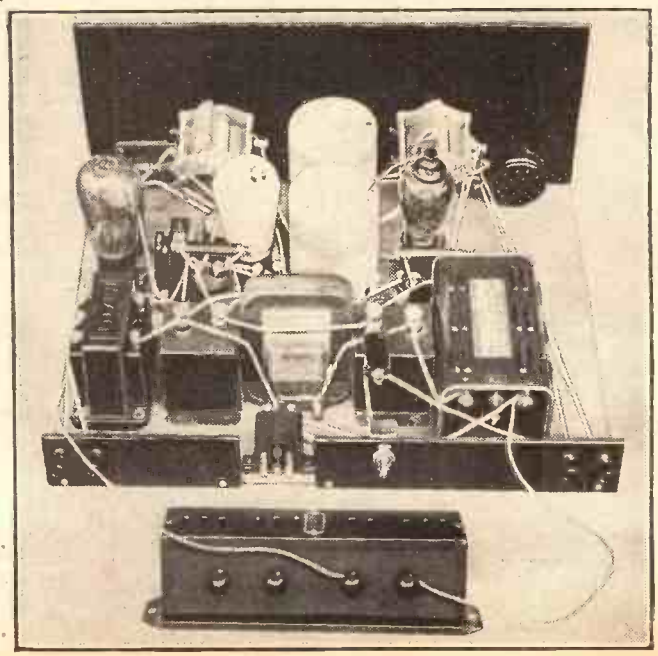
The fuses are changed by the simple procedure of unscrewing the two terminals on the bolts running through the plug (with the set disconnected from the mains, of course), when the plug section of the holder will come away from the rest, leaving the fuses protruding. They are kept up against the back of the plug pieces by means of spiral springs, so when the fuses are removed care must be taken that the springs are not lost or damaged.

The value of the fuses will not be affected either by the voltage or by the type of electricity supply, for all adjustments for voltage is made on the mains resistance, while the style of supply is immaterial in a "Universal" set.

Resistance Connections.

In the connections of the mains resistance it will be found that one of the four terminals is marked 3V, and this is treated as the "common" terminal, one of the two connections from the set being taken to it.

The other three terminals are marked 200/210, 220/230, and 240/250 respectively. To one of these should be joined the remaining lead, the terminal being chosen in accordance with the voltage of the mains with which the set is to be used.



"My friends are simply amazed at the performance"

(*Sgd.*) C.J.D., Weaste

Most of the leading set-makers fit Exide Batteries for L.T. or Drydex Batteries for H.T.

Drydex
by Exide

DRY BATTERIES

FOR WIRELESS

Obtainable from Exide Service Stations and all reputable dealers. Exide Service Stations give service on every *make of battery*

Exide Batteries, Exide Works, Clifton Junction, nr. Manchester. Branches: London, Manchester, Birmingham, Bristol, Glasgow, Dublin and Belfast.

Dx 101

A NEW "AUDIRAD" CHOKE

PRACTICALLY coincident with the Radio Exhibition, Messrs. Radio Instruments are introducing a new model of their famous "Audirad" choke.

This component is, of course, an ingenious combination device embodying in the one compact unit both L.F. and H.F. choking systems.

It can be used in any position in a circuit occupied by an ordinary L.F. smoothing choke, but it not only provides efficient L.F. smoothing, but also acts as a suppressor of H.F. irregularities.

The new R.I. "Audirad" Choke.

This the normal L.F. choke is unable to do. And inasmuch as H.F. interference from the mains is frequently experienced, it is often necessary to employ an H.F. choke in order to deal with it.

So the "Audirad" saves at least one extra component and the additional wiring entailed by its use.

It presents no complications at all in its application, and it is aseasily mounted and wired as any other choke.

The H.F. "stopper" embodied in it in no way detracts from its performance as an L.F. choke; in fact, as will no doubt be appreciated by all, it actually improves it.

Further, the H.F. suppression is independent, perhaps, to some extent, assisted by the skilfully constructed L.F. section.

In appearance an "Audirad" has no peculiar features, and its size compares favourably with any single-function choke. Indeed, in view of its high electrical efficiency it can be considered as being unusually compact.

The new model has a much lower resistance than the original one; it is now only about 500 ohms, which is a most attractively low figure. Nevertheless, its high inductance at heavy currents is fully maintained. This has been achieved, I should imagine, by the provision of a heavier core and a reduction of wire.

Anyway, whatever the method, the result is strikingly effective.

The H.F. "stopping" has been improved. Originally very good, it is now nothing short of excellent. Further, an additional terminal is provided, and this connects to the junction between the H.F. and L.F. sections. Therefore the component can be used as an H.F. choke pure and simple, if desired, and the way is also wide open for its application to numerous special and novel filter and smoothing circuits.

This versatility should strongly appeal to the home constructor, for if he purchases an "Audirad" instead of an ordinary L.F. choke for a loudspeaker output circuit or a mains set or unit (it costs no more than most and rather less than some) he gets a very efficient L.F. choke, with, if he wants to use it, the useful automatic H.F. suppression, plus the potentialities of future application to many other tasks.

At 8s. 6d., the price of a quite ordinary L.F. choke, this new "Audirad" seems to me to be one of today's best radio bargains, and I cannot see how it can possibly fail to prove one of this season's greatest successes.

THAT CAR RADIO

I recently described, in this page, an H.T. converter for car radio made by the Electro Dynamic Construction Co. But in some way—you know how these things happen—my notes were illustrated by a small E.D.C.C. anode converter and not the special car model.

The E.D.C.C. H.T. Converter for Car Radio.

However, you can now see exactly what this latter looks like if you examine the illustration reproduced herewith.

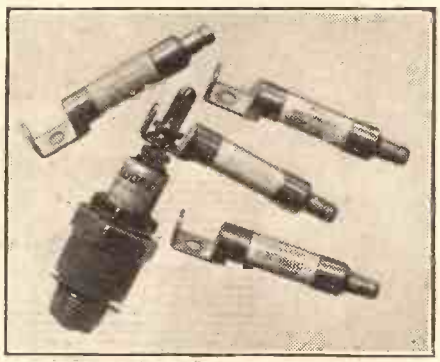
It shows the car converter removed from its special water-tight case, and reveals something of its clean, compact construction, though to appreciate this fully you must examine the thing itself.

THE USE OF SUPPRESSORS

The ignition system of a motor-car can be compared to a series of wireless spark transmitters. Each sparking plug is the focus of an oscillatory discharge, and every time it operates in order to explode the petrol mixture in the cylinder a train of ether waves is sent out.

These do not cover any very great distance, but they go far enough seriously to interfere with reception on a receiver fitted to the car itself. And the trouble is, the interference is practically "untuned," i.e., it can be heard all round the dial and cannot be tuned out like a broadcasting station.

There are two ways of dealing with such interference, and they both have to be applied at the source of the trouble.



A set of Dubilier Suppressors. One is shown connected to a sparking plug.

Firstly, a set of screened plugs can be used in conjunction with screened wiring, or, secondly, suppressors can be placed on the plugs.

This latter is the simpler method, and it is thoroughly effective. Suppressors can be fitted by anyone, and if properly designed they do not in any way interfere with the functioning of the normal petrol engine.

They are specially made high resistances, and they stop the ignition system from being an oscillatory and rather effective radiating circuit.

Dubilier are making these special suppressors for car radio, and those I have examined and tested are perfectly satisfactory in every way.

Personally, although I wouldn't mind using Dubilier suppressors, I should hesitate a long time before putting on my car suppressors made by any firm with which I was not fully acquainted.

TWIN AERIALS

Some useful installation hints.

ONE is often asked to make provision for listening in two widely separated rooms of a house: one for winter use and one for summer. The solution of the problem is up to you. If the set has an independent loudspeaker the usual practice is to run flex leads where required.

An objection to this method is that if fading occurs there is no means of increasing reaction apart from a tiresome journey downstairs and up again, by which time the fade has probably vanished and the set gone into oscillation. In the case of a set with built-in speaker the method is impracticable, as it means buying an extra speaker and fitting external terminals.

An effective way out of the difficulty is to instal two aerials. A separate aerial is taken from a common mast and stayed to opposite chimneys, the leads-in going to the rooms in which the set will be used.

There are no objections to this plan except on the grounds of unsightliness, and experience shows this fear to be groundless, two aerials being scarcely more noticeable than one. The cost is negligible, and where the set is shifted only once or twice a year the system is the ideal one.

A method that might suggest itself at first sight is a tapped lead-in. This is, however, bad practice, for there will always be some 30 or 40 feet of useless wire attached to the aerial, and in addition the risk of the end of the lead-in not in use coming into contact with a metal object and earthing the whole aerial. The result would be a most puzzling stoppage of signals.

The sketches show a double lead-in to the left, and twin aerials on the right.

RADIO in ARCTIC AREAS

Right in the north of Canada, where bleak winds whistle and snow blizzards sweep the countryside, nestles the most northerly regular broadcaster in the New World—C J C A., Edmonton—the station described on this page.

By J. F. STIRLING.

YOU may find, perhaps, a couple of radio stations marked on your broadcasting map in a more northerly position than that of C J C A, which is situated at Edmonton. Alberta, Canada. Edmonton, however, is the most northerly *regular* broadcaster in the Dominion of Canada, and hence it occupies, also, the rather proud position of the most northerly broadcaster in the New World.

An Improvised Studio.

C J C A, Edmonton, Canada, first vibrated the ether on the night of May 1st, 1922. The station was founded by the *Edmonton Journal, Limited*, which concern still retains the ownership and control of the station.

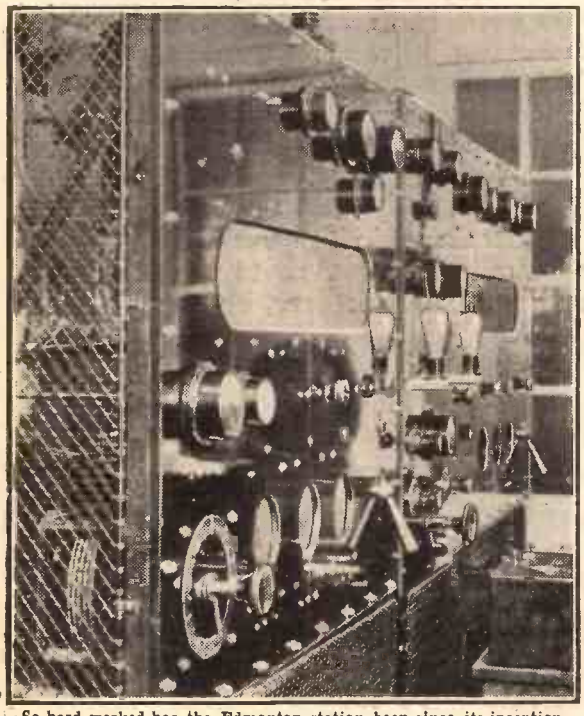
In those days C J C A was a very small affair. A Marconi transmitter, known as the Y.C.3, together with an improvised studio and a carbon microphone or two, was all the equipment it possessed.

Nevertheless, so successful did the Edmonton station become that, after two years' working, a new 500-watt Marconi transmitter was installed. The broadcasting accommodation was entirely redesigned and enlarged. Studios were added, and incidental equipment was purchased.

December, 1928, saw another enlargement of C J C A. On December 18th of that year an entirely new C J C A was opened. This broadcasting station had its transmitter located some ten miles from the city of Oliver, Alberta, and its studios in the *Journal* building at Edmonton.

This is the station which now operates in the northern parts of Canada, and which serves the areas of the Arctic even as far as the frozen coastline of the extreme north.

PRESENT TRANSMITTER PANEL



So hard-worked has the Edmonton station been since its inception that the transmitter has been changed several times. It does not confine its work to broadcasting entertainment, but conducts other very useful services as well.

Newspaper Control.

C J C A at present works on a wavelength of 517 metres. A 100-ft. five-strand flat-topped aerial, supported by two 150-ft. steel masts, serves to fling off the Arctic-bound broadcasts. Immediately below the aerial is the transmitting house, a lonely-looking place, which houses the modern transmitter of the station and the various control units. Power for the transmitter is brought by cable line from Edmonton, some ten miles distant.

At Edmonton the station's studios are located. These form part of the building which is occupied by the offices and other departments of the *Edmonton Journal*—Canada's most northerly newspaper.

Station C J C A's programmes are split up into two main sections.

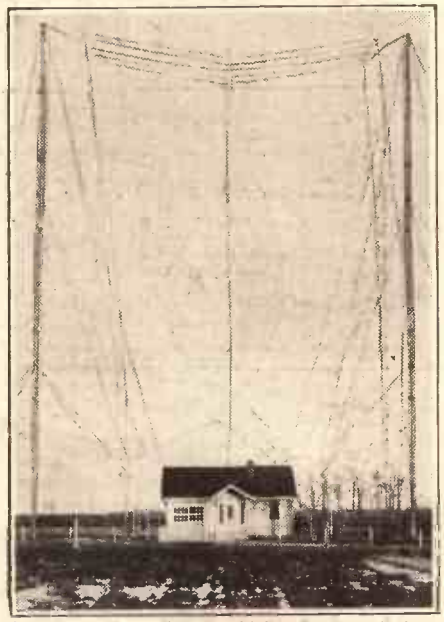
First, there is the ordinary local broadcasting service—a service which is more or less like the ordinary run of all such broadcasts. Then, on certain days of the week, the station runs a "special northerly service," that is to say, a broadcasting programme which contains news and other matter of special interest to the lonely and the often ice-bound settlers and trading communities at the Arctic coast around the McKenzie Delta, in western Alaska, and even, it is said, in the frozen East towards the Hudson Bay and Greenland.

Licensed by the Government.

The Edmonton station is licensed by the Canadian Department of Marine and Fisheries, and, although there are talks of a Government monopoly of radio services in Canada, the station authorities of C J C A are against the loss of their individuality which the establishment of the monopoly would entail.

C J C A's practical usefulness in a semi-frozen world may be gathered from the following incident, which, incidentally, is merely one of scores.

THE FIVE-WIRE AERIAL



Two steel masts 150 feet high are employed, the aerial being 100 feet long. The transmitter building is immediately below the aerial.

Diphtheria had broken out rather severely at Fort Vermilion—a northern trading post in Canada. Word of the spreading infection was carried to Edmonton by a runner who made the journey on snow-shoes to the nearest railway terminal. From this spot, word was flashed to Edmonton along the rail telegraphs.

Problem Solved.

Immediately Wop May and Vic Horner, two local aviators, set off in a small 'plane to carry supplies of antitoxin and other commodities to the stricken Fort Vermilion.

The temperature was well below zero, and the problem was how to arrange for the Fort Vermilion settlers to clear away the snow so as to provide a safe landing-place.

Radio solved the problem. In a very short time, Edmonton's station, C J C A, was flashing messages of instruction to Fort Vermilion, thus clearing up the difficulty, and, incidentally, bringing the diphtheria epidemic to an eventual close.

RADIOTORIAL

The Editor will be pleased to consider articles and photographs dealing with all radio subjects, but 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 Editorial communications should be addressed to the Editor, POPULAR WIRELESS, Tallis House, Tallis Street, London, E.C.4.

All inquiries concerning advertising rates, etc., to be addressed to the Sole Agents, Messrs. John H. Lile, 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 specialties described may be the subjects 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

HOW TO RE-NEUTRALISE.

J. N. W. (Rotherham).—"I am going to bring out an old neutralised set as a stand-by, but shall have to re-neutralise with the new valves in.

"How is it done?"

We recommend the following method for use in sets employing one stage of H.F. and provided with a reaction control.

First set the reaction control at minimum, and likewise the neutralising condenser. Now, on setting the tuning condensers so that the two tuned circuits are in step with each other, it will probably be found that the set is oscillating.

To test for oscillation, touch one or other of the sets of plates of the tuning condensers (this may be either the fixed or moving, according to the particular set). You will probably find that the set will only oscillate under the above conditions when the two circuits are in tune with each other, and this can be used as an indication.

It is convenient to perform the operation at some point near the middle of the tuning range. Now increase the capacity of the neutralising condenser.

Test at intervals for oscillation as this is done, and you will presently find that the set has ceased to oscillate, and will not recommence even when the tuning dials are slightly readjusted.

Next increase the reaction a little until the set once more oscillates, and again increase the neutralising condenser setting until oscillation ceases. Slightly readjust the tuning condensers again to make sure that the set is completely stable once more. Proceed in this way until it is found that the correct adjustment of the neutrodyne condenser has been overshot. Once this point has been passed it will be observed that further increases of the neutrodyne condenser setting no longer stop oscillation, but cause it to become stronger.

Obviously, one must not overshoot, the object being to find such an adjustment of the neutralising condenser as will permit the greatest setting of the reaction condenser to be used without producing oscillation.

It will then be observed that when the two tuned circuits are in step, and the set is brought to the verge of oscillation, a slight movement in either direction of the neutrodyne condenser will cause the receiver to break into oscillation.

INSTABILITY OF THE LOW-FREQUENCY STAGES.

G. W. (Cambridge).—"Can you give me some hints on low-frequency instability—cause, symptoms and cure?"

Some of the most common troubles in radio receivers are due to instability of the L.F. side, and here are some of the symptoms which indicate such low-frequency troubles:

1. A continuous howl, the howl taking the form of a musical note, which does not vary with the tuning adjustment.

2. Very bad distortion, frequently accompanied by a rushing or noisy background, which in many cases indicates that the L.F. stages are oscillating at a frequency above audibility.

3. "Motor-boating," which takes the form of a noise not unlike that of a single-cylinder petrol engine—that is, a steady pop, pop, pop!

(*Continued on next page.*)

"P.W." PANELS. No. 131. LYONS, FRANCE.

This popular station works on 465·8 metres, and is often singularly well received in this country.

Its power is supposed to be 1·5 kilowatts, but, despite this and the fact that it shares a wavelength with Tartu (Estonia), it frequently gets over clearly in daylight.

The distance from London is some 458 miles. Man announcer. Closes down with usual French formula and "La Marseillaise."

RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from previous page.)

In the majority of cases L.F. oscillation is due to a coupling effect in the H.T. supply circuit. It is, therefore, necessary first of all to make sure that the source of H.T. is "clean." If dry-cell H.T. batteries are employed, the voltage should be taken with the aid of a high-resistance voltmeter after the set has been working for some time.

The fact that the battery is a new one does not prove that it is in perfect condition, since dry cells deteriorate if they are kept in stock, even though they are not in use.

In addition, a single defective cell can in itself produce L.F. troubles.

H.T. accumulators can cause trouble if they are in a partly run-down condition, or if any of the cells are sulphated, or there are poor connections between the cells. All contacts on top of the batteries must be kept perfectly clean.

In the case of H.T. mains units, it is essential to see that the output is adequate. If the set is a large one, and has a super-power valve in the last stage, it may take 20–30 milliamperes. It is, therefore, quite useless to expect a small mains unit with a rated output of 15–20 milliamperes to supply the necessary properly smoothed current.

In any case, such overloaded units cannot give their rated voltages.

Sets with three, four or five valves should have separate H.T. "feeds" to each valve or group of valves when used with a mains unit.

For instance, one H.T. tapping should be taken to the H.F. side, another to the detector, and another to the L.F. stages, and so on.

If the H.T. supply is found to be up to the standard, the following schemes should be tried:

1. Reverse the leads to the secondary terminals of one of the L.F. transformers.
2. Earth the cores of both transformers.
3. Connect a ·25-meg. resistance across one of the secondary windings.
4. In the case of R.C. coupling, try reducing the size of the coupling condenser or of reducing the value of the grid resistance.
5. Insert a ·25-meg. resistance in series with the lead to the grid terminal of each L.F. valve holder.

It should be remembered that an output filter unit with one side of the loudspeaker taken to L.T. – is a very useful method of improving the stability of the L.F. stages.

EFFECT OF USING A FAULTY COUPLING CONDENSER.

C.G.D. (Swindon).—"When giving a final look-over the components for an R.C. coupled amplifying stage I found that the coupling condenser was a dud, passing appreciable current when a high voltage was placed across it. What would have been the effect if this had been used without being noticed?"

Quality would have been very bad indeed and there would have been damage to the following valve.

Part of the purpose of a coupling condenser is to prevent the preceding valve's H.T. from affecting the grid of the coupled valve. But a leaky condenser acts as a resistance, allowing some of the voltage to be applied to the following grid, and this would tend to cancel out the negative bias applied there and allow much more current to flow than the valve should pass, resulting in likely damage to the valve.

Also the interference with bias would shift the working point of the valve and thus cause distortion due to working on the wrong part of the characteristic curve.

HOW IS YOUR SET GOING NOW?

Perhaps your switching doesn't work properly? Or some mysterious noise has appeared and is spoiling your radio reception? Or one of the batteries seems to run down much faster than formerly?

Whatever your radio problem may be, remember that the Technical Queries Department is thoroughly equipped to assist our readers, and offers its unrivalled service. Full details, including scales of charges, can be obtained direct from the Technical Queries 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 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.

DO YOU KNOW—

the Answers to the following Questions?

There is no "catch" in them; they are just interesting points that crop up in discussions on radio topics. If you like to try to answer them you can compare your own solutions with those that appear on a following page of this number of "P.W."

(1) Approximately how many (ordinary and long-wave) broadcasting stations will be working in Europe when the Lucerne Plan comes into force next January?

* * *

(2) About how long ago was diode detection used in wireless?

* * *

(3) If a ·0001-mfd. and a 2-mfd. condenser are joined in series, about what will be the effective capacity?

BELOW THIRTY METRES.

C. M. P. (Bristol).—"What are the principal stations and wavelengths in use below 30 metres?"

The following are the principal ones at present listed:

Wavelength in metres.	Name of Station and Remarks
28·36	Paris (France) F Y B. Time signals at 10.26 a.m. and 11.26 p.m.
26·83	Funchal (Madeira) C T 3 A Q. Tuesdays and Thursdays, 11 p.m.—12.30 a.m., Sundays, 4.30—6 p.m.
25·63	Radio Colonial (Paris) F Y A 9–11 p.m., 12 midnight—5 a.m.
25·6	Winnipeg (Canada) V E 9 J R. Experimental. Daily (except Saturdays and Sundays) (at intervals), from 3.30 p.m.—3 a.m. Saturdays, 3.30 p.m.–6 a.m., Sundays 3–4 a.m.
25·57	Eindhoven (Holland) P H I.
25·53	Daventry G S D. (Subject to experimental alteration.)
25·51	Zeesen D J D (Germany). 4 p.m.–12 midnight.
25·45	Boston (Mass.) W 1 X A L.
25·4	Rome (Italy) 2 R O.
25·36	Wayne (N.J.) W 2 X E. 8–10 p.m.
25·28	Daventry G S E. (Subject to experimental alteration.)
25·27	Pittsburg W 8 X K. 9.30 p.m.–3 a.m.
25·2	Radio Colonial (Paris), 5.15–7.15 p.m.
23·39	Rabat (Radio Maroc) C N R. Sundays, 1.30 p.m.
19·84	Vatican City (Italy) H V J. 11–11.15 a.m.
19·82	Daventry G S F. (Subject to experimental alteration.)
19·73	Zeesen (Germany) D J B. 1.55 10.30 p.m.
19·72	Pittsburg W 8 X K. 3 p.m.–9.15 p.m.
19·68	Radio Colonial (Paris) F Y A. 2–5 p.m.
19·64	Wayne (N.J.) W 2 X E. 4–6 p.m.
19·61	La Paz (Bolivia).
19·56	Schenectady W 2 X A D. Mondays, Wednesdays and Fridays, 9–10 p.m., Sundays, 8–10 p.m.
19·36	Kemikawoa-Cho-Chiba-Ken. Tokio (Japan) J 1 A A. Daily, 10 a.m.–noon.
16·89	Zeesen (Germany) D J E.
16·88	Eindhoven (Holland) P H I. Mondays, Thursdays and Fridays, 2–4 p.m., Saturdays and Sundays, 2–4.30 p.m.
16·87	Bound Brook (N.J.) W 3 X A L. 6.30 p.m.–12.30 a.m. (except Saturdays).
16·86	Daventry G S G. (Subject to experimental alteration.)
14·47	Buenos Aires (Argentine) L S Y.
13·93	Pittsburg W 8 X K. Noon–7 p.m.

MEASURING THE IMPEDANCE OF A VALVE.

"STUDENT" (Guilford Street, London, W.C.1).—"I am not sure if it was in Dr. Roberts' Technical Notes or in the Beginner's Supplement, but I am sure that it was in 'P.W.' that you gave a very straightforward and easy way of actually measuring the working impedance or plate resistance of a valve.

"Could you repeat this, please, or give another example, as it is a subject in which I am now specially interested, but which seems to be treated rather too briefly in the other wireless books?"

(Continued on next page.)

RADIOTORIAL QUESTIONS AND ANSWERS

(*Continued from previous page.*)

You need a milliammeter for this, to show the current flowing, and then values for this figure can be divided into the voltages to find the resistance involved.

We shall be finding an average plate resistance over a certain part of the valve's curve, and this average plate resistance will be shown by the ratio between the average plate voltage and the average plate current.

This will be clear from the procedure, which is as follows:

Set the valve with usual grid bias and plate voltage—in a typical case say 4½ and 90 volts—and note the anode current—say 2 milliamps. (Incidentally you will note that Ohm's Law then shows that the D.C. resistance of the valve under these conditions is 45,000 ohms.)

It is the A.C. resistance, however, that we want. And this is shown by the ratio of the *change* in plate voltage and the *change* in plate current produced by this *change* in plate voltage.

To find this, increase the plate voltage somewhat, say to 100 volts, and read the plate current—say it is now 3 milliamps. And then decrease the plate voltage correspondingly to 80, and note the new plate current reading—say 1 milliamp.

The difference in plate voltage is 100 − 80 = 20 volts. The difference in plate current is 3 − 1 = 2 milliamps. We can now proceed with Ohm's Law, remembering that 1 milliamp is equal to ·001 amp. And we get $\frac{20}{·002} = 10{,}000$ ohms.

This shows that under the conditions named the A.C. resistance of the valve in question is 10,000 ohms.

THE LINK BETWEEN

(*Continued from page* 652.)

you can get along to the Show. In the neighbourhood of the R. & A. stand I fancy that you will find something to interest you.

A New Aerial Scheme.

I notice that quite a lot of attention has been focused of late upon the aerial end of the set. The latest gadget to make its appearance is an "auto-inductive" aerial in the form of a small unit which is claimed to do away with the necessity for external wires.

I must be honest and admit that I have not yet tried it, nor do I know very much about it. But if you would like further details you can obtain them from Airclipse Limited, 182, Vauxhall Bridge Road, London, S.W.1.

"Class B" News.

"P.W." readers will welcome the news that a "Class B" driver transformer has recently been added to the popular range of components that are manufactured by Bulgin. Like all other Bulgin components, it is pretty certain to be a winner, as also will be the "Class B" output choke that has been designed to go with it. Theirs is one of the stands that you must not miss at the forthcoming exhibition.

Incidentally, while on the subject of "Class B," I am interested to note that Epoch has just emerged with an ingenious adaptor-speaker combination for the conversion of ordinary battery-operated sets. The "Class B" unit, complete with valve, is built on to the back of one of their popular moving-coil speakers, so that any existing set of the battery-operated type can be instantly converted. It is certainly a very ingenious idea.

THE LISTENER'S NOTEBOOK

(*Continued from page* 646.)

bridge into Welsh territory. The legendary story of Owen Glendower was then begun, and as it never looked like finishing I switched off.

I was hoping to hear something about Stony Stratford, and especially Daventry. I see these towns were marked on the diagram in "The Radio Times." But they received no attention at all. The Welsh had it all, this talk.

The fact is, Mr. Filson Young sets out to do too much, with the result that he can't avoid being superficial. However, this doesn't mean that the idea of this romantic journey isn't a good one. I think it is—thoroughly good.

* * *

With music playing so great a part in the programmes it isn't surprising that we should have an occasional repetition of the same piece. It is said that there are 160 different musical compositions for Heine's famous poem, "*Du bist wie eine Blume.*"

Spread out over the year, these are hardly likely to sicken us.

It is extraordinary how certain musical gems can be associated with a certain type of concert. For instance, the "Londonderry Air" is almost exclusively now an air for the Sabbath. Hotel and spa orchestras simply love it, but principally as an encore number.

SWAT THAT ATMOSPHERIC!

A simple dodge that is a practical help in lessening the proportion of static to wanted sound.

By K. P. HUNT.

CRASH! Bang! Pop-pop! If the enjoyment of other listeners has been spoilt by atmospherics as much as mine has during recent weeks I feel sure they will be interested in a fellow-sufferer's efforts at cure.

A neighbour who previously had only a simple two-valver not long ago asked my advice on the purchase of a new set. As a result he bought a 4-valve super-het. For quality, selectivity and sensitivity I had not previously handled a more delightful thing. Using a normal aerial I identified 34 stations on the medium band and 11 on the long waves, all in one hour's rough test. My friend was pleased.

But a few days later he sought me out again. "Unless I turn the volume down so that I can't get anything much except locals," he complained, "those darned atmospherics make distant listening positively unnerving."

This man consistently can "get the distance" with his new set, but, when going full out, reception of any of the less-powerful foreigners is not worth while because atmospherics are such a nuisance.

A Good Transmission Ruined.

During the last few weeks I have been sorely troubled in the same way, particularly on the long waves. For instance, until recently I have been in the habit of switching on the breakfast-time music from Holland. Just now, on five mornings out of ten, this transmission is absolutely ruined by the machine-gun fire of almost continuous static. What can be done about it?

A remedy which is sometimes advocated is to shorten the aerial. High aerials certainly pick up more static. But when you succeed in reducing interference to a negligible factor by experimenting with shorter aerials you discover that your receiving range diminishes in proportion. Really, you are no better off.

Another static cure often suggested is a 100,000-ohm spaghetti resistance connected across the aerial and earth terminals of the set, or a potentiometer of the same value between aerial and earth, with the slider connected to the aerial terminal.

Taking the earth lead direct to the aerial terminal of the set and leaving the earth terminal blank is another dodge supposed to help in cutting out atmospherics. It

(*Continued on next page.*)

THE ANSWERS

TO THE QUESTIONS GIVEN ON PAGE 663 ARE GIVEN BELOW.

(1) The Lucerne Plan allows for between 230 and 240 stations in the European Zone.

* * *

(2) Diode detection was the first use to which the valve was put when it was originally applied to wireless by Fleming in 1904.

* * *

(3) It will be a little less than ·0001-mfd., as the effective capacity of condensers in series is always less than that of the smallest individual capacity.

DID YOU KNOW THEM ALL?

SWAT THAT ATMOSPHERIC!

(Continued from previous page.)

simply reduces the set to a local-station affair.

Anyone who has it in mind to experiment with these devices may take it from me that the general result is to lessen interference only at the corresponding expense of diminished receiving range. I have given them a fair trial.

A Definite Help.

The method I have now adopted myself and also fitted up for my much-worried neighbour is not a complete cure for atmospherics, but I have found it a definite help that certainly makes distant listening tolerable on certain occasions when otherwise I should be tempted to "give it up as a bad job."

I began by connecting an L.F. choke coil across the aerial and earth. This is probably the oldest recorded "stunt" to mitigate the shock interference caused by atmospherics. I used for this purpose the secondary of an old L.F. transformer.

To my disappointment the proportion between signals and interference was still about the same, as far as I could judge. I left the choke hooked up for a couple of days, however, after which I was convinced that, even if volume was fully restored by turning up the volume control on the set, the atmospherics, although loud, did not "crash" anywhere near so violently. They were noisy, but somewhat toned down and not half so ear splitting as formerly. What musicians call the "attack" was less marked.

Adding an H.F. Choke.

If I could retain this advantage without losing any signal strength I felt I should have secured an improvement.

It seemed likely that the choke was not only draining off some of the atmospherics and modifying their characteristics, but some of the signals as well. This thought suggested the addition of an H.F. choke.

The results with this scheme confirmed my surmise that the self-capacity of the L.F. choke coil was by-passing some of the wanted signals to earth, for as soon as the H.F. choke was fitted I could detect no loss of signal strength whatever.

The previously noted diminution in the strength of atmospherics, however, remained, as well as the slight modification of their usual "crash" nature into a less offensive noise. In this form the apparatus is proving a real benefit.

Avoid Long Wires.

It is important that no lengthy wires be used in the connections, or the signals may be by-passed through stray capacity that may be so formed, thus defeating the object of the H.F. choke. This component should be a good one on the large side, if anything, otherwise the choking action may not be fully efficient on the long waves, where static interference is usually more troublesome.

Listeners with a liking for foreign stations, but whose enjoyment is now being ruined by atmospherics, can be confidently recommended to try this method—which is the only one of any real merit out of many I have tried.

TECHNICAL NOTES

Some diverse and informative jottings about interesting aspects of radio technique.

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

Have You Noticed This?

I EXPECT those of you who use all-electric receivers have noticed not only the way in which the set lags when you switch on, but sometimes also the way in which it continues to function after you have switched off. This latter effect, by the way, differs very much with different sets, and in some sets the operation ceases the moment you switch off. In other sets it goes on for quite an appreciable time.

I came across a set the other day, an all-mains receiver of rather early design, some three years old or more, in which this effect was most pronounced; in fact, it was quite weird. When you switched off the thing went on talking with only a gradually diminishing volume for many seconds.

I did not actually test it, but I should think it must have been quite seven or eight seconds, perhaps more, the sound gradually fading away "into the distance," as it were. I have, of course, come across many sets where this effect was noticeable, but I never came across one where it persisted for such a long time as in the set mentioned above.

I suppose the effect is due to the gradually cooling of the cathodes of the mains valves and to the high-tension voltage being maintained by means of condensers in the circuit.

Tuned Circuits.

When using a set with a number of tuned circuits and ganged condensers you will sometimes find that even though you get the different circuits properly adjusted for one particular wavelength, or one particular region on the dial, they may go out of adjustment when you tune in to a point some distance away. The aerial circuit, for instance, sometimes goes quite out of tune with the other circuits, and I have actually noticed this on several sets at different times.

This can be got over and the tuning adjusted, as a rule, by putting a condenser in the aerial lead to the first coil; this condenser may have a value of 0·0001 mfd., whilst sometimes a smaller value does the trick better.

You may find that this condenser will have an effect on the strength of the signals—it may reduce the strength—but as a rule this should not be serious, and you will probably find that you get, on the other hand, an improvement in selectivity.

Selectivity.

Talking about selectivity, by the way, many people are obliged to operate their sets virtually "next door" to a powerful station, and so they require all the selectivity they can get out of the high-frequency stages. In these cases it is sometimes an advantage to use transformer coupling instead of the tuned-anode system.

Theoretically the transformer arrangement ought to give, or be capable of giving, a large step-up, but in actual practice the amount of step-up which you might expect is not obtained. On the other hand, the selectivity is generally improved.

As regards the tuning of the high-frequency transformer, this need not be done on both of the windings; generally you will find it quite sufficient to tune only one winding, particularly if there is a reasonably close coupling between the two windings. The condenser which is used for tuning one of the windings may be ganged with the aerial tuning in the ordinary way.

Aerial Joints.

If you have cause to make a joint in an aerial wire—an outside aerial, of course—it is worth while to take a bit of trouble in making the joint weatherproof. A few strands just twisted together will very soon develop bad contact and give you endless trouble. Remember that the exposure to the weather plays havoc with the surface of bare wires, and this is particularly liable to cause trouble where there is a joint.

One of the obvious things to do is to "tin" the different strands (if it is enamelled wire they should be carefully scraped free of enamel first), and then to join them together neatly and systematically, each to its opposite member, and then make the joint compact and fill in completely with solder. This at least ensures that you start with a good metallic covering over the whole of the joint.

Keeping Out the Weather.

Afterwards it is worth while to cover this well with melted "chatterton," rubber solution, celluloid varnish, ordinary paint or even (at a pinch) "Vaseline" or other thick grease, so as to protect it from the action of the elements. If you cover it well with melted "chatterton," which I think is a very satisfactory covering, you can then bind it round tightly with insulating tape.

As a matter of fact, this is in a crude way the method which is used for binding up and sealing joints in electric-light cables.

Are Magnets Permanent?

Sometimes readers ask me whether a loudspeaker is liable to lose its efficiency owing to the decay of the strength of the permanent magnets employed. I have often been told by readers that they have the idea that their loudspeaker is gradually losing strength, and this they attribute to the change taking place in the magnets.

Of course, an inferior magnet—that is, one made of inferior magnetic material—may quite possibly lose strength gradually; there is no doubt that some permanent or so-called permanent magnets do lose their magnetic strength in the course of time, so that in some of the cases referred to this will undoubtedly be the cause.

I have been to some trouble to find out what sort of performance can be expected from a really high-class permanent magnet,

(Continued on next page.)

TECHNICAL NOTES

(Continued from previous page.)

and I am told by Messrs. Ferranti, Limited, that with a really good magnet—that is, one made of best material—there should be practically no change in magnetism over a period of many years.

Tests Over Years.

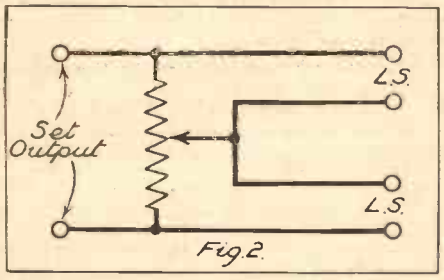
Ferranti, Limited, have for many years past made various types of electricity meters which depend entirely for their accuracy on the permanence of the magnets employed, and they have found that after quite a long period of years the meters are as accurate as when first made.

This would seem to be the best of all indications that in these cases, at any rate, there has been no change in the magnetism. Ferranti's claim—and I have no doubt that the same claim is made, and justifiably so, by other first-class loudspeaker manufacturers—that with a high-class magnet in a loudspeaker the decay of magnetic strength is virtually non-existent.

Speaker Characteristics.

Talking about speakers, I said something a few weeks back about the use of two speakers at the same time having different characteristics so as to get a more even response over the whole of the audio range. Some people actually use an old horn-type

REGULATING RELATIVE LOUDNESS



The method of connecting the two loudspeakers to which Dr. Roberts refers this week.

speaker with a cone type or moving coil, and seem to get good results with the combination.

It is quite a simple matter to use two loudspeakers together and to adjust not only the relative loudnesses of the two but also actually the quality of the tone. An arrangement for regulating the relative loudness of the sounds is as follows:

The two speakers are connected together in series across the output of the set, and then a resistance is connected also across the output of the set, that is, in parallel with the two speakers, this resistance—or potentiometer—having the slider connected to the common point of the two speakers.

High and Low Registers.

As the slider is shifted it is possible to bring out the upper register or the lower register. Supposing, for instance, we are using a horn type, to give extra strength to the upper frequencies, and a moving coil for the lower register, then by favouring the horn speaker rather than the other we shall get more of the higher tone, whilst by favouring the moving coil we shall get a greater predominance of the lower frequencies. If this arrangement is used permanently it is a simple matter to mark the two extreme positions of the potentiometer slider (or the knob) with the words "high" and "low," indicating that when the knob is moved to the "high" position the sound will have a higher-pitched quality and *vice versa*. This arrangement is indicated in the accompanying figure.

Hot Television News.

From America comes news of another world-beating television discovery which (for the umpteenth time) is going to "revolutionise television in the home." The discovery is attributed to a gentleman named Zworykin, and is the result of ten years of experimental work.

It is claimed that the efficiency of the new method is several thousand times greater than that of any other system, although I must confess I don't quite know what the term "efficiency" in this connection is supposed to mean.

Photo-Electric Battery.

This new method employs a system of millions of minute photo-electric cells, so small that they can only be seen under the microscope, and the whole arrangement of the cells is known as the "iconoscope." The light from the object which is to be televised is focused upon this photo-electric battery, as it may be called, and in some way, not exactly specified, all this is made to produce the requisite modulation of short-wave radio which is, at the other end, reconverted by means of a cathode-ray system.

I confess I don't quite understand how it is supposed to work, but if it proves to be any good, no doubt we shall hear more of it in due course.

Connecting Lugs.

A strange thing about terminals is that, in a great many cases, they are far too small for the job, with the result that it is almost impossible to grip any respectable piece of wire with them.

If you have a component with these silly little terminals which won't hold the wire, the best thing to do—short of replacing the terminals with larger ones—is to buy a few little lugs from the local shop and solder these lugs to the ends of the wires and then slip the lugs over the shanks of the terminals. But it is a poor thing if the user has to go out and buy something for himself in order to be able to make use of an article which has been sold to him as perfect.

I don't make this complaint about *all* makes, of course, as many of them are eminently satisfactory and have all the signs of having been well designed and

(Continued on next page.)

TECHNICAL NOTES

(*Continued from previous page.*)

thoroughly tested out; but there are a good many which one comes across which ought to have an engineer sent out with each one.

Decoupling.

I have more than once referred in these Notes to the importance of decoupling at various parts of a circuit. I have not the space at the moment to go into the various ways in which decoupling can be useful, but I would like to mention one particular point which occurs in practically all battery-driven sets.

Resistance Causes Coupling.

The particular case I refer to is the back-coupling which is set up by a high-tension unit—more generally a high-tension dry battery—in which there is too high an internal resistance, without a bypass being provided across it. I have on many occasions found amateurs struggling with a set which was very unstable, giving howls and so on, and have also found that the only cure they knew was to fly to a new high-tension battery.

Now, in many cases the high-tension battery will cause this trouble owing to it having developed a rather high internal resistance, even when the voltage of the battery has only fallen a comparatively small amount and when it still has quite a good deal of useful life left. To throw it away in such circumstances is wasteful and quite unnecessary.

Effecting Battery Economy.

I should mention in passing that one of the first things to do when you get this instability is to try adjustments of the grid-bias, because, apart from all other considerations, this in itself may correct the trouble, even if the high-tension battery is on the point of needing attention as well.

When, however, you get to the stage that no adjustments of the grid-bias will relieve the trouble you may be sure that back-coupling is taking place through the resistance of the H.T. battery, and this can only be got over by decoupling.

MIRROR OF THE B.B.C.

(*Continued from page* 652.)

During the first week the artistes in the variety programmes, which will be produced by John Sharman, are (in addition to the B.B.C. Dance Orchestra, directed by Henry Hall): Norman Long, Mamie Soutar, Horace Kenney, the Houston Sisters and Jass and Jassie (a visual act which has been seen and heard in a television programme).

The bill will be changed on August 21st, and for the second week will include Mr. Flotsam and Mr. Jetsam, Clapham and Dwyer, the Carlyle Cousins, Julian Rose, Laurie Devine (a dancer who has appeared in television programmes), Sydney Baynes and his Orchestra, and, of course, Henry Hall and his "boys."

A small charge will be made for admission, and tickets will be obtainable at the theatre box-office in the Exhibition.

It is, of course, a wise decision to delete the visual acts in the variety programmes from the relays for broadcasting; but the audiences in the theatre will be able to enjoy the turns by the Rodney Hudson Dancing Girls to music supplied by Sydney Baynes and his Orchestra, playing in the orchestral pit throughout the programmes.

Mr. Mais for America.

Quite often we envy the other fellow without knowing that he would just as willingly change places with ourselves. One does not know how Mr. S. P. B. Mais might look at the situation as it concerns his forthcoming trip to America, but there are plenty of people who would be only too willing to go in his stead.

The trip is in connection with the new Talks season, which begins in September and, while being framed on the lines of his previous journeyings in Great Britain and somewhat after the style of Mr. Vernon Bartlett's visits to European capitals, is very much more ambitious than anything yet devised by the Talks people.

The purpose of the talks is to give British listeners an unbiased view of what the average American is like, what he thinks and why he thinks it, and what is even more interesting: to give the talks from the actual spot in the same way as Mr. Vernon Bartlett gave his talks from the Continent.

No doubt the B.B.C. will consider the cost, whatever it may be, quite justified; but the cost of telephone lines and the transatlantic radio service calls to England as the link between Mr. Mais and listeners will be a pretty stiff item in itself.

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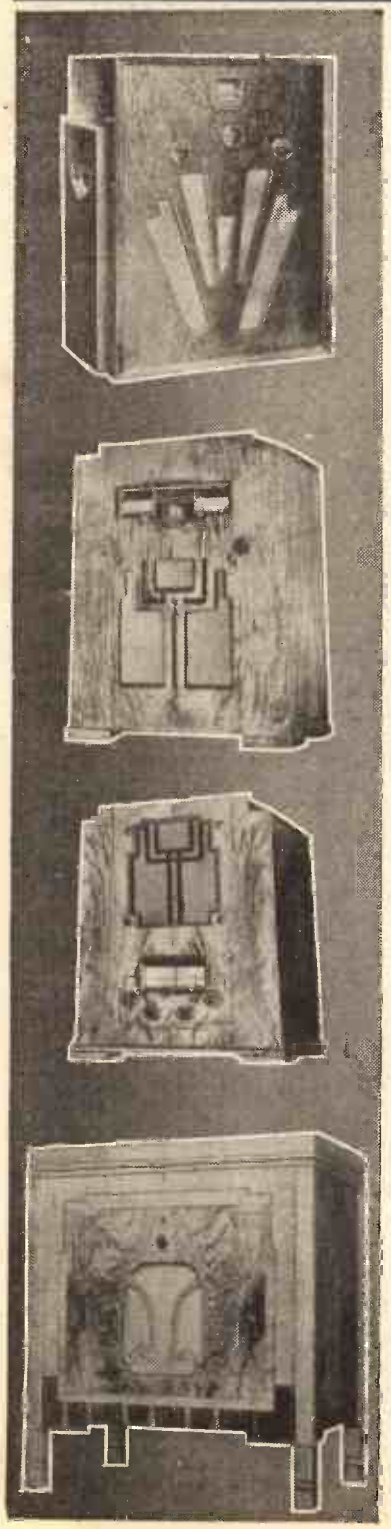

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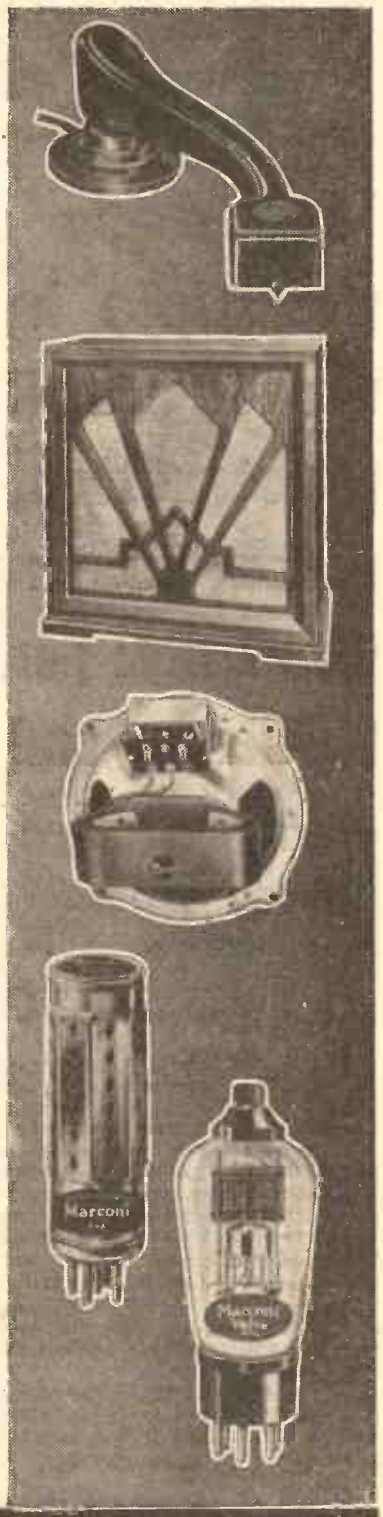

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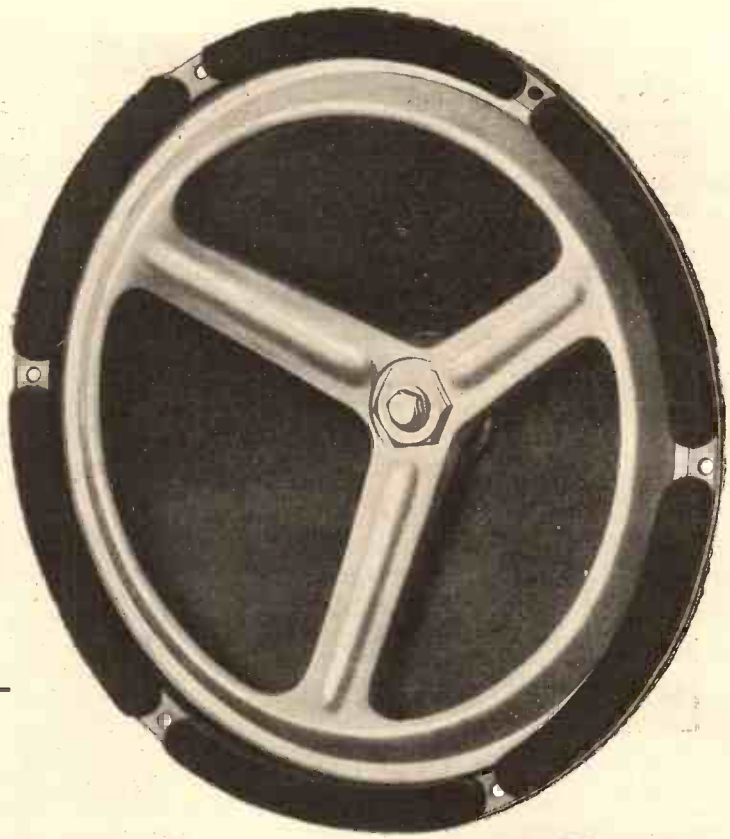

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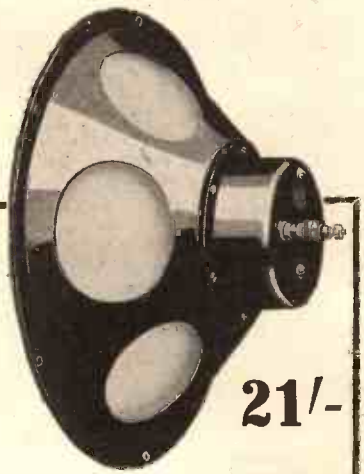

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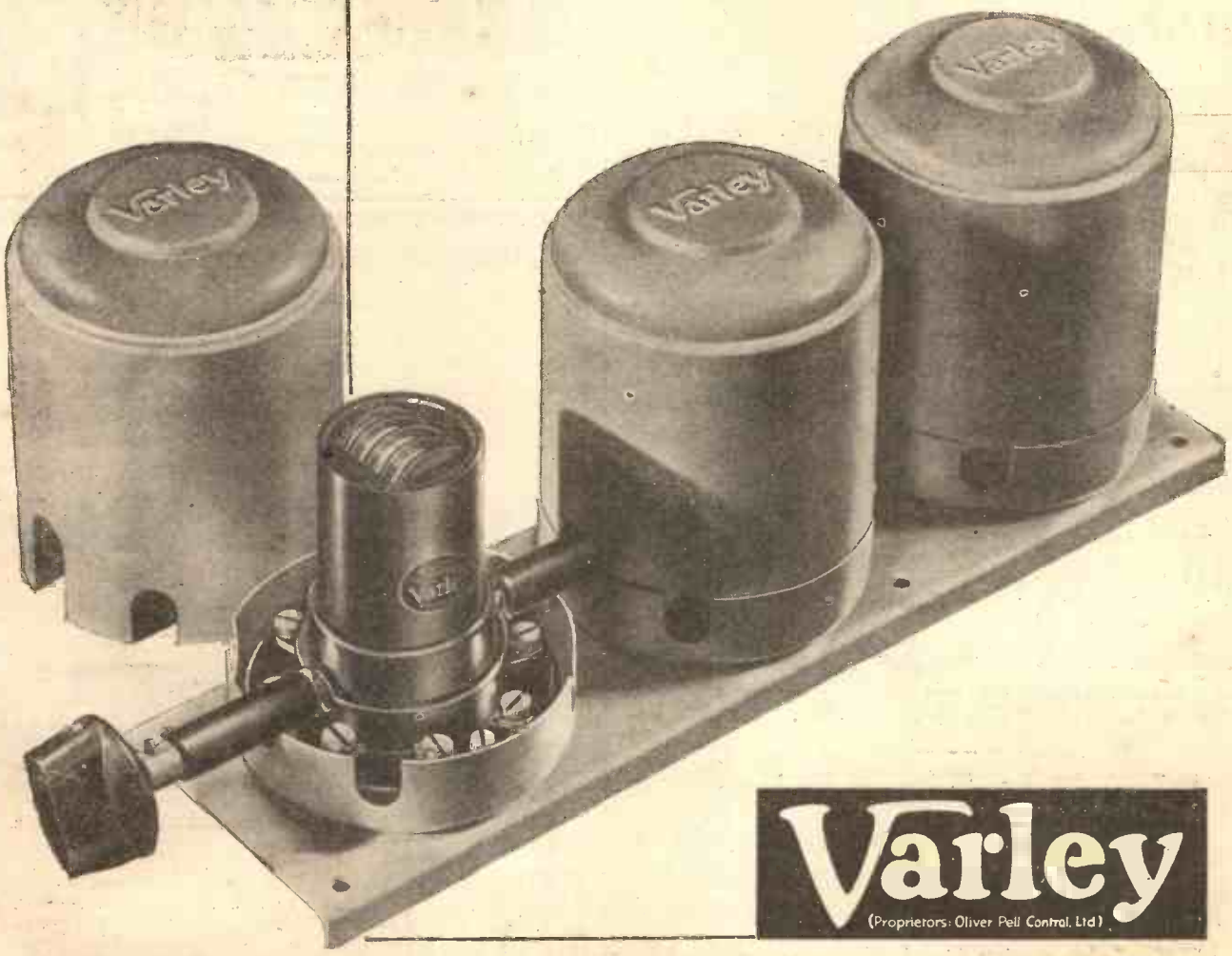

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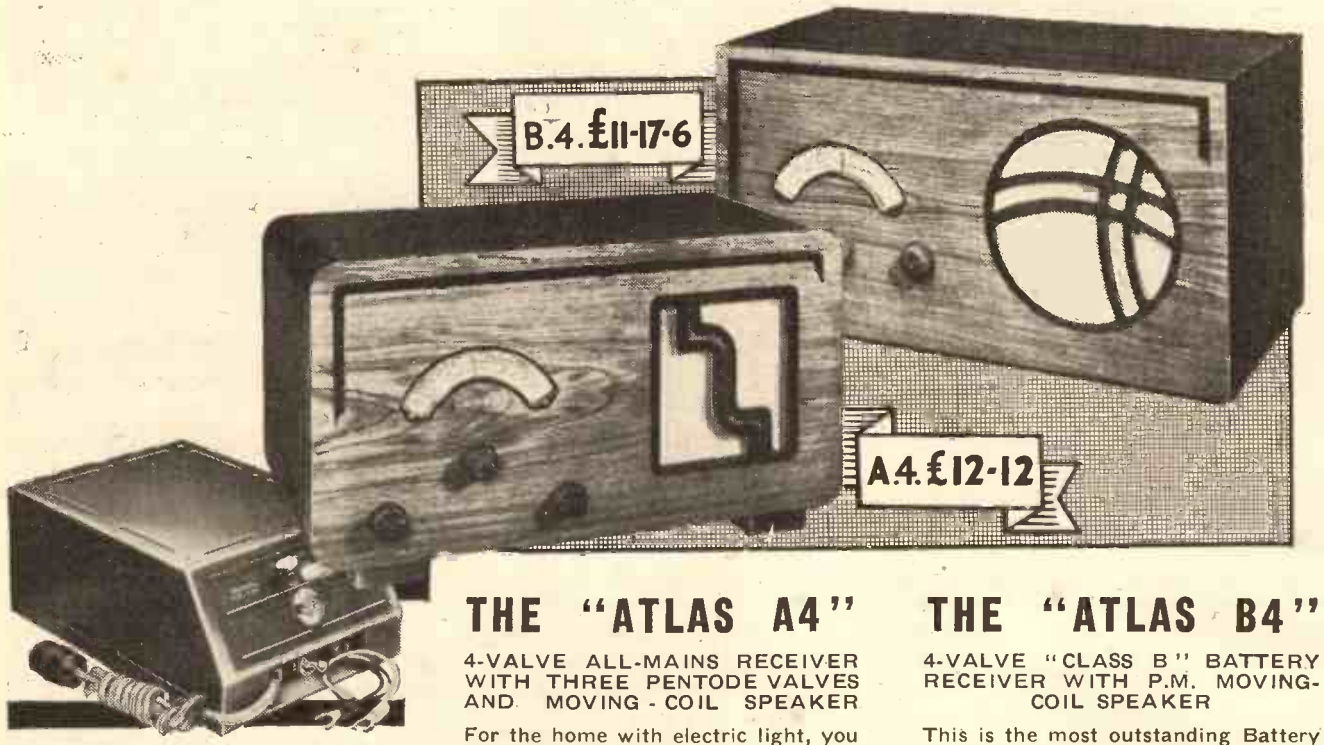

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NATIONAL RADIO EXHBN.

The new Dubilier products mark a great advance in Condenser and Resistance design and will maintain Dubilier's established position as the foremost manufacturers of the highest quality products, at the lowest price levels. Write for new illustrated booklet fully describing the new and unique designs, or inspect them on the Dubilier Stand, No. 68, National Radio Exhibition, Olympia.

DUBILIER

CONDENSERS AND RESISTANCES

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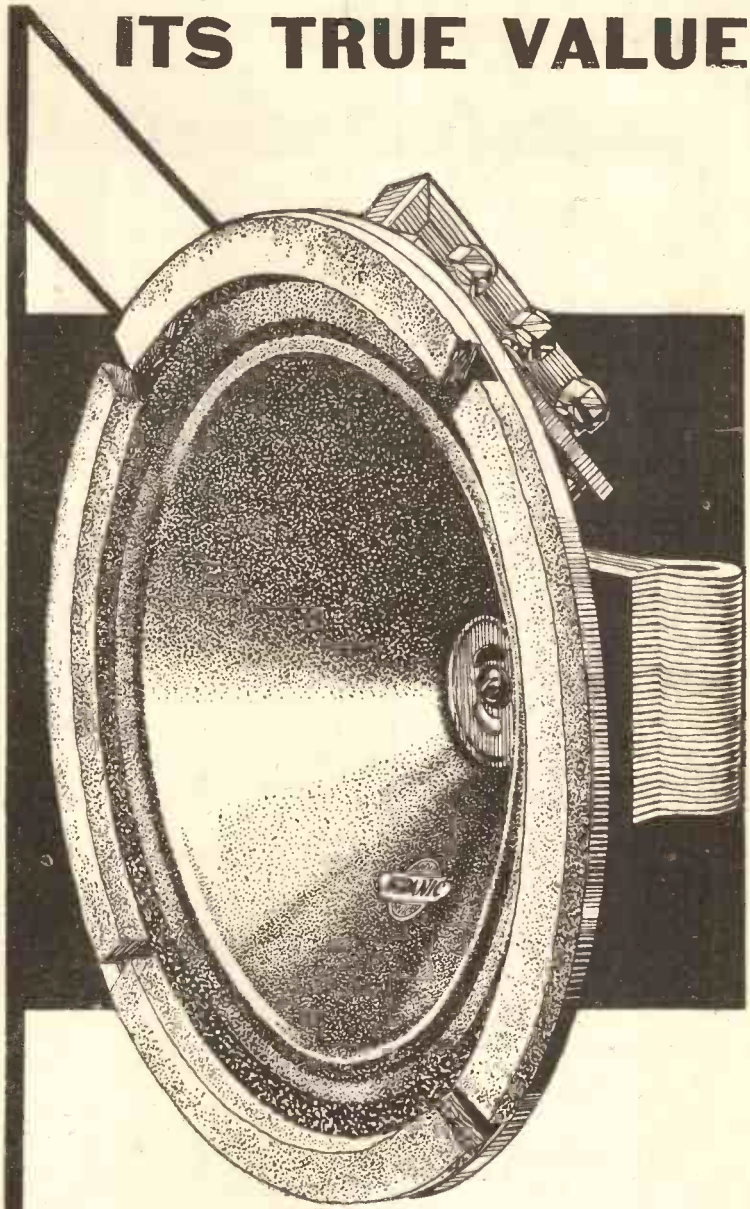
From the shrill voice of the fiddles to the deep growl of the drums Igranic D.9. delivers every note with its true tonal value. Thanks to its unique magnet construction Igranic D.9. has earned the approval of radio experts throughout the country; thanks to its modest price it is the choice of every discerning amateur. Change to Igranic D.9. and change hope to certainty, counterfeit to reality.



IGRANIC

D.9.

29/6

PERMANENT MAGNET MOVING COIL LOUDSPEAKER

Meet us at STAND 86 Radiolympia

Write for fully illustrated Catalogue No. R206 of Igranic Quality Components.

IGRANIC ELECTRIC CO., LTD., 149 Queen Victoria Street, E.C.4.

CVS—83

POPULAR WIRELESS

THE FIRST AND FOREMOST RADIO WEEKLY.

Scientific Adviser : SIR OLIVER LODGE, F.R.S. Chief Radio Consultant : P. P. ECKERSLEY, M.I.E.E.
Editor : N. F. EDWARDS.
Technical Editor : G. V. DOWDING, Associate, I.E.E.
Assistant Editors : P. R. BIRD and A. JOHNSON-RANDALL.
Chief of Research Department : K. D. ROGERS.

The Paper that Made Wireless Popular

THE EXHIBITION
ON FIVE METRES
SONG "PLUGGING"
THE ITALIAN HOP

RADIO NOTES & NEWS

THE B.B.C. SCORES
RADIO IN INDIA
TELEGRAPHS TABOO
DANNY MALONE

Better Than Ever.

THE Radio Exhibition at Olympia is now open, and I am told that it is the best so far held. The co-operation of the B.B.C. has helped greatly towards making Radiolympia the first attraction of London. If you cannot pay a visit to this wonderful bit of organisation I hope that you will enjoy the revue and the variety programmes by wireless and succeed in visualising the swirling throngs of people amidst the glories of the Exhibition stands. This show is part of a national prosperity drive. Bumper sales to it!

"P.W." To the Fore.

AS the Show would not be complete without a "P.W." stand, we are, of course, gracing it with our presence. Look us up, if you can get near the stand, and pass the time of day with the boys of the old brigade. Any free ice-cream issued by our stand will be made by the coldest therms procurable and from the milk given by cows brought up on the Foundations of Music.

And, since we are talking, how about this week's "P.W."? The whole Show for threepence! That Supplement is a humdinger, or I'm a Nazi! Dear me, how the boys stretched themselves over this number! Still—great occasions beget great deeds.

Listen to the Fastest Road Race.

ON August 19th Major Vernon Brook and Mr. H. W. McMullan will give a running commentary on the International Ulster Grand Prix, claimed to be the swiftest road race in the world. National programme listeners will hear the commentary from 1.45 to 2.45 and the last phase from 4.30 to 5.15 p.m. The race is run over a total distance of 246 miles. There are some thrilling features for the motor-cyclists to negotiate on this course, and skilful commentary should transfer some of the thrills to listeners.

German Radio Show.

GERMANY, always to the fore in radio matters, has found time to organise a national radio exhibition in spite of the tremendous political upheaval through which it is passing. The show will last till August 27th, and I understand that cheaper fares to Berlin are on offer. It is difficult to know what to think of the German situation now, and as one of the most charming men I ever knew in the radio business is a German Jew, and a Dantzig man, too, I think I had better switch off before I say something irreverent about swastikas!

Relaying America.

I WRITE this less than an hour after listening to the B.B.C.'s gallant but not very successful attempt to re-broadcast Jim and Amy from America, a feature which was spoiled by "atmospherics," Morse and a shrill squeaking of origin unknown to me.

I am reminded of the anecdote about a broadcast which was given in the early days of Argentine radio, when some local big-wig was asked to spout at the opening of a station. Just as the dignitary began, an ass in the adjacent market-place brayed, and, as the windows were open, his "remarks" were broadcast throughout South America. I hope that no neighbouring republic took umbrage at such outspoken sentiments.

Five-Metre Tests.

IF any reader picked up signals on five metres from G2FX on Sunday, August 6th, between 11 a.m. and 1 p.m. (B.S.T.), he would be nice if he sent a report to G2AX, 11, Sea Road, Bexhill, or to G5BS, c/o "Hastings and St. Leonards Observer," Observer Buildings, Hastings. As the news of these tests did not reach us till July 25th we could not give advance news of these transmissions. Once more! Club secretaries and others, please note that these Notes are compiled and handed in about *two weeks* prior to their publication!

Empire Broadcasting.

ONE cannot but be delighted that after six months of Empire broadcasting the B.B.C. feels encouraged to further efforts in that direction. Over 8,000 letters have been received from all over the world, and they show a great appreciation of the service, not only on the part of the "exiles," but the born and bred Colonials. It is singularly unfortunate that New Zealand, the most "English" of all our overseas territories, is badly served, reception being most unreliable.

Song "Plugging."

THE action by the B.B.C. against certain music publishers to restrain them from song "plugging" was withdrawn, the opposite parties agreeing to combine in opposing the practice. One would imagine that bands would value their reputation for freshness and variety more than the payment they receive for "plugging." The money may not be forthcoming always, whereas a good reputation keeps a band in demand. In this connection it is interesting to hear that American publishers say that broadcast 'plugging" became of secondary importance long ago.

(*Continued on page* 732.)

OLYMPIA AND HOW TO GET THERE

ONCE more we have reached "Show time," and thousands of radio enthusiasts will be trekking to their Mecca in the west of London—Olympia. Many will know the way by heart, having visited the Radio Exhibition very frequently during the many years of its being.

For others a certain amount of information as to how to get to Olympia will be of great assistance, and the map shown below and the details given should provide much help.

The map shows the main roads of London, including the positions of the main railway stations, and also the chief bus routes in black. Thus travellers by road will find their way to Olympia fairly easily.

Those who go by bus should look out for the following numbers, which all pass by the Exhibition, and whose routes are fed by bus and tram from all parts of the metropolis. Here are the numbers: 9, 27, 28, 33, 73, 92, 127, 173, 233, 273, 526.

From the large termini of London it is possible to get to the show quite easily by means of the Underground, so that if you come up to London by rail the following details of the easiest routes should prove useful:

KING'S CROSS.—Metropolitan Railway (King's Cross Stn.). Book to Addison Rd. Ch. Edgware Rd.

ST. PANCRAS.—Metropolitan Railway (King's Cross Stn.). Book to Addison Rd. Ch. Edgware Rd.

For the convenience of those who will be making their first visit to the Olympia Exhibition buildings, we give on this page details of the best ways of getting there by bus and by train.

EUSTON.—Metropolitan Railway (Euston Square Stn.). Book to Addison Road. Ch. Edgware Rd.

MARYLEBONE.—Metropolitan Railway (Baker St. Stn.). Book to Addison Road. Ch. Edgware Rd.

PADDINGTON.—Metropolitan Railway (Bishop's Road to Addison Road or Praed Street to Kensington High Street, and thence bus to Olympia).

VICTORIA.—District Railway. To Earl's Court, and thence by train to Addison Road. Through booking.

CHARING CROSS.—District Railway. To Earl's Court, and thence by train to Addison Road. Through booking.

WATERLOO.—To Charing Cross by Bakerloo, and thence to Earl's Court and Addison Road as above. Through booking.

CANNON STREET.—By District to Earl's Court, and thence to Addison Road.

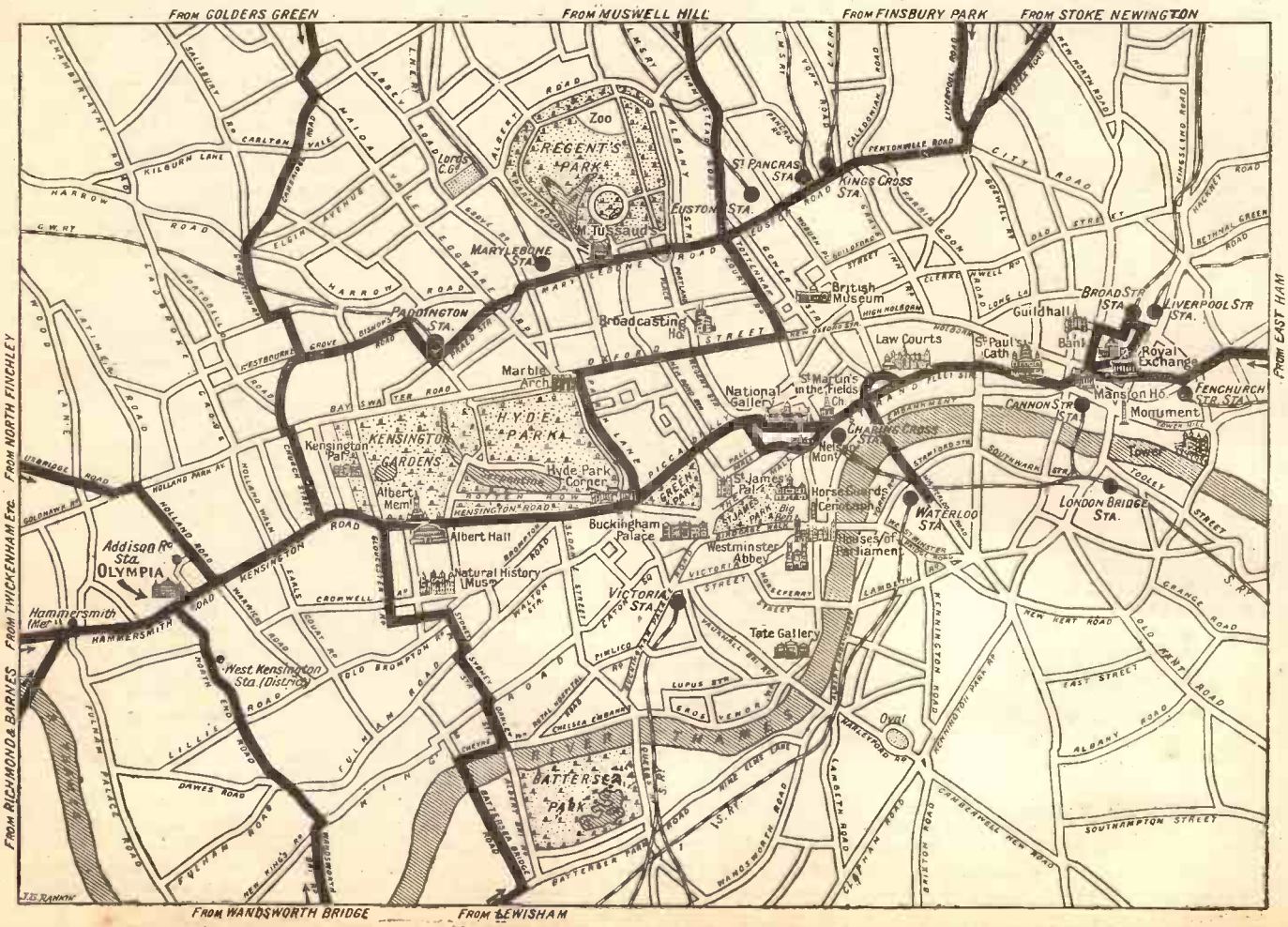
LONDON BRIDGE.—By train to Cannon Street or Charing Cross, and thence by District as above.

FENCHURCH STREET.—Walk to Mark Lane, and thence by District to Earl's Court and Addison Road.

LIVERPOOL STREET.—Metropolitan to Addison Road. Change Edgware Road.

Apart from the above, many of the recent Underground extensions will enable direct booking from the suburbs, while a convenient route for many will probably be via the Piccadilly Railway to Baron's Court, from whence it is an easy walk to Olympia.

Other routes, of course, are available, but the above gives the simplest ways, and if followed will help many to get to the Show without trouble or tedium.



London and provincial visitors to the Show will find this map helpful in finding their way to Olympia. It shows the routes taken by buses which connect Olympia with the Suburbs and various important railway stations of London.

IF the radio show had been delayed three or four months, and the same rate of progress maintained that marks 1933 as a technical boom year for wireless, it would have been impossible to have crowded all the innovations into one exhibition.

Despite the magnitude of the vast halls at Olympia, the whole building is crowded with an unparalleled display of vitally new apparatus.

Every exhibition of the past has been completely transcended, and we cannot visualise the possibility of any future show achieving quite such a step forward in the quality and interest of exhibits as the present one.

Important Developments.

Home constructors in particular should do their utmost to get along and see it, for a very large number of highly important developments make their first public appearances.

Approximately two hundred firms are showing, and even if in numbers they do not exceed those at Olympia last year, it is an indisputable fact that they have a great deal more to show.

The value for money given by most of the sets exhibited takes our breath away. In view of all the new ideas that are being incorporated in them and the general considerable improvement in craftsmanship they display it would not have come as a surprise if prices had risen.

Everyone who can do so should make certain of at least one visit to Olympia.

The 1933-4 National Radio Show fittingly embodies all the latest ideas and improvements, and never before have there been so many really important new technical developments to consider.

But no; although the sets are better, the prices are lower! Olympia is surely the set buyer's paradise. He won't be able to pay his money and take the instrument he selects away with him, but he has the golden opportunity of seeing the whole stock-in-trade of the radio industry under one roof. Maybe he will find it difficult to choose one from so many excellent designs, but that difficulty, if difficulty it can be called, will be offset by the fact that he has an unprecedented selection.

Our Stand-to-Stand Guide.

That is, so long as he makes a comprehensive tour of the exhibition. This is where we can help him, for our stand-to-stand guide, which appears on other pages in this issue, has been prepared to assist those who go to the show in finding all that is worth while, as well as to tell the "stay-at-home" all about it.

This time the exhibition is much more solidly grouped than previously. All the main exhibits are located in the Grand Hall and on the gallery which runs round it.

By skilfully arranging the stands, ample gangway room has been allowed for the very big crowds which are expected.

It can be said that the show is "easier to see." Less time will be wasted in going from hall to hall, and it will be a fairly simple matter for the visitor to walk right round and miss nothing.

In the National Hall.

Indeed, a complete stand-to-stand inspection won't be at all tiring, and there will be more time to spend examining individual exhibits.

The National Hall has been turned into a first-class theatre, with excellent seating, a fine stage and most elaborate lighting effects.

It is in this theatre that variety and revue entertainments are to be given. These will take place between 6.30 and 7.45 and 8.25 and 9.40 every evening. Musical concerts will be given in the afternoons.

The tickets for the evening shows will cost 6d., 9d., 1s., and 2s., and are to be sold from a box office in the Grand Hall.

Many of the programmes will be broadcast, and a large number of B.B.C. artistes

(Continued on next page.)

If It Had Not Been For These Men There Would Be No Radio Exhibition!

MARCHESE MARCONI.

SIR AMBROSE FLEMING, F.R.S.

P. P. ECKERSLEY, M.I.E.E.

SIR OLIVER LODGE, F.R.S.

Do you ever stop to think what we owe to the great radio pioneers—to men like Marconi, Fleming, Lodge, Eckersley and others who have done so much to create one of the greatest of modern industries?

On other pages they send messages of goodwill to the Radio Industry and to the Organisers of the Exhibition, and we, in our turn, should remember them, and pay tribute to their genius and energy which has made the Radio Exhibition possible.

THE RADIO EXHIBITION

(*Continued from previous page.*)

are appearing. These include Sydney Baynes and his Orchestra, Clapham and Dwyer, Henry Hall and the B.B.C. Dance Orchestra, Flotsam and Jetsam, Norman Long, the Houston Sisters and Julian Rose.

John Watt and Harry S. Pepper will produce a special revue.

The Radio Exhibition commences on August 15th and runs until August 24th, and is open from 11 a.m. to 10 p.m. daily.

Several readers have written to us asking when is the best time to go. Well, we do not anticipate that at any time during the day the attendance will be insignificant and that a handful of visitors will have the whole place to themselves.

Judging from past experience, sizeable crowds will be swarming round the stands every minute of every day.

And, in any case, what is an exhibition without a crowd? A pretty deadly affair. A crowd stimulates the stand attendants and brings life and laughter into being.

A crowd may make it a bit harder to get from stand to stand; but what does that matter when you know that the jostling elbows and shoulders round you by their very number are helping to make the show go with a swing?

We know when we enjoy ourselves most at the show. And that is when the crowd round our stand is at its densest.

So we fear we cannot sympathise with that type of individual who apparently wants a full-dress National Radio Exhibition for the sole benefit of himself and one or two others.

Our show motto is: "The More the Merrier."

And consideration will indicate that there is a wider significance to this idea of a crowd being the heart and soul of an exhibition.

It must be remembered that Radiolympia is British Radio on Parade. And from all over the world will come foreign visitors to see it.

The crowds will strike the keynote. And vast, enthusiastic crowds will at once convey the right impression to the buyer from overseas. He will need no further convincing that British radio is booming.

However, this is all by the way. Our descriptive articles in this issue clearly prove that no other incentive than the intrinsic merits of the exhibition itself are needed to draw the crowds.

At least four or five hours should be allowed for the briefest of visits to Olympia; many will not be able to do all they want to do in less than two or three such visits.

Very good catering arrangements have been made, and anything from a cup of tea to a full evening dinner can be obtained without leaving the premises.

In fact, the enthusiast can live there all day—and it would be a day to be remembered.

RADIO ON THE RACING TRACK

One of the latest applications of radio is to motor-racing at Brooklands, cars having been equipped with receiving sets to enable the drivers to take orders from a transmitter at the control pits.

All the interesting news and views of current short-wave practice.

EXHIBITION week, and holidays finished! All good things come to an end; and this morning I am sitting at my typewriter trying hard not to wish that I were sprawling in a deck chair or (better still) splashing in the briny. But come! Let us not give way to such unworthy feelings, but rather dip a hand in the correspondence basket.

Here is "J. T. S." (Leicester), who wants to know whether the keener readers of "Short-Wave Notes" could possibly start a kind of correspondence bureau for the mutual interchange of facts and notes that are not of sufficient general interest to be dealt with in these columns.

Requires Careful Organisation.

The trouble about such things as "correspondence bureaux" is that they *always* fizzle out unless they are well organised at the start. In this case the whole business would be so very vague that no organisation would be possible. However, if "J. T. S." would like me to do so, I will forward him the names and addresses of any readers who write to me saying that they are interested in his scheme.

"J. B. M." (Glasgow) reports P H I on 16·88 metres with an interesting programme. He thinks that the announcer was Mr. Schwartz, of "P C J" fame. He also logged a French telephony station on 12 or 13 metres. Can anyone identify?

An interesting letter has arrived from "R. S. B." (East London, South Africa). He wants to know whether I really favour resistance-capacity coupling for an L.F. stage on short waves.

Yes. "R. S. B." I really think the extra clarity and silence of background fully make up for the slight loss in volume, as compared with the transformer-coupled stage. By now, of course, you will have seen the "Short-Wave Two," with S.G. detection and R.C. coupling.

Not Ideal for Radio.

"R. S. B." finds the 31-metre wave the best of all from Daventry. Other good stations in South Africa are Moscow, Rome and the 49-metre Americans. He mentions "conditions," by the way, but not in connection with the ether.

The "conditions" that "R. S. B." refers to are those in Durban boarding-schools, and they are not exactly ideal for radio, as even the prefects do not have their own studies in which they can sit back and twiddle the knobs in perfect peace!

Next in the postbag is a note from Mr. T. Martin, 3, Gladys Road, South Yardley, Birmingham, saying that reports on signals from his station, G 2 L B, working in the 20-metre band, will be appreciated.

"T. C." (Wakefield), who did so well in the recent competition, has just sent in another log, covering the dates July 14th–25th. He has wired a ·00035 variable condenser in series with his ·00013 tuning condenser, and the extra ease of tuning makes him wish he had done so before the competition.

His log certainly seems to contain everything that one could reasonably be expected to hear, including all nine districts of U.S.A. on July 16th. He is very worried, though, because he never hears South Africa. Has anyone else been hearing South Africa lately? I haven't! (I except Nairobi, of course—we are referring to amateurs.)

There seems to be a lull in 5-metre work for the present. The full story of our recent experiments in Yorkshire will be told shortly, but no further epoch-making achievements must be expected. Personally, I think the Crystal Palace tests served their purpose well by showing that medium-distance work *is* possible on this wavelength; and by proving that the previously accepted views regarding range on these ultra-short waves were inaccurate.

Simplicity and Portability.

The chief charm about 5 metres is the extreme simplicity of the apparatus and its complete portability. For short-distance work on field-days or between stations in the same town it is unrivalled.

The line I intend to take, therefore, is the development of even lower-powered and more-portable gear, rather than the building of high-powered stations that are intended to get ten miles farther than anyone else has got!

I have seen an attache-case transmitter already, and a receiver of the same size is even easier to make. The most bulky part of the whole gear is usually the speech

(*Continued on page 748.*)

OUTSTANDING EXHIBITS AT OLYMPIA

AMALGAMATED PRESS, LTD.
Stand No. 11.

The Empire's greatest publishing house, The Amalgamated Press, welcomes you to Stand No. 11, which you will find opposite the Hammersmith Road entrance, on the far side of the Grand Hall.

Every reader of POPULAR WIRELESS who can do so is invited to come and chat with members of the Technical Staff, who will be on duty continuously to advise and assist in every way towards the greater enjoyment of radio. The stand is a large one, with plenty of room, and it houses some remarkably interesting exhibits in the form of original models of famous sets.

Here will be seen the first "Catkin" receiver, the "Ferro Q," the "No-Gap Three" and other first-of-their-type designs, and in addition we shall show the first Cathode Ray Television Viewer for home constructors.

Yet another not-to-be-missed item is a 5-metre station transmitter and receiver—which, with other kindred exhibits, will make your visit this year to Olympia a memorable one.

AMPLION, LTD.
Stand No. 104.

Although in the past Amplion, Ltd., have restricted themselves to the production of P.M. loudspeakers and gramophone pick-ups, this year they have produced a range of "Class B" components. Although this is a new venture it is one that will interest constructors.

MAKING RADIO SIMPLE

A unique component developed by Ferranti's to enable "Class B" amplification to be added to any battery set. It comprises loudspeaker, driver and output transformers and valve holder.

NATIONAL RADIO EXHIBITION

August 15th ——— August 24th.
Open from 11 a.m. till 10 p.m.

A comprehensive survey of the main features of Britain's greatest Radio Show, with brief details of the many outstanding new components, accessories, and technical advances.

On their stand will be found a driver transformer in three ratios, and also a three-ratio tapped output choke. The price in each case is 9s. 6d.

Other Amplion attractions will include new loudspeakers, the Sonette P.M., retailing at only 27s. 6d., and another newcomer, the Audiola, at 49s. 6d.

AUTOMATIC COIL WINDER AND ELECTRICAL EQUIPMENT CO., LTD.
Stand No. 46.

The particular interest of dealers and coil manufacturers will be centred on two of the new coil-winding machines now introduced for the first time. But the general public will also find attractions at this stand in the form of measuring instruments.

The Avometer, for instance, measures thirteen different ranges of amps, volts and ohms, using only one pair of leads and without external shunts or need for calculations of any kind.

Entirely new are the Avominor, which enables any and every test to be made with rapidity and ease, and the Avodaptor.

The latter is a valve-circuit tester, and both instruments will find a multitude of uses in rapid testing and maintenance.

VISIT "P.W."

Members of the Technical Staff will be present all day to assist you.

STAND 11

BAKER'S SELHURST RADIO
Stand No. 35.

Eight years of experience in moving-coil design are behind the Baker's Selhurst loudspeakers, and a large and improved range of designs is sure to attract wide attention this year.

In the moderately-priced class the Standard models will fill the need for realistic reproduction and efficiency. The 1933 Super Power models must be heard to be appreciated at their full worth, extraordinary sensitivity being one of the attention-compelling features.

BELLING AND LEE, LTD.
Stand No. 45.

Continuing its successful policy of specialisation on the needs of the keen constructor, this firm has turned out some really irresistible lines. Apart from the multitudinous terminals, connectors and so forth, there are features like the "Clip-on" Unit Pick-up which will specially interest the music lover, and a very ingenious device called the Belling-Lee Disturbance Suppressor.

All who are troubled by electrical interference will be interested in the full details of this instrument, which is specially designed to remove those exasperating clicks, sizzles and crashes.

BENJAMIN ELECTRIC, LTD.
Stand No. 42.

"Class B" driver transformers and a "Class B" universal output choke are leading new lines of this always-up-to-date firm.

Also showing will be the Benjamin Transfeeda, a 1 : 3 ratio L.F. transformer with nickel iron core and inductance of over 85 henries. Its anode-resistance feed is 50,000 ohms, tapped at 30,000, and with coupling condenser the whole unit is attractively encased and priced at 11s. 6d.

The new valve holders, also, are worthy of special note, being suitable for "Class B" double-diode triode and other newly released valves.

(*Continued on next page.*)

A PORTABLE SUPERHET

A moving-coil loudspeaker is incorporated in this self-contained battery superhet., "His Master's Voice" Model 459 M.C. It is in a handsome walnut cabinet, price £14 14s.

OUTSTANDING EXHIBITS AT OLYMPIA

(Continued from previous page.)

BLOCK BATTERIES, LTD.
Stand No. 22.

Something of a new industry may be said to be springing up out of the development of Block plate-less accumulators, and there will be few exhibits of such a revolutionary nature at the Radio Show as the new plate-less H.T. accumulator.

FOR THE MUSIC LOVER

The Marconiphone pick-up incorporates a special "humbucking" coil to eliminate mains induction.

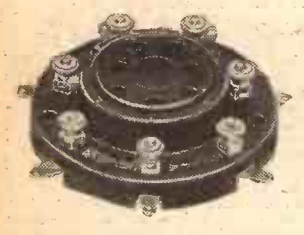
This will be made in two sizes—60 volts and 30 volts, each of 5,000 m.a.h. capacity.

The Block plate-less H.T. accumulator is only half the size of a corresponding ordinary H.T. accumulator. It is, in fact, little larger than a dry battery, and can be carried about with ease. The 60-volt size weighs about 16 lb., complete with acid—a third of the weight of almost any other type. The 30-volt size weighs only 8 lb.!

The low-tension plate-less accumulator will also be exhibited. Instead of the usual glass "box," the Block plate-less accumulator is a neat cylinder of mottled bakelite, having almost double the ampere-hour capacity of an ordinary accumulator of similar bulk.

It consists essentially of a thin lead cylinder, with a bakelite "skin," and is pasted round its inside (by a patent process) without the aid of grids. This cylinder is both the negative electrode and the battery's real container.

Inside it is a lead column similarly pasted which forms the positive. A separator is used of glass wool and soft ebonite. Not only are the weight and space of grids thus avoided, but much higher capacity is attained for a given bulk.



To meet the requirements of "Class B" and double-diode triode users Benjamin have produced this seven-pin valve holder.

BOWYER LOWE AND A. E. D., LTD.
Stand No. 102.

Pick-ups for quality reproduction of gramophone records are amongst the main items of a range which also includes variable resistances, the parallel-fed transformer unit, a log-law volume control and an exceptionally interesting all-electric record-playing unit.

THE POWER SUPPLY

H.T., L.T. and G.B. requirements are amply catered for by the makers of Pertrix batteries and accumulators.

Included in the various pick-ups are an adapter for acoustic gramophones and a new Mark IV. pick-up designed for use on de-luxe radiograms of the very highest class.

BRITANNIA BATTERIES, LTD.
Stand No. 124.

"Pertrix" is the name by which this firm's batteries are universally known, and the range is extremely comprehensive and well designed to meet the needs of present-day practice.

For the grid bias and H.T. lines the "Pertrix" dry batteries are manufactured under a patent non-sal-ammoniac process of proven efficiency, and the huge popular demand is a tribute to public recognition of manufacturing merit.

For Q.P.P. there is a new range of combined grid bias and H.T. batteries, the G.B. being included in the main carton, but not electrically connected to H.T. Composed of ultra-capacity cells, these batteries are exceptionally well designed to meet every requirement of the method, so Q.P.P. enthusiasts should not fail to see them.

BRITISH BLUE SPOT CO., LTD.
Stand No. 97.

To everyone who remembers the furore created by Blue Spot loudspeakers, with their fresh fidelity and amazing clarity, Stand 97 will be irresistible. Especially when it is realised that the firm's 1933-34 programme includes some additions of unusual merit.

The discerning purchaser of a complete loudspeaker will discover at this exhibit a remarkable variety from which to choose. There is, for example, the 31K, incorporating the latest model of the world-famed 66K unit, in a solid oak cabinet. And the old list price of 31s. 6d. has been revised to 25s. 6d. for the coming season.

DESERVEDLY POPULAR

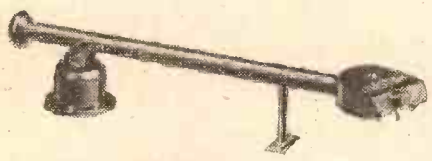
Among the many R and A speakers, the "Challenger" commands attention by reason of its high performance for moderate outlay.

Another very noteworthy price reduction is that of the 44R—enormously popular at 52s. 6d., but now obtainable at well below that figure, in two different styles.

For "Class B" sets the 44R type is available at 42s., whilst the standard 44R is now only 39s. 6d.

In addition there is a completely new line of Energised M.C. loudspeakers. There are different types of these for different supply voltages, and as they are manufactured from quality materials with the care and exactitude for which Blue Spot is famous they give a performance which is exceptionally fine.

To these attractions must be added the Blue Spot pick-ups, a line of complete receivers, the various chassis, and—specially notable—a Mains Disturbance Eliminator.



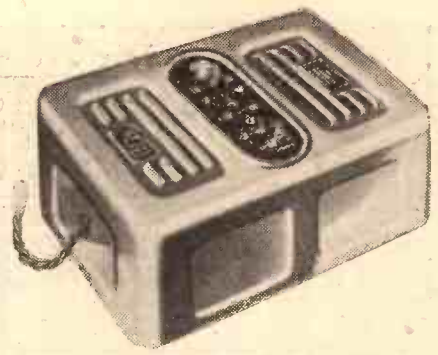
A Celestion pick-up which can be relied upon to provide reproduction which is the "very soul of music."

A quite bewildering choice of cabinet work confronts the purchaser of Blue Spot loudspeakers, so that this opportunity of viewing the whole range of them is specially valuable.

BRITISH EBONITE CO., LTD.
Stand No. 207.

Set builders, and especially short-wave and other experimenters, know that to secure perfect insulation efficiency it is essential to employ high-quality ebonite, such as has formed the basis of this well-known firm's reputation. And the long "Becol" experience in catering for constructors ensures that shape, size and finish are all that can be desired.

A very wide range of formers, rods, tubes, etc., will be showing, and the visitor should look especially for the new and handy Becolettes, which are an invaluable workshop adjunct of the very highest quality, hitherto unobtainable.



The comprehensive range of Telsen components and accessories now includes a series of mains units.

BRITISH GENERAL, LTD.
Stand No. 38.

In addition to the Apex choke, output transformer, ganging device and aerial-tuning unit which this firm featured so successfully last year, a number of favourite lines will be on view at reduced prices. Also some entirely new products, including an all-wave tuner and a parallel-fed coupling unit.

Of special interest, too, is a flexible coupler for only 9d., whilst a screened H.F. choke at 5s. 6d. is also numbered among the tempting items here.

BRITISH PIX CO.
Stand No. 204.

Fix-a-Pix has become a well-established slogan, and no doubt the other products of this popular firm will greatly interest visitors to Olympia, for some very attractive lines will be on view.

The invisible aerial will appeal to flat-dwellers especially, whilst a novel device making its first public appearance will be the "Modula."

This is an armchair control which enables a set to be attended to without stirring from one's ease. Supplied complete with flex for 2s. 11d., this is sure to prove a big attraction.

TWO SPACE SAVERS.

The Igranic midget switch below is of the quick make and break type and is cleverly designed to occupy a minimum of back-of-panel space. The T.C.C. Electrolytic condenser is a fine example of this specialist firm's large range of fixed condensers. It compresses high capacity into small space.

BRITISH RADIOPHONE, LTD.
Stand No. 118.

Radiopaks of various kinds for band-pass and superhet. work constitute a leading attraction, the uncommonly easy construction of a set in which they appear having gained them a great name amongst radio men who appreciate high efficiency and originality of design.

Good as they are, the Radiopaks are not the only lure to this stand, which also displays variable condensers, combined reaction condenser and wire-wound potentiometers, pick-ups, "Class B" transformers, switches, fixed condensers and disc drives.

(Continued on next page.)

One of the most interesting innovations at the Show is the "plate-less" accumulator, which has now been developed by the Block concern for supplying H.T.

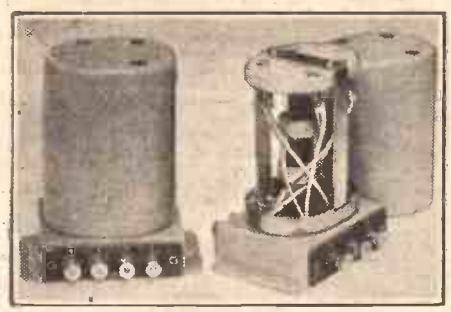
OUTSTANDING EXHIBITS AT OLYMPIA

(Continued from previous page.)

BRITISH ROLA CO., LTD.
Stand No. 52.

No less than sixteen different Rola loudspeaker units are made available in the new season's programme, the prices ranging from £1 7s. 6d. for the 6-inch diameter types to £3 for the 9-inch Permanent Magnet Model, F7—P.M.

SCREENED SUPER COILS



Included in the British Radiophone range of coils are these screened superheterodyne inductances.

All the models are available with universal tapped transformers suitable for either pentode or power valves. They can also be supplied without transformers at 7s. 6d. less than the above prices.

All Rola speakers in this wide range are available for "Class B" valves. In addition a number of dual

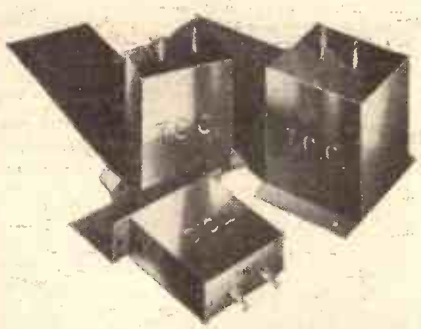
FOR L.F. COUPLING

One of the very latest additions to the large range of low-frequency coupling components of R.I. make.

balanced pairs have been arranged for, as quality seekers have found this method exactly suited to discriminating critics of radio reproduction.

Of special interest is the Rola "Class B" Speaker Amplifier Unit, which comprises a Rola permanent magnet moving-coil speaker, with which is incor-

A view of the latest form of a popular receiver—the Pye Portable.



Large fixed condensers made by the Telegraph Condenser, Co., Ltd.

porated a complete, properly matched "Class B" amplifier.

This assembly, when connected to any battery wireless set, converts it to "Class B" output, increasing the overall sensitivity of the set several times and increasing the power output or volume capacity up to five times.

It can be connected to any battery receiver without alteration, and is complete with instructions.

With this unit any battery receiver will give equivalent performance as regards richness of tone and volume of a high-grade all-mains receiver, whilst at the same time retaining inherent economy in battery consumption.

A. F. BULGIN & CO., LTD.
Stand No. 122.

It would be difficult to imagine a more varied radio display than that provided by the Bulgin products. For this old-established firm seems to have

A WELCOME FROM THE MAYOR OF HAMMERSMITH

From COUNCILLOR W. P. DAVIES, J.P., Mayor of Hammersmith.

I am glad to have this opportunity of extending a cordial welcome to those representatives of the British radio industry who will be attending the Exhibition in this Borough which opens at Olympia on August 15th. It is generally admitted that the British radio industry is now one of the largest industries in the United Kingdom, and I hope that the Exhibition will be the most successful ever held in this country.

Members of the general public should visit Olympia in large numbers to inspect and purchase all that is best and up to date in wireless apparatus, and thus stimulate the further expansion and development of an important British enterprise.

(Signed) W. P. DAVIES.

the knack of knowing exactly what the wireless man needs.

Sooner or later—and generally sooner—every worth-while radio device appears in the Bulgin catalogue, at a beat-me-if-you-can quality and buy-me-now price. So the Bulgin display at the Radio Show might be expected to be something right out of the ordinary.

It is. From a cursory examination there seem to be components of every description. And, moreover, they appear to be better than ever before, although many of the prices are lower!

So a special point to remember is to secure a catalogue from Stand 122, it being quite impossible to do justice to the many ingenious devices displayed during a necessarily brief visit. This catalogue, by the way, is far more than a catalogue, for it incorporates a manual of some thirty pages, full of circuit hints and useful technicalities.

With such a variety of lines it is invidious to mention single items, but quality enthusiasts may thank us for mentioning that amongst the brand-new lines there is an ingenious "Controlatone," easily added to any receiver and enabling its high-note response to be varied with the utmost ease.

PROVIDED WITH REST

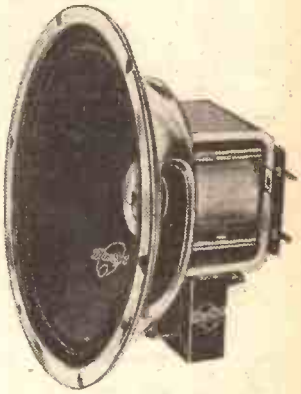
The Columbia pick-up and arm with which a rest is provided.

CARRINGTON MANUFACTURING CO., LTD.
Stand No. 83.

Radio cabinets have advanced by sure degrees into the proud position of home beautifiers, and much of the credit will be assigned to Carringtons, of "Camco" fame, who will this year again be to the fore with chaste and elegant designs.

ONE OF MANY

A wide range of loudspeakers are available in Blue Spot make, the one illustrated being a moving-coil type.



Apart from the more ambitious and handsome models for complete sets, there are the loudspeaker and portable types, with a professional finish that will appeal to all lovers of distinctive work. The range of prices is comprehensive and accommodating.

CELESTION, LTD.
Stand No. 125.

Many improvements and modifications have been arranged for this season's display, although no price

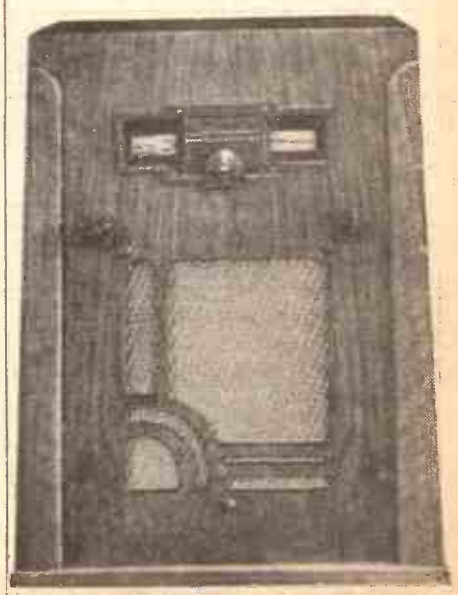
THE IMPROVED AVODAPTER

An ingenious unit for testing valves and their circuits externally to the set, made by the Automatic Coil Winder and Elec. Equip. Co., Ltd.

increases have been made in the famous Celestion range of loudspeakers and associated apparatus.

A new departure is the introduction of cabinet speakers combined with a stage of "Class B" output, thus ensuring that the speaker is accurately

(Continued on next page.)



An illustration of one of the attractive Consolette type of receivers in the Columbia range.

OUTSTANDING EXHIBITS AT OLYMPIA

(Continued from previous page.)

matched to the valve. Readily plugged into an existing battery set, this renders the full advantage of "Class B" output immediately available—a point which is sure to add to the crowd that will always be attracted to Celestions.

CHLORIDE ELECTRICAL STORAGE CO., LTD.
Stand No. 241.

Exide and Drydex batteries of all kinds will be found on Stand 241 in the gallery, and visitors will find that the already very extensive range has been added to this year, in pursuance of the firm's policy of providing the radio man with exactly what he needs.

Additions to the Triangle range of H.T. batteries have now made it possible to cover the requirements of every well-known portable, whilst the four main

NEW "CLASS B" VALVE

Combining in one bulb two high-mu triodes for "Class B," this is the new Mazda P.D.220. H.T. current consumption is very economical with this valve, which gives a power output of 1¼ watts for 135 volts on the plate.

Exide L.T. types are equally effective in providing for the low-tension requirements of modern radio receivers.

H. CLARKE & CO. (M/CR), LTD.
Stand No. 91.

A 4-valve "Class B" set and a 4-valve all-mains set are leading attractions in the "Atlas" range this year

The "Class B" set, known as the "Atlas B4,"

SUPER OR STRAIGHT

Messrs. Varley have chosen this admirably executed and well-proportioned cabinet to house either their new 3-valve A.C. receiver AP34, or their Superhet. AP48.

employs a variable-mu H.F. stage, leaky-grid detector, driver and power "Class B" valves. H.T. consumption is approximately 8 milliamps, and the output power is 2½ watts. On this set provision is made for extra speakers, and pick-up sockets are also provided. Batteries are included, and a noteworthy feature—of special importance since the Lucerne Plan involves alterations in many of Europe's wavelengths—is the easily-altered tuning scale of the illuminated dial.

The "Atlas" 4-valve all-electric set is designed to operate on A.C. mains, and in addition to a variable-mu H.F. valve employs an H.F. pentode detector (anode bend) and directly-heated power pentode,

POWER IN PLENTY

A value-for-money proposition is the Hellesen "Hi-Life" H.T. Battery.

with valve rectifier. The output power is three watts, and the set has many special points which lack of space debars from mention here.

"Atlas" mains units will, of course, be shown in wide variety, this firm having acquired a very enviable reputation for just-what-you-want design, backed up by an easy-payment system that has proved of the greatest convenience to the radio public.

Full details of all the models will, of course, be supplied to all interested enquirers.

From SIR OLIVER LODGE, F.R.S.

There is going to be another Wireless Exhibition at Olympia. Radio progress every year is very marked, and the rapidity with which the industry has progressed is surprising. There is now chiefly the crowdedness of the ether to be contended against, and some devices are sure to be exhibited to make broadcasting more selective and tuning sharper, so that stations may be placed closer together in wavelength than they can be at present. That seems to be the direction in which advance is probable. Meanwhile, I wish all good luck to those engaged in the industry.

(Signed) OLIVER LODGE.

CLIMAX RADIO ELECTRIC, LTD.
Stand No. 84.

The new "Climax" transportable console model has the great advantage that it is not a one-room set—it is a self-contained all-electric receiver that can conveniently be moved to any room in the house.

Almost as selective as a superhet., it gives a wide choice of programmes on its moving-coil loudspeaker even without an external aerial, the circuit being multi-mu S.G., detector and pentode, a combination of great power.

Its novel pedestal makes this an unusually noteworthy design, and the prospective set purchaser is sure to be well repaid by an inspection of the models on this stand.

E. K. COLE, LTD.
Stand No. 70.

This enterprising firm, makers of the universally popular "Ekco" receivers and mains units, have decided that in future all their receivers will be designated by the number of effective stages they incorporate, instead of by the number of valves.

"Class B" two-in-one valves, double-diode triodes and similar new types that perform several functions simultaneously should, "Ekco's" say, be rated by the number of stages they represent rather than by an arbitrary "number of valves."

So all the new "Ekco" receivers to be introduced at Olympia will be specified in this interesting

BY BOWYER-LOWE

A pick-up of superlative performance, by an old-established radio firm.

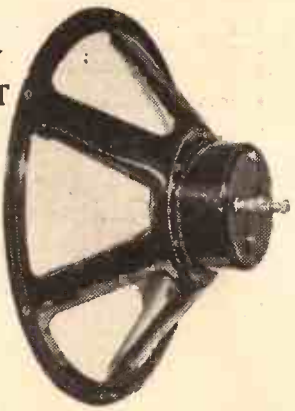
HOME CONSTRUCTED!

No, not an expensive commercial receiver, but the latest Cossor Kit, which can be easily and inexpensively built by any possessor of a pair of pliers and a screwdriver.

manner; and although at the time of going to press the technical details are not available for these lines it is evident that new design in valves is to be fully reflected in the coming season's "Ekco" products.

Even without the attraction of novelty the callers

A QUALITY PRODUCT



The moving-iron principle of loudspeaker construction, as exemplified in this R and A product, enables high-quality reproduction to be obtained at low cost.

at the great Southend firm's exhibit would be certain to find plenty of outstanding interest, the long specialisation in mains apparatus having gained the firm a most enviable reputation amongst the mains-served radio public.

(Continued on next page.)

IRON-CORED EFFICIENCY

The highest possible efficiency in tuning is made available by means of iron-cored coils. This is the famous Varley "Nicore" version.

OUTSTANDING EXHIBITS AT OLYMPIA

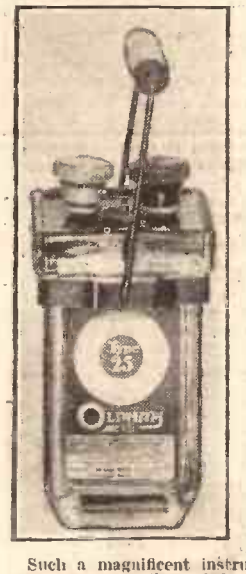
(*Continued from previous page.*)

COLUMBIA GRAPHOPHONE CO., LTD.
Stand No. 66.

Admirers of the superhet. are amongst those who will make a bee-line for the Columbia display, the popularity of the firm's Autoradiograph Superhet. Seven being proverbial. And they will find that this year's version is all that they could have hoped.

Various economics in production have resulted in the price being altered to 43 guineas, for which the purchaser has an A.C. seven-valve superheterodyne receiver, with automatic record changer and electro-magnetic moving-coil loudspeaker.

With its floodlit wavelength scales and illuminated station indicator this is undoubtedly a receiver of the really super class.



L.T. POWER

A representative example from the comprehensive range of accumulators shown at the Oldham stand. The neat carrying handle is instantly removable, but at the same time cannot slip when in use.

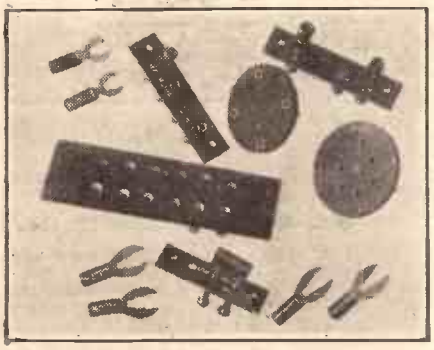
Such a magnificent instrument makes the comprehensiveness of the Columbia range of receivers and radiogramophones all the more marked, for although you can go up to ninety guineas for an "Autoradiograph" Ten-Valver there are also Columbia instruments below the £5 mark.

For the battery user there is the "C.Q.A." Battery Radiograph, featuring a 4-valve improved form of Q.P.P. chassis, double-spring motor, new-type Columbia pick-up and extra large permanent magnet moving-coil loudspeaker. This is priced at 20 guineas.

For 11 guineas there is "C.Q.A." Battery Four, with permanent magnet moving-coil loudspeaker built into a handsome walnut cabinet, giving an undistorted output of 1¼ watts. A combined 166-volt H.T. and 9-volt G.B. battery and 2-volt accumulator are also included.

Here, too, will be found a 30s. balanced armature loudspeaker, a combined pick-up and carrying-arm, 2-valve, 3-valve and other receivers, all backed by Columbia experience and reputation.

FOR MAKING CONNECTION



Some of the large variety of connecting devices which bear the name of Clix.

COLVERN, LTD.
Stand No. 56.

Over and above all the usual coil attractions for which this firm is noted, we have at their stand this year what will undoubtedly prove to be one of the most notable features of the 1933-34 Radio Show—viz., Ferrocart.

Even the non-technical reader will have heard something of these wonderful new-style coils, with cores not of air (as was universal only twelve months ago) but of finely separated iron particles, providing greatly superior magnetic qualities.

The air-cored coil had established such a firm hold upon the public that it seems almost incredible that its days are numbered. And thus a complete range of Colvern Ferrocart coils is an exhibit of the first importance.

POWER OR PENTODE

Provision for connecting either to power valve or pentode is provided in this Rola permanent-magnet moving-coil loudspeaker.

The new lines are prefixed by the letter F, the F5 being an aerial coil with reaction, for det. L.F. receivers. Similarly, F10 and F3 are the types for the new aerial and H.F. coils for one-screened-grid H.F. receivers.

TEN WAYS OF SPENDING NOT MORE THAN 5/-

1.	A 60-ft. length of PIX Invisible Aerial. (Stand No. 204)	3 6
2.	A BULGIN "Controlatone" unit for tone control. (Stand No.122)	5 0
3.	A DUBILIER 4-mfd. electrolytic condenser. (Stand No. 68)	4 6
4.	A GRAHAM FARISH "Zelos" variable condenser.(StandNo.205)	5 0
5.	An IGRANIC "Indigraph" vernier knob and dial.(StandNo.86)	5 0
6.	A VARLEY 100,000-ohm wire-wound resistance with holder. (Stand No. 85)	4 6
7.	A T.C.C. 250-volt working 4-mfd. condenser. (Stand No. 98)	5 0
8.	Set of four W.B. anti-microphonic valve-holders. (Stand No. 128/129)	5 0
9.	A POLAR "Panel-Mounting" disc drive. (Stand No. 93)	5 0
10.	A WEARITE 50,000-ohm "Q.V.C." volume control. (Stand No. 1)	4 6

For the popular arrangement of 2 S.G.-stage receivers without bandpass coupling the new coils specified are F10, F14 and F13, and other combinations are available for other circuit arrangements, in the same way.

Of special interest are the F1, F2 and F3 assemblies, these being for a bandpass filter and auto-transformer arrangement with reaction.

It is to be hoped that in the pardonable interest and great curiosity aroused by these new lines, the other Colvern products will not be neglected; but, if so, this enterprising firm has only itself to blame.

A. C. COSSOR, LTD.
Stand No. 89.

The latest achievements of Cossor engineers and technicians have fully justified the great expectations entertained of the Highbury Grove firm when they turned their attention to "Class B" and the valve developments.

In addition to the huge Cossor range of what we may call ordinary valves, we now have the newcomers to the Cossor range: the 240.B., for example, enables volume sufficient to suit the most exacting to be obtained with a current demand well within the capabilities of the dry H.T. battery.

Other specially interesting releases are the 220.V.S. (of relatively small consumption for a variable-mu valve) and the D.D./Pen.

This latter consists of a multi-mu L.F. pentode, intended for use as an R.C. coupled L.F. amplifier, and two diodes, all in the same bulb and working from one common cathode. The M.V.S./Pen. offers a wide range of possibilities, including the use of the valve as a mixer, etc.

These Lissen coils are band-pass intermediates for the home-constructor's superhet.

The suppressor grid in this design is brought out to a separate terminal, and the output of this interesting valve is far greater than that obtainable from a variable-mu screened-grid valve.

These are only a few of the newcomers—the whole range must be inspected at leisure to be valued at its true worth.

Another new development is the Cossor Neon Tube Voltage Stabilizer, which enables the user to provide for mains unit output voltage that does not change appreciably when the current drawn from the unit is varied within wide limits.

Quite apart from revolutionary valve departures, the firm has been preparing many new lines in kits and receivers. A "Class B" Battery Kit is one new feature this year, and another is a 4-valve mains kit, including rectifier and energised moving-coil speaker.

Two entirely new models of table Mains Receivers will also be on view, whilst another new design provides a floor console battery receiver which can also be used as a table model, the circuit comprising 2 S.G. stages, detector, driver and "Class B" output.

Very high selectivity and great volume are features of this combination.

"Class B" also figures in the new Battery Model 634, which has a permanent magnet moving-coil loudspeaker and is housed in a handsome veneered walnut cabinet.

Attractive in appearance and outstandingly efficient in performance, the British-General H.F. choke should be examined by all discerning constructors.

DUBILIER CONDENSER CO. (1925), LTD.
Stand No. 68.

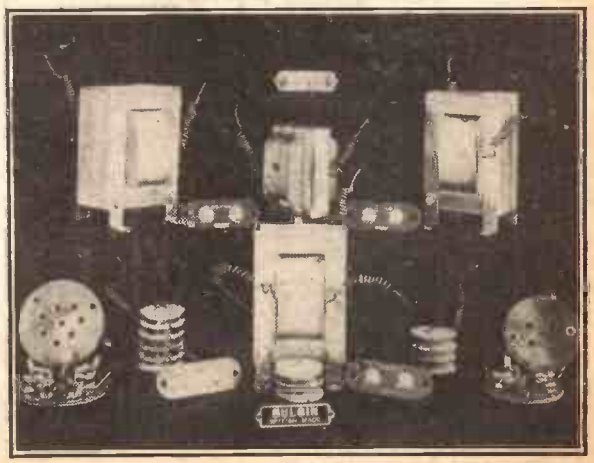
A completely new range of paper dielectric condensers is one interesting aspect of the Dubilier display.

They are of cylindrical can shape, fitted with terminals and a patented fixing device.

These condensers will replace the present popular type 9,200, and in addition the firm is adding new

(*Continued on next page.*)

A FEW OUT OF MANY



Some of the hundreds of components and accessories which you will see on the Bulgin stand, open for inspection.

OUTSTANDING EXHIBITS AT OLYMPIA

(Continued from previous page.)

types of paper condensers in rectangular metal cases, one range being fitted with soldering tags and the other with terminals.

The standard "can" types of electrolytic condensers of 8 mfd. and 4 mfd. have been still further improved, and a new range of low-voltage electrolytic condensers has been introduced.

Outwardly the Dubilier resistances are unchanged, but here, again, certain improvements in construction have been carried out, making them an even more attractive proposition than their predecessors, which are so deservedly popular.

For the car owner who contemplates fitting his car with radio there is an attractive and unusual Dubilier line, taking the form of a set of resistances

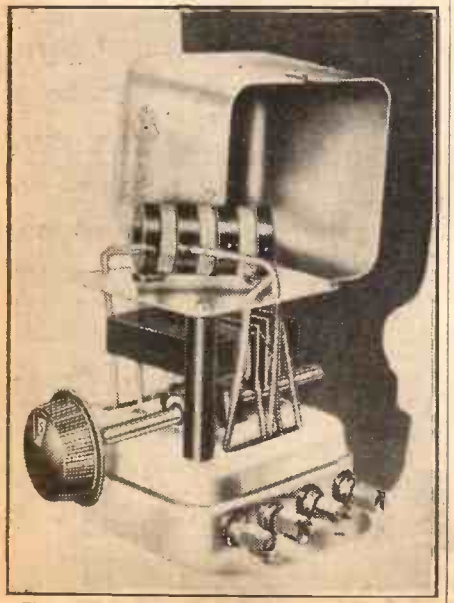
A W.B. UNIT

Clean lines characterise the appearance of this permanent-magnet speaker of well-known make. The input transformer for providing connection between set and speaker is neatly incorporated in the stand of the instrument.

for the plugs and distribution leads of 4- and 6-cylinder cars. They are attractively priced, and full instructions are supplied as to installation.

Considering the great diversity of condensers which have been evolved specially for radio, and the many alterations in plant which must have been necessary to supply these, it seems remarkable that any one firm could have continued to keep in the forefront of popular favour in the way that Dubilier's have done; but probably most constructors have learnt by bitter experience that only condensers of reputable make can be trusted, and certainly it is only this class that they will find at Stand No. 68.

PRODUCED BY WEARITE



This Nucleon Senior Coil with its special switch is a product of Messrs. Wright and Weaire, Ltd.

J. J. EASTICK AND SONS.
Stand No. T12.

You cannot possibly take in a half of the noteworthy items on this stand, so varied are the Eelex lines, so the best thing to do is to visit it, see as many as you can, and obtain a catalogue for future reference.

One thing to look out for is the short-wave convertor—of special interest to "P.W." readers,

Two radiogram components of Garrard make, a name which has long been famous for gramophone motors.

because it was in this journal that the convertor idea first saw the light.

Set builders will find it difficult not to linger over the firm's standardised plugs and sockets, switches, terminals, aerial and earth equipment and so forth, all of which are cunningly designed to meet their requirements with exactitude, at low cost.

EDISON SWAN ELECTRIC CO., LTD.
Stand No. 82.

Prominent in the Ediswan attractions are the Mazda valves, designed to supply the technician with the electrical characteristics necessary to every different type of circuit and the public with reliable long-service replacements of the highest standard. Recent price reductions have rendered these valves an even greater bargain than ever.

From SIR AMBROSE FLEMING, F.R.S.

I am glad to respond to a request on the part of the Editor to write a few words wishing good luck to the radio industry and beneficial results to it from the Wireless Exhibition at Olympia. Each year sees some fresh advances in this remarkable industry, and we are by no means at the end of possibilities connected with it. There is a vast field of invention and industry open in connection with television if only the B.B.C. could be induced to provide its transmission at a less inconvenient hour than 11.0–11.30 p.m., when most people are in bed.

The combination of television and speech or song transmission is a marvellous example of scientific invention; and if the transmission was provided at a convenient hour it would result in a great new opening for the radio industry in providing suitable receivers at a popular price. This last condition is altogether a question of mass production, and this in turn depends on the facilities offered to lookers-in.

(Signed) AMBROSE FLEMING.

The whole range is so interesting and so comprehensive that no attempt can be made to outline its attractions; but the fullest inquiries about it are welcomed by the staff in attendance, who will be pleased to advise as to the best types for various circuit combinations, etc.

The battery user will also be well advised to take particular note of the extensive range of H.T. batteries, accumulators and grid-bias batteries on show here. And if possible to secure a copy of the valuable Ediswan publication, "How to Get the Most Out of Your Battery."

It explains in non-technical language how to ensure the maximum length of battery life and obtain the best quality of which your set is capable.

Yet another strong attraction here is the B.T.-H. range, with the famous B.T.-H. pick-up and tone-arm and the R.K. reproducers. Evolved from the original Rice-Kellogg technique, there is now an R.K. reproducer for every purpose and every pocket.

Many of the pick-ups obtainable nowadays are incapable of doing justice to the wide range of frequencies which science has made it possible to impress upon the record. But B.T.-H. pick-ups and tone-arms are used so extensively by the leading radio gramophone manufacturers that all enthusiasts who aim to have the best equipment will find the range exhibited on Stand 82 of absorbing interest.

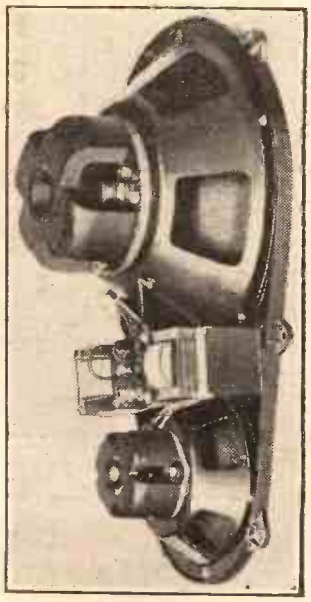
A few of the many types of fixed condensers made by Messrs. Dubilier Condenser Co., Ltd.

ELECTRO DYNAMIC CONSTRUCTION CO., LTD.
Stand No. 240.

By the aid of an Electro Dynamic Rotary Convertor any A.C. set may be run from D.C. mains with the assurance that purity of reception, volume and range will be in every way comparable with operation from A.C.

NEW DUAL "M.C.'S"

The latest model of the Celestion double loudspeaker, which is designed for true reproduction.



There are also specially wound electro-dynamic instruments for operation from fluctuating D.C. supplies, and these, together with rotary transformers for public address H.T., will be strong features of the firm's display.

EPOCH RADIO MANUFACTURING CO., LTD.
Stand No. 2.

Epoch is a name to conjure with in the loudspeaker world, and the programme to be revealed at Olympia includes a number of new models that are of the greatest importance.

(Continued on page 697.)

Power Ohmites and dual and single screened H.F. chokes are included in the Graham Farish exhibits, and are illustrated here.

OUTSTANDING EXHIBITS AT OLYMPIA

(*Continued from page 694.*)

All popular models are available for "Class B," but in addition a special adaptor combination "Class B" speaker, ready for attachment to ordinary battery sets, will be introduced.

A high-quality "Class B" adaptor at a low price, is also to be released at this year's display.

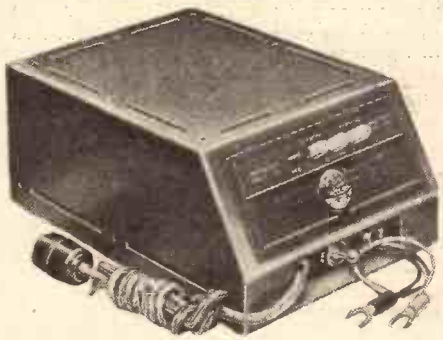
EVER READY CO. (GREAT BRITAIN), LTD.
Stand No. 57.

Over fifty different classes of high-tension and grid-bias batteries will be showing—a variety that permits the user's exact requirement of current and voltage to be met, ensuring economical running costs.

This season, in addition to the famous Winner and Portable series, there is the "Popular Portable" series, specially designed for the principal types of portable sets.

The "Popular Power" series are made up of

COMBINED MAINS UNIT



As well as supplying H.T., this Clarke's Atlas A.C. mains unit also provides current for L.T. charging.

large-capacity cells and are intended to give economical service with four- and five-valve sets which require an emission of 10 to 16 milliamperes.

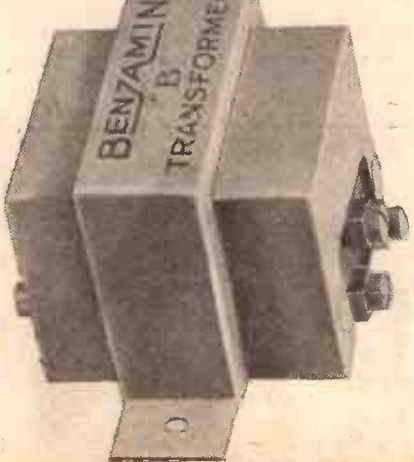
The Ever Ready "Standard" series are for those who want something better for the operation of two- and three-valve sets requiring six- to ten-milliamperes emission; whilst designed to give exacting service with four- and five-valve sets requiring 10- to 16-milliamperes emission are the Ever Ready "Power" series.

The High-power "60" battery, as the name implies, has a voltage of 60, and is designed for use with all high-power sets taking up to 30 milliamperes. It has tappings at every 12 volts.

In addition there are the super-capacity batteries, suitable for transmitting or receiving sets requiring an unusually large output, such as public-address equipment, garden parties, etc.

Another feature of the display on the stand will be the Ever Ready accumulators, which are fitted with an indicator that makes it impossible to mis-

FOR "CLASS B"



A neatly shrouded Benjamin transformer for the new form of L.F. amplification.

understand the condition of the charge at any moment.

FERRANTI, LTD.
Stand No. 74.

In what branch of radio are you specially interested? Audio-frequency transformers, output transformers, electric clocks, condensers, chokes, push-pull transformers, "Class B" converters, rejectors

A neat Igranic component, known as the Igranipak Tuning Unit.

anode-feed components, mains apparatus, including safety boxes, power units, metres and set testers—these are but some of the regular Ferranti lines which merit close attention at this year's exhibition.

Over and above these we have a number of new models of receivers, and some singularly interesting new loudspeakers, all to make their debut at Olympia.

In the receiver class the new Lancastria Consolette is eminent for value and performance. It is of the superhet. type, with the great range and selectivity to be expected, housed in a solid walnut cabinet.

TEN WAYS OF SPENDING NOT MORE THAN 10/6

1.	A BENJAMIN "Class B" driver transformer. (Stand No. 42) ..	10 6
2.	A 108-volt PERTRIX H.T. battery (Catalogue No. 405.) (Stand No. 124)	10 0
3.	A BLUE SPOT mains disturbance eliminator. (Stand No. 97) ..	10 6
4	A set of 4 "ATLAS" plug-in short-wave coils. (Stand No. 91) ..	10 0
5.	A MULTITONE universal push-pull output choke. (Stand No. 55)	9 6
6.	A SOUND SALES "Class B" output choke. (Stand No. 213) ..	10 0
7.	A TELSEN iron-cored screened coil. (Stand No. 88)	8 6
8.	An EDISWAN vacuum thermal delay switch. (Stand No. 82) ..	7 6
9.	A FERRANTI A.F.10 L.F. transformer. (Stand No. 74)	8 6
10.	An EVER READY 108-volt "Winner" H.T. battery. (Stand No. 57)	10 0

The cost is fifteen guineas, and it features reception of long- and medium-wave stations, one knob tuning, volume control and super-power output of 2½ watts.

Higher up in the price scale is the magnificent "Gloria," which is available in four models. The prices range from 24 guineas upwards.

The "Gloria" is highly selective, and incorporates the latest developments, including automatic volume control, super-power output of 2½ watts, stations by name and wavelength, one-knob tuning, solid walnut cabinet, Ferranti moving-coil loudspeaker, gramophone pick-up socket, and provision for a separate speaker.

This set was designed, regardless of cost, to provide the best all-round performance obtainable to-day. There is also a "Gloria Companion" model, which may stand in any part of the room, but is primarily intended to stand beside one's armchair, or other position where it may be desirable to use it as an occasional table.

The various new "Class B" apparatus and new loudspeakers—both of the permanent magnet and mains-energised types—round off a display that even at Olympia will be really outstanding.

FULLER ACCUMULATOR CO. (1926), LTD.
Stand No. 34.

An excellent reputation for reliability and efficient service has always attended Fuller accumulators and dry batteries, and as many improvements in detail design have recently been effected, this year will see a remarkably engaging display.

Evidences of successful specialisation for radio purposes are to be found in the "Sparta," "Super," "Triple" and "Portable" H.T.B. lines, whilst mammoth-plate, standard and non-spill classes of L.T. satisfy all filament requirements to the full at competitive prices.

GENERAL ELECTRIC CO., LTD.
Stand No. 90.

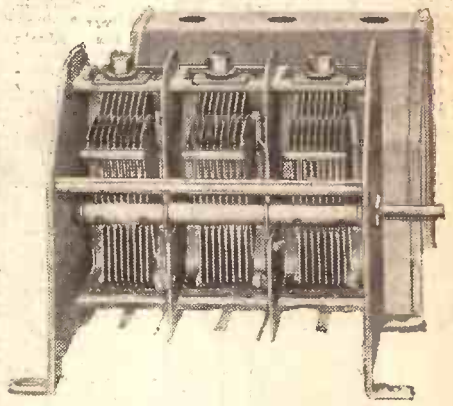
A wide range of new G.E.C. lines will greet the visitor to Stand No. 90, where an imposing array of receiving and sound-reproducing equipment of all classes has been arranged.

The principal sets will be an inexpensive 3-valve battery model, fitted with moving-coil loudspeaker; a 5-valve superhet. in A.C. and D.C. types, also available in the A.C. type with large moving-coil loudspeaker; a 6-valve superhet. with "Class B" output; two 8-valve superhets. for A.C. mains, and a 5-valve superhet. radiogram.

For the constructor with happy memories of former successes there is also the Osram Thirty-Three Kit Set, battery operated.

A magnetic loudspeaker in bakelite cabinet, and in chassis form only; a "Junior" permanent loudspeaker in both cabinet and chassis forms; and a "Senior" permanent magnet loudspeaker in cabinet and chassis forms will also be features of this season's exhibit.

ORMOND TRIPLE GANG



An example of the screened and ganged condensers available in Ormond make.

Also showing will be a comprehensive range of components and accessories, including batteries and accumulators. One of the highlights in this will be the new Magnet electric automatic gramophone record changer.

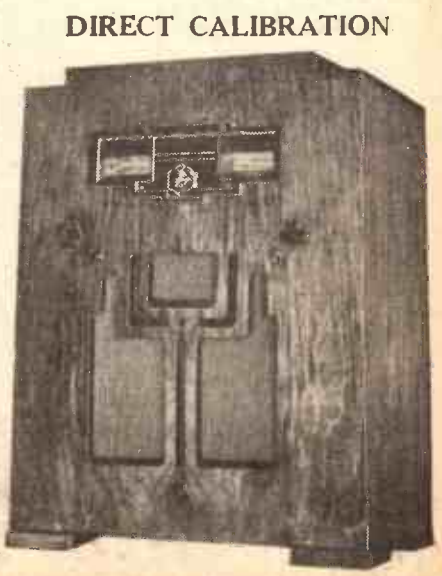
Designed for use on A.C. mains, it will play automatically eight ten-inch or eight twelve-inch records if they are provided with the usual eccentric groove or "run-off."

GARRARD ENGINEERING AND MANUFACTURING CO. LTD.
Stand No. 119.

Gramophone enthusiasts will need no urging to visit this stand, for here are to be found the very

(*Continued on next page.*)

DIRECT CALIBRATION



Calibration in stations as well as wavelength is a feature of this Marconiphone receiver.

OUTSTANDING EXHIBITS AT OLYMPIA

(Continued from previous page.)

heart and soul of electrical reproduction in the form of motors of all types, with the relevant accessories.

The Garrard Induction Electric Gramophone Motor claims as a selling point "As used by the B.B.C.," and the discriminating will need no further recommendation, for what is good enough for transmission is certainly not to be excelled for reception conditions.

Of outstanding mechanical interest is the Garrard automatic record-changing unit.

Dual-purpose ends are a feature of this Loewe resistance.

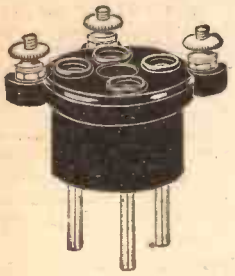
GRAHAM FARISH, LTD.
Stand No. 205.

What is Graham Farish doing this year?

So great has been the demand for the products of this old-established and well-known company that on at least four occasions the factory accommodation has had to be rearranged to house the new machinery required.

Indications for the coming season forced Mr. Graham Farish to the conclusion that once again an extension was necessary, so during the summer workmen have been busy and the finishing touches are now being put to the new building which will increase the accommodation by 50 per cent.

At Olympia, of course, Filt Gard, Ohmites and the all-star items of the Graham Farish range will



FROM HARLIE'S

A neat valve holder adaptor supplied with terminals for convenient connection.

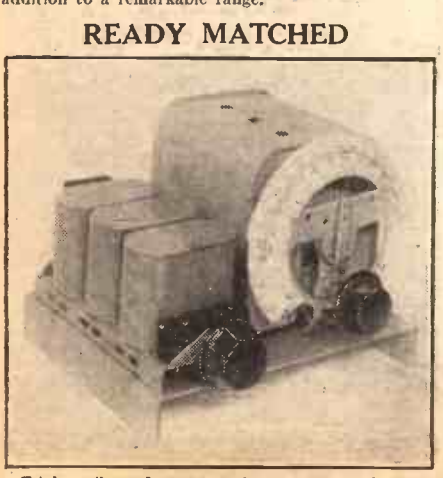
be represented again, and of the new components we should like specially to mention to our readers the latest five-shilling variable condenser.

High electrical efficiency had to be combined with mechanical perfection of the moving parts and extreme rigidity of construction. This was accomplished by the use of steel end-plates adequately protected from rust and corrosion by a suitable finish, together with three-point suspension of the frame and fixed plate assembly free from any form of distortion when mounted in place.

The moving centre part is built irrespective of the driving spindle, and is mounted between cone end-bearings. Two-point fixing to the centre spindle is provided, ensuring truth with the main moving-vane assembly, whilst the absence of spacing washers, etc., gives complete reliability over a very long period.

Remembering the past achievements and present successes of Graham Farish components, it is not difficult to prophesy a very big future for this latest addition to a remarkable range.

READY MATCHED



Triple coils and gang condensers are used on this Colvern tuning unit.

THE GRAMOPHONE CO., LTD.
Stand No. 80.

Stand No. 80 in the Grand Hall is one of the largest in the whole show. Here will be found the H.M.V. display, which last year caused quite a sensation because one of its exhibits was a radio-gramophone in glass.

So successful was it that now the visitor will be able to repeat the experience with no less than five of the H.M.V. models treated in this way.

WELL KNOWN!

Siemens Full-o'-Power H.T. batteries are well known to all constructors.

Chief interest this year will probably centre round the beautiful superhet. models, which include the "Portable Six" M.C. model, with single-knob tuning, self-contained in a walnut cabinet with moving-coil loudspeaker.

This is priced at 14 guineas. At the other end of the superhet. scale we have the "Superhet. Ten" Autoradiogram De Luxe, which costs 95 guineas!

But think what you can get for the money. A ten-valve super radiogramophone, incorporating delayed automatic volume control and automatic record changer, available in walnut cabinet or light walnut and macassar ebony.

From THE MARCHESE MARCONI.

The National Radio Exhibition marks the climax of another year of research and development in the British wireless industry; and in view of the rapid progress in many phases of development that has been made during the past twelve months I am sure that the coming Exhibition will be of great interest to every listener.

Those who are attracted by the technical side of their hobby will have the opportunity to examine the newest circuits and accessories, while those who regard broadcasting primarily as a means of entertainment will see how British manufacturers have provided receivers which worthily reproduce the first-class programmes now available.

The manufacture of broadcast receivers has developed during the past few years into a great industry; and I am glad to see that Great Britain, where so much of my own pioneer work in wireless was done, is maintaining its position in the van of progress in this fascinating branch of the science.

(Signed) G. MARCONI.

Other interesting features of the instrument are a standard H.M.V. automatic record changer playing up to eight records with record repeater, high-power energised field moving-coil loudspeaker, tone control and mains aerial device.

The standard model of this remarkable production is eighty guineas.

As leading gramophone specialists, the firm's record player and also the pick-up unit will be viewed with special interest. In fact, Stand No. 80 is one that it will be very difficult to leave.

GROSVENOR ELECTRIC BATTERIES, LTD.
Stand No. 126.

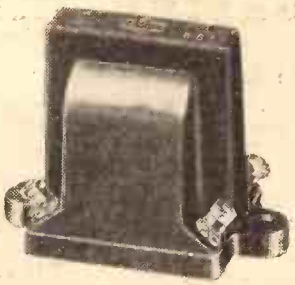
A strong feature of the Grosvenor battery service is the classification of the batteries for various sets under the name of the latter, so that the owner of a receiver has only to name it to be assured of the correct Grosvenor battery that should be employed.

The range is a wide one, and it will be remembered that the firm specialises in a mercury amalgam which prevents corrosion and lengthens the life of the battery zinc. Great success has attended the method, and full particulars, together with detailed advice, will gladly be given at Stand No. 126.

HARLIE, LTD.
Stand No. 54.

A wide range of products from pick-ups to microphones will be displayed here, and the constructor and gramophone enthusiasts who make for "Harlies" in memory of past successes will not be disappointed this year.

Of outstanding interest in these days of insistence upon quality is the tone selector and scratch filter.



An L.F. intervalve transformer that is being shown by the Ormond Engineering Co.

whilst pilot lights, automatic stops and similar ingenious lines provide that touch of the just-what-I-need which the visitor to Olympia always appreciates.

F. C. HEAYBERD & CO.
Stand No. 16.

The Heayberd slogan, "Monarch of the Mains," is a well-merited one, and no firm could offer a wider selection of mains units and kits. There is a Heayberd unit for every type of set, ranging from the model D.120 for A.C. mains with an output of 18 m/a, to the C.250, which is capable of supplying up to 60 m/a at 250 volts, and the necessary L.T. for an A.C. all-electric design.

A "Mercury" H.T. battery made by the Grosvenor Electric Batteries, Ltd.

In addition, the firm's activities embrace D.C. mains units, home-chargers, mains transformers, auto-transformers and smoothing chokes. All of these can be relied upon to give unfailing service combined with efficiency, and all carry the Heayberd guarantee.

The maker's statement that "the present range of complete mains units and assembled kits will remain

IN ALL SIZES

Heayberd mains transformers are available in a multitude of types.

unaltered—we find it difficult to improve on them" is fully justified and one which we ourselves agree with.

The additions to the existing ranges include two new portable amplifier kits of the 5-watt and 10-watt types. These should prove very popular, and are ideally suitable for radio-gramophone work and for use as speech amplifiers in small halls. A comfortable carrying handle is provided, and a special pilot

(*Continued on page* 702.)

Pix valves, obtainable in many types at reasonable prices, are made by the British Pix Co.

RECEPTION FOR YOU AT LAST!

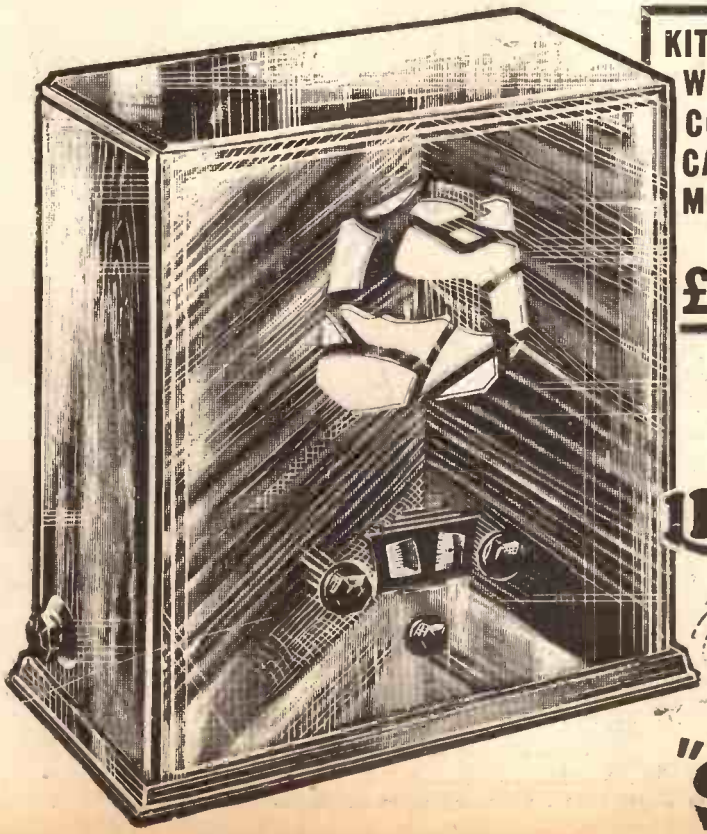
"SKYSCRAPER"

ULTRA-SHORT-SHORT MEDIUM *and* LONG

but you've never heard AMERICA & AUSTRALIA DIRECT!

And you can build the Lissen All-Wave All-World "Skyscraper" 4 for yourself. Lissen have made it a Home Constructor's Kit Set because they feel there are thousands who, when told how, can use their own hands. Building it yourself saves you pounds in first cost, it makes you an enthusiast to feel and to hear what a wonderful thing you have created !

And when you see the Great Free Chart of the All-Wave All-World "Skyscraper" which tells you how to build it and how to work it and why it gives such marvellous results, you will agree at once that it would be wise of you to build for yourself rather than buy a factory assembled receiver when Lissen have so simplified home construction. YOU CAN'T GO WRONG ! There are pictures of every part, with every wire numbered, every hole lettered, every terminal identified. Even the exact length of every connection is given to you !



KIT COMPLETE WITH WALNUT CONSOLETTE CABINET AND MOVING COIL SPEAKER

£8.2.6

But get the Chart and see for yourself—then build the Lissen All-Wave All-World "Skyscraper" 4 and become a pioneer of the World Range Radio of 1934—hear the ultra-short and short wavelength stations for the first time.

Lissen have published a splendid Chart of the All-Wave All-World "Skyscraper." It tells you exactly what to do with every single nut and screw, so that success is certain. Post coupon on left for your FREE copy.

NOW BUILD THE SET THAT SPANS THE WORLD!

OUTSTANDING EXHIBITS AT OLYMPIA

(*Continued from page* 698.)

lamp is fitted which remains illuminated as long as the amplifier is connected to the mains. Another new line is a portable charger capable of charging from one to thirty 2-volt cells at the very satisfactory charging rate of 1·65 amps.

HELLESENS, LTD.
Stand No. 106.

This old-established firm of battery manufacturers are showing a complete range of batteries for radio and flashlamp purposes, as well as the various models of the "Sunlite" handlamp.

Foremost among the exhibits is the new "Hi-Life" range, originally in the higher-priced class and now presented in coloured cartons and selling at popular prices.

Both radio and flashlamp batteries are included in this new range, the previous range being replaced by a new series of "Super" batteries coutaining improved and patented cells giving a greater capacity and power output than ever before, while in no way increasing the overall size of the battery.

The 108-volt general-purpose H.T. battery is priced at 10s. and the "Hi-Life" grid-bias battery at 1s.

In the "Super" range are the 99-volt H.T. battery, which retails at 11s. 6d., and the 9-volt grid-bias battery at 1s. 3d.

ECONOMY

The Mullard "Class B" valve possesses the merit of being modest in its driver requirements. An ordinary L.F. valve can precede the P.M.2B.

THE HIGH VACUUM VALVE CO., LTD.
Stand No. 108.

A visit to this stand will act as a tonic to the constructor with ambitious plans for the autumn and winter months, for here he will find an imposing array of valves selling at the amazing low prices usually associated with valves of foreign origin.

But "Hivac" valves are entirely British made, hence the patriotic listener need have no qualms that he is supporting other than home industries

STORED ENERGY

The 45-ampere-hour capacity of this efficient Fuller accumulator will ensure long trouble-free periods between charges.

when he chooses the types he requires for his new set. There is a "Hivac" valve for every position, whether S.G., detector or L.F. stage, and the following examples taken from the comprehensive range merit special reference:

The B.230 is a "Class B" valve having an output

A CURE FOR CRACKLES

Sufferers from man-made static will be well advised to investigate the Lamplugh Anti-stat aerial unit, which is designed to eliminate interference.

of approximately 1·8 watts at 120 volts, the total quiescent current being about 3·5 m/a.

Then comes the Z.220, a multi-grid pentode output valve with a mutual conductance of 2·2 m.a./volt, and a power output of ·75 watt at 150 volts H.T.

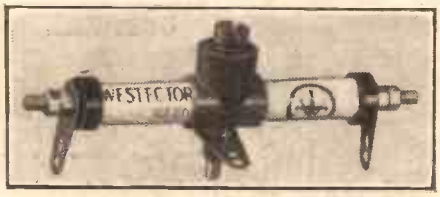
Thirdly, the Y.220, a pentode consuming ·2 amp.,

TEN WAYS OF SPENDING NOT MORE THAN 15/-

1.	A MULLARD P.M.202 super-power valve. (Stand No. 71) ..	12 0
2.	A BRITISH RADIOGRAM ·0005 2-gang shielded variable condenser, with trimmers.	15 0
3.	An R.I. 40-henry smoothing choke. (Stand No. 41)	14 6
4.	An R & A type "50" differential armature speaker. (Stand No. 44)	15 0
5.	A BRITISH RADIOPHONE type 377A 2-gang condenser. (Stand No. 118)	15 0
6.	A COLVERN "F.5" Ferrocart coil for "det.-L.F." sets. (Stand No. 56)	12 6
7.	A LISSEN "Hypernik" L.F. transformer. (Stand No. 72) ..	12 6
8.	A MARCONI U.12 rectifying valve. (Stand No. 77)	15 0
9.	A G.E.C. 2-volt, 40 ampere-hour (actual) accumulator (Catalogue No. 0627). (Stand No. 90) ..	13 0
10.	A COSSOR 240B. valve for "Class B" amplification. (Stand No. 89)	14 0

and having an output of ·5 watt. This valve is especially suitable for portable receivers.

A series of A.C. mains valves are also in the course of preparation and will be released very shortly.



The Westector "cold valve" detector will, of course, be an important member of the all-metal rectifier exhibit at the Westinghouse stand.

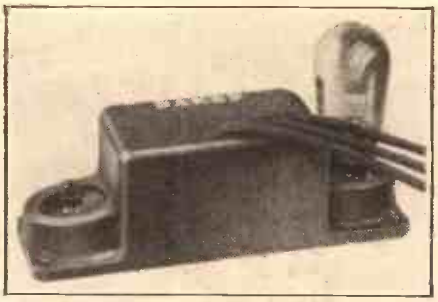
IGRANIC ELECTRIC CO., LTD.
Stand No. 86.

It has always been the Igranic Co.'s proud boast that they offer to the public only the very highest quality components that scientific research and design, the finest materials and first-class workmanship can devise.

Although Igranic components may not be cheap in the generally accepted sense of the word, they are nevertheless real value for money, and can be purchased with the sure knowledge that they set a standard of efficiency which is second to none.

So comprehensive is the selection of components offered that we can only hope to touch very briefly upon a few of the more outstanding lines.

For instance, there are the new "Igranicor" coils, which employ cores built up of thin laminations



The Baker's Selhurst "Class B" converter is a particularly neat and efficient means of converting ordinary battery sets to employ "Class B" amplification.

of a ferrous material consisting of finely divided iron mixed with other substances which insulate the particles from one another

These coils are accurately matched, so that they may be mounted on a common base and ganged. Available in various types for the broadcast- and short-wave bands, as well as for super-heterodynes, these new inductances will doubtless achieve a well-deserved popularity during the coming season.

In addition, there are the excellent Igranic moving-coil speakers which are obtainable in "Class B" and Q.P.P. models, a "Class B" driver transformer, having a primary inductance of 31 henries, the well-known C.H.4 choke with its bimetal core and high-inductance value of 40 henries, an extensive range of switches, differential condensers and a host of other components so dear to the heart of the home constructor. Every Igranic component bears the indelible stamp of quality.

NEWCOMERS

The Hivac range of valves includes types for all purposes. The robustness of the construction will be evident from this illustration.

JACKSON BROTHERS (LONDON), LTD.
Stand No. 116.

The name "Precision Instruments," when applied to J.B. products, is no idle one. Since the early days of broadcasting the firm has concentrated upon one product only, and an examination of any J.B. condenser at once reveals the extreme accuracy of workmanship and electrical efficiency upon which this concern's enviable reputation has been built.

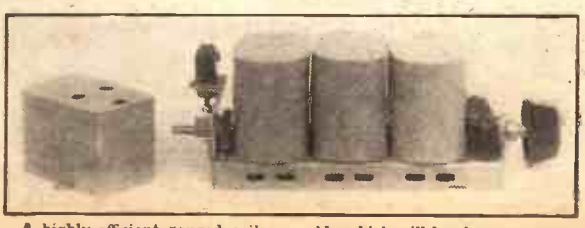
On Stand No. 116 constructors will find types of condensers for every possible requirement.

The recent developments in iron-cored tuning coils makes accurate matching in gang condensers an even greater necessity than in the past, and the close matching, coupled with mechanical rigidity of the J.B. ganged assemblies, renders them specially suited for use in these new circuits.

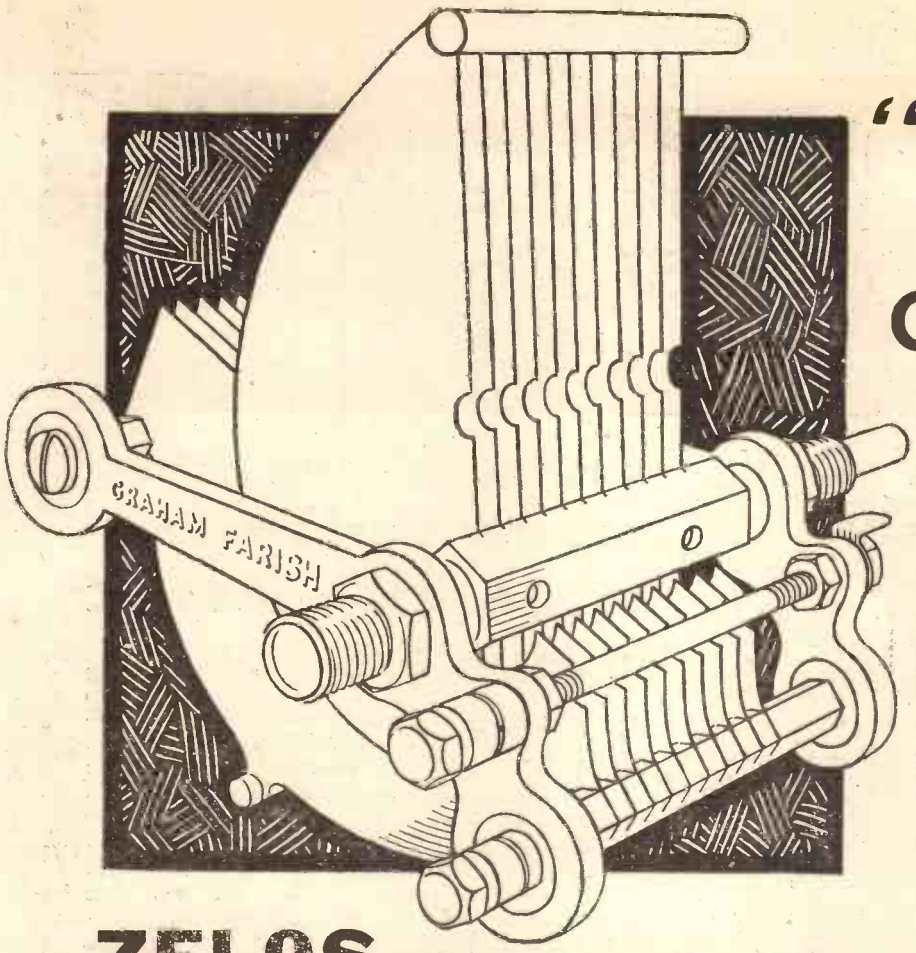
The existing range of screened- and semi-screened gang condensers has proved so satisfactory that their general design is remaining unchanged except for slight modifications. There is a new straight-line dial in which a hair-line cursor is arranged to move parallel across a straight fixed scale. The whole scale is always on view, and since the cursor moves close to the scale there is a minimum of parallax error.

Another interesting line is the superhet gang condenser, one section of which is provided with specially shaped vanes which tune the oscillator to a frequency 110 k~. different from that of the fundamental frequency.

(*Continued on page* 705.)



A highly efficient ganged coil assembly which will be shown among other examples of a coil specialist's wares by Messrs. Colvern.

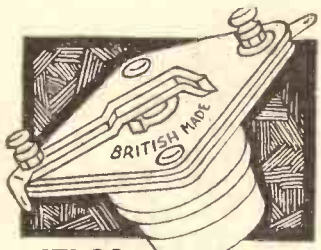


"When better Condensers are possible I'll build them"

Graham Farish.

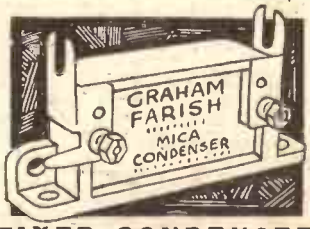
ZELOS VARIABLE CONDENSER

A superb component, possessing extreme rigidity of construction, mechanical perfection of moving parts and high electrical efficiency. Negligible H.F. loss, large accessible terminals, shaft provides easy ganging. Capacity ·0005. EACH 5/-



LITLOS VARIABLE CONDENSER

Compact and efficient. Accurately gauged bakelite dielectrics and solid brass pigtail connections to moving vanes. All capacities up to ·0005 mfd. in tuning straight-line capacity and differential types. Each **2/-**



FIXED CONDENSER

In a complete range of capacities, upright or flat mounting. Every condenser is tested on 750 volts D.C. Capacities accurate within fine limits.

·00005 mfd. to ·004 mfd. **1/-**

·005 mfd. to ·01 mfd. - - **1/6**

Ensure a safe and efficient Aerial and Earth. The new **AEROFICIENT KIT** provides all you need. **6/6** Complete.

GRAHAM FARISH PRODUCTS

Write for the new 1933/4 CATALOGUE to be published shortly.

Advertisement of GRAHAM FARISH LTD., Masons Hill, BROMLEY, Kent.

Export Office: 11/12 Fenchurch St., E.C.3.

7,000,000 people waited for it! CQA made it possible!

The BATTERY Radiogram with the same superb performance as an all-electric instrument . . .

Everybody covets a radio-gramophone—most of all, perhaps, the 7,000,000 without electric supply. A Columbia instrument is within their reach at last—an instrument with the power, tonal purity and economy of its all-mains equivalent. Constant Quality Amplification means purity at all volume. Self-regulated Battery Life means H.T. Consumption in proportion to the strength required for each *note* and no more!

Send the coupon below for full details of this new discovery and learn how easily you can own a CQA Battery Radio-graph.

Model 1003

The CQA BATTERY RADIO-GRAPH

- Three-stage band-pass receiver.
- Quiescent push-pull pentode amplification.
- Automatic lighting of appropriate scale from switch M.W.-L.W. (and Gram.).
- Permanent magnet moving coil speaker.
- Marconi Valves.

20 GNS.

Radio only: CQA BATTERY FOUR Model 1001 . 11 gns.

See these CQA models, and the full Columbia range of Radio and Radio-graphophones on

STAND 66

at

RADIOLYMPIA

the **Columbia**

RADIO & RADIO-GRAPHOPHONES

Please send me fullest particulars of the new
★CQA Battery Radiograph or
★CQA Battery Four. ★Cross out if not required.

Name.....

Address.....

Pop. W. 19/8/33.

MAGIC NOTES TRADE MARK

Cut this out and post in an unsealed envelope bearing ½d. stamp to Columbia, 98/108 Clerkenwell Road, London, E.C.1.

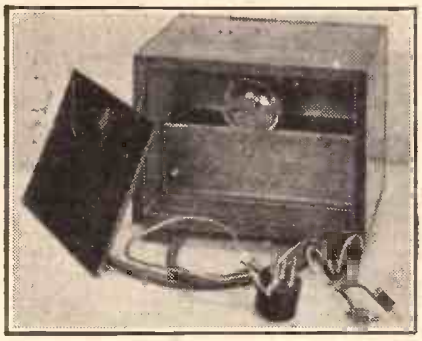
OUTSTANDING EXHIBITS AT OLYMPIA

(*Continued from page 702.*)

LAMPLUGH RADIO, LTD.
Stand No. 219.

The whole range of the well-known "Silver Ghost" products, with the exception of the popular Farrand inductor speaker, is entirely new.

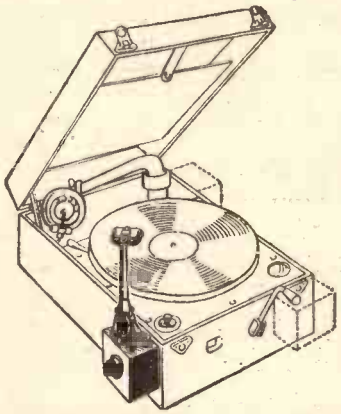
Besides a wide range of permanent-magnet moving-coil speakers there are two other lines of unusual



No battery set owner need be without mains volume with such easy methods of converting existing receivers as are offered by the Multitone "Class B" converter.

interest, the first being the "Antistat" aerial unit and the second the "Timpani" tone baffle.

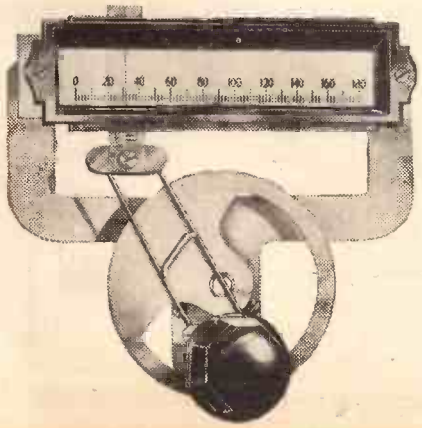
The moving-coil loudspeakers are fitted with a completely new diaphragm which will in future be known as the "Tone-Tex." These diaphragms



Any portable gramophone can be adapted for use in conjunction with an amplifier by means of this ingenious Belling-Lee unit.

permit a control of tone, and special types can be supplied to augment the high- or low-frequency response, or alternatively to give an even balance over the musical range.

All "Silver Ghost" moving coils are available for "Class B" working, the standard three-ratio



A particularly open scale is provided by this J.B. dial.

or "Class B" input transformer being fitted according to choice.

The "Antistat" aerial unit is something entirely new in aerials, and is designed to cut out electrical interference, besides increasing the selectivity of the set. Readers who suffer from electrical interference should make a special point of seeing this.

The "Timpani" tone baffle consists of a metal membrane imposed between two wood baffles, and is claimed to improve the reproduction from any type of loudspeaker by adding brilliance and prolonging the rich overtones.

Further new lines are an extension kit which gives a professional appearance to loudspeaker extensions, and a neat lightning arrestor.

LECTRO-LINX, LTD.
Stand No. 37.

"It's the little things that count"—and this is particularly the case in radio.

A very large percentage of reception troubles are ultimately traceable to a faulty connection or contact—possibly in the set itself or in a battery or accumulator. There are so many points of contact, any of which may produce unpleasant crackles or even stop reception altogether that it is not worth while to take any risks.

For several years Messrs. Lectro-Linx have specialised in the manufacture of contact devices, with the result that every one of the many "gadgets" and components bearing the "Clix" trade mark fulfils the requirements of perfect electrical connection with conspicuous success.

The famous Clix helically-slotted resilient wander plugs and sockets, cleverly devised terminals, power plugs and sockets, chassis mounting valve holders in 4, 5, and 7-pin types—all are to be found on the "Clix" stand, and no constructor should leave the Exhibition without first acquainting himself with the important question of connection as demonstrated on Stand No. 37.

And don't forget to see the new Clix air-spring valve holder.

From P. P. ECKERSLEY, M.I.E.E.

I wish to send a message of goodwill to the radio trade of Great Britain.

No one, perhaps, can appreciate to what extent the valve, component and set manufacturers have given service to the public. It should be an encouragement to everyone, in spite of all the difficulties, to compare the price, performance and appearance of to-day's product with its forerunner of 10 years ago.

I would like to pay particular tribute to those manufacturers who not only made successful products on the initiation of the industry, but who are still carrying on.

(Signed) P. P. ECKERSLEY.

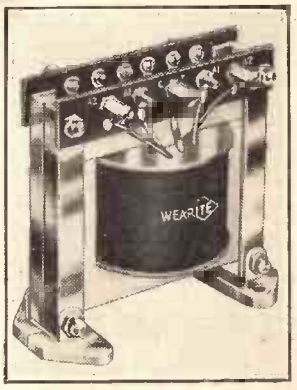
LISSEN, LTD.
Stand No. 72.

It is a proud boast of the exhibitors at this stand that "There is a Lissen part for every radio use." One glance at the array of components on view proves that this is no idle boast.

Mains units, screened and unscreened coils, variable and fixed condensers, chokes, transformers, switches, valve holders, loudspeakers—these and many other home-constructor parts are evidence of the wide field covered by this famous firm and of the truth of their slogan.

A GOOD CHOKE

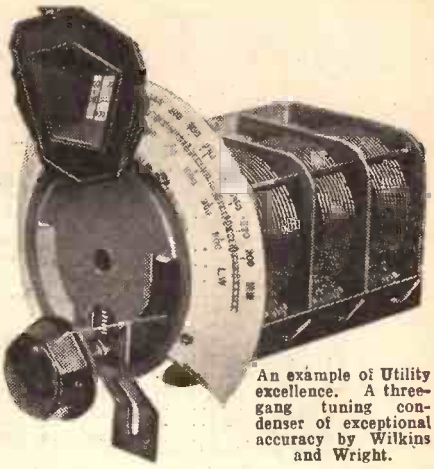
The well-known excellence of Wright and Weaire's iron-cored apparatus is exemplified by this particularly neat centre-tapped choke on Stand No. 1.



Among the very latest lines are a "Class B" "Hypernik" transformer with a primary inductance of 25–15 henries and a secondary D.C. resistance of 500 ohms. This component retails at 12s. 6d.

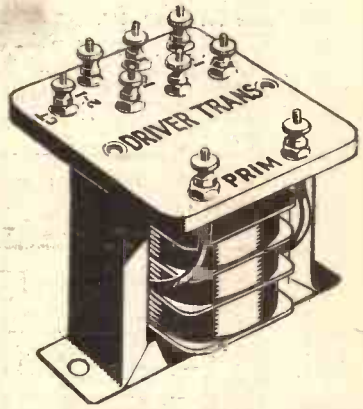
The Lissen range of extended grid valves should not be overlooked. In this section the constructor will find 2- 4- and 6-volt types, as well as numerous A.C. indirectly-heated valves, both metallised and otherwise.

On the kit side there is the new Lissen S.G. detector and quiescent push-pull receiver, which gives an output of 1,300 milliwatts in return for a very moderate expenditure of H.T.



An example of Utility excellence. A three-gang tuning condenser of exceptional accuracy by Wilkins and Wright.

In addition the well-known "Skyscraper" Three, which has achieved such phenomenal success, is now to be had in A.C. form, the complete all-electric model being priced at £7 19s. 6d. with valves and mains unit. Last, but by no means least, there is the comprehensive range of Lissen New Process batteries, the excellence of whose performance has earned for them such well-deserved popularity. You must not miss the Lissen stand!



The Sound Sales driver transformer fulfils all the stringent requirements imposed on a transformer by "Class B" amplification.

LOEWE RADIO CO., LTD.
Stand No. 245.

If you have been looking for a resistance of some particular value without success, then it is evident that you haven't tried Loewe's. In order to

(*Continued on page 742.*)

A SUPERIOR SUPER

A highly-selective super-heterodyne receiver, incorporating all the latest developments, is housed in this attractive consolette cabinet. It is one of the "Gloria" series by Ferranti.

HOW THE STANDS ARE ARRANGED

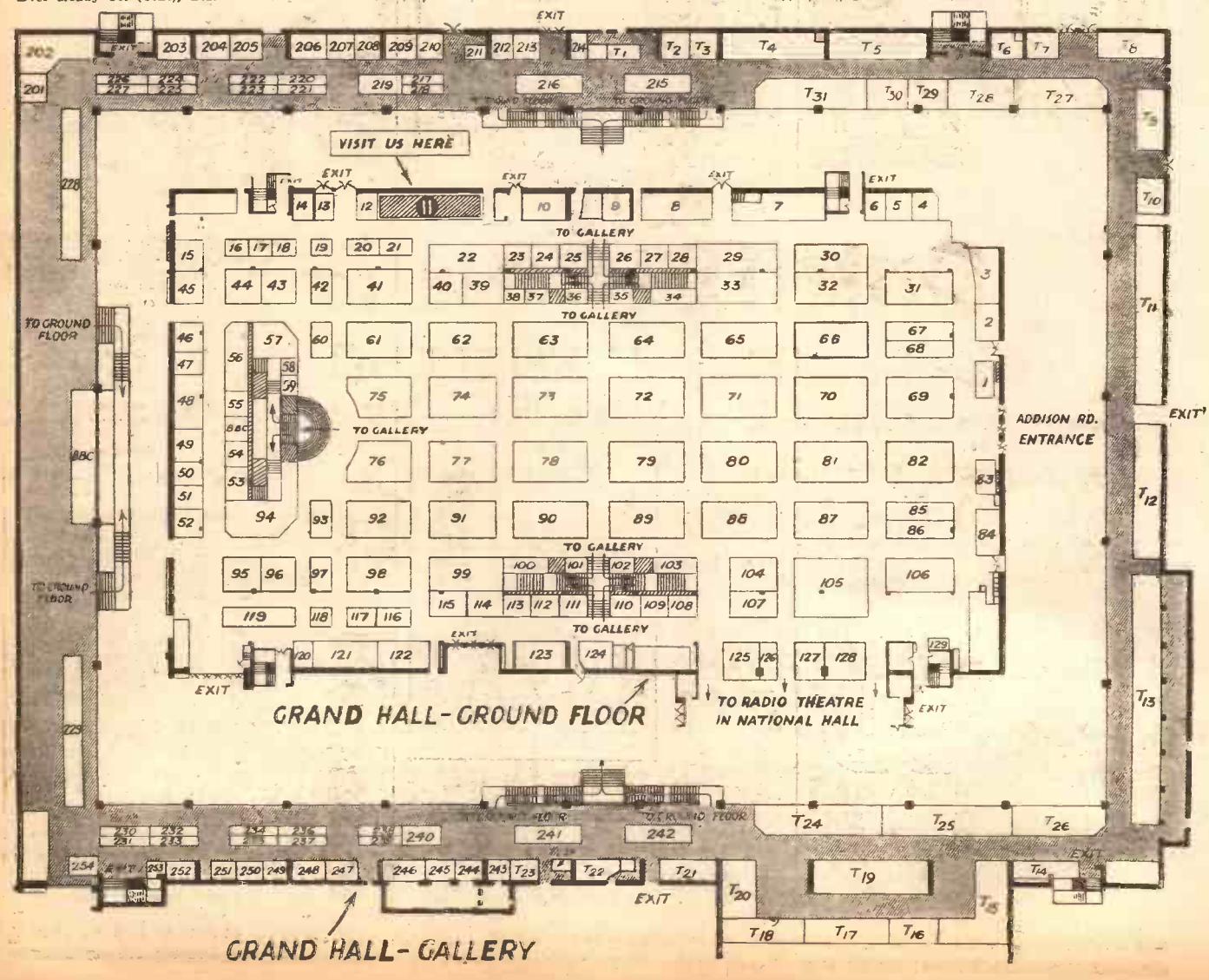
An Abridged List Showing the Positions of the More Important Firms

Name of Firm.	Stand No.
Amalgamated Press, Ltd.	11
Amplion (1932) Limited.	104
Automatic Coil Winder & Electrical Equipment Co., Ltd.	46
Baker's Selhurst Radio	35
Belling & Lee, Ltd.	45
Benjamin Electric, Ltd.	42
Block Batteries, Ltd.	22
Bowyer-Lowe & A. E. D., Ltd.	102
Britannia Batteries, Ltd.	124
British Blue Spot Co., Ltd.	97
British Broadcasting Corporation	—
British Ebonite Co., Ltd.	207
British General Mfg. Co., Ltd.	38
British Pix Co., Ltd.	204
British Radiophone, Ltd.	118
British Rola Co., Ltd.	52
British Thomson-Houston Co., Ltd.	209
Bulgin & Co., Ltd., A. F.	122
Carrington Manufacturing Co., Ltd.	83
Celestion, Ltd.	125
Chloride Electrical Storage Co., Ltd.	241
Clarke & Co. (M/c.), Ltd., H.	91
Climax Radio Electric, Ltd.	84
Cole, Ltd., E. K.	70
Columbia Graphophone Co., Ltd.	66
Colvern, Ltd.	56
Cossor, Ltd., A. C.	89
Dubilier Condenser Co. (1925), Ltd.	68
J. J. Eastick & Sons.	T12
Edison Swan Electric Co., Ltd.	82
Electro Dynamic Construction Co., Ltd.	240
Epoch Radio Mfg. Co., Ltd.	2
Ever Ready Co. (G.B.), Ltd.	57
Ferranti, Ltd.	74
Fuller Accumulator Co. (1926), Ltd.	34
Garrard Engineering & Manufacturing Co., Ltd.	119
General Electric Co., Ltd.	90
Graham Farish, Ltd.	205
Gramophone Co., Ltd.	80
Grosvenor Electric Batteries, Ltd.	126
Harlie, Ltd.	54
Heayberd & Co., F. C.	16
Hellesens, Ltd.	106
High Vacuum Valve Co., Ltd.	108
Hustler, Simpson & Webb, Ltd.	62
Igranic Electric Co., Ltd.	86
Jackson Brothers (London), Ltd.	116
Lamplugh Radio, Ltd.	219
Lectro-Linx, Ltd.	37
Lissen, Ltd.	72
Loewe Radio Co., Ltd.	245
Marconiphone Co., Ltd.	77
Mullard Radio Valve Co., Ltd.	71
Multitone Electric Co., Ltd.	55
New London Electron Works, Ltd.	107
Oldham & Son, Ltd.	123
Ormond Engineering Co., Ltd.	99
Osborn, Charles A.	202
Osram Valves	92
Philips Lamps, Ltd.	81
Pye Radio, Ltd.	73
Radio Gramophone Development Co., Ltd.	79
Radio Instruments, Ltd.	41
Reproducers & Amplifiers, Ltd.	44
Siemens Electric Lamps & Supplies, Ltd.	31
Six-Sixty Radio Co.	95
Slektun Products	47
Sound Sales, Ltd.	213
Sovereign Products, Ltd.	101
Standard Telephones & Cables, Ltd.	96
Telegraph Condenser Co., Ltd.	98
Telsen Electric Co., Ltd.	88
Vandervell Ltd., C. A.	228
Varley (Oliver Pell Control), Ltd.	85
Vince's Dry Battery, Ltd.	105
Westinghouse Brake & Saxby Signal Co., Ltd.	32
Whiteley Electrical Radio Co., Ltd.	128, 129
Wilkins & Wright, Ltd.	20
Wingrove & Rogers, Ltd.	93
Wright & Weaire, Ltd.	1

POPULAR WIRELESS

welcomes you to

STAND 11



Wherever wireless terms are understood "Ohmite" means "The Best Resistance"

"Better than wire wound."

OHMITE RESISTANCES

The most popular and efficient type of fixed resistance for all general purposes. "Better than wire wound." All values, 50 ohms to 5 megohms.

1/6

HEAVY DUTY TYPE 2/3

Safe maximum current carrying capacity of "Ohmites."

100° F Temperature Rise

Ohms.	Milliamps.	Ohms.	Milliamps.
1,000	40	20,000	8
2,000	35	30,000	6·75
3,000	29	40,000	6
4,000	24	50,000	5·5
5,000	20·25	60,000	5
10,000	12	80,000	4·24
Other values pro rata		100,000	3·5

Safe maximum current carrying capacity of "Ohmites" Heavy Duty Type.

100° F Temperature Rise

Ohms.	Milliamps.	Ohms.	Milliamps.
1,000	80	20,000	16
2,000	70	30,000	13·5
3,000	58	40,000	12
4,000	48	50,000	11
5,000	40·5	60,000	10
10,000	24	80,000	8.48
Other values pro rata		100,000	7

GRAHAM FARISH PRODUCTS

Ensure a safe and efficient Aerial and Earth. The new AERO-FICIENT KIT provides all you need. Complete 6/6

Send for copy of new Catalogue ready shortly.

Advertisement of GRAHAM FARISH, LTD., Masons Hill, BROMLEY, Kent.

Export Office: 11/12, Fenchurch Street, E.C.3.

PETO-SCOTT RADIO CABINETS

Distinctive . . . Modern . . . Value for Money

PETO-SCOTT were pioneers of Radio Cabinets as far back as 1919. By persistent attention to design for 14 years, the 1933-1934 Peto-Scott series of Radio Cabinets sets an extremely high standard. Their continued exclusive specification by all the leading designers of "Popular Wireless," "Amateur Wireless," and "Practical Wireless" provides more than ample proof of their quality, sound construction and attractive appearance.

1934 FITZALL
WALNUT CONSOLETTE

19/6

CASH or C.O.D.

A very popular Cabinet for the self-contained Set. Extremely neat in design with a beautiful appearance, readily harmonising with most furnishing schemes. In two-tone figured veneered walnut with contrasting fret surround. Front drilled to your specification. Size 19¾" high, 15" wide x 12¾" deep. Shelf and baffleboard 3/6 extra. Carriage 2/-.

UNIVERSAL
OAK TABLE CABINET

14/-

CASH or C.O.D. Carriage Paid.

A wonderful Cabinet essential to the Home Constructor by virtue of its adaptability. Soundly constructed in attractive, vignetted front as illustrated. In figured oak, hand french polished. To take panel 12" x 7" and baseboard 12" x 10" 14/-.

Panel 14" x 7" ;	Baseboard 14" x 10".	15/-.
Panel 16" x 7" ;	Baseboard 16" x 10".	16/6.
Panel 18" x 7" ;	Baseboard 18" x 10".	18/6.
Panel 21" x 7" ;	Baseboard 21" x 10".	21/-.

CLASSIC
WALNUT CABINET

With standard Fret as illustrated, an ultra-modern design with graceful lines combining beauty of appearance with utility and efficiency. The ideal Cabinet for the Home Constructor, in keeping with present-day set design. In chosen veneered walnut with contrasting silk-covered fret. Front drilled to your specification. Size inside : 20" long, 10" high, 12" deep. Takes panel 12" x 10" ; baseboard 12" x 12".

Cash or C.O.D. Carriage Paid (less stool) .. .. 25/-.

STOOL IN VENEERED WALNUT TO MATCH.

(28" high) Cash or C.O.D. 25/-. Carriage 2/6 extra.

CLASSIC CABINET and STOOL. Cash or C.O.D. Carriage Paid £2-12-6 or 7/6 Deposit and 10 monthly payments of 5/-.

SEE PETO-SCOTT CABINETS AT OLYMPIA, USED IN "P.W." EXHIBITION SETS— STAND No. 11

25/-

Cash or C.O.D. Carriage Paid.

INLAID WALNUT ADAPTAGRAM

A REAL Masterpiece. Exquisitely designed in Inlaid Walnut with attractive two-tone effects and contrasting fret and side panels. The embodiment of dignity and a beautiful example of the cabinet art. Built by leading craftsmen of the piano industry, mortised and tenoned ; hand french polished. With motor-board screened by the NEW METAPLEX PROCESS. Front ready-drilled to take set, or vignetted to take panels up to 18" x 8".

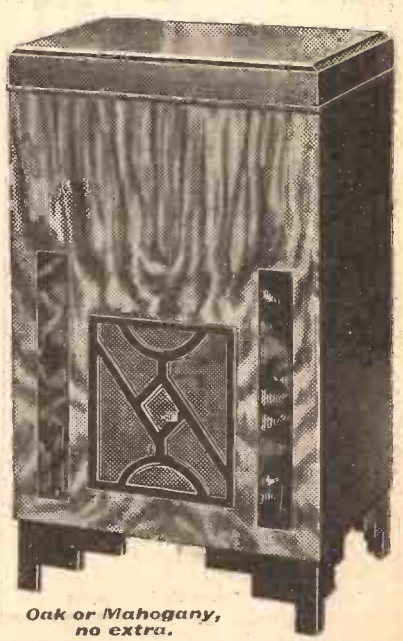
YOURS FOR 8/3

MODEL A. Cash or C.O.D. 63/-. Carriage 2/6 extra, or 8/3 deposit and 11 monthly payments of 5/9. Carriage Paid.

MODEL B, with Garrard Double Spring Motor, 12" Turntable. Automatic Stop. B.T.-H. Tone-Arm with Pick-up and Volume Control complete. Automatic Needle Cup, 6 Gns. Cash or C.O.D., or 12 monthly payments of 12/-. Carriage Paid.

MODEL C, with Collaro Induction Electric Motor with Tone-Arm, Pick-up and Volume Control in one Unit. 12" Turntable. Automatic Stop. Automatic Needle Cup. 7 Gns. Cash or C.O.D., or 12 monthly payments of 13/9. Carriage Paid.

38¾" high, 21¾" wide, 15½" deep Panel 18" x 8" ; Baseboard Depth, 14". Speaker Compartment, 17" x 19½" ; Fitted with back Baffleboard, 3/6 extra, if required.



Oak or Mahogany, no extra.

WALNUT CONSOLE (similar to ADAPTAGRAM, but with fixed lid), Cash or C.O.D. 62/-. Carriage 2/6 extra.

PETO-SCOTT CO. LTD., 77, City Rd., London, E.C.1. Tel. Clerkenwell 9406/7.
West End Showrooms : 62, High Holborn, London, W.C.2. Tel. Holborn 3248.

Dear Sirs,—Please send me CASH/C.O.D./H.P. ADAPTAGRAM MODEL.....
CLASSIC CABINET (with/without stool).....
UNIVERSAL CABINET ..... 1934 FITZALL CABINET .....
Send me your New Cabinet Catalogue.

NAME .....

ADDRESS..... P.W. 19/8/33

PETO-SCOTT RADIO CABINETS COME TO YOU DIRECT FROM OUR FACTORY

OUR CAVALCADE of RADIO

One of the most fascinating displays at this year's Radio Exhibition is that on the "P.W." stand (No. 11), where many of the very latest technical developments are to be seen, forming a procession of progress unapproached by any other radio journal. Here is a brief account of the main exhibits that will attract considerable attention during the nine days of the show.

IT is always interesting and often not uninstructive to look back on the past, to view one's achievements—yes, and failures too—and to take stock of what has been happening with a view to getting some sort of perspective on the probabilities of the future.

In radio such a retrospect is unusually fascinating, for the rapid growth of home-constructor radio and broadcasting has coloured the pages of wireless history in brilliant hues. POPULAR WIRELESS, the first home-constructor journal, has played no small part in the painting of those pages, and the familiar blue and gold can be seen all along the line.

Looking Back.

As we look back we can see the high lights of radio successes in set designs standing out in bold relief against the naturally dim figures of the past. It is surprising how rapidly the past becomes dimmed and only the very high lights remain.

So, as we gaze back over the years, eleven of them, we see among the haze the famous "Combination" set, the "Unidyne" (the first set to use tetrodes), the "Filadyne," and then on to the "Magic" series, the "Titans," "Comet," "Cosmic," and up to modern days with the "Air-sprite" of last year.

As we come closer still we see clearly how rapidly radio has leapt ahead during the last few years with ever-increasing speed, until during the last few *months* we have been almost overwhelmed by new developments in the presentation of which POPULAR WIRELESS has played no small part.

Outstanding Exhibits.

It is not surprising, then, that our stand at the Radio Exhibition this year contains an array of the very latest members of a veritable Cavalcade of radio progress. There can be seen the nation-wide famous "Catkin" Three, the receiver that set the whole country talking and introduced to trade and public alike the new all-metal "Catkin" valves that made their first appearance a short time ago.

Nearby is the cathode-ray television viewer that was developed in our laboratories, and which was the first receiver of its type. It will not be in operation, of course, for such a thing would not be permitted in the Show; but visitors are invited to come along and examine it closely, while questions about it and the other exhibits will be gladly answered by the technical staff in attendance.

The first permeability-tuned receiver is there, too, which recently introduced to the world a new system of tuning of which we shall hear very much more in the near future—another concrete example that POPULAR WIRELESS is not only up to date, but ahead in radio development and with the news of fresh advances in the science.

Many of the sets that have been the means of announcing new ideas to the public cannot be shown, much as we should wish, owing to the exigencies of space. But a number of the chief "firsts" for which "P.W." is so rightly noted will be on view, while a selected list of our successes during the last few months is to be seen.

"No-Gap" Tuning.

Visitors to the Exhibition will be interested to see on our stand the first "No-Gap" tuning coils in use in sets specially designed for them. Regular readers of POPULAR WIRELESS will remember that these coils are the direct outcome of the plea put forward some time ago, by our Chief of Research, for inductances covering all the broadcast wavelengths used in Europe. The commercial outcome of that plea is to be seen in the iron-cored coils used in the "No-Gap" Three, the description of which was published a month or so ago.

Valve developments have been rapid and spectacular this year, and many of the new valves made their debut in "P.W." receivers. Among these were the double-diode triode, the double-diode pentode and the multi-mu screened pentodes. These, therefore, take their places in our Cavalcade, and are landmarks in radio history.

FULLY TESTED AND TRIED

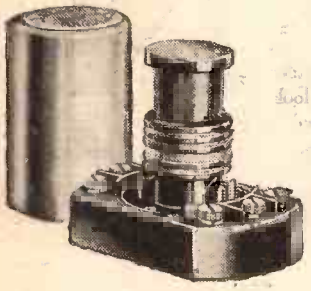
Mr. G. V. Dowding and prominent members of the radio trade watching our Chief of Research putting a "P.W." set through its paces.

"Class B."

We have forgotten "Class B"? No, that deserves a paragraph by itself, for it has truly revolutionised the radio industry. Again it was POPULAR WIRELESS that brought it out and gave it its start among British constructors, with the "Class B" Four, which is to be seen among the honoured at the show. And so we could go on through a whole list of recent sets of outstanding merit, but, large as it is, the stand is not big enough to hold them all, and we must perforce limit our display to typical examples which have reached radio prominence and which have received general acclamation. Come along to Stand 11 and examine all these things; we shall be pleased to explain everything and look forward to this opportunity to meet you.

Sensational New

TELSEN COMPONENTS



TELSEN IRON-CORED SCREENED COILS

The smallest and most efficient tuning coils ever designed. Can be used either as aerial tuning coils or H.F. transformers.

	Price
Single Coil	8/6
Twin Matched Coils	17/-
Triple Matched Coils	25/6

THE most all-embracing range in radio history—that is the only way to describe the wonderful range of radio products which Telsen offers you now! Not only have designs been improved—not only has efficiency been increased—but, in addition, a large number of sensational NEW components has been introduced! The name TELSEN now covers every radio requirement—from the smallest yet most efficient Iron-Cored Coils to the most brilliant All-mains, Battery and Kit-Sets ever designed. See them on Stand No. 88 at Olympia—to-day!

TELSEN HIGH VOLTAGE ELECTROLYTIC CONDENSERS

Excellent for use wherever high voltage high capacity condensers are required. Supplied with special bracket and terminal for mounting on any type of baseboard or chassis.

Cap.	275 working peak voltage Price	500 working peak voltage Price
4 mfd.	3/6	4/6
6 ,,	3/9	5/-
8 ,,	4/-	5/6

TELSEN LOW VOLTAGE ELECTROLYTIC CONDENSERS

Ideal where a very high capacity with a fairly low voltage is required. Very compact, with wired ends for easy suspension in the wiring.

25 mfd. at 25 volts ..	Price 2/6
50 ,, 25 ,, ..	,, 3/-
25 ,, 50 ,, ..	,, 3/-

TELSEN SMALL TUBULAR CONDENSERS

Very small, yet quite as efficient as the larger types. Tested up to 1,500 volts. Wired ends make them very suitable for suspension in the wiring.

Capacity.	Price.
·0001 mfd. to ·006 mfd.	1/-
·01 mfd.	1/3
·1 mfd.	1/6

H.T. UNIT AND L.T. CHARGER FOR A.C. MAINS

For input voltages between 200 and 250 at 40 to 100 cycles. Charges 2-, 4- or 6-volt accumulators at 0·5 ampere.

Price £4 17 6

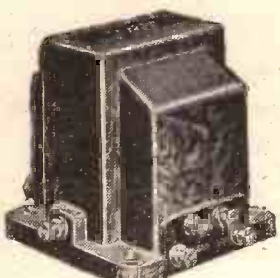
H.T. AND L.T. UNIT FOR A.C. MAINS

Similar to H.T. Unit and L.T. Charger, but with the L.T. charger replaced by a centre tapped transformer winding capable of supplying 2·5 amps at 4 volts.

Price £3 7 6

H.T. UNIT FOR D.C. MAINS

For D.C. inputs of from 200 to 250 volts. **Price 35/-**



TELSEN "CLASS B" OUTPUT CHOKE

For matching to any M.C. speaker having either a high resistance speech coil or a low resistance coil and input transformer. D.C. resistance 220 ohms per half winding. Total inductance 18 henries. .. .. **Price 8/6**

TELSEN "CLASS B" OUTPUT TRANSFORMER

For matching to M.C. speakers having low resistance speech coils. Primary resistance 200 ohms per half winding.

Price 8/6

TELSEN RESISTORS WITH WIRED ENDS

Negligible self-capacity and inductance Noiseless in use. Value remains unchanged under all circumstances.

Power rating of ½ and 1 watt: 250, 500, 1,000, 1,250, 5,000, 10,000, 20,000 25,000, 50,000, 100,000, 250,000, 500,000 ohms resistance .. **Price 1/-**

Power rating of 2 watts: 250 to 100,000 ohms resistance .. **Price 2/-**

Three and 6-watt types can be supplied on demand.

GET YOUR COPY OF THE TELSEN RADIOMAG No. 5 NOW!

ANNOUNCEMENT OF THE TELSEN ELECTRIC CO., LTD., ASTON, BIRMINGHAM

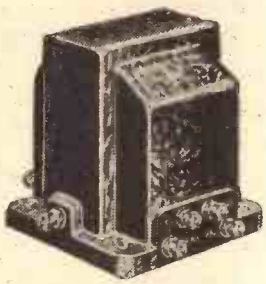
AMAZING PRICE REDUCTIONS for 1934!

VALUE has always been an outstanding feature of the wonderful Telsen range—but never before has Telsen value been so amazing as it is now. For now Telsen announce almost unbelievable PRICE REDUCTIONS! Just look at this list—and see how much you will save by insisting on Telsen Components for that new set you intend to build!

TELSEN "CLASS B" DRIVER TRANSFORMER

Made in two ratios covering the requirements of all the "Class B" valves available at present. Supplied with comprehensive instructions.

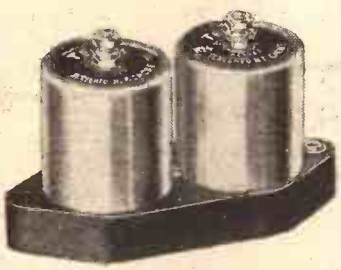
Overall Ratio	Primary to half-secondary	Price
4—1	2—1	8/6
1·5—1	3—1	8/6



TELSEN SCREENED H.F. CHOKES

The metal screen, which is connected to an earthing terminal, eliminates interaction.

"All-Wave" Binocular (10—2,000 metres) Price 4/6
"Standard" (100—2,000 m.) Price 2/6
"Short Wave" (10—100 m.) Price 3/-



TELSEN BAKELITE DIELECTRIC REACTION CONDENSERS

Entirely re-designed. Now incorporate several valuable improvements with no increase in price, the whole unit being also now enclosed in a strong dust-proof bakelite case

	Price
·0003 mfd. to ·0001 mfd.	1/9
·00075 mfd. to ·0005 mfd.	2/-

TELSEN DIFFERENTIAL CONDENSERS

Similar in design and construction to the reaction condensers.

	Price
·0003 to ·0001 mfd. ..	2/-

TELSEN AERIAL SERIES CONDENSER WITH SWITCH

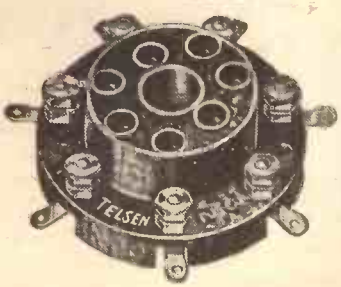
Built on similar lines to the new reaction condensers, providing an ideal selectivity and volume control.

Max. capacity ·0003 mfd. Price 2/-

TELSEN 7-PIN VALVE HOLDERS

Accommodate the latest types of valve, such as "Class B" valve. Contact sockets extended in one piece to form soldering tags, ensuring perfect connection.

	Price
7-pin Solid Type ..	1/6
7-pin Anti-Microphonic Type	1/9



No.		Reduced to
	H.F. CHOKES	
W.74	Binocular H.F. Choke ..	3/6
W.75	Standard H.F. Choke ..	1/6
W.221	Short Wave H.F. Choke ..	2/6
	L.F. CHOKES	
W.68	40 hy. L.F. Choke.. ..	4/9
W.69	100 hy. L.F. Choke ..	4/9
	OUTPUT CHOKES	
W.71	Output Choke	6/3
W.72	Tapped Pentode Output Choke	6/9
W.172	Power Pentode Output Choke	9/6
	COILS	
W.76	Dual Range Aerial Coil ..	5/6
W.154	H.F. Transformer Coil ..	4/6
W.216	Screened Coil	7/-
W.287	Twin Matched Screened Coils	14/6
W.288	Triple Matched Screened Coils	21/6
W.290	Band Pass Coil Unit ..	14/6
W.292	Band Pass and Oscillator Coil Unit	21/6
W.293	Oscillator Coil	7/6
W.294	Intermediate Frequency Transformer Coil	7/6
S.330	Superhet Coils	21/6
	TUNING CONDENSERS—Air Dielectric	
W.130	·00025 mfd	2/6
W.131	·00035 mfd.	3/6
W.132	·0005 mfd.	3/6
W.339	Single Condenser Unit ..	7/6
W.306	Twin Ganged .. .. With Dust Cover, 2/- extra	12/6
W.307	Triple Ganged .. .. With Dust Cover, 2/6 extra	17/6
	PRESET CONDENSERS	
W.152	·0001 mfd.	1/3
W.151	·0003 mfd.	1/3
W.150	·001 mfd.	1/3
W.149	·002 mfd.	1/3
	FIXED CONDENSERS—Mica	
W.310	·01 mfd.	2/-
W.311	·02 mfd.	2/6
W.316	·05 mfd.	4/6
	VARIABLE RESISTANCES	
W.299	Hum Adjuster	2/6
	PAPER BLOCK CONDENSERS	
W.175	4 mfd., 500-volt test ..	4/9
W.176	6 mfd., 500-volt test ..	7/-
W.177	8 mfd., 500-volt test ..	9/6
W.178	4 mfd., 1,000-volt test ..	6/6
W.179	6 mfd., 1,000-volt test ..	9/6

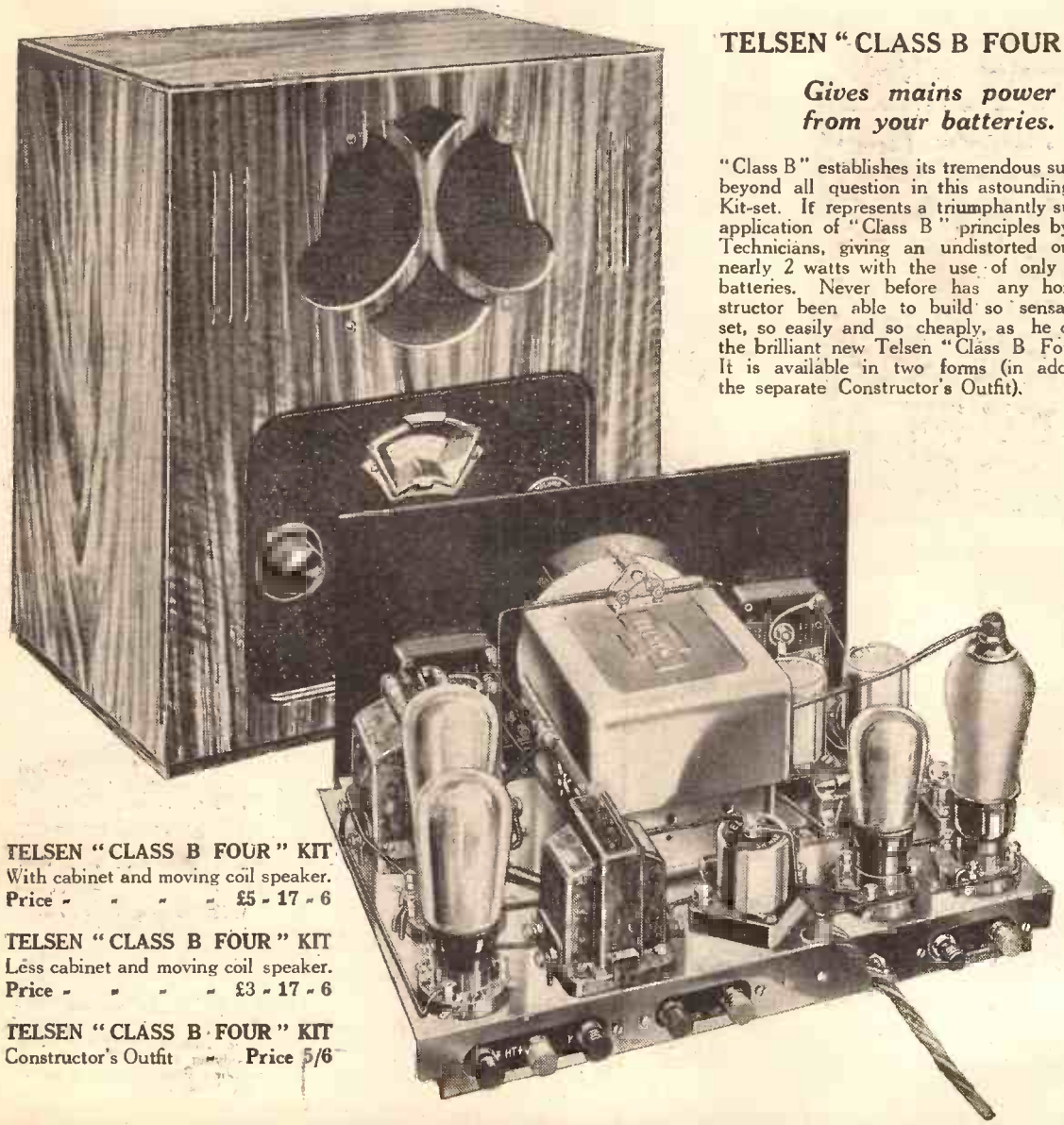
No.		Reduced to
	PAPER CONDENSERS	
W.232	·01 mfd., 500-volt test ..	1/3
W.230	·04 mfd., 500-volt test ..	1/3
W.231	·1 mfd, 500-volt test ..	1/6
W.229	·25 mfd., 500-volt test ..	1/6
W 228	·5 mfd., 500-volt test ..	1/6
W.227	1 mfd., 500-volt test ..	1/9
W.226	2 mfd, 500-volt test ..	2/6
W.239	·01 mfd., 1,000-volt test ..	1/9
W.237	·04 mfd., 1,000-volt test ..	1/9
W.238	1 mfd., 1,000-volt test ..	2/-
W.236	·25 mfd., 1,000-volt test ..	2/-
W.235	·5 mfd., 1,000-volt test ..	2/-
W.234	1 mfd., 1,000-volt test ..	2/6
W.233	2 mfd., 1,000-volt test ..	3/6
	DIALS	
W.141	Slow motion, Black ..	1/6
W.141A	Slow Motion, Brown ..	1/6
W.184	Illuminated Disc Drive ..	2/6
W 257	Small Disc Drive	2/-
W.313	"313" Disc Drive ..	3/6
	SWITCHES	
W.107	2-pt. Push-Pull	9d.
W.108	3-pt. Push-Pull	1/-
W.153	4-pt. Push-Pull	1/3
W.297	Mains Type	1/6
	TONE CORRECTORS	
W.308	Pentode Tone Corrector ..	2/6
W.314	Variable Tone Corrector ..	4/6
	TRANSFORMERS—Intervalve	
W.61	1·75—1 "Radiogrand" ..	9/6
W.59	3—1 "Radiogrand" ..	6/9
W.58	5—1 "	6/9
W.60	7—1 "	9/6
W.66	3—1 "Ace"	4/9
W.65	5—1 "	4/9
	OUTPUT TRANSFORMERS	
W.62	1—1 "Radiogrand" ..	9/6
W.63	Multi-Ratio "Radiogrand"	9/6
	VOLUME CONTROLS	
W.296	50,000 ohms, with Mains Switch Combined	4/6
	LOUDSPEAKERS, UNITS AND CHASSIS	
W.54	Loudspeaker Unit ..	3/6
W.170	"Maior" Chassis ..	7/6
W.181	Loudspeaker	8/6
W.182	Loudspeaker	11/6
W.183	Loudspeaker	12/6

For full details, prices and catalogue numbers of the complete Telsen range (over 500 component parts, many of which have been improved in design at no increase in price), see the new Telsen "Radiomag," Issue No. 5, price 3d.

PRICE ONLY 3D.—3 FULL SIZE 1/- BLUEPRINTS FREE WITH EVERY COPY

ANNOUNCEMENT OF THE TELSEN ELECTRIC CO., LTD., ASTON, BIRMINGHAM

AMAZING Telsen & 'CLASS B'



TELSEN "CLASS B FOUR" KIT

Gives mains power from your batteries.

"Class B" establishes its tremendous superiority beyond all question in this astounding Telsen Kit-set. It represents a triumphantly successful application of "Class B" principles by Telsen Technicians, giving an undistorted output of nearly 2 watts with the use of only ordinary batteries. Never before has any home constructor been able to build so sensational a set, so easily and so cheaply, as he can with the brilliant new Telsen "Class B Four" Kit. It is available in two forms (in addition to the separate Constructor's Outfit).

TELSEN "CLASS B FOUR" KIT
With cabinet and moving coil speaker.
Price - - - - £5 - 17 - 6

TELSEN "CLASS B FOUR" KIT
Less cabinet and moving coil speaker.
Price - - - - £3 - 17 - 6

TELSEN "CLASS B FOUR" KIT
Constructor's Outfit - - **Price 5/6**

FULL DETAILS IN ISSUE No. 5 OF THE TELSEN RADIOMAG—

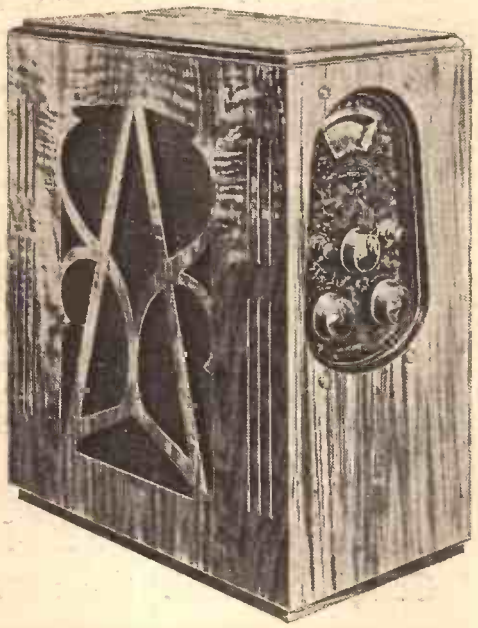
ANNOUNCEMENT OF THE TELSEN ELECTRIC CO. LTD., ASTON, BIRMINGHAM

NEW RECEIVERS KIT SETS

TELSEN "464" A.C. MAINS RECEIVER

Telsen's previous experience in the all-mains field has been an invaluable aid in the production of this superb new all-electric receiver. It has that lasting perfection which means the practical elimination of the "servicing" bugbear. Its brilliant circuit incorporates every conceivable ultra-modern refinement, including the new Telsen Iron-Cored Coils, Variable Tone Control, New Type Moving Coil Speaker, Single Knob Tuning, Wavelength Calibration, etc., in a beautiful Walnut-finished cabinet, providing really astounding selectivity with amazing sensitivity, exceptional volume and wonderful tone **Price £9 - 9 - 0**

Or can be had for 15/6 down and 12 equal payments of 16/9.



TELSEN "AIR MARSHAL"

The ultra-selective, ultra-modern circuit of this wonderful Telsen three-valver makes it the most efficient set of its type ever produced—yet it is simpler to operate, cheaper to run, and costs less to buy. It is absolutely self-contained in a beautiful cabinet of modern design, finished in Walnut and is supplied complete with valves, batteries and either Moving Iron or Moving Coil loudspeaker.

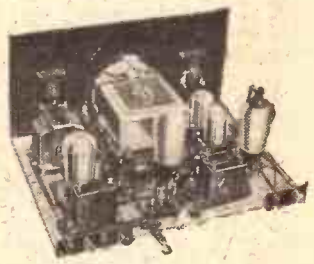
With Moving Iron loudspeaker - -
Price £4 - 17 - 6

Or can be had for 9/6 down and 12 equal payments of 9/6.

With Moving Coil loudspeaker - -
Price £5 - 5 - 0

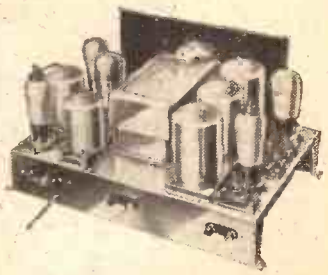
Or can be had for 10/- down and 12 equal payments of 10/-.

If the receivers shewn on the left are not exactly what you require, then one of the following two Constructors' Sets will certainly be your choice. They are not 'Kit' sets but circuit designs using Telsen Components (some of which you may already have). Complete details, together with full size 1/- Blueprint of each, are contained in the New Telsen Radiomag, Issue No. 5, price only 3d.



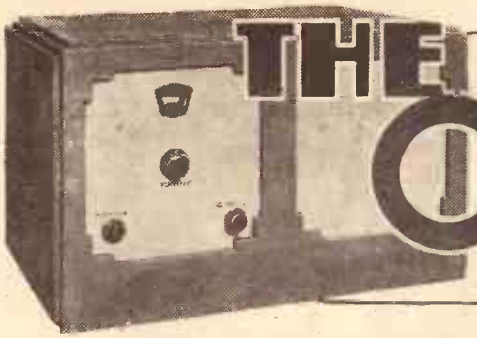
TELSEN BATTERY S.G.3

An economical yet outstandingly efficient battery operated S.G. Det. Pentode three valver, employing the sensational new Telsen Iron-Cored Coils, with single knob tuning.



TELSEN A.C. SUPER FIVE

A magnificent five-valve superheterodyne receiver for A.C. Mains, embodying every de luxe feature, including Band Pass Tuning with single knob control.



THE OLYMPIA SUPER

This magnificent five-valve A.C. all-electric superheterodyne—"P.W.'s" first star set of the new season—attains a degree of efficiency unsurpassed by any receiver of its type. Essentially modern in every respect, its enormous power, knife-edge selectivity, unified control and superlative tone quality form an unbeatable combination of universal appeal.

Described by G. V. DOWDING, Assoc.I.E.E.

THIS is our first "star" set of the 1933-34 radio season. And it provides the home constructor with his first opportunity to build a receiver which *in every way* equals, if not transcends, the best commercial practice.

It is up to the minute in its circuit detail, and in appearance and operation Olympia Super compares most favourably with any factory product.

By adopting a novel form of unit construction the assembly has been simplified to an extraordinary extent without sacrificing either efficiency or compactness.

Those of you who imagine that an all-mains superheterodyne must necessarily be a difficult proposition, and one that can be tackled only by a highly experienced amateur, are quite wrong in so far as the Olympia Super is concerned.

As a generalisation it might be more or less correct to say that A.C. supers are beyond the powers of many set builders, but this definitely does not apply in the present instance.

"The most successful piece of work ever accomplished by our Research Department."

Everything that could be done in accordance with the most modern technique to remove the usual difficulties encountered has been done, and, beyond that, our own lengthy research, which preceded the evolution of the design, enabled us to adopt novel steps which at long last bring the A.C. super within the reach of all.

The superheterodyne constitutes a specialised branch of radio engineering, and so, for some time past, a special section

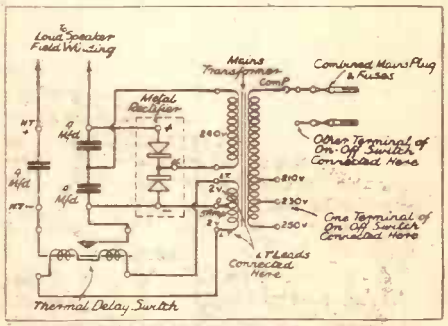
SEE THIS SET ON STAND No. 11 AT THE RADIO EXHIBITION.

of the "P.W." Research Department has been devoting its full time to "super" investigation and experimentation.

The result is to be seen in the Olympia Super, which we regard as probably the most successful piece of work ever accomplished by our Research Department.

It *looks* like a highly-efficient, powerful modern set, and it *is* just what its appearance at once leads one to anticipate.

THE POWER CIRCUIT

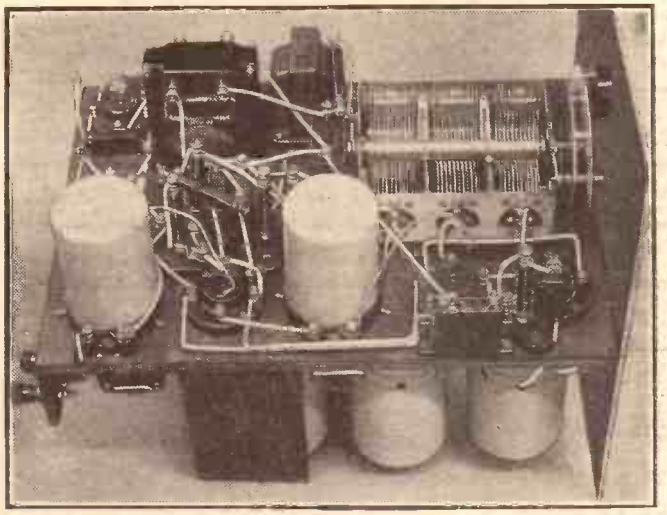


Among its well-tried technical features the "Olympia" Super includes full-wave rectification and thermal delay switching. No high-tension is therefore applied to the anodes of the valves until the heaters attain their correct working temperatures. This valuable refinement obviates the possibility of condenser breakdown being caused by initial surges.

The outfit is built into a table-consolette cabinet, with the loudspeaker occupying the same plane as the set—a refreshing departure from the wearyingly conventional "two-floors" plan.

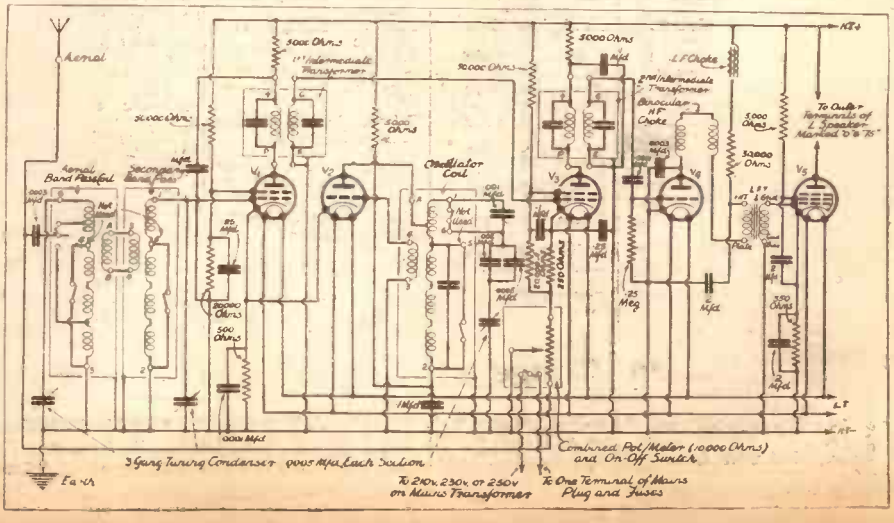
You cannot gain a full appreciation of the set's appearance from the photos,

(*Continued on next page.*)



COMPACT PERFECTION.

The cleverly arranged layout, whilst resulting in a remarkably compact assembly, also enables the wiring to be carried out in the most efficient manner possible. An examination of the theoretical circuit (below) reveals a skilful blending of the latest technical developments, and it will be observed that as an aid to simplified control the multi-mu potentiometer and the "on-off" switch are combined.



THE "OLYMPIA" SUPER

(Continued from previous page.)

because these cannot show the handsome (but quite inexpensive) gauze-covered front.

However, if you visit the Radio Exhibition you will be able to examine the actual set on our stand, and, by the way, if there are any points concerning it which are not covered by this or the following article which you want to know, one or other of our representatives will be delighted to explain them to you.

In the meantime, I shall do my very best to forestall any such queries, and, to make it simple for both readers and myself, I am going to sectionise this descriptive article.

WHAT THE "OLYMPIA" SUPER IS.

An all-mains (A.C.) superheterodyne receiver employing five valves and built into a home-made consolette cabinet with a mains-drive moving-coil loudspeaker.

The only external connections needed are aerial and earth and the mains. No batteries whatever are employed.

WHAT IT WILL DO.

It would be easier to tell you what it won't do! This magnificent super develops an enormous power. But it remains at all times under perfect control. You can regulate it from a comparatively few milliwatts up to a full, well-balanced two and a half watts of undistorted output.

Its selectivity is "super" selectivity at its very best. Stations come in and go out during a fraction of a degree on the dial. There is unilateral station separation and sensitivity over both long- and medium-wave ranges.

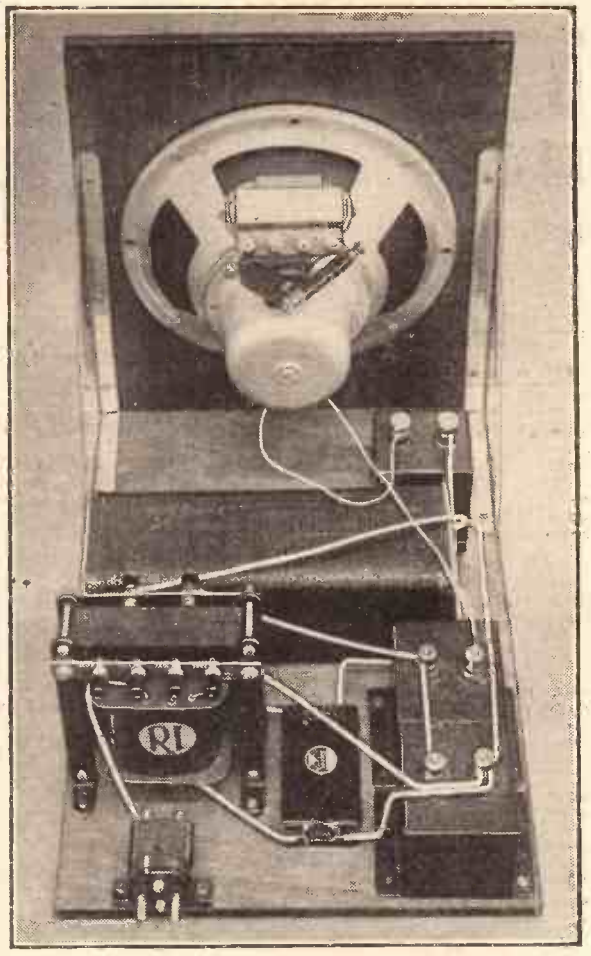
On even a moderate indoor aerial the whole of Europe's ether is open to you. We have tuned in a hundred stations at full loudspeaker strength *in the middle of the summer.*

No rearrangement of the European wavelength plan is likely to handicap the "Olympia" Super in any way; its capabilities are practically unlimited and would seldom need to be applied at anything approaching their maximum.

THE OUTPUT QUALITY.

By carefully balancing the inherent bass emphasis of the super principle against the treble characteristics of a pentode, a superlative quality of rendition is achieved through the distortionless moving-coil loudspeaker.

There is a minimum of background and a freedom from hum. In these respects the set is uncannily effective.



The power pack and energised moving-coil loudspeaker form one unit, the speaker field winding combining with its normal duties those of a smoothing choke for the high-tension supply. This effects a considerable economy in smoothing gear without in any way reducing the efficiency of the "power section."

THE OPERATING CONTROLS.

Only one tuning control appears on the "Olympia" Super. One-knob super tuning was only a dream a year or two ago, but in our exhibition set this dream achieves

(Continued on page 720.)

USE THESE PARTS AND MAKES FOR YOUR "OLYMPIA" SUPER

Component	Make used by Designer	Alternative makes of suitable specification recommended by Designer
1 triple-gang tuning condenser	J.B. "Nugang," type A	—
1 Set superhet. coils	Colvern K61, K62, K63	—
2 Intermediate frequency transformers	Colvern, type 110	—
5 Five-pin valveholders	W.B., large type	Benjamin, Ferranti, Telsen, Lissen
2 2-mfd. fixed condeusers	Telsen W226	Lissen, Dubilier, T.C.C., Ferranti
1 2-mfd. fixed condenser	Igranic 2231/70	Ferranti, T.C.C., Lissen, Dubilier
2 1-mfd. fixed condensers	T.C.C., type 50	Lissen, Dubilier, Ferranti, Igranic
2 4-mfd. fixed condensers	Dubilier, type LSB	T.C.C.
1 4-mfd. fixed condenser	T.C.C., type 80	Dubilier
2 ·25-mfd. fixed condensers	Telsen, small type	—
2 ·1-mfd. fixed condensers	Telsen, small type	—
1 ·002-mfd. fixed condenser	Dubilier, type 620	Telsen, T.C.C., Graham Farish, Lissen
1 ·0005-mfd. fixed condenser	Dubilier, type 620	—
1 ·0003-mfd. fixed condenser	Dubilier, type 670	—
2 ·0001-mfd. fixed condensers	Dubilier, type 670	—
1 ·001-mfd. fixed condenser	T.C.C. 34/25A	Dubilier
1 ·0003-mfd. fixed condenser	Telsen W242	T.C.C., Lissen, Dubilier, Graham Farish
1 ·005-mfd. fixed condenser	Dubilier, type 670	—
1 ½-megohm grid leak with wire ends	Dubilier, 1 watt	Lissen, Goltone, Igranic
2 50,000-ohm resistances with vertical holders	Graham Farish "Ohmite"	—
2 20,000-ohm resistances with vertical holders	Graham Farish "Ohmite"	—
3 5,000-ohm resistances with vertical holders	Graham Farish "Ohmite"	—
1 500-ohm resistance with vertical holder	Graham Farish "Ohmite"	—
1 30,000-ohm resistance	Graham Farish "Ohmite"	—
1 5,000-ohm resistance	Graham Farish "Ohmite."	—

Component	Make used by Designer	Alternative makes of suitable specification recommended by Designer
1 350-ohm resistance with terminals or wire ends	Graham Farish "Ohmite"	Dubilier
1 250-ohm resistance with terminals or wire ends	Graham Farish "Ohmite"	Dubilier
1 10,000-ohm resistance with terminals or wire ends	Graham Farish "Ohmite"	Dubilier
1 10,000-ohm potentiometer and switch combined	Bulgin VS32	Lewcos
1 L.F. transformer	Ferranti AF3	Telsen R.I., Lissen, Varley
1 L.F. choke	Lissen LN5299	R.I., Telsen
1 H.F. choke	Telsen binocular	—
1 Mains transformer	R.I., type EY37	—
1 Metal rectifier	Westinghouse H.T.9	—
1 Thermal delay switch	Varley, type EP17	—
1 Combined mains plug and fuses	Bulgin, type F15	—
1 Mains energized loudspeaker	W.B. (2,500 ohms.)	—
1 Pair terminal blocks	Goltone	Belling & Lee, Bulgin
2 terminals	Igranic	Goltone, Belling & Lee
7 Lengths of insulated sleeving	—	—
10 Yards 18-gauge TC wire	—	—
2 Anode connectors	—	Clix, Bulgin
1 Aluminium panel, 12 in. x 10 in. x 16 gauge	Belling & Lee	—
1 Metaplex chassis 14 in x 10 x 5⅞ in.	Peto-Scott	—
1 Baseboard, and baffleboard assembly.	Peto-Scott	—
1 Cabinet	Peto-Scott	—
Flex, screws, etc.	—	—

AERIAL AND EARTH EQUIPMENT.—Electron "Superial"; Goltone "Akrite"; Graham Farish "Filt" earthing device; Bulgin lightning switch; Radiophone "Receptru" down lead.

FIRST IN 1919—FOREMOST ALWAYS

NEW SEASON'S RADIO—CASH—C.O.D.—H.P.

Originators of Kits of Parts in 1919, we supply all your Radio needs, Cash—C.O.D.—or Easiway. Our customers are invited to take advantage of our FREE Technical Service or call for demonstrations at 77, City Road, London, E.C.1 or 62, High Holborn, London, W.C.2.

NEW COSSOR, MODEL 341, S.G., Detector and Pentode, and Balanced Armature Speaker, complete with Cabinet. Cash or C.O.D. Carriage paid. **£3/7/6.** Balance in 11 monthly payments of **11 9.** Send **11/9** only

NEW LISSEN ALL-ELECTRIC SKY-SCRAPER THREE, complete with 4 valves and constructional Chart in Sealed Carton. Cash or C.O.D. Carriage paid. **£7/19/6.** Balance in 11 monthly payments of **14/6.** Send **14/6** only

NEW LISSEN SKYSCRAPER THREE (Battery Model), complete with three valves and constructional chart in sealed carton. Cash or C.O.D. Carriage paid. **£4/9/6.** Balance in 11 monthly payments of **8 3.** Send **8/3** only

NEW FERRANTI "CLASS B" SUPER-POWER CONVERTOR. Instantly converts your set to "Class B." Complete with Valves. Ready Assembled. Cash or C.O.D. Carriage paid. **£3/3/0.** Balance in 11 monthly payments of 5/9. Send **5/9** only

NEW LISSEN SKYSCRAPER FOUR ALL-WAVE CHASSIS MODEL complete kit comprising all components including set of Lissen valves. Cash or C.O.D. Carriage paid. **£5/12/6.** Balance in 11 monthly payments of **10/3.** Send **10/3** only

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1	**T.C.C.** 4-mfd. fixed condenser, type 80		7	0
2	**TELSEN** ·25-mfd. fixed condensers, small type		4	0
2	**TELSEN** ·1-mfd. fixed condensers, small type		3	6
1	**DUBILIER** ·002-mfd. fixed condenser, type 620		2	0
1	**DUBILIER** ·0005-mfd. fixed condenser, type 620		1	8
1	**DUBILIER** ·0003-mfd. fixed condenser, type 670		1	0
2	**DUBILIER** ·0001-mfd. fixed condensers, type 670		2	0
1	**T.C.C.** ·001-mfd. fixed condenser, type 54/25A		1	6
1	**TELSEN** ·0003-mfd. fixed condenser, type W.242			6
1	**DUBILIER** ·005-mfd. fixed condenser, type 670		1	6
1	**DUBILIER** ½-meg. grid leak with wire ends		1	0
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1	**T.I.** mains transformer, type EY.37	1	17	6
1	**WESTINGHOUSE** metal rectifier, H.T.9	1	1	0
1	**VARLEY** thermal delay switch, type EP.17		6	6
1	**BULGIN** combined mains plug and fuse, type F.15		3	0
1	**GOLTONE** pair terminal blocks			9
2	**BELLING-LEE** terminals and (2) Anode connectors		1	1
7	Lengths of insulated sleeving, 10 yds. 18-gauge wire, flex, screws, etc.		2	7
	KIT "A." CASH OR C.O.D.	£14	11	0

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Balance in 11 Payments of 13/-.

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	£	s.	d.
1 Peto-Scott "Metaplex" B/Bd., 16 × 12		2	3
1 Set of Specified Valves	2	5	0
1 Bulgin M.R.5 Mains Resistance		11	6
1 Speaker, W.B. PM.4	2	2	0

KIT-BITS You pay the postman. We pay post charges on orders over 10/-.

1 Pr. Telsen Matched Screened D/Range Coils, type W.287		17	0
1 Lissen L.N.5301 L.F. Smoothing Choke		12	6
1 Ferranti Output Transformer, type O.P.M.8		12	6
1 Westinghouse Metal Rectifier, type H.T.7		17	6

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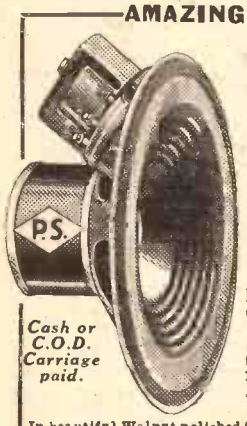

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Exquisite tone; sensitive to every sound inflection. Moulded diaphragm. Tapped input transformer for Power or Pentode. Mains Energised Model for A.C. (2,500 ohms) or D.C. Mains (5,000 ohms) 15/-

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SEND DIRECT to AVOID DELAY — CASH, C.O.D. or EASIWAY

THE "OLYMPIA" SUPER

(*Continued from page 718.*)

concrete, perfected realism. The one tuning adjustment is a true station selective, and no tricky juggling with complementary or even auxiliary knobs or dials is necessary.

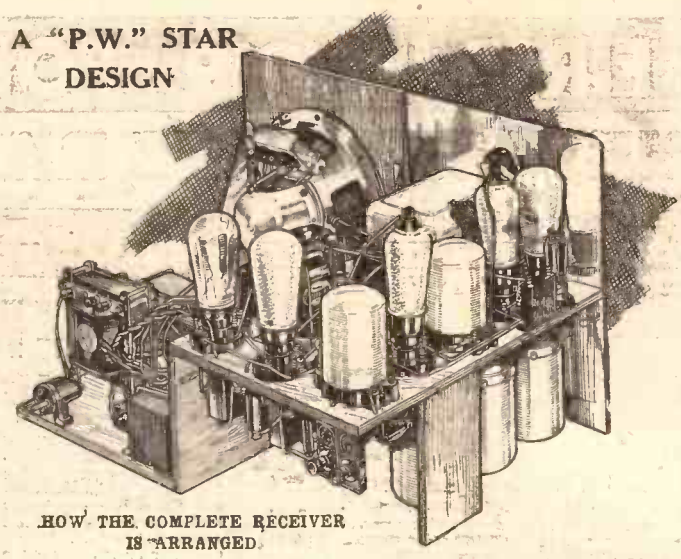
But the smooth slow-motion movement incorporated in this solitary dial enables anyone to select from the scores available the particular programme desired.

There is a wave-change switch providing immediate access to either of the broadcast wave bands.

grid biases and H.T. voltages are automatically fixed by the various anode and cathode resistances, so that the constructor is not left to decide by trial and error how such adjustments should be made.

When he has built the set it can at once be placed in commission. After connecting up the aerial and earth and mains, all that has to be done is to switch on!

A "P.W." STAR DESIGN



HOW THE COMPLETE RECEIVER IS ARRANGED.

THESE ARE THE CORRECT VALVES

Make	1st Det.	Oscillator	Int.	2nd Det.	Output
Cossor	41M.S.G.	41M.H.L.	M.V.S.G.	41M.H.L.	M.P./Pen.
Mullard	S.4V.A.	354V.	V.M.4V.	354V.	Pen.4V.
Mazda	A.C./S.G.	A.C./H.L.	A.C./S.G.V.M.	A.C./H.L.	A.C./Pen.
Marconi	M.S.4B.	M.H.4	V.M.S.4	M.H.4	M.P.T.4
Osram	M.S.4B.	M.H.4	V.M.S.4	M.H.4	M.P.T.4

The volume control and on-off switch are combined. The one knob controls both. When it is fully rotated in an anti-clockwise direction the set is switched out of action.

Rotation in a clockwise direction first switches the set on and then gradually increases the volume. Therefore it is impossible to plunge right into maximum volume.

CIRCUIT DETAILS.

The aerial feeds into a band-pass circuit, and this ensures a high degree of "front-door" selectivity, an absence of re-radiation (in combination with another special feature) and an absence of second-channel interference.

A separate oscillator is employed, and this is coupled by means of its cathode circuit with the cathode circuit of the first detector.

This is a highly satisfactory method, and results in negligible coupling between their respective tuning circuits. The elimination of such interference results in a supplementing of the non-radiation effect referred to above.

The most effective volume control is obtained by the employment

> ". . . . Its selectivity is 'super' selectivity at its very best. Stations come in and go out during a fraction of a degree on the dial."

of a variable-mu S.G. valve in an intermediate position.

The second detector is by-passed for H.F. impulses and functions on the grid-circuit demodulation principle.

A pentode output valve contributes great amplification and, in team with the preceding circuit characteristics, a balanced quality output.

The field winding of the loudspeaker is made to serve as a smoothing choke, and thus a considerable economy in smoothing gear is effected without in any way reducing the efficiency of the "mains-pack" section.

Full-wave metal rectification is used.

It should be observed that all the

BUILDING THE "OLYMPIA" SUPER.

The construction of the "Olympia" Super is not a difficult matter, for it is built in two separate portions, one containing the radio section of the set and the other the loudspeaker and the mains power pack.

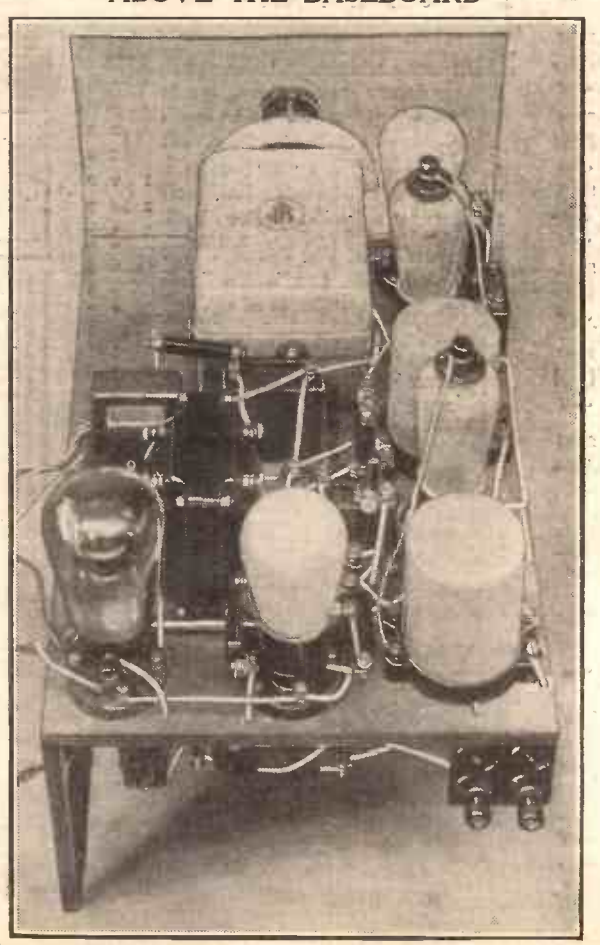
Thus the two parts can be assembled and wired quite independently, being joined together at the end of the construction.

The whole receiver, when completed, fits into a cabinet of modern design, the set and the speaker sections resting side by side, each sliding into the cabinet from the back. Therefore each must be built on some form of chassis, with complete mechanical rigidity in each.

The baseboard and panel method of construction has been adopted, the "panel" in the case of the speaker portion being the baffle of the speaker, and a certain amount of sub-baseboard construction being employed in the set section.

A metal panel of sand-blasted aluminium is used, and on this are mounted the main controls of the set, the tuning condenser, the volume control, and the knob for the wave-change spindle. The latter two controls are situated low down on the panel, for the components concerned come below the baseboard. The variable condenser, a triple-gang type, is fixed above the baseboard.

ABOVE THE BASEBOARD



The ganged tuning condenser together with the valves, intermediate transformers, L.F. transformer and certain other components are arranged above the tuning and oscillator coil assembly, thus greatly simplifying the wiring.

How the Tuning Coils are Mounted.

The baseboard should consist of a piece of ⅜-in. thick wood, 10 in. by 14 in., and it is supported on the right-hand side (looking from the back) by a piece of the same wood, 14 in. by 5½ in., and on the other side a piece of wood 3 in. by 5½ in. The front, of course, is supported by the panel in the usual way.

This construction leaves ample space under the baseboard for the mounting of the tuning coils, which are placed to the left of the baseboard (looking from the back), the variable condenser being on the top in the centre, and the volume-control potentiometer to the right, on a line with the wave-change control of the coils

So much for the main lay-out. The detailed construction calls for a fuller treatment than we have space for, so a further article on building the "Olympia" Super will appear next week.

ECKERSLEY EXPLAINS-

Our Radio Consultant-in-Chief deals with a variety of subjects this week, including: The European Wavelength Plan—Values Marked on Components—Measuring Resistance—Fuses—Charging Accumulators.

I SHOULD like to make an addendum to my article about the new European plan.

It looks if as I were attempting to blame our delegation for the situation which has come about. I do not blame them. The Chief Engineer of the B.B.C. inherited some difficult problems, but his most difficult concerned the international situation. The most inspired and factual person can do nothing against the forces of reaction and stupidity which now govern the Union. The technical men have been superseded. They can do nothing. So, if it unwittingly appeared as if I were criticising our B.B.C. technical people, let me be quite clear that this was not my intention.

Do you "go" by the markings on resistances, condensers, inductances, etc., when you are making up sets? I think you are probably quite right to do so, because even a 10 per cent error in a "fixed" condenser or resistance does not matter. But sometimes when a set is "off colour" it may well be that either a "0" has slipped a too casual eye or that a resistance has definitely changed its value—perhaps through overload or because of faulty manufacture.

Searching for Defaulters.

I admire the technique which labels a resistance by a colour scheme. There is no excuse for fitting wrong values then, provided you remember the code, of course!

But resistances and condensers do go. I had a case the other day of a tuned circuit which suddenly made up its mind to require about four times the capacity it was designed to have to tune it! Well, perhaps not four times, but twice! The inductance had had appendicitis and the lesion was adhesions. Or, in other words, short-circuited turns internally.

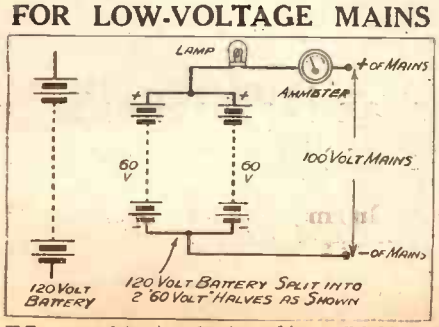
You may want to test resistances. They may be of the order 100, 1,000, 10,000, 100,000, or 1,000,000 ohms. The fundamental law is that the value of a resistance is given by the value in volts applied to it, divided by the current these volts cause to flow through it. Resistance is volts divided by amps. So, if you have an alleged 100,000 ohms, a 100-volt battery ought to pass one-thousandth of an ampere through it—i.e. 1 milliamp.

So, if you have a sensitive milliammeter and a high-tension battery, you can amuse yourself and maybe find a "bug" in your set by testing your resistances. Remember that with only 100 ohms to test you must cut down your applied voltage, otherwise you will spoil the battery, burn out a milliammeter and not amuse yourself so much. This method is not applicable to the measurement of meg. (or million) ohms unless you have a very high voltage battery, and then you must be careful of leakage currents. The resistance of the body can be a good deal less than a megohm, and catching hold of things may therefore upset readings.

The measurement of capacity and inductance is much more difficult and beyond the resources probably of a simply equipped laboratory.

I notice a tendency among my friends to use fuses in all high-tension leads. I, perhaps, have been careless in the past about this, but I am becoming more fuse-conscious as time goes on. It *is* worth while, I think, when you are experimenting, or particularly when you are about to try a newly wired-up set, to get a flashlamp and connect it in the H.T. (+1 lead). People sell these things specially for the job.

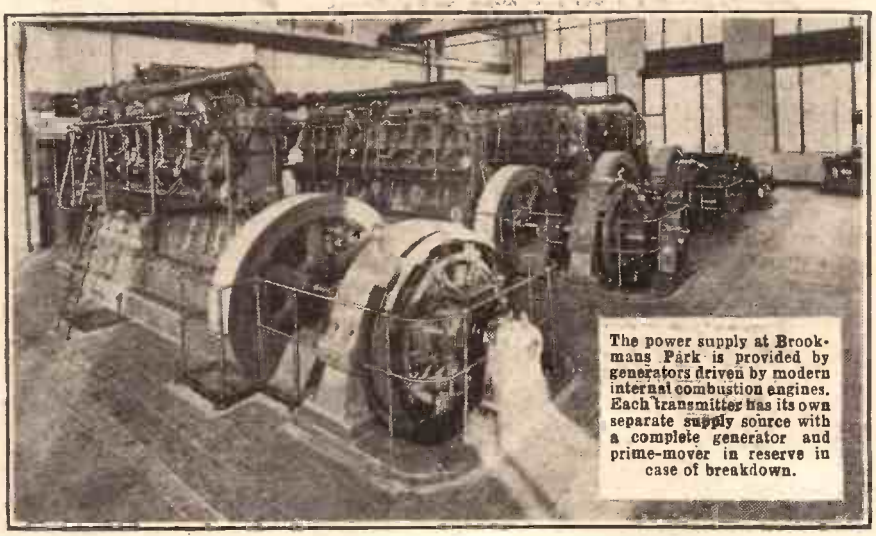
FOR LOW-VOLTAGE MAINS



H.T. accumulators may be charged in paralleled banks

Here's someone asking about charging wet H.T. accumulators again! Mr. I. A., of Highgate, is lucky enough to have wet accumulators of 120 volts and D.C. mains of 100 volts. He wants to know how to get the 100-volt mains to push current into 120-volt accumulators. Of course, if he were to snap the positives and negatives together the accumulators would "charge" the mains, his electricity meter would run backwards and the pressure in the boiler at the power house would rise—(or perhaps not)—(and not for long, anyway!!!).

THE GENERATORS FOR THE LONDON PROGRAMMES



The power supply at Brookmans Park is provided by generators driven by modern internal combustion engines. Each transmitter has its own separate supply source with a complete generator and prime-mover in reserve in case of breakdown.

The way to do it.

The best thing to do is shown in my diagram. First split the accumulators in half, getting two banks of 60 volts. Then connect these through a lamp of suitable resistance value to the mains. Use an ammeter and choose the right lamp to allow the right charging current. Never charge an accumulator with a greater current than the makers suggest. You will find a label on your accumulator telling you the advisable charging current. Don't exceed it.

Of course, when the accumulator is charged the two halves should be put in series again for use as a 120-volt battery.

"Been to Olympia yet?"
"Well, no, but I've seen the Pye Superhets"

"It's going to be a superhet year, that's quite clear."

"Yes, I saw the Pye Superhets in the shop windows as I came up this morning."

"In that case, Olympia can't tell you anything. Pretty good, aren't they?"

"Good? I think they're marvellous! That 6-valve portable superhet is the best way of spending 14 gns. I've ever known."

"That's a battery set, of course. The A.C. version is more in my line. Only a guinea more."

"And that automatic volume control—positively uncanny, isn't it?"

"But you've not been to Olympia? How did you discover all this?"

"How did I discover it? In my wireless shop this morning—when I went in to buy one!"

PYE

Pye Radio Ltd., Sales Organisation, Africa House, Kingsway, London, W.C.2

E.W.G.

STATIONS WORTH HEARING

A review of recent conditions on the "broadcast" bands, including details of stations that are coming in well, and other information that will enable you to get the best results when searching for foreigners.

By R. W. HALLOWS, M.A.

THOUGH somewhat inclined to be atmospheric ridden, the few weeks prior to the Exhibition have been amazing for long-distance reception so far as both the number of stations receivable and the volume with which they could be tuned in, were concerned.

A large variety of interesting events have been occurring in the DX world, and are still doing so. The Dutch 50-kilowatt long-wave transmitter at Kootwyk, after running frequent tests outside programme hours, now takes over the Huizen programme transmissions after 4 p.m.

Received With Immense Volume.

This transmission is one that you should certainly try for—and if you try you will hardly help picking it up, for it comes in with immense volume. The 50-kilowatt transmitter will probably replace Huizen altogether when the Lucerne Plan comes into force, and the power should be great enough to drown interference from Kharkov, which will share the new wavelength of 1,345 metres.

Huizen, by the way, recently carried out its three-monthly exchange with Hilversum. You are now hearing the latter's programmes on 1,875 and the former's on 296·1 metres.

It is, I know, apt to be rather confusing. What it amounts to is that on 1,875 metres you have either the 8·5-kilowatt Huizen or the 50-kilowatt Kootwyk giving the Hilversum programmes, whilst on 296·1 metres you have the Hilversum station, using 7 kilowatts up to 5.40 p.m. and 20 kilowatts thereafter, which sends out the Huizen programmes.

The new Kalundborg station, which is capable of an output of 60 kilowatts, was opened on July 18th. The station would be strongly and well received in this country were it not for the appalling interference to which it is subjected.

Toulouse Again on the Air.

The 15-kilowatt Italian-Swiss station, Monte Ceneri, is working exactly on 1,153·8 metres, and there are Russian stations operating within a few metres. Kalundborg has tried operating recently on a slightly lower wavelength, but even so heterodyne interference is severe.

After a long period of silence Radio Toulouse is again making itself heard. Readers may remember that the original 8-kilowatt station, for years one of the most strongly received of Continental transmitters, was burnt down early in the spring.

Though a new 60-kilowatt plant at St. Agnan has been ready since the year 1932 to come into immediate action, the French Government persistently refused permission to broadcast. This permission has now been given, but solely on condition that St. Agnan shall limit its output to 8 kilowatts.

The programmes that you now hear come, therefore, from St. Agnan. The volume is excellent, and the quality is a vast improvement upon that of the old station.

Power Increases.

A good many of the new high-powered stations are taking over the programme services at the week-ends. In addition to them, not a few of the existing Continental stations seem to raise their power considerably at such times, and the result is that quite a number of stations that are rather feebly received during the rest of the week now come in with splendid volume at the week-ends.

Amongst the most notable are Genoa, Bratislava, Frankfurt, Hörby and Moravska-Ostrava. It is possible that in some cases increased depth of modulation accounts for the greater ranges achieved.

Munich's big transmitter has had a good many adventures during the summer, but it now seems to have settled down to a period of steady working and fine volume. Vienna's aerial is not yet quite completed, but the station is showing very greatly improved reception.

A particularly interesting station at the present time is Paris Ecole Supérieure on 447·1 metres. This station shares a wavelength with a small Norwegian relay.

Effect of Summer Time.

Until recently the Ecole Supérieure could hardly ever be received without strong interference, but in this instance the summer-time effect has proved most beneficial. The interfering stations have become inaudible, and this Paris transmission is now clearly and well heard on most evenings.

On the long waves the Eiffel Tower can hardly ever be received now free from interference. To Kalundborg I have already referred, and Oslo is another station which is too often badly interfered with. Only at odd times can the Norwegian station be received without an accompanying whistle.

The trouble here is due to Russian transmitters. In addition to Huizen and Kootwyk, Radio-Paris, Zeesen, Warsaw and Luxembourg all provide first-rate reception at any time, whilst Motala, though weaker than the others, can generally be tuned in at loud-speaker strength.

Budapest, at the top of the medium waveband, has now returned on most evenings to respectable, though not outstanding, volume. Vienna still varies considerably, though passable reception is obtainable more often than not. Brussels No. 1, Florence, Prague, Langenberg and Lyons Doua are uniformly good.

For a long time Beromünster was clear of heterodyne troubles, but these have now returned and the station is seldom to be received well. When you do succeed in finding it clear of interference the volume and quality are excellent.

The Milan Experimental station on 453·2 metres shares the wavelength with no less than ten relays, but owing to summer-time effects the Italian station is sometimes to be heard with good volume and without serious interference.

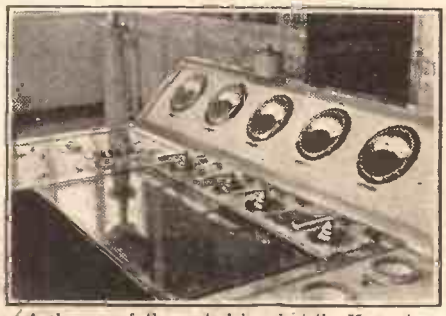
Rome and Toulouse should never be neglected. Stockholm shows signs of improvement, though it is still not quite up to the mark. Belgrade and Madrid Union Radio are both to be heard on favourable evenings. Katowice varies greatly, but comes in well on certain evenings.

Strong Stations.

Leipzig and Hamburg are both strongly received. Lwow has hardly been heard at all for a long time, but I can chronicle its reappearance on some recent evenings. Strasbourg, Brussels No. 2 and Milan are always there when required. Brno is an elusive station, and I have heard little of him for a week or two now.

The Poste Parisien, though generally good, is occasionally heterodyned. Breslau has a good record throughout, and Göteborg is usually to be found.

THE NERVE CENTRE



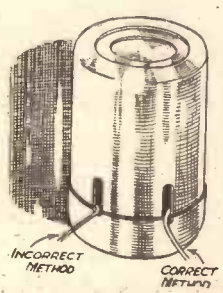
A close-up of the control board at the Marconi-built super-power broadcasting station at Warsaw.

SAVING SHORTS WITH SHIELDED COILS

WHEN taking leads through the slots provided in the sides of screened coil covers, care must be taken to ensure that the wire is taken out in the form of a gentle curve. Unless wires are taken out in this manner there is grave danger of the sharp edge of the can cutting through the insulating sleeving.

FOR LONG-DISTANCE SETS

A tip which many users of multi-valve receivers with H.F. stages will find of value.



If this occurs the wire will probably come into contact with the earthed metal cover. Such contact may not be serious, but if the lead concerned is connected indirectly or directly to H.T. positive, the battery may be shorted with serious results.

NEW TELSEN COMPONENTS

The existing Telsen range is extremely comprehensive, but numerous additions have recently been made to it. I cannot possibly deal adequately with all of them at once, so I propose to take them in twos and threes. As was naturally anticipated, Telsen have accomplished excellent work in connection with "Class B" amplification. Inasmuch as they have always catered strongly for the battery user, we can regard that as quite inevitable.

A holder for the new 7-pin valves. It is of Telsen make.

As for the actual Telsen "Class B" components, these include everything necessary for an inexpensive but high-grade application of the principle.

I was particularly attracted by their "Class B" Output Choke—a fine piece of work which I recommend to the attention of all constructors.

It provides for four ratios: 1/1, 1·3/1, 2/1 and 2·6/1. The terminals are plainly marked, so that any of the ratios are at once available without reference to a chart. An excellent point, that.

An earthing terminal is fitted for earthing the core. The D.C. resistance of this choke is low, and approximates only about 200 ohms for each half-section. The total inductance is 18 henries, and the generous proportions of the component enable it to carry heavy currents without saturation being reached.

At 8s. 6d. it is a most attractive proposition, for, on test, we found that it gave very good results, close matching with various speakers of diversified characteristics and with various valves being easy to obtain.

The Telsen seven-pin valve holder is equally satisfactory. It is based upon a clean, precision bakelite moulding and its sockets are positioned with extreme accuracy.

It takes any "Class B" or other such multi-pin valve smoothly and with efficient contact at every pin.

Soldering tags are fitted in addition to hexagonally-headed terminals.

The Telsen variable ratio "Class B" output choke.

It must not be thought that the above Telsen components have been singled out because I consider them to be better than the many other new Telsen products. The remainder maintain the same standard, as I shall show when, in due course, I deal with them on this page.

NEW GRAHAM FARISH CHOKES

H.F. chokes tend to fall into two classes—those which can be employed for practically any task, including S.G. and superhet. operations which demand the highest technical qualities, and those which, while being perfectly satisfactory for many purposes, do not reach quite that level.

In the first category is the now well-known Graham Farish Twin Screen H.F. Choke. It is both screened and binocular in construction and has no limits in its successful application. Even so it costs only 4s. 6d.

Recently, however, Graham Farish have produced a junior version, still screened but not binocular which is known as the H.M.S. Screened Choke. Selling at the very reasonable price of 2s. 6d., it is completely adequate for the anode circuit of a detector and equivalent positions.

The single type screened H.F. choke. Made by Messrs. Graham Farish, Ltd.

It must not be thought that this implies that a comparatively inefficient choke can be tolerated in such conditions. The Graham Farish Screened Choke definitely is a technically sound component, and it is also an exceptionally well-made article.

With its smooth bakelite base and polished screen it compares advantageously with the best radio gear made.

Stout nickeled terminals are provided and there is an earthing tag for the screen. I should explain that the "H.M.S." indicates High, Medium and Short, from which it will be gathered that this choke has a wide waveband coverage.

We have already tested it in connection with various "P.W." sets, and it has been found to function admirably.

THE R.I. AUTO-PARAFEED TRANSFORMER

Ten years ago Radio Instruments were making a very good L.F. transformer—so good, in fact, that, in my opinion, it was the best on the market. I know I simply had to use it in the famous "P.W." Combination set.

Recently R.I. have produced a transformer, the Auto-Parafeed, which provides sensibly straight-line amplification. It is fully representative of ten years of research and progress.

But—and this is the remarkable point—whereas that early R.I. transformer cost 25s., this latest one retails at only 6s. 9d., although the first was regarded as fine value for money in its time.

The Auto-Parafeed is the newest example of high-permeability nickel-iron L.F. transformer technique for parallel-feed circuits. R.I. are, of course, specialists in this particular branch of the art, and have done a great amount of pioneer work in it.

The Auto-Parafeed constitutes the culmination of this. It is wonderfully compact, and its distinctive shaping is in keeping with its modernistic characteristics.

It is internally shielded, and is provided with only three terminals instead of the almost traditional minimum of four for a transformer. This obviously is a valuable simplification.

An R.I. auto-parafeed transformer.

I am glad to note, too, that in the R.I. Auto-Parafeed there is only the one ratio. The transformer can be connected up in several different ways, but in each case the 1 to 4 ratio is maintained.

I believe R.I. have done wisely in this because 1 to 4 is eminently suitable for all ordinary purposes; and even if at times other ratios might be desirable, which is debatable, the confusion aroused in the minds of constructors as to their use would offset their possible advantages.

The technical characteristics of the R.I. Auto-Parafeed are as follows:

D.C. Resistance Primary, 1,100 *ohms.* (*Terminals A and G.B.*).
D.C. Resistance Secondary, 3,900 *ohms.* (*Terminals G. and G.B.*).
Primary Inductance, 85 *henries.*
Ratio 1 : 4 *Auto Connection only.*
List No. DY 45.....6s. 9d.

It is interesting to note that R.I. have prepared curves for their new transformer on a decibel basis, and have included these in their publicity matter instead of the conventional voltage-amplification type.

This is a departure which I can heartily commend. A voltage-amplification curve can convey little to any but an expert, whereas a curve plotting the actual magnification in decibels at various frequencies is easy to appreciate in terms of what one would actually hear because the decibel is a unit which represents directly the variations of sound-power intensities.

All this is explained in the R.I. Auto-Parafeed leaflet, which I would advise readers to secure.

TWO NEW STATIONS

RADIO KOOTWYK. This is the name of the new Dutch long-wave station which has been testing with 50 kilowatts on a wavelength of 1,875 metres.

* * *

MINSK KOLODISTCHI. One of the new Soviet stations is working on 1,107 metres under the name Minsk Kolodistchi. The power rating is 35 kilowatts.

AUTOMATIC TONE COMPENSATION

AS will be remembered, Automatic Tone Compensation or Balance made its first appearance in the famous "P.W." "Airsprite." And it was largely owing to the incorporation of this novel and effective invention that that receiver occasioned considerable interest and praise from the British Radio Industry.

The "A.T.B." patent rights have now been acquired for a substantial sum of money by Marconi's Wireless Telegraph Co., Ltd., and will in due course be included in the British licensing "pool's" schedule.

It will thus be available for use by at least one hundred British manufacturers.

As will be known to all our readers, the inventor of A.T.B. is "P.W.'s" Technical Editor, Mr. G. V. Dowding.

Details of a quite novel method of television reception utilising an ingenious vibrating mirror scheme in place of the ordinary rotating disc scanner.

AS we have often pointed out, there is a definite limit to the size and definition of the pictures which can be transmitted by using a rotating-disc type of scanner. And so far the results obtained by this method have fallen short of the point where the picture can be said to have any real and permanent interest-value.

Valuable work has, of course, been done with the aid of rotating discs—in fact, the quality of the television programmes has been wonderfully improved as compared with the early attempts—but with it all, the best that has so far been accomplished is not quite good enough.

The Best System.

Recently the cathode ray has come to the rescue, and in our view it is still the most likely system to bring real television into the home. It is efficient and at the same time comparatively inexpensive and compact, and, above all, there are no mechanically-moving parts and no heavy motor. Reproduction is therefore free from exaggeration due to resonance, and the tube itself imposes only a negligible load on the circuit.

Cathode-ray scanning is effected by means of a stream of electrons which can be accurately controlled, and thrown over the viewing screen at a far higher speed than it is possible to obtain from a rotating disc. Now speed, so long as it can be accurately controlled, is the beginning and end of the problem in television. It means better definition and, in the end, larger and more attractive pictures, so for that reason we hold the cathode-ray system in high esteem.

At the same time, it is quite on the cards that there may be other solutions still to be discovered—in particular one which will be free from the disadvantages of the rotating disc and give much the same results as the cathode-ray tube, possibly at less expense.

Very Ingenious.

For this reason we are interested to see that Messrs. Ferranti are about to place on the market a new television receiver which operates on novel lines. The new set will be known as the Scophony receiver, and utilises—in place of the ordinary rotating disc scanner—a vibrating mirror arrangement.

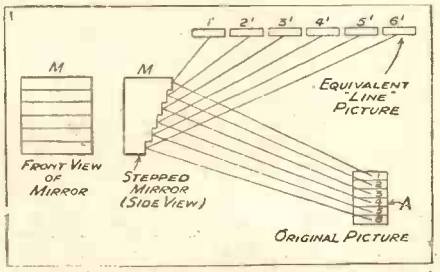
The mirror is small in size and light of weight, so that it can be oscillated at a very rapid rate by a tiny motor driven by something less than one-tenth of a watt, whilst the receiver as a whole can be operated from any broadcast set capable of delivering an output of 1½ to 2 watts.

The Scophony system of television covers transmission as well as reception. Its inventor is Mr. G. W. Walton, who has devoted several years to working out the details of a very original method of scanning.

He has discovered, in short, that by using an "echelon," or stepped mirror, it is possible to reflect an ordinary picture so that it is automatically converted into a single straight line.

The idea is illustrated in the accompanying sketch. Light from the surface of the picture A to be transmitted is focused on to the facets of a stepped mirror (M). The angle of incidence is so

HOW IT WORKS



Illustrating how an ordinary two-dimensioned picture A is automatically converted into an equivalent "line of light" with the aid of the stepped mirror M.

arranged that the reflection from each step is thrown to one side. For instance, the top strip (1) of the picture reappears as shown at 1^1, whilst the next strip (2) is displaced to the position 2^1, and so on from top to bottom.

Easily Achieved.

The result is that by using a stationary element—the stepped mirror—an ordinary two-dimensional picture is automatically converted into an equivalent "line of light" represented by the strips marked 1^1 to 6^1. The light-and-shade values along the line of strips 1^1 to 6^1 are exactly the same as those of the original picture, but they are now arranged in a much more convenient form for scanning.

All that is required is to place a small vibrating mirror so that by a simple to-and-fro motion it traverses the whole line from 1^1 to 6^1 in one movement. In doing so it picks up, in turn, each variation of light and shade and throws it on to a light-sensitive cell. The cell then produces corresponding fluctuations of electric current, which, after suitable amplification, is applied to modulate the carrier wave before radiation.

It will be observed that the introduction of the stepped mirror renders the use of a rotating disc quite unnecessary. Instead of having to employ a spiral series of holes to view the picture line by line, from top to bottom, the whole operation has been reduced to the simple to-and-fro movement of a single pivoted mirror.

A Tiny Mirror.

The size of the mirror is so small that it can be carried in one's waistcoat pocket. It is vibrated by a tiny motor taking a negligible wattage.

The speed of vibration is approximately fifteen times a second. At each swing the mirror traverses the whole of the light-and-shade values going to form the picture. It therefore gives a complete reproduction fifteen times a second, which is sufficient to give the kinematographic effect of motion.

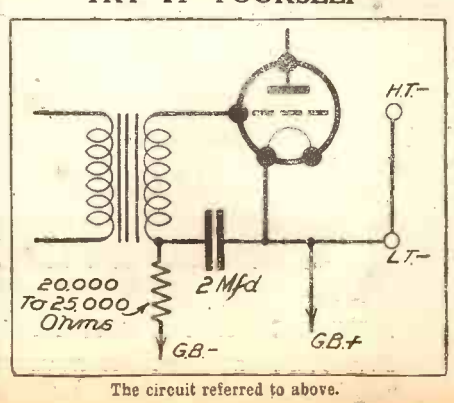
At the receiving end the incoming picture signals are first applied to a Neon lamp to convert the electric currents into equivalent light values. The Neon lamp "flickerings" are then collected by a vibrating mirror and thrown on to a stepped mirror, which converts the "line" signals back into their original two-dimensional shape, in which form they are projected on to the viewing screen.

As the present B.B.C. television programmes are transmitted from a 30-line rotating-mirror scanner, the new Scophony receiver will, apparently, be adapted, for the time being, to meet these conditions.

CURING FEED-BACK

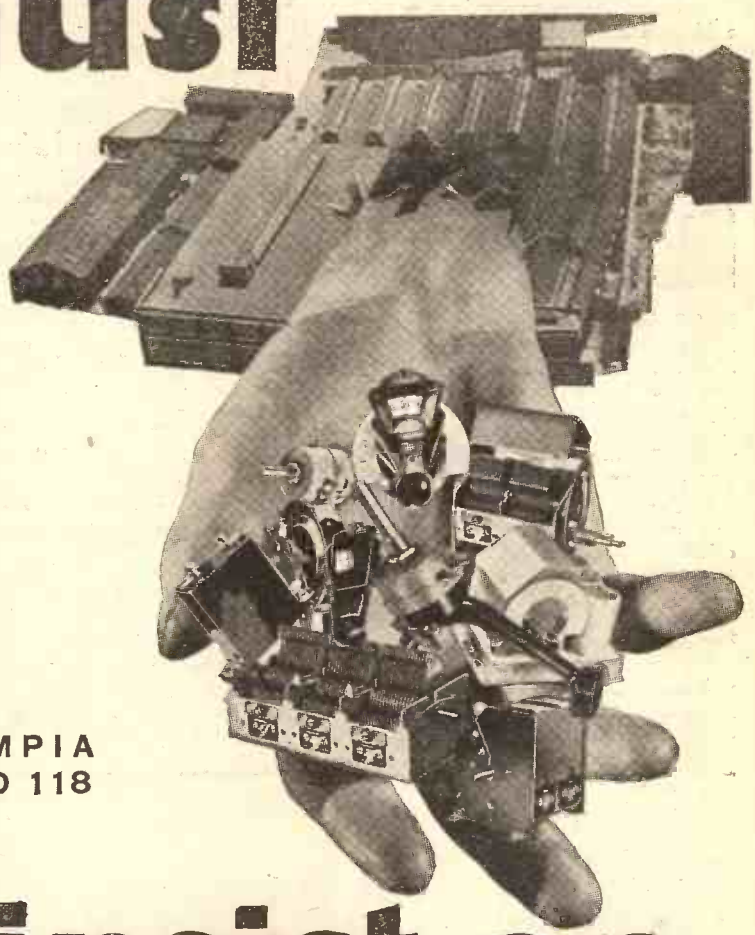
SHOULD instability, due to feed-back in L.F. stages, make itself evident in a battery-operated set (or H.T. eliminator and battery G.B.), even when the detector-anode circuit has been decoupled on conventional lines, the trouble is probably in the grid circuits of the L.F. valves. Decoupling here will almost surely effect a cure. Insert a resistance of approximately 20,000 ohms in the G.B. minus lead, and connect a fixed condenser of 2 mfd. between G.B. end of transformer winding and L.T. minus.

TRY IT YOURSELF



The circuit referred to above.

THIS YEAR you must



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Whether you're building a new set or reconditioning your present one, you will find complete satisfaction only by using British Radiophone " matched perfection " components.

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BRITISH RADIOPHONE, LTD., ALDWYCH HOUSE, LONDON, W.C.2

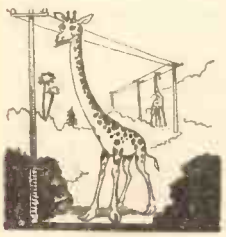
"MATCHED PERFECTION"

NOTES AND NEWS

(Continued from page 685.)

Giraffes and Telephone Wires.

FROM American sources I have received the news—and it *is* news—that owing to the giraffes in Kenya Colony rubbing their necks against the telephone wires and thereby causing "static" interference with telephone conversations, the P.M.G. has ordered all the poles to be lengthened by three feet.



A pretty story—but I'll not believe it till the P.M.G. in question confirms it; he is in England now, and maybe I'll be able to ask him. Anyway, I'd like to know where Kenya is to find the money for the pole replacement.

Radio and the Italian Hop.

GENERAL BALBO has reported to Mussolini that the Italian flying squadron on its hop to Chicago received valuable assistance from radio, especially during the most difficult section of the flight over the Atlantic. It is, therefore, gratifying to learn that the Marconi organisation provided that assistance by fitting six deep-sea trawlers to act as contact vessels with the squadron throughout the Atlantic crossing and to give wireless-direction-finding services as required—services for which General Balbo telegraphed his thanks.

SHORT WAVES

The B.B.C. is searching for comedians, but so far has not invited the co-operation of Scotland Yard.—"Punch."

* * *

The wife of a popular American broadcaster has obtained a divorce on the ground that he said he was fonder of the wireless than of her.

It would, of course, be unfair to blame him without knowing what the wife sounds like.

* * *

A wireless invention enables a piano to be used as a loudspeaker.

This really is no help, because when the piano is not being used as a loudspeaker it can still be used as a piano.

* * *

Our contemporary, "Modern Wireless," recently described a wireless receiver which had been specially designed for use in a motor-car.

There is no truth in the rumour, however, that this set will enable the motorist to pick up pedestrians with even greater ease.

* * *

Come into the garden, Maud!
And watch the spinach grow.
It puts on an inch per day
By the use of radio.

My celery sticks all blanch
When the wireless "aunties" sing;
And the scarlet runners—well,
They run like anything!

The B.B.C. Scores a Hit.

ALTHOUGH I fully agree with Mr. Garry Allighan that, in general, women's voices do not come well over the "mike" for speech, the appointment of the B.B.C.'s lady announcer tickles me enormously. Here Mr. Allighan goes and gets a "Punch" poem written about his defence of men's "mike" voices, and then—the B.B.C. promptly retorts by engaging a lady as a full-blown announcer, in London, too.

I *thought* the B.B.C. was out gunning after Mr. Allighan, for he has been trying to incite Fleet Street to "get all het up" about the B.B.C.'s alleged competition with the Press.

Broadcasting in India.

IT is reported that the B.B.C. has offered to lend to the Indian Village Welfare Association, for ever, if necessary, the Swansea transmitter. What the I.V.W.A. will do with it if it ever gets to India I cannot predict, but I do hope that none of the spirit of the B.B.C. will go with it.

The villagers of India need food, clothing, shelter, sanitation, medicines and protection from Brahmins, usurers—and Ghandism. If the old Swansea hook-up can provide those—O.K.! The villagers do not want Indian music, Indian folklore or Indian politics. They just want to live in comfort, health and safety—as Indian peasants.

A Few Schoolboy "Howlers."

"TIMBRE is wood in large quantities." "Resonance is where you live." "Syntony is what they play at Queen's Hall." "Radio relay is getting

(Continued on page 734.)

*SUPER*CHARGED WITH POWER!

MORE and more ***power***; that is the demand of the modern radio set. And no battery is so densely packed with power as the Grosvenor.

For, by the Grosvenor process, MERCURY protects the all-important zinc cells against corrosion. So long do the cells last that, to use them up, they are crammed with extra chemicals by hydraulic pressure.

That is why Grosvenor batteries give such astonishingly long life. For sheer value-for-money, try Grosvenor next time, and see for yourself!

MERCURY means ENORMOUSLY INCREASED LIFE

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Also long-lasting Grosvenor Mercury Batteries for Torches, Pocket and Cycle Lamps. Grosvenor Mercury Batteries are made in three grades *for every Radio need.*

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CLASS B PUSH-PULL

COMPONENTS STAND 85

A range of tested components ensuring maximum results from Class B amplification.

The Input Transformer, D.P.40

(1) gives good amplification of low notes because of its high primary inductance.

(2) prevents grid current distortion by employing a low-resistance secondary.

(3) permits accurate matching of the Class B and "Driver" valves by means of alternative ratios.

The Output Choke D.P.42 gives a choice of three ratios, making the matching of the Class B valve and loud-speaker an easy matter.

Write for free illustrated literature.

CLASS B INPUT TRANSFORMERS

Primary inductance: 28 henries with 2 m/A. D.C. Maximum primary current: 6 m/A.
D.P.40 Ratios 1·5:1 & 1:1
D.P.41 „ 1·5:1 & 2:1

Each **11/6**

(Plus 1/6 nett royalty.)

D.P.42 CLASS B OUTPUT CHOKE

Ratios: 2·5:1, 2:1, and 1·5:1. Inductance 10 henries per half primary with 33 m/A. D.C. D.C. resistance: 350 ohms. PRICE **13/6**

(Plus 1/6 nett royalty.)

Varley

(Proprietors: Oliver Pell Control, Ltd)

Advt. of Oliver Pell Control Ltd., Kingsway House, 103, Kingsway, London, W.C.2.

NOTES AND NEWS

(*Continued from page 732.*)

wireless without a receiver." "Selectivity means being able to pick up what you want." (*Ha!*) "Potential is something which is not now but will be some day, like a man's wife before she is married but only engaged." (Again *Ha!*) "The B.B.C. is the firm which supplies the wireless with music sometimes." (That *sometimes* is priceless!)

"The Regional programme is the one that does nothing whilst the Natural is giving out the news."

Telegraphs Taboo.

THE grand-daughter of Samuel Morse relates that in the 1830's, while Morse was lecturing on telegraphy, he was told by an Ohio school-teacher that he might use the school for lecturing, but not on subjects like the telegraph or railway, which the teacher described as "impossibilities and rank infidelities."

After referring to the complete absence of any mention of those devices in the Scriptures, the teacher asserted that "they are devices of Satan to draw immortal souls down to hell." So when you are tempted to telegraph to your wife on the wedding anniversary—don't risk it!

A Good Start.

I WAS interested to learn that a radio club has been organised in connection with the Nottingham Corporation Passenger Transport Social and Athletic Society. A week after the club came into being it had a membership of some 100 to 120.

Its Hon. Sec., Mr. S. W. Kinch, 41, Bracknell Crescent, Whitemoor Estate, Nottingham, would like to know of any radio clubs within a 30-miles radius, so will their secretaries kindly take action? "P.W.'s" best wishes to the new enterprise.

"P.W." Circuits Appreciated.

WE are the fortunate recipients of a steady flow of letters expressing appreciation and goodwill, so that, in referring to one in particular, I must say at once that I have not selected it because its bouquets are of unusually deep purple or anything so cheap. E. T. (Maida Vale, W.) is a radio enthusiast of 1911 vintage—before some of us were born. I judge from some of his feats of reception that he is as slick with a handful of components as a conjurer with a pack of cards.

But instead of charging about with his chest out he recollects that "P.W." contributed the basic features of his circuits. Also he pays a tribute to the work of W. L. S., which, he says, is really fine. Sir, your letter is fine, too, and we are grateful for it.

Hats off to the Scots.

A WONDERFUL people and a wonderful land! Hospitable and generous to the guest. Hence the current jokes about their meanness!

On my recent holiday, I was much struck by the keenness of an old crofter who had brought up seven sons in his little cottage, where he himself was born 75 years ago. He had a crystal set. I examined it and pronounced it—inaudibly—"terrible." He listened mostly to talks, and was very interested in currency matters—therein a true Scot.

He said that his youngest was road-mending, but aiming at Edinburgh University! This accounts for the MacDonalds, Barries, etc.

The Ball At His Feet.

SO Danny Malone, the almost down-and-out, has the ball at his feet, begorra! May he kick it wisely and in accordance with the rules of the game.

He landed here not many months ago, unemployed, a wanderer of slack waistcoat. Now he is on gramophone records, he has been booked for the Astoria Circuit, Stoll's Theatre, Manchester, Liverpool and Ireland, and is going to take singing lessons in France under a teacher of Continental fame. People say that this is a dull and unromantic world, but Danny Malone can contradict that from his own recent experience, and probably many others could do likewise.

Moral: A man isn't out till he's buried.

ARIEL.

RADIOTORIAL

The Editor will be pleased to consider articles and photographs dealing with all radio subjects, but 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 Editorial communications should be addressed to the Editor, POPULAR WIRELESS, Tallis House, Tallis Street, London, E.C.4.

All inquiries concerning advertising rates, etc., to be addressed to the Sole Agents, Messrs. John H. Lile, 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 specialties described may be the subjects 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

COMPONENT VALUES RECOMMENDED BY THE B.B.C.

J. L. K. (Haverfordwest).—"On a separate sheet attached I am enclosing a one-valve circuit which has been given to me with the assurance that it was designed by the B.B.C. as being specially effective in this district for the reception of the West Regional.

"The circuit itself is one which seems to feature nothing novel unless it is in the values of the components. But I wish to make some inquiries about these.

"First, the aerial lead goes to one of three terminals, marked respectively A1, A2 and A3. A1 is joined internally to a ·0001-mfd. fixed condenser, and A2 is joined to the other terminal of this, as well as to another fixed condenser of similar value.

"A3 is connected to a ·0002-mfd. fixed, and the other side of this and of the A2's ·0001 go to the tuning coil and condenser and to the grid condenser.

"The capacity of this latter is given as ·0001 mfd., instead of the usual ·0002 or ·0003; but there is nothing unusual about the tuning, which has a switch shorting out the long-wave windings. However, another unusual value is the grid leak, which is 1 megohm, instead of the 2 generally indicated.

"The rest of the circuit is exactly as usual, with differential (·0003) reaction, so my queries are confined to that part of the circuit mentioned above. What I want to know is:

"(a) Why three different aerial terminals, two of which are connected to condensers of identical value?

"(b) Why are grid leak and condenser values lower than those usually recommended?"

Regarding (a), the object is to provide for different aerials and varying selectivity requirements, as well as for the reception of long waves if desired. For although the set has been given as being specially suitable for use in the West Regional area, it makes provision for the reception of Daventry 5 X X.

On long waves the idea is that the aerial lead should go to the A3 terminal, which joins the aerial to the grid coil through a ·0002-mfd. condenser—a common arrangement. On medium waves the aerial lead can be used on either A1 or A2 to obtain sharper tuning.

DO YOU KNOW—

the Answers to the following Questions?

There is no "catch" in them; they are just interesting points that crop up in discussions on radio topics. If you like to try to answer them you can compare your own solutions with those that appear on a following page of this number of "P.W."

(1) If a current of one milliamp flows through an anode resistance of 50,000 ohms, what is the voltage dropped across the resistance?

* * *

(2) Which European station is to be permitted to use a super-power of 500 kilowatts under the Lucerne Plan?

* * *

(3) If a house is lighted with D.C., and its lamps serve to trickle-charge an accumulator, does the charging add anything to the electric-light bill?

If it is placed on the A2 terminal, a ·0001-mfd. condenser is placed in series with the aerial, and the other ·0001 and the ·0002 mfd. are both out of circuit.

If, on the other hand, the aerial lead is placed on the A1 terminal there will be *two* ·0001-mfd. fixed condensers in series with it. And two ·0001 mfd. in series will give an effective capacity of ·00005 mfd.

So the three aerial terminals have the effect of altering the capacity in series with the aerial—A1 giving ·00005 mfd. in series, A2 giving ·0001 mfd., and A3 giving ·0002 mfd. (The use of a variable condenser would, of course, provide intermediate values of capacity as well.)

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RADIOTORIAL QUESTIONS AND ANSWERS

(*Continued from page* 736.)

As regards (b), the values of the grid leak and grid condenser have always been varied a great deal in practice; and although it has been more or less conventional to use a 2-meg. leak with a fairly large grid condenser of ·0002 or ·0003 mfd. capacity in sets designed largely for long-distance reception, there are theoretical advantages in using lower values when fairly short-distance reception is the object.

The quality should be a little better than that given by the more commonly used valves while the sensitivity may be a little less. No doubt both these considerations had weight with the B.B.C. engineers when stating the values for this set, which is primarily a local-station design.

You will find full particulars of the recommended coils, etc., for the circuit in the B.B.C.'s free pamphlet "Receiving the West Regional Transmitter," which can be obtained on application to any B.B.C. station, or from Broadcasting House, London.

CUTTING OUT THE SCREENED-GRID STAGE OF A METAL CHASSIS ALL-ENCLOSED RECEIVER.

J. D. (Otley, Yorks).—"Last year I was fortunate enough to win the district prize for the maximum amount of new business obtained. And it took the form of a magnificent wireless set.

"There are five valves in all, with moving-coil loudspeaker in a beautiful cabinet, and the amount of pleasure it has given is beyond telling. But then bad luck came along, illness, etc., and the last straw was an accident to the set which has put it out of use.

"What happened was that, while the back was off (the only time it was ever opened!), my little boy kicked a broom, and the handle fell full force on the first S.G. valve, smashing it to atoms. Nothing else was injured in any way, because all the works are out of sight inside the metal chassis.

"What with doctor's bills, etc., I can't afford to get it put right with a new valve at once, but I am told I might be able to use the remaining valves by altering the connections.

"Is this possible, to one who knows nothing about the working of the set? Unless it can be easily and safely done I would prefer not to attempt it; but if you can explain how a simple alteration could restore the set, in some measure, although it is one valve short, I should be very pleased."

HOW IS YOUR SET GOING NOW?

Perhaps your switching doesn't work properly? Or some mysterious noise has appeared and is spoiling your radio reception? Or one of the batteries seems to run down must faster than formerly?

Whatever your radio problem may be, remember that the Technical Queries Department is thoroughly equipped to assist our readers, and offers its unrivalled service. Full details, including scales of charges, can be obtained direct from the Technical Queries 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 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.

You will probably find that the following alteration, which can be carried out very easily indeed, will meet the circumstances completely.

Procure a ·0002-mfd. pre-set condenser, mount it inside the back of the set, and join your aerial lead to one of its terminals. Then connect its other terminal to the lead which previously went to the terminal on top of the bulb of the first S.G. valve.

(There will be another lead going to this, which is to be left in place.)

Switch on, and if necessary readjust the new pre-set condenser for better selectivity. The set should work very much as before, but with reduced power, of course. Also, if you had an aerial input control, this will be inoperative under the new conditions. But in effect you will have cut out the circuit of the broken valve.

When this is eventually replaced, you must simply revert to the original connections.

"CLASS B" EXPERIMENTS.

G. L. C. (Norwich).—"At the moment I am toying with the idea of 'Class B,' and I was going to hook up with ordinary transformers instead of the special ones, when I realised that it would probably be 'no bon' because of the arrangement of the windings and high resistance as compared with a special 'Class B' transformer.

"All the same, I wondered about the multi-ratio types, as I believe I could borrow one or two of them to try if it is a promising line to investigate. Any hopes?"

If you can get one of the multi-ratio type with which it is possible to approximate to the conditions required for "Class B," there is no reason why you should not try.

As a matter of fact, another reader who has tried this wrote to us from Lincolnshire at the same time as you did, and as his letter is an uncommonly helpful and interesting one we are reproducing it below for the benefit of all who are wondering about the possibilities of such an experiment.

The Editor, POPULAR WIRELESS.

Dear Sir,—Many of your readers are no doubt experimenting with "Class B." For the last few days I have been awaiting the arrival of a "Class B" output transformer, and during the wait I have managed to carry on in the following way:

My previous transformer gave 4 ratios of 10, 20, 35 and 50 to 1. I realised that the last three ratios could be used by connecting the anode leads to the 20 : 1 and 50 : 1 terminals and the H.T. + to the 35 : 1. This gave an equal balance between the two anodes and H.T. +. Of course, the spare winding on the primary is not desirable, but apparently it has no very harmful effect on results. In fact, I am

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RADIOTORIAL QUESTIONS AND ANSWERS

(*Continued from page* 738.)

wondering what will be the difference when the proper transformer arrives.

Perhaps some of your readers would like to try this before going to the expense of a proper transformer.

It may not be technically correct by any means, but it has delivered the "goods" all right when normally I should have been devoid of the B.B.C.'s programmes.

Incidentally, may I hand a bouquet to your staff on their cathode-ray television receiver? I agree that this is the most likely means of furthering good television results.

With all good wishes.

Yours sincerely,
LEONARD C. HODGE.

4, Tunnard Street, Boston, Lincs.

IS THIS A RECORD?

K. W. B. (Woodland Place, Merthyr, South Wales).—"At about 2.30–3.0 Sunday morning I picked up an American station just under London Nat. wavelength, 261·3.

"I want to know if other readers have had this station and noticed the gain in strength as the morning grew older. Do you know that I had him definitely up to 5.20, when all the night clouds had rolled away?

"The last thing I had out of him was the landing of Mr. Wiley Post, the round-the-world flier. He landed at 3 minutes to 12. His wife also was there. It was a Columbia station, and it called himself, W C A G.

"Is this a record?"

Congratulations, K. W. B. Although yours is not a record, it is certainly a great piece of work to pick up an American station on ordinary wavelengths at this time of the year.

It is, of course, comparatively easy on the short waves below 50 metres or so; but a great many people still do not believe that it is quite possible, under good conditions in the late or small hours, to do what you have done on the ordinary wavelengths.

This has been a singularly good summer for long distance reception, and a great many readers have actually succeeded in getting not merely N. America, 3,000 miles away, but S. American stations like Buenos Aires, which are roughly twice as far distant as the States!

So you must try again for these, or for somewhere even further, before you can claim a record. Good hunting!

HOW TO CARRY OUT SIMPLE TESTS.

M. G. (West Worthing).—"Now that the holiday is over and the pocket is beginning to recover, I thought of raking up the old set, but I feel sure it wants a good overhaul. (My sets, even the new ones, never go right off the mark, like some lucky people's.)

"Last year you explained to a correspondent how to carry out simple component tests with a battery and loudspeaker. Could you do the same again, as I have forgotten the method?"

Defects in the wiring of a receiver, or those arising from faulty components, may often be detected by a very simple series of tests with a loudspeaker (or 'phones) and a dry cell. One tag of the loudspeaker or 'phone lead should be connected to one terminal of the dry cell, and two flex leads should be connected, one to the remaining tag and the other to the remaining terminal of the dry cell (a flashlamp battery is quite satisfactory).

These two flex leads, if now touched lightly together, will produce a strong double click in the 'phones or loudspeaker, one click when they make contact with each other and another when they are separate again.

They may thus be used for testing for continuity in leads, etc., since the loud double click is ample evidence that everything is satisfactory.

A fault on the coilholder, for instance, such as a break between the terminal and the plug or socket to which it is connected, may now easily be detected, since, if one flex lead is connected to the terminal and the other to the side of the holder to which the terminal should make connection, absence of the double click is positive evidence that the component is faulty.

On the other hand, if one of the flex leads is connected to the socket of the coilholder and the other to the plug, if a double click is heard there is a short circuit across the holder.

Similar tests may be made with valve holders, both for testing for a connection between each terminal and its socket and for testing for short circuits between the sockets.

Variable condensers may also be tested by this method, a short circuit between the plates giving rise to the usual loud double click, which should not be present in the usual way.

It is, of course, essential to see that all leads are removed from the components under test, and also that no coils are in position in the coil sockets when these are tested.

THE ANSWERS

TO THE QUESTIONS ON PAGE 736 ARE GIVEN BELOW.

(1) V = R × I, and in this case R = 50,000 ohms and I = ·001 amp., so V = 50.

(2) Moscow.

(3) No. There is no extra current, so there is no extra charge.

DID YOU KNOW THEM ALL?

"P. W." PANELS. No. 132. MADRID, UNION RADIO.

The Madrid Union Radio station works daily on 424·3 metres from 8–9.30 p.m., and also (except Monday nights) from 11 p.m.–1 a.m.

The distance from London is 786 miles. Opening signal, Siegfried's bugle-call theme from the opera "Siegfried."

Closes down with "Buenas noches, Senores; hasta manana."

QUALITY WITHOUT GRID BIAS

A Useful Suggestion.

THERE seems no end to the development of wireless parts; component is added to component, control upon control is embodied, until a standard of performance is reached that is armour plated against criticism except upon the highest theoretical grounds.

This elaboration is, it is hoped, not becoming frightening to the more timid among constructors. Whatever may be the case, I am offering one small opportunity towards simplification which will not reduce in any way the performance of the set.

Here it is: Do you know that grid bias on the first L.F. valve of a det.-2 L.F. receiver may be quite unnecessary? This isn't true universally, but it may be true if you are using a valve which possesses unusual grid-current characteristics.

We apply grid bias for, among other reasons, the purpose of preventing a flow of grid current through the grid-filament path, *i.e.*, through the transformer secondary or grid resistance. When, therefore, under Det.-2 L.F. conditions, you consider that the signal on the grid of the first L.F. valve may not exceed 1-5th of a volt, it is obvious that the valve could be operated at zero bias if grid current did not flow until the grid becomes more than 1-5th of a volt positive. This, in fact, is the case with certain valves; grid current does not flow until the grid becomes about ½ volt positive.

Information of this character is not a'ways available in the makers' catalogues, so I have been unable to make a complete list of such valves. The Mazda H.L.2 and one or two others in the same list may be noted.

With the Mazda H.L.2 in an intermediate L.F. stage, grid bias is unnecessary so long as the signal does not exceed ½ volt, and the grid resistance can be taken direct to filament negative.

It may be thought that ½ volt on the grid does not represent a very useful signal, but wait a moment—and watch how it grows! The amplification of the valve is 30 times; therefore the voltage across the primary of a transformer in its anode circuit will be ½×30=15 volts. If the transformer step-up is 3 times, the peak voltage on the grid of the output valve becomes 45! Good enough, isn't it?

You will see at once that if you need only a 9-volt signal on your power it is necessary only to have 1-10th of a volt on the first L.F. grid. This, of course, is true only with the amplification and transformer ratio mentioned.

There is one point that should be remembered: a valve should not be used in this way, without bias, unless its impedance is at least 18,000–20,000 ohms, otherwise the anode current may be 2 or 3 milliamps and above the economical value.

I should, perhaps, add that with mains valves grid bias is always necessary in amplifying stages, as grid current flows "early" in these types.

C. J. D.

OUTSTANDING EXHIBITS AT OLYMPIA

(*Continued from page 705.*)

eliminate atmospheric and chemical effects, Loewe high-vacuum resistances are fused into glass tubes, the connecting wires being joined integral with the resistance element to ensure perfect contact. They are obtainable in a range of values from 1,000 ohms to 10 megohms with capped or wire ends.

Tubular paper condensers are another branch of the firm's activities, these handy components bearing a similarity to grid leaks as regards shape and being available in capacities of from ·00005-mfd. to ·01-mfd.

Radiogram enthusiasts will be interested in the Loewe pick-up and built-in volume control. No rubber is employed for cushioning the armature of this model, and its high sensitivity renders it suitable for use with quite small sets.

MARCONIPHONE CO., LTD.
Stand No. 77.

Just as the name of that great pioneer Marconi is indelibly linked with the history of wireless development, so the word Marconiphone has become closely identified with all that is good in the reception of entertainment by radio.

The Marconiphone programme for next season is an ambitious one, extending as it does from a compact two-valve battery receiver with built-in londspeaker, selling for something under five pounds, to a magnificent de-luxe seven-valve superhet radiogram for A.C. mains.

Not only are these receivers remarkably efficient from the point of view of technical design; they are attractively housed in a style fit to grace any room.

Both mains and battery users are equally well catered for, the particularly interesting model 260 incorporating the latest development in battery-set design, including a multi-mu S.G. stage, power-grid detector and dual-pentode output operating on the Marconi P.C.T. quiescent push-pull system. The undistorted outpnt is 1·3 watts in return for an H.T. current consumption of only 9 m/a.

Included in the all-electric models is a four-valve radiogram for A.C. or D.C., as well as five- and seven-valve superheterodynes for A.C. working. Two of these receivers are provided with automatic volume control, and are fully representative of the highest standard of design.

In the accessory section are a selection of quality loudspeakers and the well-known Marconiphone pick-up, the excellence of whose response curve enables it to do full justice to every type of recording.

Marconi valves need no introduction, and the fact that they are so widely used in commerical radio is in itself sufficient guarantee as to their efficiency and reliability. The latest development in Marconi valve technique is the M.H.D.4, which has been specially developed for automatic volume-control circuits.

Combining two diode rectifiers and a triode amplifier in one bulb, this valve has great potentialities. And in dealing with valve progress one must not forget the Mareoni "Catkin"—the famous all-metal unbreakable valve which marks the first change in the basic principles of valve design since the earliest days of radio.

A visit to this stand is an education!

MULLARD WIRELESS SERVICE CO., LTD.
Stand No. 71.

The Mullard exhibit is a very attractive one, and displays the complete range of valves made by this famous firm. Since this covers every conceivable type of receiving as well as large transmitting valves, the exhibit fully justifies the word comprehensive. No matter what the circuit, there is always a Mullard valve with suitable characteristics for the particular task for which it is required.

Most important among the new types in the battery range is the "Class B" output valve, the P.M.2B. The advantages of "Class B" amplification are exploited to the full with this valve. While consuming only ·2 amp. from the L.T. battery it is capable of delivering a very generous power output with maximum economy of H.T.

The high-frequency amplifiers are represented by the P.M.12M., a new multi-mu screened-grid valve requiring a grid-bias range of only 4½ volts, and the P.M.12A., a highly sensitive screened-grid valve of conventional type.

In the A.C. types Mullards present an entirely new valve technique. There are the two screened-grid H.F. pentodes, the V.P.4 and S.P.4. The first of these has multi-mu characteristics, and both of them make possible a very high stage gain.

MULTITONE ELECTRIC CO., LTD.
Stand No. 55.

A few years ago it was the aim of practically every designer to achieve a perfectly straight-line response on the low-frequency side of the set, irrespective of the characteristics of the loudspeaker or H.F. amplifier.

Nowadays we know better. We realise, for instance, that selective-tuning circuits are responsible for a loss of "top," and that loudspeakers are often improved by adopting some system of tone correction.

But just how this tone compensation could conveniently and efficiently be applied by home constructors was something of a problem until the tone-control transformer pioneered by Multitone's appeared on the market.

This particular transformer operates in conjunction with a graded potentiometer, the shape of the response curve, and therefore the amount of amplification given to the various musical notes, being dependent upon the setting of the potentiometer knob.

NEW LONDON ELECTRON WORKS, LTD.
Stand No. 107.

There is a truism in radio that the use of a really good aerial saves a valve. And the practical proof of this can readily be obtained by trying a given set first on an efficient aerial and then on one to which little or no care has been given in the erection.

Even though you may not be able to erect the ideal aerial, there is no excuse for not doing the best you can in the space available. But before you can do this you should provide yourself with first-class materials.

On Stand No. 107 will be found everything for the aerial. There is the ever-popular "Superial" for those who prefer insulated wire with its advantages of easy handling and erection, as well as the Electron high-grade copper aerial wire.

OLDHAM & SON, LTD.
Stand No. 123.

The discriminating battery user will find his needs well catered for at this stand, an additional attraction being the new insured life scheme covering all Oldham accumulators. Under this scheme the "O," "C.L." and "Plus" type accumulators will be covered for two years, and the H.T. accumulators for 2½ years. In the event of failure within the specified period, resulting from any defect in manufacture, a replacement will be made at a fraction of the list price corresponding to the number of months' use.

Oldham H.T. accumulators are improved for next year. The filling plugs and end terminals have been redesigned, while the special system of unit construction and air spacing prevents surface leakage, thus giving longer service and less frequent recharging.

ORMOND ENGINEERING CO., LTD.
Stand No. 99.

Ormond exhibits embrace moving-coil and armature loudspeakers, variable condensers, a compact transformer of the nickel-iron type and the firm's popular slow-motion controls. The moving-coil loudspeakers are available in permanent magnet and energised forms and as chassis or cabinet models. The friction-control condensers and the handsome logging drum dial are much in evidence, in addition to the substantially constructed differential-reaction controls and solid dielectric condensers.

OSRAM VALVES
Stand No. 92.

The degree of perfection achieved by the modern valve has caused the listener rather to take things for granted. Yet the most painstaking research, elaborate machinery and skilled testing are necessary to ensure the present high standards of constancy and reliability.

A visit to the research laboratories of the General Electric Co. at Wembley or to the M.O. valve factory at Hammersmith would immediately reveal the vast amount of work that is carried on "behind the scenes."

Osram valves are, of course, familiar to every radio enthusiast, and the continual search for ways and means of improving existing types or of developing new ones is reflected in the outstanding display on the firm's stand at the Radio Exhibition.

There is the 2-volt battery series incorporating the famous Wembley filament, and in the indirectly heated class the comprehensive range of mains types suitable for A.C. and D.C. mains operation. In fact, it is perfectly true to say that there is an Osram valve suitable for any position in any circuit.

But the greatest development in valve technique since the inception of broadcasting is undoubtedly the "Catkin." This all-metal valve, which is to all intents unbreakable, is an Osram product, and visitors to the Exhibition will have the opportunity of examining the various types on the Osram stand. And they should make a special point of meeting the "Catkin," which by virtue of its construction has certain definite advantages over the glass bulb valve.

Visit the stand, and you will see for yourselves one of the most outstanding achievements in radio.

PHILIPS LAMPS, LTD.
Stand No. 81.

The superinductance principle is a feature of all Philips' receivers and is, in fact, unique to that firm. One of the advantages of sets employing this method is that neither oscillator nor reaction control of any kind are employed, and it is therefore impossible for the set to give rise to re-radiation or heterodyne whistles.

Among the range featured by this enterprising concern are battery and all-electric A.C. and D.C. models.

The superinductance four-valve receiver for battery operation has a special current-control valve which, by its automatic action, affects a considerable economy in the cost of high-tension battery renewals. A moving-coil loudspeaker is fitted as standard and sockets are provided for a gramophone pick-up and additional speaker. There are also

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OUTSTANDING EXHIBITS AT OLYMPIA

(Continued from previous page.)

two highly efficient all-electric designs, available in A.C. and D.C. versions, the model 634 possessing automatic fading compensation and a station identification chart, giving the tuning positions of nearly 100 stations accurately logged.

PYE RADIO, LTD.
Stand No. 73.

The attractively priced Pye exhibits include a complete range of superhet. portables and superhet. receivers for use with external aerials. These include models for battery, A.C. and D.C. mains operation. In addition there is a "straight" portable which sells at a very moderate price.

The new P./B. six-valve portable superheterodyne is remarkable value at 14 guineas, featuring as it does a "Westector," a "Class B" output stage, giving an output (undistorted) of 1·4 watts, a moving-coil loudspeaker and automatic volume control.

Another specially interesting receiver is the battery radiogram, giving an output of 1 watt from its quiescent push-pull stage in return for an average H.T. consumption of approximately 8 m/a.

With regard to the mains sets, in this category there is a wide choice of types, each of which embodies the most up-to-date radio practice. The model S, for example, is a single-control six-valve superheterodyne, with band-pass tuning and a power-pentode output valve having an undistorted output of 2 watts. In common with the other Pye receivers the tone quality is exceptionally good, and the set is capable of giving first-class entertainment from a very large number of stations.

RADIO GRAMOPHONE DEVELOPMENT CO., LTD.
Stand No. 79.

Featured on this stand are de-luxe receivers of essentially modern design. The twelve-valve all-electric A.C. superheterodyne radiogram will delight the hearts of the multi-valve enthusiasts. The circuit comprises a multi-mu H.F. stage, band-pass coupled to a multi-mu first detector, triode oscillator, multi-mu intermediate stage, having six tuned band-pass circuits, followed by a double-diode triode acting as a second detector and delayed-action automatic volume control. The L.F. amplifier utilises resistance-coupled push-pull coupling, and the output is 6 watts. There are also superheterodyne radio-gramophones utilising seven and nine valves and moving-coil loudspeakers, handling up to 3 watts and 12 watts respectively.

The radio-gramophones can be supplied with or without automatic record-changing mechanism.

RADIO INSTRUMENTS, LTD.
Stand No. 41.

The R.I. exhibit this year should be more popular than ever, and home constructors should seize the opportunity of getting acquainted with the firm's entirely new production—the Auto-Parafeed transformer.

This component is designed solely for auto-connection, and therefore has three terminals only. Using a nickel-iron core and internal shielding, the Auto-Parafeed has a primary inductance of 85 henries and a voltage ratio of 1–4. The response curves for the instrument employed under the makers' recommended conditions are exceptionally good, and visitors to this stand should make a special point of asking for literature dealing with the Auto-Parafeed.

Other new lines include smoothing- and output-filter chokes possessing excellent electrical characteristics. The Audirad is now presented in a new and improved form. The D.C. resistance has been reduced to 500 ohms while maintaining the high inductance and current handling qualities of the original model. There is also a third terminal which permits the L.F. and H.F. choking systems to be used either separately or together.

The new aerial and tuned-grid coils which Messrs. R.I. are introducing contain cores made from a special iron-dust alloy known as "Micrion." Each unit is effectively screened, and a contributory factor to the high efficiency is the use of litz wire for the medium-wave windings.

REPRODUCERS AND AMPLIFIERS, LTD.
Stand No. 44.

Acoustic efficiency is not the only essential feature in the design of loudspeakers. Precision workmanship such as can be achieved solely by the correct application of sound engineering principles is of equal importance.

The R. & A. range of speakers comes within this category. They are definitely first class, both in workmanship and acoustic efficiency. The permanent magnet de-luxe model is a particularly good speaker, one of its features being a built-into-the-chassis six-ratio input transformer. As a protection against rough handling the cone has a chromium-plated grille in front. This particular model is called the "Victor," and is priced at 70s.

Another value-for-money model is the popular "Challenger," a permanent magnet moving coil, which will handle up to 3 watts of undistorted energy and yet is sufficiently sensitive to work well

(Continued on next page.)

OUTSTANDING EXHIBITS AT OLYMPIA

(Continued from previous page.)

with quite small sets. This speaker sells at 35s., and can be supplied with the standard three-ratio "Class B" or Q.P.P. transformers

The "Bantam"—a slightly smaller version of the "Challenger"—is priced at 27s. 6d., and is capable of handling inputs up to 2 watts.

SIEMENS ELECTRIC LAMPS AND SUPPLIES, LTD.
Stand No. 31.

The main feature of the imposing Siemens exhibit is, of course, the well-known "Full o' Power" radio battery. The battery-unit cells are produced by special automatic machinery, designed and constructed by Messrs. Siemens at their Woolwich works, the ordinary type of machinery for making batteries not being suitable for the "Full o' Power."

The voltage characteristic on load of these batteries is remarkably good, and the construction of the cells is such that a long and useful life is ensured.

SOUND SALES, LTD.
Stand No. 213.

Specialists in transformers and chokes, the main outstanding features shown by this firm include a complete series of Sound Sales transformers ranging from the smallest H.T. 5 Westinghouse model at 12s. 6d. to high-voltage models having outputs of 1000–1–1000 volts at 250 m/a for use with G.W.1 rectifiers.

In addition, the new "Class B" unit is prominently displayed. This unit, which, together with its patented adaptor, is priced at 35s., makes the task of converting a battery receiver to "Class B" a very simple one.

The firm are marketing a full range of "Class B" components, including a multi-ratio transformer with tapped primary at 10s. and a special "Class B" output transformer at the same price.

SOVEREIGN PRODUCTS, LTD.
Stand No. 101.

The Sovereign exhibit is a comprehensive one, comprising, in addition to the existing well-tried and popular components, a number of new lines following the very latest practice.

The Universal Screened Coil is a highly finished product suitable for use with S.G. receivers of modern design. For "Class B" amplifiers there is a driver transformer in two types, either 1–1 ratio or multi-ratio, and a "Class B" output choke with ratios of 1–1, 1·5–1, and 2–1. Those who require a good volume control are catered for by the "Junior" model, which is a scientifically constructed component obtainable in values ranging from 10,000 ohms to 2 megohms.

STANDARD TELEPHONES AND CABLES, LTD.
Stand No. 96.

The display on this stand embraces the comprehensive range of "Micromesh" valves, including the latest types of high-frequency pentodes and double-diode triodes. The outstanding feature of the "Micromesh" valve is the close and extremely rigid spacing of the electrodes, which ensures high mutual conductance with a remarkably low noise level.

These valves are designed for battery and mains operation, and can be relied upon to maintain their efficiency over very long periods.

An interesting feature on this stand is the Standard Cathode Ray Oscillograph, which is shown in operation.

THE TELEGRAPH CONDENSER COMPANY, LTD.
Stand No. 98.

This famous firm of specialists, whose activities cover every conceivable type of fixed condenser, has on view a wide variety of paper, mica, and electrolytic condensers of all denominations and working voltages.

Backed with the experience of nearly a quarter of a century, T.C.C. condensers are used by the Admiralty, G.P.O. and cable companies of the world.

Special interest attaches to the dry and aqueous electrolytic condensers, which include a small tubular dry type for grid-bias filter purposes, and the well-known 8-mfd. aqueous model for smoothing in mains sets.

The type 87 paper condensers are also displayed, this particular model being suitable for continuous working at voltages up to 450 and capable of withstanding surges up to 650 volts.

TELSEN ELECTRIC CO., LTD.
Stand No. 88.

As might be expected, this progressive and enterprising concern is showing an extensive variety of up-to-date receivers, components and accessories, covering every phase of radio reception. Numbered among the exhibits are the latest Telsen iron-cored screened coils, which employ an iron-dust core enabling the dimensions to be reduced without sacrificing efficiency. These coils are available singly or as twin- and triple-matched units

In the "Class B" apparatus are a driver transformer, obtainable in two ratios, and very moderately

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OUTSTANDING EXHIBITS AT OLYMPIA

(*Continued from page 744.*)

priced at 8s. 6d., and a "Class B" output choke and transformer also selling at 8s. 6d. So extensive is the range covered that it is impossible to do more than to touch briefly upon a few main outstanding lines.

Apart from the iron-cored coils and "Class B" apparatus, however, other components which call for special mention are the screened H.F. chokes, available in all-wave and short-wave types, a well-made solid-type 7-pin valve holder, the high-voltage electrolytic condensers, reaction, differential and series aerial condensers, as well as tubular condensers and resistors.

An example of Telsen thoroughness is to be seen in the high-voltage electrolytic condensers, which are supplied with a special bracket and terminal to facilitate mounting.

The popular Telsen mains units are much in evidence, and include an H.T. unit and L.T. charger for A.C. mains, giving an output of 28 m/a at 150 volts, together with a D.C. unit with the same output characteristics. The price of the A.C. unit is £4 17s. 6d., and of the D.C. unit 35s.

Fulfilling, as they do, every home-constructor requirement, Telsens are assured of even greater success during the coming season.

VANDERVELL, LTD., C. A.
Stand No. 228.

In purchasing an accumulator the first essential is solid reliability coupled with economy of upkeep. Any of the batteries on the C.A.V. stand will give you this, and more. Realising that the life and trouble-free working of an L.T. accumulator are dependent upon the care with which the charging is carried out, Messrs. Vandervell provide their radio batteries with a recessed panel on the side of the glass case so that, in addition to the owner's name, a record of the charging dates can be written.

Moreover, these excellent batteries have a device which indicates the state of discharge and a neat metal carrier which cannot become dislodged when carrying.

VARLEY (OLIVER PELL CONTROL, LTD.)
Stand No. 85.

A visit to this stand is well repaid. Varley's are a firm to whom progress is a watchword. It seems only a short while ago—actually it amounts to a matter of years—that the concern produced their "Square Peak" band-pass coil units.

A few months back came the Nicore tuning coils—high-efficiency inductances having metal cores, with a permeability factor greatly in excess of air, the resulting coil being definitely one of low-loss characteristics and a very marked improvement on the ordinary air-core variety.

Now Varleys have made another step forward by producing a permeability tuner. This is, of course, by no means new to "P.W." readers, since the first set ever to be described, employing this form of tuning, appeared in the July 8th issue of POPULAR WIRELESS.

Apart from the "Nicore" coils and the permeability tuner, Messrs. Varley's exhibits include "Class B" components and a compensating L.F. transformer, especially suitable for use in the A.T.B. circuit, due to "P.W.'s" Technical Editor, Mr. G. V. Dowding, Assoc.I.E.E.

Another item that should not be missed is the the new Varley superhet radio-gramophone with automatic volume control This model has five valves in addition to the rectifier.

As we go to press, we learn that the firm is producing two entirely new components. One of these is a Nicore A.V.C. unit and the other a compensating R-C. coupler, both of which will be on view at the stand.

VINCE BATTERIES
Stand No. 105.

The well-known Lion series of British-made dry batteries are on view on this stand. Amongst the special types for radio are high-tension and grid-bias batteries, the former being available in 60-, 100-, 108- and 120-volt units, the prices ranging from 4s. 6d. for the 60-volt battery to 9s. for the 120-volt unit.

For grid bias there are 9- and 16-volt batteries, provided with tappings at 1½ volts and retailing at 10d. and 1s. 4d. each respectively.

All constructors who power their sets from dry battery H.T. sources should pay a visit to Stand 105, where may be seen batteries for all wireless purposes.

(*Continued on page 746.*)

OUTSTANDING EXHIBITS AT OLYMPIA

(Continued from previous page.)

and, in fact, every purpose for which a dry battery is required.

WESTINGHOUSE BRAKE AND SAXBY SIGNAL CO., LTD.
Stand No. 32.

The name of Westinghouse is familiar to everyone, and immediately brings to mind the ubiquitous dry rectifier so intimately associated with the firm's activities. As might be expected, metal rectifiers of every conceivable type are to be found on the Westinghouse stand.

There are the new high-tension units, H.T. 12 and H.T. 13, which may be seen for the first time. The H.T. 12 is to supersede the H.T. 6 and H.T.-7, and gives an output of 200 volts 30 milliamps., so that it is very suitable for the smaller mains sets or for exciting field-energised loudspeakers.

The H.T. 13 has been specially designed for "Class B" and Q.P.P. working, and, like the H T. 12, sells for 17s. 6d.

WHITELEY ELECTRICAL RADIO CO., LTD.
Stand No. 128 and No. 129.

On these stands are to be found the well-known "W.B." moving-coil loudspeakers, a three-way change-over switch and various "Class B" components, including "driver" and output transformers, an output choke and seven-pin valve holder.

The new "Microlode" series of permanent-magnet moving coils are of particular interest. There are the P.M.6, a junior instrument incorporating the "Microlode" feature with a 6½-in. cone, and the Mansfield magnet system.

Next, the P.M.4 A, a medium-priced speaker, the P.M.2 A, an extremely sensitive unit, and finally the P.M.1 A, which can handle an ontput adequate for a small hall. All these speakers are available in cabinet or chassis form, and are quality instruments in every respect. Another interesting exhibit is a "Class B" unit for adapting an ordinary receiver for "Class B" working. It is made in chassis form, and can be mounted either in the set or speaker cabinet as desired. Two types can be obtained, one for the smaller types of "B" valves, the other for heavy-duty work.

WILKINS & WRIGHT, LTD.
Stand No. 20.

First-class workmanship and long life are two of the features of "Utility" components. In particular does this apply to the excellent ganged condensers bearing the firm's trade mark, every one of these condensers having its sections carefully matched to less than ½ per cent (or within 1 mmfd.), and possessing the qualities of absolute rigidity and permanent stability. For example, heavy gauge steel is employed for the chassis, and each partition is riveted at six independent points. Stiff steel spindles rotating in ball bearings are provided to ensure smooth action, and the condensers have three-point bearings to prevent any likelihood of frame distortion.

WINGROVE & ROGERS, LTD.
Stand No. 93.

This firm are better known by their famous trade mark, "Polar." As makers of precision components, notably condensers, they have long been among the leaders.

The existing lines, such as the well-known "Polar" Star gang condensers and drives, the "Compax" solid dielectric and popular pre-set types, are being continued. These are components that have well stood the test of time, and their accuracy and sound workmanship assure for them a steady market.

Among the new lines to be seen are the "Star Minor" range of gang condensers, full-vision drives, some special short-wave condensers, and the latest type of "Uni-Knob" 2-gang condenser.

WRIGHT & WEAIRE, LTD.
Stand No. 1.

Foremost among the Wearite exhibits are the new "Nucleon" iron-core coils. These are screened dual waveband units with clearly marked lettering recessed into the control knob to indicate the waveband to which the set is adjusted. The terminals are essentially practical, and numbers are provided to facilitate wiring up.

Other Wearite components include heterodyne filters, cutting off at approximately 3,500 and 5,000 cycles, mains transformers of the input voltage selector type, H.F. chokes, volume controls and switches.

THE "POPULAR WIRELESS" STAND is No. 11

We shall be pleased to see you there.

TECHNICAL NOTES

Some diverse and informative jottings about interesting aspects of radio.

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

High-Capacity Condensers.

SEVERAL readers have asked me from time to time why it is that the electrolytic condenser has such an enormously greater capacity than an ordinary condenser of similar size.

I think I dealt with this in these Notes some little time back; but for the benefit of those of you who may not be familiar with the electrolytic condenser, I should explain that the very large capacity is due to the extremely small distance which separates the "plates."

You may remember that the electrolytic condenser is in principle similar to an ordinary "dry" cell; that is to say, it contains electrodes and an electrolyte, and is moist but does not contain free fluid—in the sense that the fluid cannot be shaken out of it. When a potential is applied to the terminals it tends to drive current through the "cell" (as we may call it), and this immediately "polarises" one of the electrodes.

Polarisation.

By "polarising" I mean that a film of gas, such as hydrogen, is produced up against one of the electrodes, and this prevents the current from getting through. This film forms one of the "plates" of the condenser, and as it is separated from the metal electrode by an exceedingly small distance—almost infinitely smaller than any distance we could get in a mechanically-made condenser—the capacity is correspondingly large. You know that the capacity of any condenser *increases* as the distance separating the plates is *decreased*.

Use the Right Way Round.

Incidentally, the fact that the operation of the electrolytic condenser depends upon the formation of this layer of gas shows you why it is that the condenser must be used only one way round. If alternating current is applied to it the gas film will be alternately made and destroyed, and current will get through the condenser, causing chemical action. The same thing will happen, only much more so, if D.C. potential is applied the wrong way round.

A Salt Earth.

I often get letters from readers asking me various questions about how to make a chemical earth, whether these earths are of any use, and so on, so I think I had better say a few words about it now.

The chemical earth can be a very useful type of earth indeed, especially in cases where you are bound to rely upon an artificial earth (I mean as distinct from a cold waterpipe connection), and also where in such cases there is a tendency for the soil to be dry.

(*Continued on next page.*)

TECHNICAL NOTES

(Continued from previous page.)

In principle the chemical earth consists of a metallic plate or vessel in contact with a quantity of metallic salts, buried in the earth, the metal plate being, of course, connected by the earth lead to the earth terminal of the set.

The purpose of the metallic salts is to absorb and draw into their immediate surroundings any available moisture in the vicinity. Also the solution of salts which is produced gradually penetrates the surrounding earth and spreads conducting tentacles, as it were, from the metal plate into the earth, and so gets much better connection.

Mains Hum.

In a mains set, one of the commonest troubles is due to hum, and this hum may arise from a variety of causes—it is not always due to any single cause. One of the first things most people do when troubled with hum is to earth the core of any transformers they find lying about, in the belief that this must necessarily quieten the set. As a matter of fact, whilst this is a kind of stock excuse, it is not always the proper thing to do. In some cases, indeed, the earthing of the transformer core will make matters worse. Many transformers are now sold with an earthing terminal or lug already provided, so as to facilitate the earthing of the core.

Generally, if you are building up a set to a particular design, you will be told whether the transformer cores should be earthed or not. If you are told that they should *not* be earthed, or if this point is not specified, it is generally better to leave them unearthed. Anyway, it is a fairly simple matter to try, but don't be surprised if in some cases you find that earthing makes the trouble worse, and don't be afraid to unearth if this proves to be the case.

Short-Wave Conversion.

When a short-wave converter is added to an ordinary broadcast receiver, so as to enable the whole combination to be used for short-wave reception, it generally operates on the principle of converting the whole thing into a super-het receiver. In the past, one of the practical troubles about the addition of the converter, when the set is mains-operated, has been to supply the necessary voltages and so on to the valve in the converter, when this is mains-operated.

All this is got over, however, in the R.I.A.C. converter, in which a short-wave coil, choke, etc., are provided for making what is, in effect, a first detector and oscillator. The valve is a mains-operated, indirectly heated one, and, instead of providing the supply from the set, this is all looked after inside the short-wave converter unit itself.

Self-contained Unit.

A mains transformer and rectifier are incorporated in the unit, with the result that it only has to be connected to the electric light, when it is all complete for working. The aerial and earth leads, which previously went to the set when used for broadcast reception, are disconnected from the set and connected instead to sockets on the converter, whilst leads are taken from the converter to the aerial and earth terminals of the set. The receiver is tuned for a long wavelength, and then the whole outfit works as a super-het from about 10 to nearly 100 metres.

This arrangement is extremely convenient; and although it involves a certain outlay (in view of the substantial components contained in it), it is really a worth-while investment.

SHORT-WAVE NOTES

(Continued from page 688.)

amplifier and modulator, but "Class B" may be the solution of these troubles. For further information, "watch this space."

"A. B. T." (late of Fort Portal, Uganda, now returning home) has written to me again about pentode detectors. He quite misunderstood my last remarks on the subject, and rather thought I was trying to administer a "snub."

The reason for my remark that pentode detectors were only likely to be of special interest to those making their first attempt at short-wave work was simply this: A "pentode-detector" set sounds, to the average person, like a detector-and-note mag.

It Depends On Circumstances

Most of us make our sets up with the idea of using the components that we have in stock. That being the case, we would sooner get our stronger signals by using two valves than go to the expense of buying a pentode.

The man just starting up, however, with no gear "in hand," so to speak, would undoubtedly benefit and even be able to economise by using a pentode single-valver instead of an ordinary two-valver.

At the same time, as "A. B. T." points out, we all ought to try out a pentode detector for ourselves before forming an opinion. Personally, I have formed mine, but that is neither here nor there!

At the present moment I am turning my attention once more to S.G. H.F. amplification on short waves. One or two new ideas on the subject have been brought up lately, and I have heard reports of marvellous results with an entirely new receiver using H.F. right down to the 5 metre waveband.

I must admit that H.F. for short waves interests me far more than L.F., for I absolutely despair of ever meeting an L.F. stage that does not reduce the signal-mush ratio.

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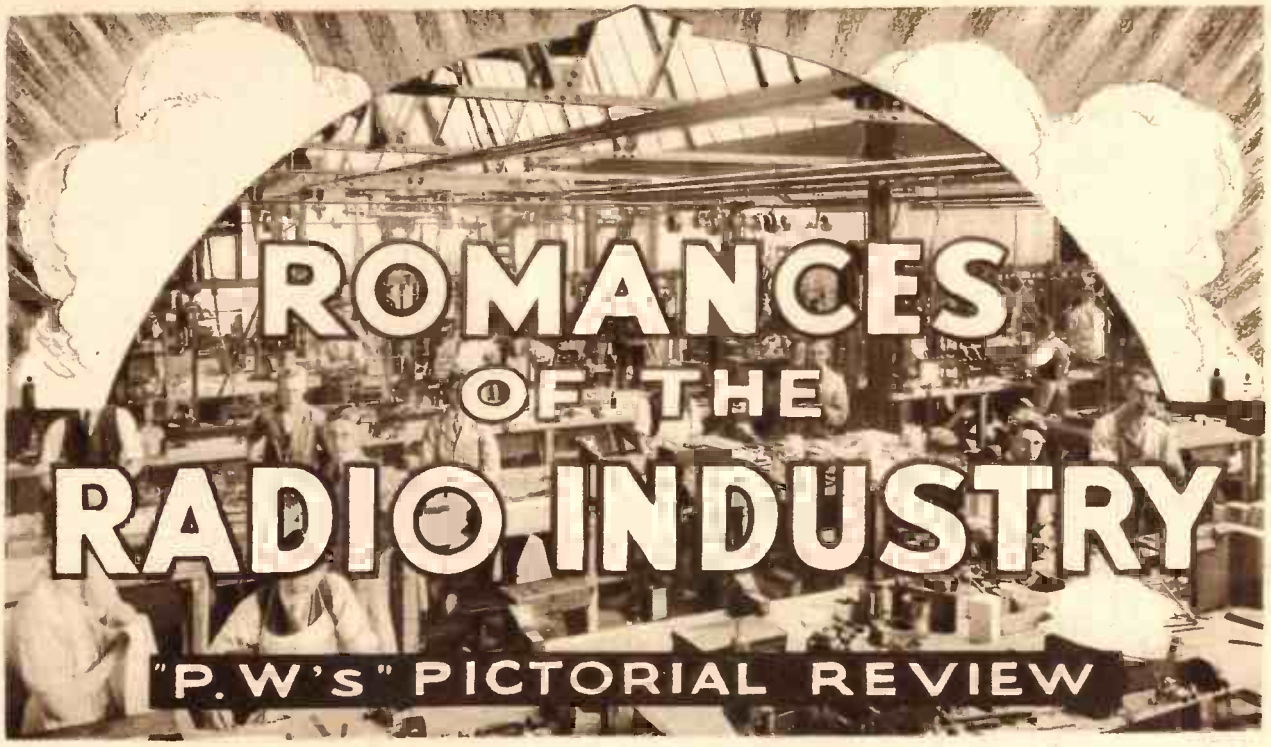


ROMANCES OF THE RADIO INDUSTRY

"P.W's" PICTORIAL REVIEW

THE opening of the Radio Exhibition at Olympia marks still another milestone in the forward march of radio progress. Months of unprecedented activity have culminated in the staging of what is undoubtedly the finest show ever held under the auspices of the Radio Manufacturers' Association. For never before in the whole history of radio have so many new sets, new components and new accessories been concentrated in a single exhibition. Radio to-day is no longer the luxurious prerogative of the privileged few. It is as much a part of the home life of the average man as the newspaper that is pushed through the letter-box every morning.

* * *

HOW often, when you pick up that paper from the door-mat, do you pause to think of the amazing organisation that enables you at breakfast to read of the world-wide events of the day before? How often, when you are sitting contentedly listening to the radio, do you pause to think of the vast amount of technical research that has been necessary to enable you, in the comfort of your own home, to be all but present in the broadcasting studio? It is probably true to say that there is no greater romance of industry than that which is associated with radio. To-day, so enraptured do we become with the joys of home entertainment that we scarcely stop to think about it.

BUT it is a story that is fraught with interest: a story that goes back, in some cases, to long before this modern era of broadcasting. How many people know, for instance, the origin of the modern valve? How many could go back more than a few years in the history of any one of the components or accessories with which we are familiar to-day? Where are they made? Who are the great men behind them? Who are the personalities who have raised this industry from insignificance to might? The answers to these and to many other similarly interesting questions are unfolded—in many cases for the first time—in the course of the following pages.

* * *

IT is fitting that this exclusive story—the greatest story of modern times—should be included in the Exhibition Issue of "P.W." Our only regret in the presentation of this present Supplement is that it has not been possible, for reasons of space, to include every firm to whom tribute should be paid. All the same, it has been our endeavour not to spare any effort in the compilation of the details concerning those firms which are included. The omission of a firm from this Supplement should not, under any circumstances, be taken as an indication of its unworthiness for inclusion, any more than should significance be attached to the order in which the following pages are arranged.

FACTS AND FIGURES ABOUT BROADCASTING AND THE RADIO INDUSTRY

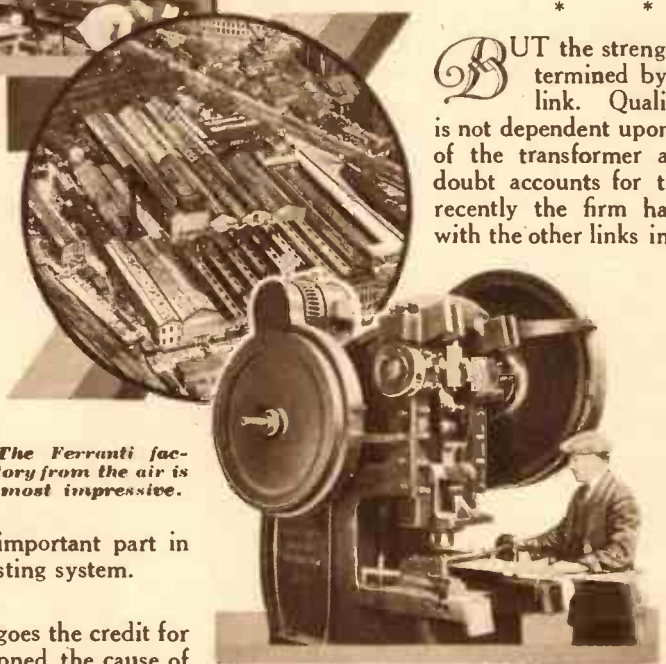
Number of Licensed Listeners	
1923	580,380
1933 (June)	**5,561,396**
Total Programme Time, 1932	(hours) 59,547
Turnover of the Radio Industry	
1926	£7,800,000
1932	**£36,627,425**
Total number of receivers sold	
1932	1,436,849
Total number of valves sold, 1932	4,656,100
Attendance at Olympia	
1924	46,000
1932	**180,750**
Exhibitors at Olympia	
1924	50
1932	**240**

Radio Exhibitions are held at LONDON, MANCHESTER, EDINBURGH, GLASGOW and BELFAST.

Ferranti Limited

RATHER more than fifty years ago—on September 15th, 1882—the late Doctor Ferranti established the company of Ferranti, Thomson and Ince, a company that was destined to become one of the most respected names in the great electrical industry. The fifty years' life story of the firm forms in itself almost a complete history of the development of public electricity supply. From its very small beginnings in the late nineteenth century, the firm has steadily progressed, until to-day it is one of the most gigantic organisations of its kind in the world, with a vast factory area at Hollinwood and an employment roll of some 5,000 work-people. To a firm of such long standing in the electrical industry, radio, comparatively, is a recent innovation. Yet Messrs. Ferranti were in it from the start and, backed by their many years of electrical research and development, they have played an important part in the establishment of our present broadcasting system.

Part of the vast assembly shop at the Hollinwood factory of Ferranti.



The Ferranti factory from the air is most impressive.

* * *

ON the radio side, to Ferranti goes the credit for having consistently championed the cause of quality of reproduction. From the moment when broadcasting in this country was an established fact, their accumulated experience of so many years in the design and manufacture of transformers was turned to good account. But it was not just a case of producing a miniature version of the same thing. The advent of broadcasting called for entirely new principles in the technique of transformer design, and the esteem in which their products are now held is proof—if proof is wanted—of the thorough way in which they tackled the problem. The term "Ferranti Transformer" is synonymous with high quality of both production and reproduction. When you buy a Ferranti transformer your purchase has a musical significance. You are buying, not just a piece of electrical apparatus, but high notes and low notes, and providing you pay proportionate attention to the other links in the chain, you can be assured of fidelity of reproduction. The modern Ferranti range of transformers, all of which can be seen on their stand at Olympia, includes models for almost every conceivable radio purpose. Whether your interest centres around straightforward intervalve couplings, output transformers, push-pull components or just efficient L.F. chokes, you will find your needs adequately covered in the products of Ferranti.

* * *

BUT the strength of a chain is determined by that of its weakest link. Quality of reproduction is not dependent upon the characteristics of the transformer alone, and that no doubt accounts for the fact that more recently the firm has been concerned with the other links in the low-frequency chain. They make valves; they make loudspeakers; they make mains units; accessories to do justice to their transformers; accessories to further the cause of perfect home-constructor radio. And now the march of Ferranti progress carries in its wake another lusty offspring. "P.W." led the way with the first practical home-constructor television. Quick to realise the commercial possibilities of a great new venture, Ferranti have embarked upon television: television, moreover, in the form of a kit-set for home constructors. That they will ultimately achieve the same measure of success with vision as they have done with sound is a reasonably safe conjecture.

One of the huge power presses that are used in the manufacture of Ferranti components.

The latest additions to the Ferranti range of audio transformers consist of driver and output models for "Class B" amplification. On the left is the new A.F.15(C) (driver), while on the right is the O.P.M.16(C), the appropriate output model.

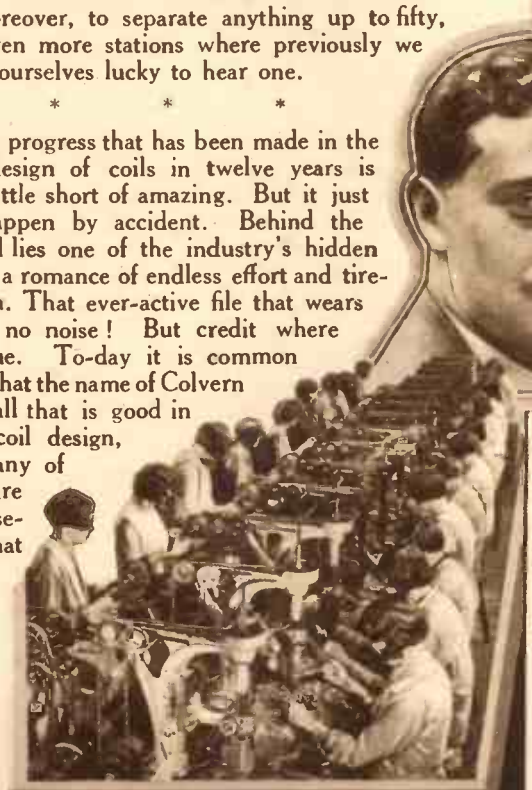
Colvern Limited

TIME is a file that wears and makes no noise. Twelve years ago we used to wind literally hundreds of yards of wire around a cumbersome former, and, wonder of wonders, it worked. At least, with the addition of certain other components, it enabled us to hear what was then the one and only station. We called it tuning, but that was merely a courtesy term. For the slider, or, if we were lucky enough to possess one, the variable condenser, was nothing more than a glorified volume control. Selectivity just did not exist, and in any case there was no need for it. But that was twelve years ago. To-day, our coil and condenser combination enables us to tune in and, moreover, to separate anything up to fifty, sixty, or even more stations where previously we considered ourselves lucky to hear one.

* * *

THE progress that has been made in the design of coils in twelve years is little short of amazing. But it just did not happen by accident. Behind the modern coil lies one of the industry's hidden romances: a romance of endless effort and tireless research. That ever-active file that wears and makes no noise! But credit where credit is due. To-day it is common knowledge that the name of Colvern stands for all that is good in up-to-date coil design, but how many of us are aware of the ceaseless effort that has been made to place and to keep them in that enviable position? How many of us associate the present successful position of Messrs. Colvern with the midnight oil-burning activities of one who has shaped the destinies of the company from the first? Mr. Richard Collinson, the energetic Managing Director of Messrs. Colvern, is one of those inspiring people who get on with it and say nothing. But he is essentially a specialist. Give him a problem to do with coil design and it is as good as solved. Ask him what he thinks of a certain L.F. scheme and—well, frankly, he is just not interested. But the wisdom of his policy is strikingly exemplified in the excellence of his company's products. By specialising in the design and production of coils from the earliest days, the firm's present range, which is probably one of the most comprehensive in the world, is not only in keeping with, but actually ahead of, the times.

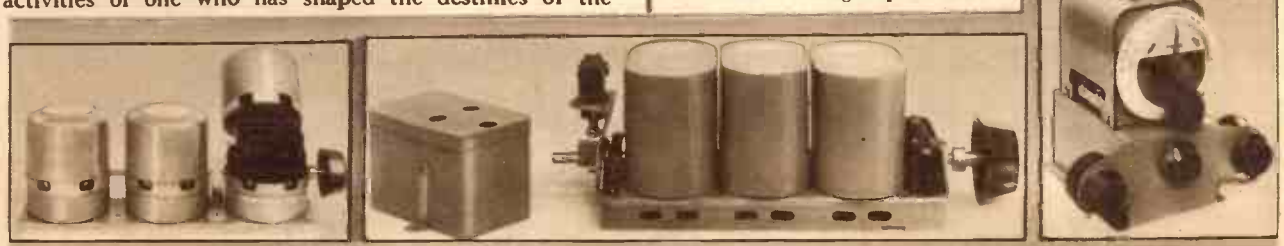
The Romford factory of Messrs. Colvern, under the Managing Directorship of Mr. Richard Collinson (left), is devoted almost entirely to the manufacture of coils.



Even the small terminals which are used in the manufacture of Colvern coils call for the services of a small army of skilled operatives.

* * *

THEY were the first firm to introduce into this country the new iron-cored coils. Colvern Ferrocarts, as they are called, met with instantaneous approbation. Constructors clamoured for them; they were new, and Colvern! To-day, not so many months later, there is a Colvern Ferrocart for almost every circuit. From the details which you will find in our exhibition pages, you will marvel at the progress that has been made. Who could doubt the wisdom of being a specialist?



A representative selection of the new Colvern Ferrocart coils and radio-frequency packs. Interesting circuit applications for these and other Colvern products are given in the Ferrocart booklet No. 12, obtainable from Messrs. Colvern.

Marconiphone Company Limited

ASK nine people out of ten for what Marconiphone are famous, and they will tell you for the wireless sets they manufacture. Pity we have to disillusion you, but they would be wrong; or, at least, they would only be partly right. For Marconiphone sell much more than just wireless sets. They sell fascination; they sell realism; they sell honest-to-goodness entertainment. From the Baltic to the Levant, from Belfast to Budapest and the eastern fringes of Europe, they sell travel! They have to. For their very name is a symbol of authentic radio. G. Marconi! Affectionately, one might almost say Gee! Marconi. And the ejaculation would not be misplaced. For around this name, surely, is woven one of the greatest romances of the radio industry. Marconiphone, like the genius from whom they take their name, are pioneers. They started in on the ground floor, and now they are standing on the roof waiting for the next storey to be built; nay, more, they are helping to build it. For that same spirit of undaunted enterprise that has brought the company to its present heights will never be exhausted while Mr. J. H. Williams, the Managing Director, is at the helm. Eight thousand employees and a factory which covers an area of 60 acres are to-day responsible for the output of Marconiphone. And yet the difficulty is not to sell the sets, but to produce a supply sufficient to meet the huge demand!

* * *

THE joys of operating a Marconiphone instrument are not easily forgotten; that is, if you can call it operating. For Marconiphone, in the design of their sets, are ever conscious of the fact that the primary purpose of a wireless set is to entertain. The days of multiple and complicated controls are over. Nobody wants them. All that seems to matter now is the maximum number of stations with the minimum number of controls, and that is one of the secrets of the success of Marconiphone models. The ease with which you can tune in distant stations is literally amazing. It is the first thing that impresses you, but it is not the only thing. For before you have gone very far, you find yourself marvelling at the quality of reproduction. It all seems so very real. There is an indefinable atmosphere about it; a sort of feeling that you are present in the studio. And not just *the* studio, *any* studio, for on local and distant stations alike the quality of reproduction is superb.

* * *

THE name of Marconiphone as the producers of all that is good in modern radio and gramophone practice is famous. No less are they renowned for their valves, their loudspeakers and their pick-ups. The world of wireless was recently startled by the advent of unbreakable valves. Catkins! And Marconiphone played no small part in their development and ultimate production. It was just another striking demonstration of that pioneering spirit which pervades the whole organisation. With their sets, with their radiograms, with their valves, their pick-ups and their speakers, Marconiphone have set standards that are equalled by few and excelled by none. They are indeed upholding worthily the glorious traditions of the name they bear. No small wonder that their difficulty is in producing a supply sufficient to meet the demand! If you are fortunate enough to be able to get to Olympia and to the stand of Marconiphone, the reason will be obvious. For there you will be able to examine one of the finest ranges of sets in the world.

An imposing view of part of the gigantic Marconiphone factory at Hayes (right.)

In circle above: Mr. J. H. Williams, the Managing Director of Marconiphone Limited.

Some idea of the vastness of the Marconiphone factory at Hayes will be gathered from the aerial view on the right. One of the very latest models to emerge from this hive of industry is the "274," the magnificent all-electric radio-gramophone on the left. The small picture is of one of the new Marconi Catkin Valves.

Igranic Electric Company Limited

THERE is a certain glamour which surrounds those radio firms which started their activities at the beginning of the broadcasting era and whose progress follows closely the progress of the British Broadcasting Corporation. The Igranic Electric Company knows no such glamour. When, some thirty years ago, the company was founded, its policy was to provide only the very highest quality apparatus that scientific research and design, first-grade materials and unparalleled workmanship could devise. The coming of broadcasting may have added another chapter to the history of the firm, may have increased its activities. But it did nothing to alter its policy nor to change by one iota its determination to offer only the best. The Igranic Electric Company has never built down to a price where such a policy was inconsistent with fine workmanship. The sole aim of the founder and his associates has been to maintain and to improve that high standard of design, service and finish for which the name Igranic has for many years been famed, and justly famed, throughout the world.

* * *

"BEGIN nothing until you have considered how it is to be finished," may not sound an inspiring slogan. Nevertheless, it is a slogan which must influence the progress of any firm which sets out to supply the home constructor's every need. The success of the Igranic Company could never have been founded upon an indefinite policy. It has moved with the times, not allowed itself to be carried along on the tide of changing whims and fancies. Coils or condensers; transformers or chokes; resistances or loudspeakers—the whole Igranic range that you can see this year at Olympia has achieved its success because never was any component offered to the constructor unless it was as perfect as modern knowledge could make it. "Igranicor" coils, a feature of the new range, are a fine example of Igranic policy. Modern usage demands iron cores. Igranic will provide them. But at the same time they will offer that little difference in manufacture which makes "Igranicor" no ordinary coils. Nothing but the best must be offered to the constructor.

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THAT the Igranic policy of backing their products with years of experimental and research work is no deterrent to progress is proved by their range of loudspeakers. The excellence of Igranic permanent magnet moving-coil reproducers has not been achieved without careful consideration of the needs of the moment, which is why you will find on the Igranic stand models for Q.P.P. and "Class B" working, models which carry with them the guarantee of the firm, whose success has been founded on quality. Again the constructor must have the best.

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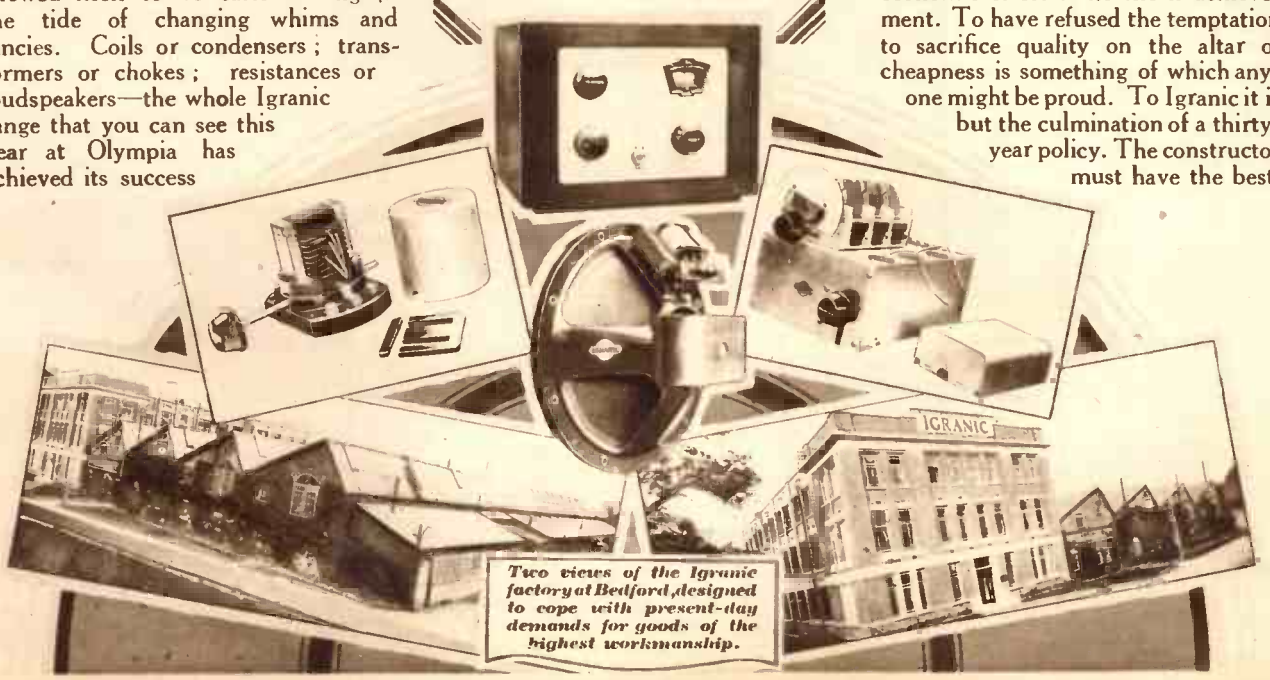
THAT same spirit of perfection which inspires the directors of the Igranic Company has infused itself into each and every one of the firm's workpeople. The factory at Bedford is a model of efficient activity. The pride which they take in each new season's products is a pride which can well be justified by the contribution that such products make to the progress of the industry. To have withstood the demands of the present economic stress is no mean achievement. To have refused the temptation to sacrifice quality on the altar of cheapness is something of which anyone might be proud. To Igranic it is but the culmination of a thirty-year policy. The constructor must have the best.

A new Igranicor coil, one of the improved permanent magnet speakers, and a complete tuning assembly are among the components below, components which show how the firm caters for the constructor's every need.



Two views of the Igranic factory at Bedford, designed to cope with present-day demands for goods of the highest workmanship.

Telsen Company

Electric Limited

MIGHTY oaks from tiny acorns grow. And no mightier oak from such a tiny acorn has ever grown in so short a space of time than that which was planted by Telsen. To-day the Telsen Electric Company stands silhouetted in brilliant relief against the skyline of successful business enterprise. Weathering the storms of an ever-changing market, it has emerged triumphantly as one of the pillars of the industry. And no small wonder. For throughout the anxious years of perturbation which have preceded industrial rationalisation, the destinies of the company have been guided by a man with boundless foresight and energy; a man whose very personality is electric.

The Home of Telsen in Birmingham.

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MR. A. W. MACNAMARA, the Managing Director of the Telsen Electric Company, is one of those people to whom a visit is like a dose of tonic. His vision is permanently obscured to anything but the silver lining, and his one aim in life is to study the pocket of the man in the street. Eliminate fancy prices without sacrificing quality, and the way is open for the industry to double its output. Maintain the high levels and so brand radio with the luxury stamp, and slowly you are cooking your own goose. Those are the views of the man whose policies are so plainly reflected in the activities of the company he founded. And no more striking testimony to the soundness of those views need be sought other than to trace the almost phenomenal growth of the Telsen organisation. Not even acorns grow by accident.

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TO-DAY the range of components manufactured by Telsen is probably one of the most comprehensive in the world. From the early beginning with L.F. transformers, the activities of the company have gradually been extended until now is it doubtful whether there is a single component that is likely to be required in the construction of a set which cannot be obtained under the Telsen trade mark. Their range of standard transformers, which covers almost every intervalve circuit application, has recently been supplemented by models for "Class B." The principles of iron-core coil construction are to be found in the latest addition to their already comprehensive range of coils; an addition, incidentally, which lays claim to being one of the smallest dual-range coils on the market. New, and even better condensers, both variable and fixed, new H.F. chokes, new resistances—all have been introduced concurrently with the opening of the Exhibition to mark still another milestone in the march of Telsen progress. You can see them all on their stand at Olympia. You can see, also, still another Telsen venture, a range of mains units which very definitely have the appearance of being built up to a standard, yet down to a price. The mighty oak is still spreading its branches, and under the ambitious slogan of radio for everybody there is little doubt that it will bear fruit.

A section of the extensive tool-making shop which forms but a small part of the Telsen organisation. In circle: Mr. A. W. Macnamara, the enterprising Managing Director of the Telsen Electric Co., Ltd.

Concurrently with the opening of the Exhibition, Telsen are releasing several new and attractive lines. Here, from left to right, are the dry electrolytic condenser, a new screened H.F. choke and the Telsen iron-cored coil.

Edison Swan Electric Co., Ltd.

FIFTY-THREE years ago a young electrical engineer in the employ of a young and ambitious company was experimenting in the company's laboratories with a scientific curiosity called the "Edison effect." On February 14th, 1890, the young engineer described in these words to the Royal Institution the peculiarities of a new "lamp" he had constructed: "The highly vacuous space lying between the middle plate on the one hand and the incandescent carbon on the other possesses a kind of unilateral conductivity in that it will allow the current from a single galvanic cell to pass one way but not the other." How little did he then realise that he was on the verge of an invention that would change the habits of the whole world: an invention that would make it as easy for us to talk to America, to Africa or to Australia as to our own neighbours! For in that moment was born the radio valve! Dr. J. A. Fleming, now Sir Ambrose Fleming, F.R.S., was the genius who made the discovery, and he was at that time the chief electrical engineer of the Edison and Swan United Electric Light Co., Ltd., or, as it is now, the Edison Swan Electric Co., Ltd.

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THAT was in 1890. It was not until several years later—in 1904—that the Fleming "valve" was first used for the detection of wireless signals, or, as they were then, damped high-frequency currents. From that date onwards the "life" story of the famous Ediswan factory at Ponders End is one of which the company can justly be proud. Pioneers in every sense of the word, they have been responsible for an almost unbroken chain of valuable contributions to the progress of the industry. During the war they supplied valves in large numbers to the Government; shortly after it they emerged with another specimen that will go down in the annals of radio—the famous Ediswan A.R. valve. It is a far cry from the original Fleming valve of 1904 to the range of super Mazda valves for which Ediswan are responsible to-day, yet the amazing progress that has taken place in the interim period is typical of the company's unremitting activity in the cause of better radio.

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TO-DAY, with the pooled research facilities and manufacturing resources of Metro-Vick Supplies and the British Thomson-Houston Company—the radio businesses of which concerns were taken over by Ediswan in 1929—the company produces a range of accessories that are second to none. Ediswan guaranteed H.T. batteries and "Extra Life" accumulators are, to the battery user, what the power station is to the mains enthusiast; B.T.-H. pick-ups and R.K. reproducers are, to the musician, what the microphone is to the broadcasting studio; Mazda valves, to everybody, are the outcome of one of the greatest industrial romances of modern times. So, also, are their Cathode-ray tubes. But no account of the radio activities of Ediswan would be complete without a reference to the man to whom the company so largely owes its present success. Mr. W. W. Burnham, the Chairman and Managing Director of the Edison Swan Electric Company, is very definitely a business genius of whom, in this world, there are all too few. Originality, courage and enterprise dominate his personality to such a marked extent that unconsciously he infects not only the whole of his staff, but all those whose good fortune it is to come into contact with him. In the case of Ediswan it has made all the difference between what might have been mediocrity and what most certainly is fame.

The Ediswan range of H.T. batteries (left centre) and their velvet-action volume control are familiar to all discriminating constructors.

Mr. W. W. Burnham, the Chairman and Managing Director of the Edison Swan Electric Co., Ltd., is largely responsible for the high esteem in which the company is now held.

As a result of the development of the Ediswan Cathode-ray tube (left), "P.W." was able to introduce to its readers the first practical home-constructor television outfit. This, with the R.K. reproducer (centre) and the famous B.T.H. pick-up (right), are three notable examples of Ediswan products.

Whiteley Radio Electrical Co. Ltd.

IT is not easy to see why, in the Radio Industry, one particular firm is able to make a world-wide success with a special product, but fails when it attempts additional lines; while another firm, with apparently equal opportunity, can succeed with an almost unlimited range of varied products. Manufacturing skill does not seem to be the secret. Sales methods are not an adequate solution. It is all a question of certain firms possessing that little something—an annoyingly elusive something—that some others haven't got. It is because the sponsors of W.B. apparatus possess that something, that they can be famous at the same time for loudspeakers and valveholders, for "Class B" units and switches. It must be gratifying to the firm itself; it is still more gratifying to the constructor who is enabled to buy so many of his components at the same time with the assurance that they will be dependable.

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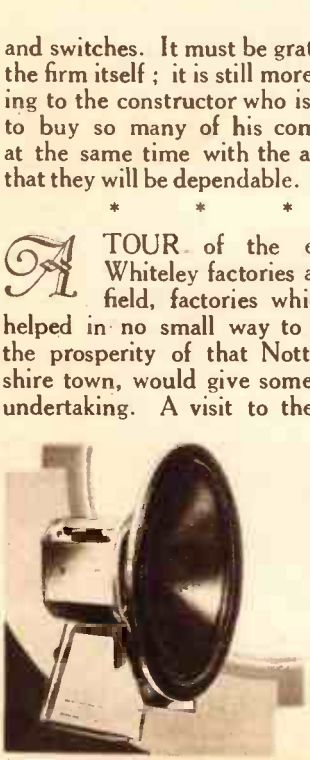
A TOUR of the extensive Whiteley factories at Mansfield, factories which have helped in no small way to increase the prosperity of that Nottinghamshire town, would give some idea of the vastness of the undertaking. A visit to the Whiteley stand at Olympia would achieve the same purpose. In pursuance of a long-standing-policy to keep W.B. products in the van of progress rather than to let them follow in the footsteps of convention, an entirely new feature has been incorporated in all the W.B. loudspeakers, thus giving the lie to the adage that "you cannot have better than the best." As a further mark of progress, these new "Microlode" speakers will have as stable companions a range of "Class B" apparatus; apparatus which has been designed not as a hasty sop to the vagaries of the constructor's whim, but with an intelligent eye on the future. Attention to the needs of progress and a measure of intelligent anticipation have, in the case of the Whiteley firm, been added to "that little something."

A portion of the fine new factory which was built last year to keep pace with the demand for W.B. products.



A representative model of the new, improved range of W.B. "Microlode" speakers.

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THE success of the Whiteley Electrical Radio Company has not become an accomplished fact without an effort. The products of the firm have done their part towards reaching the goal. But at the same time there can be no shadow of doubt that the personality of Mr. Whiteley himself has contributed the lion's share to the fame of the concern which he founded many years ago. Certainly to Mr. Whiteley must go the credit for the harmony in which the many hundreds of employees of the firm have always worked. This harmony, which starts in the 45,000 square feet of factory and spreads throughout the country, is all part of that "little something." Moreover, it has been the means of ensuring a loyalty to the firm, a fostering of individual ingenuity, and a spirit of unconscious co-operation without which the present unassailable position could never have been reached. Hard work has indeed played its part. A firm which made the first permanent-magnet loudspeaker, a firm which has its products in every radio store in the country, a firm which, by attention to detail, has seen its valveholders used by the British Broadcasting Corporation as well as by the majority of the leading valve manufacturers, can afford to take a little credit for the success which it so richly deserves.

Mr. Whiteley, founder of a flourishing concern, whose personality has led the firm from success to success.

A corner of one of the modern workshops which turn out the famous W.B. components and loudspeakers.

Oliver Pell Varley Control Ltd.

GREAT minds are seldom slaves to fashion. Permeability tuning, one of the most remarkable radio developments of recent years, was first introduced by Varley. In a vague sort of way it had been talked about for years. But "one of these days" is none of these days. Something just had to be done about it, and Varley did it. Great minds, indeed, for here was something entirely new. That Varley's should have been the first to introduce it was—well, frankly, no great surprise. For right through the Varley pattern of 35 years' successful trading is woven Enterprise with a capital E. Meet Mr. Rees, the Managing Director, and instantly you will know why. A quiet, unassuming personality whose primary concern is the well-being of the staff to whom he attributes every shred of the credit. No small wonder that the staff has responded so magnificently in placing Varley on its present enviable footing. For Varley to-day is one of the great names in radio. It is a hall-mark of quality, and the discriminating constructor knows only too well the extent to which he can rely upon the products of this famous organisation.

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Mr. J. M. G. Rees, A.M.I.E.E.

EXPERIENCE counts for everything. Thirty-five years ago, Varley's started business as the manufacturers of electrical apparatus. Even in those days, not a small part of the organisation was devoted to the design and production of coils for ordinary electrical work. Little wonder, therefore, that with the inception of broadcasting their accumulated experience of so many years was turned to good account. To-day, the Varley coil-winding shop is probably one of the best equipped in the country. Conducted on the latest mass-production lines, it affords facilities for the manufacture of something like a million coils a year. Here, coils of every type—meter coils, lift coils, transformer coils, clutch coils, choke coils, tuning coils, etc.—are wound on machinery which, like the coils, is of Varley's own design. Definitely, it is experience that counts, and with such exceptional resources and long experience it is only to be expected that Varley's radio products have made a name for themselves; a name, moreover, that is respected by both technician and layman alike.

The very latest additions to Varley's already comprehensive range of transformers are models for "Class B" amplification.

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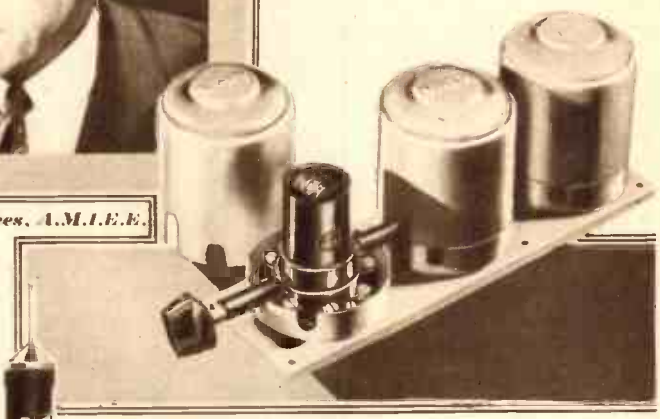
THE range of Varley products to-day, a range which you can examine at your leisure at Olympia, is largely centred around components in the manufacture of which their winding experience can be put to good account. Wisdom! Perhaps the most outstanding examples are to be found in the already famous Nicore Tuning Coils, and in their particularly comprehensive range of audio transformers. Yet from such a galaxy of worthwhile components it is difficult to single out any particular part as being of more importance than the rest. The standard of excellence in each case is the same, and it is all a matter of where your interest happens to be centred. But if it is anything to do with winding, you can rest assured that Varley will make it. They are responsible for mains transformers, for audio transformers of almost every description, for chokes—both H.F. and L.F.—for tuning coils, for wire-wound resistances, in fact, for pretty well everything in which a winding operation is necessary. And what, in this respect, is good enough for the Admiralty, for the War Office, and for some of the principal Railways is certainly good enough for radio! Veritably, great minds are seldom slaves to fashion, and originality on the part of Messrs. Varley has no doubt played a large part in the building up of their tremendous organisation.



A three-gang version of the famous Varley Nicore Coil. On the left is one of their new one-watt resistances.

General Electric Company Limited

IT is the proud boast of the General Electric Company, Ltd., that it is the largest British manufacturing organisation in the Empire. With the immense total of something like 26,000 employees, it operates thirty branches in this country as well as extensive works in Birmingham, Coventry, Salford, Lemington-on-Tyne, Southampton and London. But even that does not complete the story of what is perhaps one of the greatest romances of the radio industry, for in addition to overseas branches in Australia, New Zealand, South Africa, Argentine, India, Burma, Malaya, China, France and Holland, it has Agencies in the principal towns throughout the world. Barely 45 years ago, the organisation was registered as a limited company with a capital of £30,000. To-day, its issued capital stands at £10,000,000, and the development of this huge concern from such comparatively small beginnings is very largely the life story of Sir Hugo Hirst, Bart. As Chairman and Managing Director, he has been its driving force and its guiding light from the earliest days. Credit is due, also, to Mr. M. J. Railing, who, as joint Managing Director with Sir Hugo Hirst, has spent his life in the service of the Company.

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MOST of the radio apparatus for which the G.E.C. has justly earned a reputation is manufactured at the works at Coventry. There alone, a floor area of approximately 750,000 square feet provides adequate accommodation for the 5,000 people that are employed in it. The story of the G.E.C.'s radio activities is one that dates back to before the inception of broadcasting in this country, and the valuable contributions that they have made to the progress of the industry will ever stand them in good stead. When the old 2 L O first commenced operations from Savoy Hill, there was a nightly trek along Kingsway to the Head Office of the G.E.C. of crowds of interested people who were to hear demonstrated one of the earliest commercial crystal receivers. The G.E.C. was out to popularise this great new pastime, and from those early demonstrations a story of continued effort unfolds itself.

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TO-DAY, as one would rather expect, the G.E.C. is one of the most respected firms in the industry. But their present enviable position in the radio world has not been obtained without that spirit of pioneering enterprise which has been characteristic of the organisation from the start. The person to-day who buys a Gecophone receiving set is buying the result of years of research and development; he is buying an instrument that challenges comparison with the whole world of wireless. As such, it cannot fail to impress. It is because of their almost meticulous attention to details that the G.E.C. have scored such a universal success with their famous kit set, the Osram "Music Magnet." More recently their name has leapt into prominence as one of the two pioneers who are behind the world's first unbreakable valve. The advent of the "Catkin" method of valve construction was hailed on all sides. The inquiring mind may pause to wonder what is the secret of the G.E.C.'s success. There is little doubt that first and foremost it is directly attributable to the resourcefulness amounting to genius of its Chairman and Managing Director. Sir Hugo Hirst is one of the world's great men, and under his guidance the future of the G.E.C. is assured.

With a total floor area of approximately 750,000 square feet, the Coventry factory of the General Electric Company provides accommodation for over 5,000 employees. Almost all of the radio apparatus is made there, of which the two handsome receivers shown above are excellent examples. On the left is the new Superhet 8 for A.C. Mains, while the other picture is of the Superhet 5, also for operation on A.C. mains. Notice particularly the handsome cabinet work.

The G.E.C. All-Electric Console Superhet 5 is pleasingly futuristic in appearance.

To the battery user, the G.E.C. Battery M.C.3 is of particular interest. It is a fine instrument.

Lissen Limited

IN September, 1923, there were approximately 150,000 licensed listeners in this country. To-day the immense total of 5½ millions has been reached and passed. To what can the phenomenal growth be attributed? Is it, do you think, altogether to do with the programmes that are put out by the B.B.C.? Perhaps not. But let us leave programme considerations out of it. The plain fact is that radio to-day is no longer handicapped by its association with luxury pastimes. It is as vital a force in the life of the community as the cinema. Indeed, in many respects it is more so. The postman can discuss the merits of a particular artist on equal terms with a peer, for veritably broadcasting, no longer the prerogative of the favoured few, is a nation-wide institution.

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INTO the same category we place the tremendous organisation that is symbolised by the name of Lissen. Is it likely that there would have been 5½ million listeners, or anything like that number, but for the policy which has resulted in the building up of what is undoubtedly one of the greatest radio firms in the country? Cut out the fancy prices; give the public first-class goods at prices which it can afford to pay, and success is bound to follow. Five and a half million listeners! Can there be any possible doubt about the wisdom of that policy which has so consistently been advocated by Lissen? With its unlimited resources for research and manufacture, Lissen is now one of the vital forces of the industry. Modern mass-production methods under the control of brilliant men have paved the way to cheaper and better radio. Without a doubt their policy has been justified one hundredfold. To-day there is not a single component that Lissen's do not make. If you examine their catalogue, or, better still, if you visit their stand at Olympia, the comprehensiveness of their range will astound you. In it you will find coils, condensers, resistances, chokes, transformers, volume controls, in fact everything that could possibly be required in the construction of a set. It would be more appropriate to say in the construction of a *good* set, for quality is the dominating factor behind all modern Lissen components. But the story of Lissen does not end there. Not content to rest on their component laurels, however well merited, they have added to their fame by the production of a range of outstanding accessories. Lissen H.T. batteries are known and used from Land's End to John o' Groats. Lissen valves, Lissen speakers, Lissen accumulators, Lissen pick-ups—all are no less famous. Perhaps most renowned of all is that very remarkable kit set, the Lissen "Skyscraper" Three. From the moment when it was first introduced it met with universal approbation. Thousands upon thousands of people bought it and revelled in the joys of assembling it. It was just another striking demonstration of the soundness of Lissen's policy of providing the best at the lowest possible price.

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FOR more than a decade Lissen's have gone from strength to strength; for more than a decade it has been their one aim to study the pockets of their potential customers. Why? Principally because of the foresight and unbounded energy of a man whose name is almost as well known, and is certainly as greatly respected, as that of Lissen itself. Mr. T. N. Cole, the Chairman and Managing Director of Lissen, Limited, has courageously and consistently championed the cause of cheaper and better radio from the start. To-day he has the satisfaction of knowing that he is in no small way responsible for the amazing growth of licence figures; a fact which is so plainly reflected in the success of his company.

A new venture. One of the Lissen Q.P.P. home-constructor kits.

The five modern factories which provide the constructor with his Lissen kits and components. Above is a view of the A.C. "Skyscraper" kit.

The original battery "Skyscraper" still meets with universal approbation.

Dubilier Condenser Company Limited

"FIND out what you can do and then do it well." Twenty-one years ago, when many of to-day's most enthusiastic constructors were still at school, a factory in Shepherd's Bush found that it could make condensers. That it proceeded to make them well needs no other proof than that the name Dubilier was over the door of that factory. To-day, twenty-one years later, the same factory in Shepherd's Bush is still making condensers. Albeit, the condensers it makes are but a fraction of the total output, for there is a fine new factory now at Acton, a factory nearly eight acres in extent, which works at full pressure throughout the year. Constructors are not the only people who want a share of the Dubilier output. The Admiralty, the War Office, the Air Ministry, the Post Office — all help to keep more than seven hundred workpeople employed.

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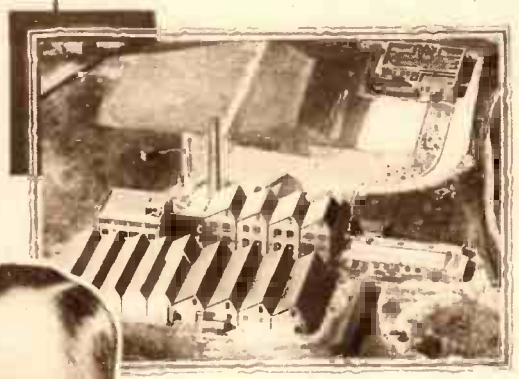
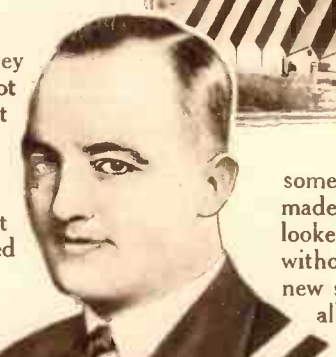
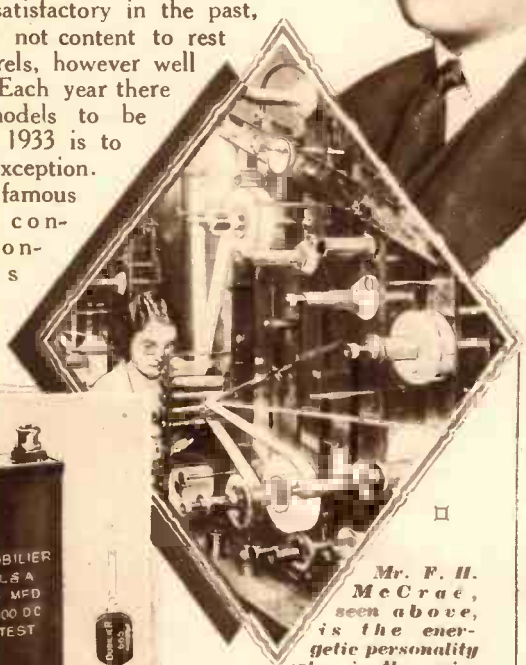
DUBILIER early found out what they could do. The constructor did not take much longer to find out that they did it well. Which is why the Dubilier stand at the Olympia Show will draw more than the average number of visitors. More especially will this be due to the fact that although Dubilier condensers have proved more than satisfactory in the past, the firm is not content to rest on any laurels, however well deserved. Each year there are new models to be found, and 1933 is to be no exception. Even the famous electrolytic condensers, condensers which are the sole product of the old Shepherd's Bush factory, will be further improved, while the growing tendency for car radio has led to the timely introduction of ignition suppressors. At the same time it would be unthinkable for any of the old models of Dubilier to be withdrawn. All of them are firm favourites with constructors, but there is, perhaps, some danger of the improvements which have been made even to the best of these condensers being overlooked among the new lines. "Increase efficiency without increasing prices" was the order for the new season. With the result that, this year as in all years, Dubilier condensers are right in the forefront of progress.



The Dubilier factory at Acton, covering nearly eight acres in area, supplies but a part of the total output of the firm, the old factory being still maintained for specialised manufacture.





Mr. F. H. McCrae, seen above, is the energetic personality who, in the guise of Sales Director, acts as the driving force for the firm. A corner of one of the condenser winding workshops, together with representative examples of Dubilier products, are shown in the other pictures.

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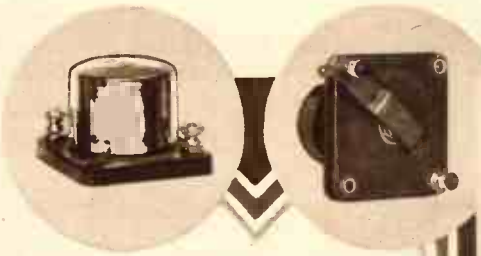
JUST as manners maketh man, so it is the dynamic personality of a firm's principals which changes mediocrity into outstanding success. At the Ducon Works will be found Mr. Goodman, Managing Director and one of the founders of the firm, whose straightforward policy of twenty-one years ago has been modified only inasmuch as it has moved with the times perhaps ahead of the times. Here, too, is the bluff good-humour of Mr. McCrae, who under the title of Sales Director infects the whole organisation with his North Country heartiness. "Find out what you can do and then do it well." Because the firm of Dubilier is controlled by men who have for long made this their motto, success for them has been a foregone conclusion.

Graham Farish Limited

THERE was once a man who had the foresight to realise that in radio, as in everyday life, it is the comparatively small things which make the biggest impression. He was the kind of man who, when he asks you to stay with him, is not content merely to provide a six-course dinner, a four-poster bed and shaving water in the morning. He attaches real importance to an ashtray by the bedside, notepaper on the writing-table, and a book for sleepless nights. He knows that however good the dinner may be, you are not going to enjoy it if you cannot find any soap to wash your hands. That man was Mr. Graham Farish;



The Graham Farish H.M.S. choke and reaction condenser provide fine examples of the firm's range of components.

and because he still practises to-day that attention to detail which was his creed in earlier years, the radio constructor has come to look upon him with a respect which amounts almost to affection. That is probably the secret of the success of the Graham Farish firm. You do not deal with an impersonal firm at all; you deal with Mr. Graham Farish. You read the firm's advertisements; they are Mr. Graham Farish's advertisements, and he is not ashamed of them. You buy the firm's products; they are Mr. Graham Farish's products, and he is proud to back them with his name. The sense of personal guarantee, the personal touch; these are the things that count in the radio trade as much as in anything else. And if any man has the gift for making his firm his personal concern, that man is Mr. Graham Farish.

* * * *

IN this page are illustrated a few of the many products of Graham Farish, Limited. All of them are well known. All of them are bought and used. Their users come back for more, the only infallible sign of satisfaction. But two most important "details" to which so much attention has been given are not illustrated. They do not need illustration so well are they known. Graham Farish "Filt" is one; Graham Farish "Gard" the other. Anyone who uses an earth for his receiver has heard of Filt, has probably seen it in its distinctive tin. It is possibly the best example of the firm's thoroughness in details. "We have supplied you with first-class components for your set," say Graham Farish, "we have sold you chokes and condensers and resistances which will give you a well-nigh perfect receiver. But you will never have the advantage of these components unless the receiver is working under the best conditions. We have thought of that, and here is our reply." And so it is with Gard. Your installation never has been struck by lightning—possibly it never will be. But one day you will open your newspaper and see that your neighbour has not been so fortunate. You will begin to doubt, and you will find that Graham Farish have forestalled your doubts and provided you with perfect safety. Just attention to detail, but it is the kind of thing you will not forget.

The personality behind the firm; Mr. Graham Farish has an energy and enthusiasm that are infectious.

* * * *

IT is interesting, but not really surprising, that on four occasions the whole factory accommodation of the Graham Farish firm at Bromley has had to be rearranged to house the new machinery which, year after year, has been needed to cope with increased business. During this summer there have been comings and goings of an army of workmen, and now the finishing touches are being put to a new building which will increase the floor space by 50 per cent. Welcome as will be these increased facilities to constructors, they will be still more welcome to the head of the firm, who will see in them a full justification for his policy, his enthusiasm and his optimism. Whether the firm will decide to enter new realms of radio interest or will prefer rather to concentrate on the betterment of its existing products remains to be seen. At any rate, there can be no possible doubt but that future policy will be guided by past experience, and that the constructor who remembers his Filt, his Gard and his Ohmite will have no cause for regret.

Condenser of recent design, or choke of remarkable efficiency; you will find what you want is made by Graham Farish.

One of the best known of all the products of this firm is the "Ohmite" resistance, distinctive in design, made for every receiver, and efficient in use.

Radio Instruments Limited

CUSTOM invariably lessens admiration. That R.I. are held in such high esteem to-day is no doubt due entirely to the fact that they have never been content to sit on the fence and wait for others. Their whole history of eleven years of successful business enterprise is one of progress and achievement. Think of the world of wireless to-day without all-electric radio. It is almost unthinkable.

Where R.I. components are made. Part of the large assembly shop at their Croydon factory.

Yet it is doubtful whether the utilisation of the mains for receiver operation would have been brought to nearly such a fine art but for the pioneering efforts of R.I. To R.I. goes the credit for having been one of the first firms ever to produce an all-electric receiver in this country. But that was only one of many notable steps in the right direction for which they have been responsible. Deserve success and you shall command it might well have been the policy upon which R.I. were founded, for it is the one policy above all others that is so strikingly in evidence in the personality of their Managing Director.

* * *

MR. J. JOSEPH has shaped the destinies of R.I. from the start. That he has shaped them well is only one of the conclusions to be drawn from the fact that R.I. have emerged so triumphantly from the "teething years" of the industry. A kindly, prepossessing character, he is imbued with a keen sense of responsibility towards the vast army of constructors who use his company's products. No less is he concerned with the maintenance of the highest possible standards in the R.I. components that he supplies extensively to set manufacturers. That same attention to detail which has resulted in the placing with his Company of so many

To the fore again, R.I.'s have just emerged with a new "Auto-Parafeed" transformer.

Government contracts is characteristic of the whole organisation. Quality must come first. And thus it has been, right from the start. To-day, R.I. are in that happy position of having ample justification for resting on their laurels, but that is never likely to happen while Mr. Joseph is in command. In 1925, R.I. were responsible for the production of the first permanent crystal detector, followed shortly afterwards by the first multi-ratio L.F. transformer. Four years later they introduced nickel-iron cores into L.F. transformer construction, a development which resulted in the design and ultimate production of the now famous R.I. "Hypermu."

* * *

MORE recently they were responsible for still another important coupling development, the "Parafeed" transformer. And now, concurrently with the opening of the Exhibition, they are releasing the first "Auto-Parafeed" transformer. But it is not only in connection with L.F. coupling devices that R.I.'s reputation has been built up. No survey of their activities would be complete without at least a passing reference to some of the other components for which they are justly famed. One's mind turns almost automatically to such well-known lines as the dual-astatic H.F. choke, to the compression condenser, to the "Audirad" L.F. choke, and to their particularly comprehensive range of mains

The R.I. factory at Croydon is almost as much a landmark as the airport itself. Above: Mr. J. Joseph, the enthusiastic Managing Director of Radio Instruments Ltd.

transformers and chokes. A visit to Olympia would certainly not be complete without a call at the stand on which this fine range of components is exhibited. For there you will see, in addition to components, the famous "Antinodal" short-wave adaptor, another remarkable development for which R.I. were responsible. R.I. first started business in a comparatively small way in June, 1922. Their premises then were at Hyde Street, New Oxford Street, but in the first eight years of their activities the Company grew so very rapidly that a move became imperative. It was in June, 1930, that the move was made into their magnificent new factory at Croydon. From that day to this they have never looked backwards.

Telegraph Condenser Company Limited

FOR more than a quarter of a century the Telegraph Condenser Company have been making condensers. Over twenty-five years of specialised and continuous research are symbolised in the green case of the T.C.C. condenser. So that to-day the trade mark T.C.C. has come to be accepted with much the same regard as the lion on a piece of silver. Another example of the value of specialisation. The progress of radio design, offering vast opportunity for innumerable sidelines, has not tempted this firm. Rather than stretch out their tentacles to embrace those branches of the industry already specialised in by other firms, they have been content to take the sane course of exerting all their energies, all their experience, to the betterment of that one line in which they have served the constructor and the industry so well. In an industry where competition is so keen, there are those who may doubt the wisdom of keeping all one's eggs in a single basket. With the Telegraph Condenser Company that basket has been handled with such confidence, and yet with such care, that never once, not even while passing along the rocky road of trade depression, has there been the least fear of a single egg being cracked.

* * *

THOSE who visit the Telegraph Condenser stand at the Olympia Show expecting to see other apparatus besides condensers will be disappointed. Those who go to see condensers will find more than enough to interest them. The firm is jealous of the reputation which it has so earnestly built up through the years. Whatever else it may do, it will not disappoint the constructor. Whether it be transmitting or high-voltage models for professional work; whether it be special contracts for the Admiralty, the Post Office, or the cable companies—whatever the particular job may be, it will carry, in the letters T.C.C., a guarantee not only of good and accurate workmanship, but also of dependable service. A company which embraces many ramifications can afford to ignore an unprofitable product. The Telegraph Condenser Company must stand or fall on the merits of its specialised output In this case specialisation is your security.

* * *

AT North Acton, there stands a factory whose size and equipment is worthy of the firm whose name it carries. There never was a time when the machines were idle. This year they will be more active than ever. Not only because the demand for T.C.C. condensers increases in direct proportion to the number of satisfied users, but also because this year a problem of the greatest moment has been tackled, and tackled successfully, by the technical designers of the firm. It is the problem of mains interference. It has been met by the production of a new unit, an "anti-interference" unit of condensers and fuses, designed not as a sideline, but as a serious addition to the present-day needs of the wireless listener. For more than a quarter of a century the Telegraph Condenser Company have been making condensers. If, when the full century has been reached and passed, they are not still making them, it will not be the fault of those wise and capable men who have built up a reputation for rational specialisation, for unaltering quality and for constant service.

Above is a portion of the factory where an army of men and girls are kept in constant employment at the important task of ensuring that each T.C.C. condenser is as good as the last. Representative types of mica and electrolytic models, all of which you may see for yourself at Olympia, are also shown.

The familiar green case of the T.C.C. condenser—"Green for Safety" is their slogan—is your guarantee of dependability. Below: An aerial view of the Acton factory shows the extent of the works needed to turn out one specialised product.

The Peto Scott Company Limited

THERE is nothing that succeeds like success. Twelve years ago people talked vaguely about wireless sets; the word went round that you could actually hear voices through the air. It was all very wonderful. You began to see them in trams and trains immersed in a journal with the now familiar yellow and blue cover. It had the fascinating title of POPULAR WIRELESS. It told its readers how to make wireless sets with which to receive these voices through the air; it told them what to buy, and the fact that they had in some cases to tramp halfway round London to obtain a slider rod of the right dimensions or a coil former exactly to specification did not stem the march of progress. The seed of the great new hobby had been sown. This, indeed, was "Popular Wireless."

When you build from a Pilot Kit, you build with the identical parts used by the author.

* * *

THERE is nothing that succeeds like success. Twelve years ago a man with tremendous foresight visualised the vast commercial potentialities of this great new hobby. Why should this new arrival, the home constructor, have to tramp half-way round London in order to obtain his requirements? Why should he have to go to one shop for the slider rod and perhaps to another for the coil former? Why not a centralised depot from where he could obtain everything on the spot? The seed was sown; the idea caught on; and from those comparatively small beginnings of twelve years ago has emerged an organization whose name to-day as the suppliers of kit sets is known the world over. The Peto Scott Company, guided by the enterprising personality of Mr. W. Scott-Worthington, who first conceived the idea of kit sets, has grown up with the industry. The modern kit set is as far removed from its prototype of ten or twelve years ago as the modern valve from the coherer. It represents the last word in service. When you build from a Peto Scott kit, you build from the parts—the *actual* parts—used by the author. As near as it is possible to guarantee anything in radio, you are assured of success before you start. So much for the aftermath; what of the actual construction?

* * *

A PILOT Author Kit is the next best thing to having a set made for you. It does everything save rob you of the fascination of putting the parts together. When you open the sealed carton, you find inside a complete set of components identical in every respect with those used by the author and as shown on his wiring diagram; you find the panel ready drilled; you find wire, and screws, and, in fact, everything that will be required for the construction of the set, even down to the wander plugs for the H.T. battery and spade connectors for the accumulator terminals. That represents Service with a capital S. Pilot Author Kits are available for every set that is published. They cost not a penny more than the bare price of the parts. You can obtain them on hire purchase, you can obtain them C.O.D. Service, not only in the composition of the kits themselves, but also in the marketing arrangements. The fame of the Peto Scott Company as the suppliers of kit sets has been carried with success into other spheres. They are the manufacturers and sole suppliers of "Metaplex," the new metallised baseboards; they are responsible for a particularly efficient short-wave adaptor; they have overcome the difficulty of supplying good quality cabinets built up to a standard yet down to a price. In short, that same go-ahead spirit which characterised the inception of the company so many years ago dominates the organisation to-day to an even greater extent. As long as there is home construction there will always be Pilot Author Kits, and as long as there are Pilot Author Kits there will always be home construction.

Above: Mr. Scott-Worthington, the Managing Director of the Peto Scott Company, Limited.

POPULAR WIRELESS, August 26th, 1933. REGISTERED AT THE G.P.O. AS A NEWSPAPER.

HOW TO MAKE THE OLYMPIA SUPER

New Valves at the Radio Show

Popular Wireless

THIS YEAR'S ADVANCE IN SETS

No. 586. Vol. XXIII. August 26th. 1933.

EVERY WEDNESDAY PRICE 3D

THE HOME CONSTRUCTOR At the EXHIBITION

HITLER'S NATIONAL SET AND BROADCASTING IN GERMANY

Also :

NEW CIRCUITS AT OLYMPIA

WIRELESS AND YOUR HEARING

etc., etc.

New and Improved Dubilier Paper Condensers

This new range of Type 9200 non-inductive condensers represent the latest design in Condenser Practice, and embody all the features essential to the Constructor who follows the modern "all-metal" trend of design.

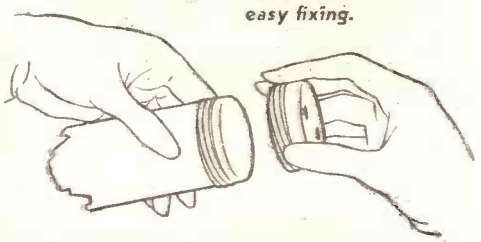
The method of fixing these condensers to the chassis which is exclusive to this type of Dubilier Condenser demands only the minimum of space and has been designed by engineers to give absolute satisfaction.

PRICES : 1 MFD 2/6; 2 MFD 3/6; 4 MFD 7/-

HERE ARE THE OUTSTANDING FEATURES . . . .

1. True non-inductive type of construction.
2. Available for working voltages from 300-900 D.C. peak.
3. Adequate factor of safety for each.
4. New method of fixing to chassis.
5. Aluminium containers with moulded bakelite top of distinctive appearance to match other components.
6. Takes up minimum amount of space on chassis.

Showing how condenser screws into base for easy fixing.



DUBILIER

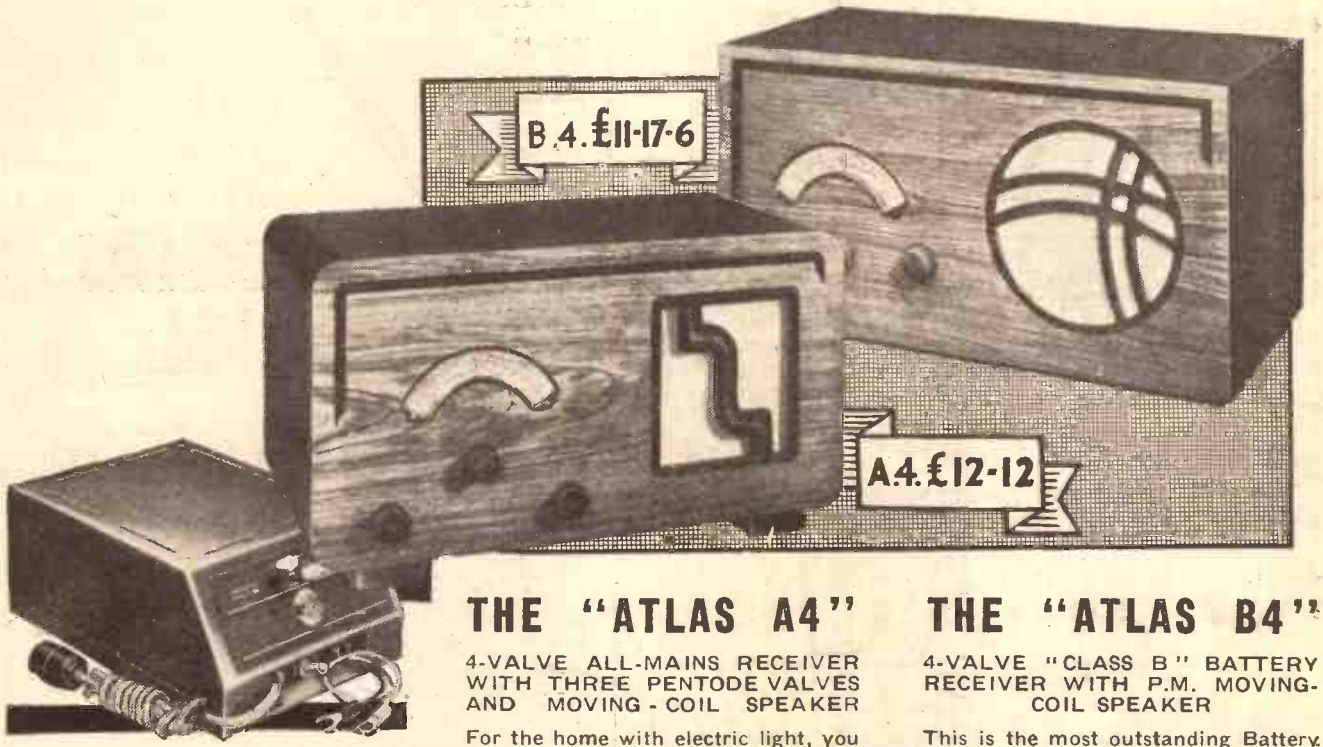
PAPER CONDENSERS

Write for copy of the new Dubilier catalogue, or better still, visit stand No. 68, National Radio Exhibition, Olympia, when a copy will be presented to you.

DUBILIER CONDENSER CO. (1925) LTD., DUCON WORKS, VICTORIA ROAD, NORTH ACTON, W.3.

The secret revealed

SEE THE *NEW* "ATLAS" SETS AND UNITS AT RADIOLYMPIA, STAND 91



"ATLAS" MAINS UNITS

It seems incredible that these world's finest Mains Units, the only Units to win the "Olympia Ballots" for two years in succession, could possibly be improved. But they have been—and without any increase in price! Handsome new cases and panels—increased outputs—higher voltages—better smoothing—now suitable even for "Q.P.P." or "Class B."

IF YOU CANNOT VISIT RADIOLYMPIA POST THIS COUPON TO-DAY.

Messrs. H. Clarke & Co. (M/CR) Ltd.,
Atlas Works,
Patricroft, Manchester.

Please send me full details of the new "ATLAS" Sets and Units.

Name .....

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THE "ATLAS A4"

4-VALVE ALL-MAINS RECEIVER WITH THREE PENTODE VALVES AND MOVING-COIL SPEAKER

For the home with electric light, you could not choose a better set at any price. It gives every single thing you want in radio—world-wide reception—flawless truth of tone—3 watts output—and wonderful selectivity.

The secret lies in the three Pentode Valves: Variable-Mu S.G., Detector and Power, the new "ATLAS" M.C. Speaker, and a host of refinements.

For A.C. Mains £12. 12. 0. Cash, or 30/- down and 13 monthly payments of 20/.

CONSOLE MODEL £13 17 6. Cash, or 40/- down and 14 monthly payments of 20/-.

THE "ATLAS B4"

4-VALVE "CLASS B" BATTERY RECEIVER WITH P.M. MOVING-COIL SPEAKER

This is the most outstanding Battery Receiver ever produced. It gives the performance of a Mains Set with an H.T. Consumption so low as to be the radio sensation of the year.

So efficient is the circuit, Variable-Mu S.G., Detector, Driver and "Class B" Power, that an output of only 8 m/A. gives an output of fully 1½ watts.

Tone, range, selectivity and volume are beyond comparison. Complete with Valves, batteries and accumulator £11. 17. 6. Cash, or 30/- down and 12 monthly payments of 20/-.

CONSOLE MODEL £13. 5. 0. Cash, or 40/- down and 13 monthly payments of 20/-.

CLARKE'S "ATLAS"

H. CLARKE & CO. (M/CR) LTD., PATRICROFT, MANCHESTER

London Office: **Bush House, Aldwych, W.C.2.**

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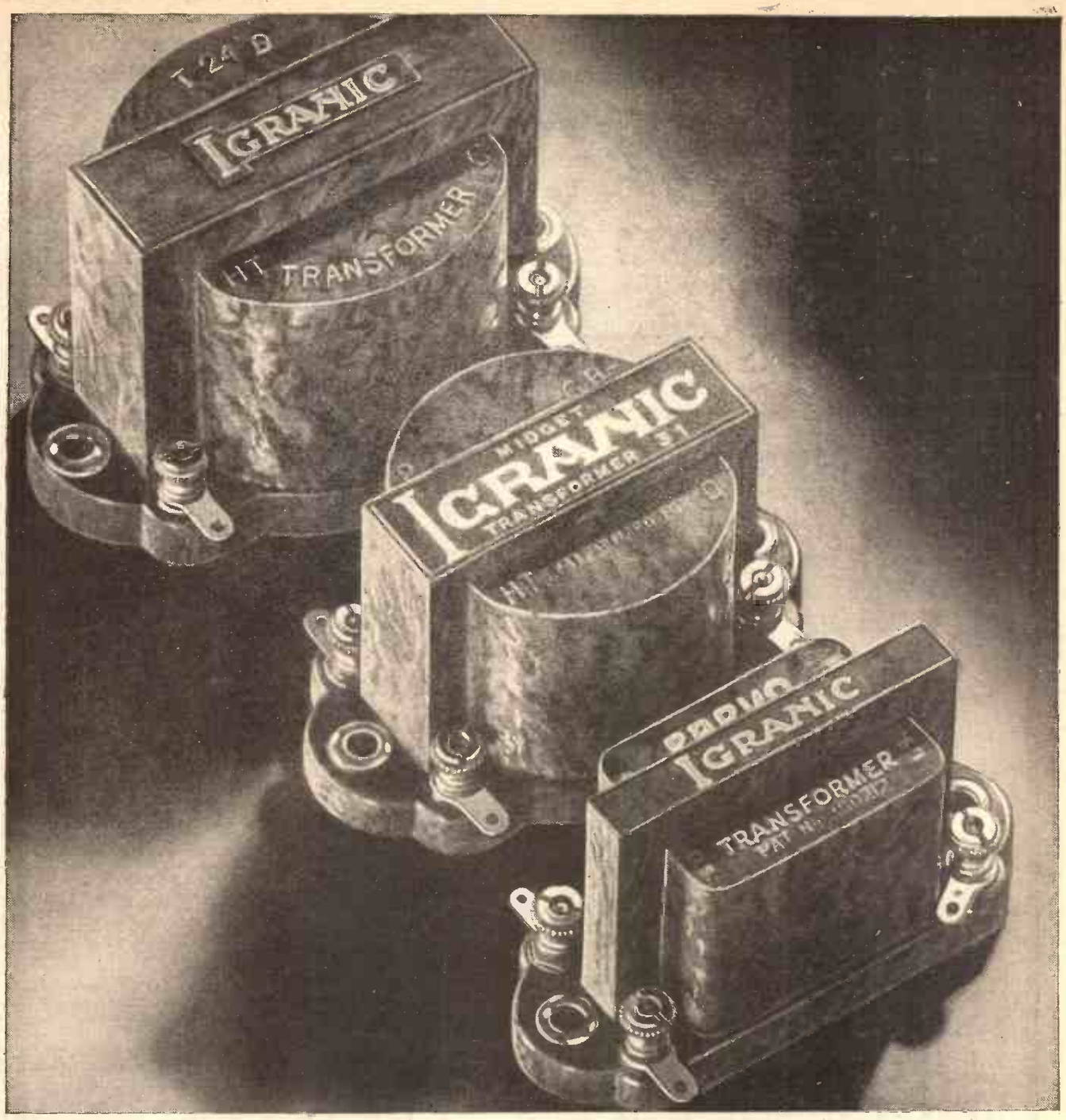

There is a complete range of Igranic Transformers to suit every requirement of the up-to-date constructor. The special feature of all Igranic Transformers is a patented core of high permeability and small polarization which permits a reasonably high current-carrying capacity in the primary. A high amplification of all bass notes and faithful reproduction of all notes over the whole scale of musical frequencies are the results of experienced design and meticulous care in construction; the finest bakelite finish is in keeping with the reputation of all Igranic radio components. The prices of Igranic Transformers are:

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Write for fully illustrated Catalogue No. R.208 of Igranic Quality Components.

IGRANIC ELECTRIC CO., LTD., 149, Queen Victoria Street, E.C.4

RADIO IGRANIC DEVICES

If you cannot obtain Igranic components, write to us direct and include the name of your local dealer.

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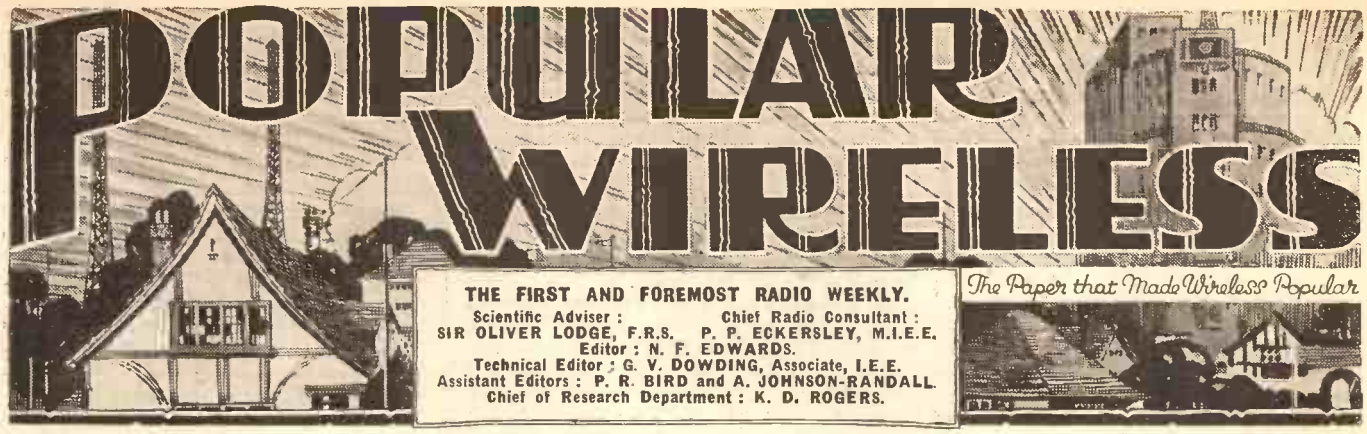

A GREAT SUCCESS
JUBBO AGAIN
THE B.B.C.'s REPLY
A CRYSTAL DIEHARD

RADIO NOTES & NEWS

CHICAGO REVERTS
"KEYBOARD TALKS"
AUSTRALIAN TARIFFS
POLICE CENSORS

The Radio Show.

SO the Radio Show will close to-morrow for another year—but *what* a top-notcher it is! "Prosperity is just round the corner," I sang to myself as I scrunched the schoolboy underfoot, dodged the sharp elbow of the "flapper" and worked my way round the matron and the beefy male person who were mesmerised by some "kit" or other and could not move.

I laughed up my sleeve when I recalled how in 1922 I boldly prophesied that broadcasting would give employment to hundreds. These amateur prophecies! Don't tell me the British are unimaginative. The way in which radio has spread like flame in this country proves the contrary.

And, remember, it was Britain which first saw in Marconi's box of tricks the possibility of a great future.

News from Norway.

THE Norwegian broadcasting system is, as I have reported, being reorganised. Trondheim has ordered a 20-kw. (aerial power) station from Marconi's, and now a similar station has been ordered by the Government for Bergen.

As Britishers we have cause for pride that broadcasting stations all over the world have been constructed in Essex by British workmen from designs by British engineers—despite the fact that Germans work for lower wages and Americans will sell at a loss for selling's sake.

P. P. ECKERSLEY

As Chief Engineer of the B.B.C. he originated Regional Broadcasting, which scored a great success in the face of almost universal technical scepticism. P. P. Eckersley is not only a regular contributor to "P.W.," but is our Chief Radio Consultant.

An Anti-Fan "Fan."

W. C. L. (Aboukir, Egypt) pleads for sympathy because for the next few months his radio life will be unvarnished heck on account of the many electric fans, all a-sparking, which are at work. The sympathy will not, as the saying goes, be unreasonably withheld.

W. C. L. will not find a holiday from radio wholly evil. It's like a holiday apart from your wife, wherein absence makes the heart grow fonder. Sir, I thank you heartily for your cheery screed, and as you are at Aboukir I bid you to keep cool and ponder on Nelson.

Jubbo Explains Further.

JUBBO (no Fubbs need apply) now explains that the wicked piano-tuner accused his (Jubbo's) loudspeaker of being "flat," on the strength of his (Jubbo's) piano which he (the wicked p.-t.) had tuned. Jubbo thereupon told the fellow that he (the fellow) must have been born with his ears half a tone *sharp*, and called attention to the multitude of *sharp* pianos which there must now be in Kent—a crying scandal, etc. To this the p.-t. retorted that he had been tuning pianos thirty years, man and boy, come next hopping, and wouldn't be *putt* upon by the likes of *'im* (Jubbo). Another thrilling instalment at Jubbo's convenience. P.S.—Jubbo says I have got his name all wrong. It is—well, it looks like Jumbo now!

SIR OLIVER LODGE

THE INVENTOR OF TUNING

For many years Sir Oliver has been Scientific Adviser to "Popular Wireless," and he contributes many important articles to this journal.

Olympus Unbends.

THE B.B.C.'s reply to its Press critics, published in the "Radio Times," is just one long, priceless scream; not so much for its subject matter as for its style. Oh, Samuel Johnson!

Imagine the Archbishop of Canterbury patting a little street arab on the head! Imagine an elephant gravely observing an ant on one of its huge toes! Imagine the Lord Chancellor rebuking the gardener's lad for leaving his greasy cap on the sundial! Then you will have the B.B.C.'s style exactly.

Well, it won't do at all. A little less omniscience, a little less of the heavy indulgent uncle, would become the B.B.C. very well. The Press is, after all, more powerful than the B.B.C., with or without Sir John.

Car-radio Boomlet.

DEPRESSION or not, there has been a boomlet in car-radio sets in the U.S.A. this summer, some manufacturers being hundreds of sets behind their orders. The average price paid for the sets most in demand is $39.50, and, apart from these, radio sales have been noticeably poor. In July it was said of Chicago that the only things which could not be obtained there without trouble were auto-radio sets, linen suits for men and hotel rooms.

I Have a Complaint.

NOT mumps, or liver, but a complaint about the "Radio Times." That organ of British broadcasting purports to tell the public what will be broadcast. Hence one is justified in regulating one's listening according to it. This, however, is what frequently happens to me. I see that the National is regaling the ether with a "miracle play" and some poetry reading, and that the Regional is pumping out a variety programme which, in my judgment, would sicken a Hottentot. Therefore I read a good book.

Next day a colleague asks me if I heard the famous explorer, or film actor, or American tennis "star" whose talk had been broadcast. It isn't fair. I cannot listen-in from 7 p.m. till 10.30 p.m. on the off-chance of a tit-bit.

Dr. J. H. T. ROBERTS

Following work in the famous Cavendish Laboratories at Cambridge, with Lord Rutherford, Dr. Roberts achieved fame as a Radio Consultant and Physicist. His weekly "Technical Notes" in "Popular Wireless" is the most widely-read feature of its kind in the world.

"Crystal Clear."

IN the matter of crystal diehards, A. M. (Glasgow) has a distinguished record, for if I had discovered him a few months ago I should have bagged in him one who

(*Continued on next page.*)

ARIEL CONTINUES HIS RUNNING COMMENTARY ON RADIO

had used nothing but a crystal receiver since broadcasting began. But for his dissatisfaction with the "Scotch" programmes he would still be using it.

His three-valver is behaving nicely, he says, but he misses the intimacy of the 'phones. I myself used to find the "intimacy" of the 'phones too "pressing." However, why does A. M. not fit telephones to his set, damp down the output and resume his intimacy? He used to work six pairs from his crystal set. *What* a crystal!—as the American "fan" said when he saw the Koh-i-noor diamond.

Daylight Saving and W L S.

QUITE naturally you think I refer to our popular short-wave expert, but quite definitely you are wrong. Station W L S, of Chicago, is, so far as I know, the only one in any part of the world where "summer time" is adopted which has had to revert, in effect, to its normal time.

You see, most of W L S's listeners are farmers who hold strong views unfavourable to any fooling about with what the old lady called "God's time," and so W L S has had to alter its programme schedules entirely.

A Short-Wave Event.

ON Friday, September 1st, there is to be a grand reopening of the London Chapter of the International Short-Wave Club at the R.A.C.S. Hall, Cavendish Grove, Wandsworth Road, S.W.8. Doors open at 7.30 p.m. for 8 p.m.

All "P.W." readers are cordially invited to be present to hear the radio notabilia speak and to listen to demonstrations of receivers and a recital of records of short-wave station reception. No tickets. Just say "P.W." and you're in.

By the way, perhaps R.A.C.S. should be R.A.S.C.—but I have faithfully copied the letters as supplied to me.

Radio "Bootlegging" Alleged.

HERE'S a novelty indeed. On a ship outside the 12-mile limit off Los Angeles a new broadcasting station, R X K R, is operating on 815 kc. with 10 kw.

I understand that in return for daily "boosts" of the Republic of Panama that country has given the ship the right to fly its flag—a clever wheeze on the part of the promoters. The idea behind all this is the sale of certain products which are advertised by R X K R and at the same time pushed by salesmen ashore.

Neat! But will the Federal Radio Commission lie down under it?

Autumn Fruits.

WHETHER his material interests you or not, I think that you will agree that one of the most attractive broadcasters is Sir Walford Davies, who used to run the series entitled "Music and the Ordinary Listener." He is coming back to the microphone in the autumn with another series, "Keyboard Talks." It's a tribute to Sir Walford that I, who do not and will not analyse a piece of music if I like it, could not switch off when I happened to strike one of his talks, all because of the joyous zip, zoop and zest of the man.

A Note on Freedom.

THE "Electrician" reports that on the last day of July six leading officials of the Reich Broadcasting Company were dismissed on the spot under the Hitler Act authorising the dismissal of Jews.

SHORT WAVES

A recent American wedding was filmed, broadcast, and gramophone records were taken.

We feel that this represents a real attempt to make the thing binding.—"Punch."

* * *

A critic recently described a new radio play as having a very bad ending.

The fault with the ending of the average radio play, of course, is that it is too far from the beginning.

* * *

In furnishing radio bulletins for the development of sets, an advertisement in an American journal states that they are for fans "who build their own or WASH to improve their present sets."

We wonder if it is necessary to work on this set while immersed in the bath up to your neck?

* * *

Williams: I'd like you to come over and listen to my new wireless set.

Beare: Thanks very much, old man, but I'm afraid I only listen-in when there's a "w" in the month.

* * *

It is said that wireless has added hundreds of words to the English language.

But, of course, we couldn't print them here.

* * *

Theatrical Booking Agent (to Contortionist, who has almost tied himself up in knots): Have you ever done your stunt for the radio?

"Punch."

That some of them have long-term contracts makes no difference, and that some are of international repute makes none.

Add this to the dismissal and subsequent suicide of Herr Schaefer a few months ago and you see a picture of how Hitler is making Germany free—free of Jews—and incidentally robbing her of many of her most intellectual and talented citizens.

The persecution of the Early Christians failed in its object. So will that of the modern Jews, for barbarism has long since had its day. (*Later.*) It is reported that the six have been imprisoned. Heil, Hitler!

Direction-Finding Development.

FOR the assistance of airmen in flight the Department of Commerce, Elizabeth, New Jersey, has installed a combined radio communication and radio range beacon. This station, which is to serve the New York area, will provide airmen with both aural and visual directional signals, simultaneously or separately, and it can transmit also the voice and visual signals.

Result of a Tariff.

AN unusual result of a tariff is reported from Australia. When the *ad valorem* duties on imported dry batteries had reached the prohibitive figure of 300 per cent it was found that the prices of Australian-made batteries went up and that excessive profits were being made. Whereupon the Australian Tariff Board has recommended a reduction of the duties, proof that a tariff can be a two-edged weapon.

"Bang Went Point Nought Sax Amps."

R. F. G. (Woolwich, S.E.) describes an occurrence which may happen to others; I repeat the facts so that those others may be forearmed with knowledge.

His set, a "P.W." three-valver, on an inside aerial, was quietly resting and being trickle-charged. A flash of lightning near by produced a nasty "click" in the set, which refused to function thereafter. A post-mortem showed that the 0·06 ampere fuse bulb in the L.T. — and H.T. — lead had been blown.

When the bulb was replaced the set worked normally. R. F. G. thinks that the flash produced an overload on his mains unit.

A Listener's Dream.

WHILE I was tossing uneasily on my straw pallet in the Stygian gloom of my garret during the last heat-wave, a good fairy fluttered in through a broken pane and, after fanning me with her wings, sat down on the head of the tintack from which hangs my shaving-glass. As she powdered her nose she said: "You seem to be having a thinnish sort of time—or are you? Have a wish."

I replied: "I would like to see and hear the D. G. of the B.B.C. trying to imitate Leonard Henry's giggle." "Young man," she said, "I'm not that sort of fairy. However, thanks for the buggy-ride." And off she flew. I'm still wishing.

Sensitive Brazilian Police.

THE British United Press reports that five Brazilian broadcasting stations shut down for a day as a protest against the Brazilian police who had censored their bed-time stories. A fat lot the police would fret about that!

But, I say! If the bedtime stories seemed worthy of censoring, what would a Brazilian vaudeville broadcast be like? Now, don't all rush to make superhets! I expect the kids had been treated to a little political propaganda; that's all.

ARIEL.

The HOME CONSTRUCTOR AT THE EXHIBITION

By THE TECHNICAL EDITOR.

The home constructor visiting Olympia is inevitably impressed by the difference which, year by year, manifests itself between the home- and factory-built set. The manufactured set often strikes him as achieving a standard of neatness in assembly and apparently enhanced efficiency in performance with which he fears the built-at-home assembly of components cannot compete.

Such superficial assessment of the seemingly superior position occupied by the resplendent product of the factory does not, however, stand up to close investigation. The advantages which home construction enjoys over factory production are startlingly numerous and enable the followers of the greatest hobby on earth to exploit new developments which the "trade" is unable to commercialise until many months afterwards.

THE first impression that Olympia will make on the home constructor will undoubtedly be the wide divergence between commercial and home-constructor technique.

There are few if any differences which reflect wholly unfavourably on either side; it is simply that they conform to two entirely different sets of conditions.

Externally, many home-constructor designs are similar in size, control disposition and cabinet work to manufactured sets. It is not in outward appearances that there are any marked distinctions to be found.

Block Construction.

But internally it will be plain to all that there are indeed two methods of achieving more or less the same result.

This was hardly the case a few years ago. Factory sets were also assemblies of individual components. Now, however, as visitors to Olympia will see, they are invariably of block construction.

That is to say, their individual parts are designed specifically to fit in to the one scheme of assembly and are not necessarily interchangeable with similar parts of other receivers.

Such a system is almost essential to modern mass-production methods. We could say a great deal for and against it, and it is not difficult, by comparison, to exalt the unit scheme adopted in home construction. However, it is not our purpose to introduce controversy of that nature now, for the subject has been dealt with at length on previous occasions.

Rather let us point out that the home constructor has much to learn from the highly-finished factory design.

Let us peep into the interior of any well-known make of set. What is the most outstanding thing about it? Indisputably the short, neat wiring. There will be not one wasted inch of connecting lead.

And a general tidiness will pervade the whole. No flexibles trailing with apparent lack of aim over valves and components; no odd bits of metal or wood to bolster fitting faults; no loose terminals or clumsily-made soldered joints.

Symmetry and Efficiency.

The meticulous symmetry of layout that is to be seen gracing the "innards" of many of these commercial sets may or may not be of technical advantage. That is quite another matter.

The constructor need not feel that, because such apparent artistry of assembly is impossible without machines, a home-built set must necessarily always be "below par."

Far from it. One of the most famous of all set designers in the British radio industry has made the following statement:

"My first model of a set is as good as one of your ('P.W.') home-constructor designs. It loses 25 per cent of its efficiency during its transformation into a 'works' model. When it goes finally into production it loses another 25 per cent."

And it is of supreme interest to note that his "first models" are assemblies of standard components and are identical in practically all respects to home-constructor designs.

No doubt some set designers will consider he was exaggerating a little; but, be that as it may, the blunt fact remains that there is no efficiency gain and probably *some* loss in the majority of production modelling processes.

Yes, it is decidedly worth while to build your own set even though the financial profit of so doing is less than it used to be.

It is still great, though, particularly because it is possible to use so many parts of an old home-made outfit in building a new and up-to-date one, whereas an obsolete factory outfit must be scrapped as a whole.

Changing by Instalments.

It is also possible to reconstruct a home-built outfit in instalments, as it were, changing the circuit a little here or there, replacing this or that component with a new one as and when advances are registered in the general development of radio.

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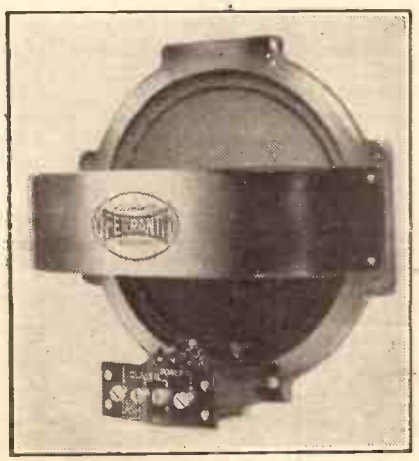
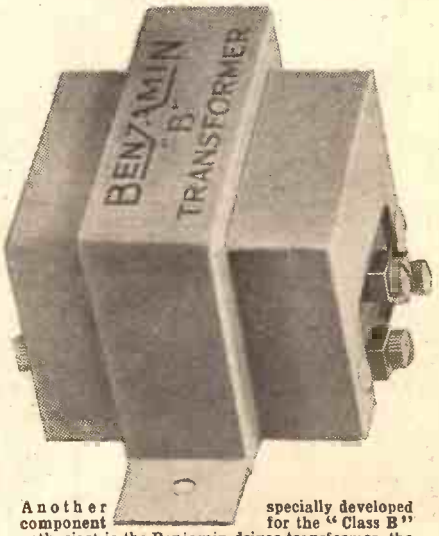
FOR CLASS B



Many home constructors have been enjoying the advantages of "Class B" amplification for months past, and they will be glad to inspect at Olympia this special Ferranti loudspeaker for Class B.

APPEARANCES COUNT



Another specially developed component for the "Class B" enthusiast is the Benjamin driver transformer, the clean appearance of which enables the home-built set to vie with the manufactured receiver's neatness.

THE HOME CONSTRUCTOR AT THE EXHIBITION

(*Continued from previous page.*)

In this way the home constructor can keep ahead of the times, for the factory system is a bulky affair and possesses great inertia.

We could prove this by many examples, but one or two will suffice. Perhaps the most striking of all is "Class B" amplification, which is admitted by all to be one of the most important innovations of the decade.

This was placed before the home constructor by POPULAR WIRELESS on March 25th, 1933. The specification of a "Class B" receiver appeared in this issue.

It was a long time after that the first factory-made set using this remarkable new principle appeared; indeed, so far as commercial practice is concerned, Class B is "virtually new" at this August Radio Show at Olympia.

Pleasurable Superiority.

No doubt "P.W." readers who have built one or other of our "Class B" sets, and who have now had some considerable experience of handling the method, will feel a thrill of pleasurable superiority as they pass the various stands on which are displayed "first release" "Class B" models!

Then, again, automatic volume control, with H.F. multi-mu pentodes and double-diode triodes or double-diode pentodes, is new to the set-buying public at Olympia, but by no means new to home-constructor readers of "P.W."

VALVES ARE BETTER

Improvements in valve technique have taken place in all the stages of the modern set. Here is the latest Cossor S.G. valve and the Mullard Class B.

And what about permeability tuning? Maybe we shan't see that in the factory-built set until the *next* Show. And it will then be introduced as a "startling novelty." But already it is very well known to the home constructor, and will doubtless figure in a vast number of home-made sets this season.

And so it goes on, the home constructor always a number of paces ahead of the factory.

Which would all seem to indicate that while he may profit from a knowledge of the assembly methods of the commercial designer, it is rather the component that should occupy the major portion of his time at the Exhibition.

If he looks carefully he will find isolated "bits and pieces" here and there, the products of go-ahead component manufacturers, which, already available to him, are to form the parts of the commercial set of to-morrow.

We believe he will encounter at least two permeability tuners. Now, permeability tuning is not a "little stunt" from which the big factories are keeping aloof. If it had been completely developed eight or nine months ago, goodness knows how many sets at Olympia would have included it. Perhaps the whole lot.

Importance of Permeability Tuning.

The fact is, practically every receiver is a medley of circuit and component developments picked from all quarters. But the home constructor naturally gets the first pick, because he doesn't have to wait until these things are gathered together, retried, remodelled and redesigned for the special grouping demanded by a mass-production set.

We have said quite a bit about permeability tuning because we consider it to be of great interest and importance.

The visitor to Olympia will, as we have indicated, have to search for it, but only because of its supreme newness. And when he inspects a tuner constructed on the principle he should bear in mind that it is more than a mere tuning coil. It is a complete tuning unit, and is the equivalent of both a variable condenser and a tuning coil.

A complete band-pass, three-stage permeability tuner is no larger than a compact gang condenser! Varley were "first away" with such apparatus, and they have been followed closely by Sovereign. However, by the time these words appear in print there may be others in production with permeability tuners.

There is some very fine "Class B" apparatus for the home constructor at Olympia. Previously we have had to exercise discrimination in advising readers in the selection of "Class B" gear, but the general standard has risen greatly.

Consistently High Standard.

Not that such a remark is anything more than a generalisation, however, for some of the firms, particularly Telsen, have maintained a consistently high standard right from the beginning while others were feeling their way.

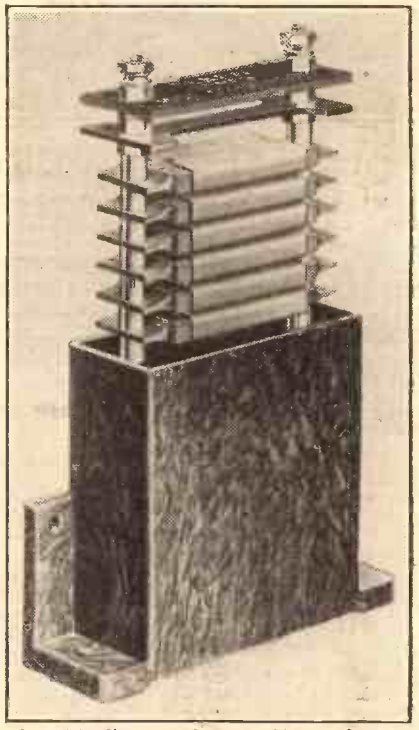
One of the most intriguing "lines" for the home constructor is the parallel-fed L.F. transformer, for it offers alternative methods of coupling.

There is just enough opportunity for experimentation without it becoming bewilderingly or even tiresomely complicated. Radio Instruments are specialists in this particular branch of the art, and they have a knack of being able to present their components in a way that intrigues the home builder of sets. At this year's Show they are making special efforts in that direction.

One very significant feature of all the exhibits (or practically all of them) which are designed to attract the man who "rolls his own" is the provision of terminals on components.

It has taken some time for the fact that many constructors can't or won't solder to be generally realised. But it is now obviously quite universally accepted. And it is possible to build ambitious modern designs without the necessity of touching a soldering iron and lose nothing except the doubtful advantage of dry joints!

A UNIT ASSEMBLY



An outstanding example of the high quality now available to the home constructor. A Telsen mica condenser of ·05-mfd. capacity, built up of parallel-connected smaller capacities, thus ensuring a high degree of accuracy.

It is also worth noting that there is a tendency on some radio components, especially variable condensers, to duplicate terminals in order to facilitate wiring. In our opinion, this is a step deserving encouragement.

What is not so good, however, is the absence of standardisation in many departments, particularly in regard to coils and coil units. The varying marking and disposition of terminals on coils render it practically impossible for the different makes to be interchangeable.

We would be the last to advocate any form of standardisation which tended to cripple individuality, but such a technically

(*Continued on next page.*)

THE HOME CONSTRUCTOR AT THE EXHIBITION

(Continued from previous page.)

superficial standardisation as the above is not likely to do that. But it would greatly assist the designer and render it easier for the home constructor.

The kind of standardisation we would hate to see would be a complete uniformity of variable-condenser dials and escutcheons,

CONDENSERS FOR CONSTRUCTORS

Always popular with the home constructor, the Igranic range of components now includes an improved series of large fixed condensers.

though we must hasten to add that a uniformity of dial or scale marking is definitely desirable. There are still both 0 to 100 and 0 to 180 scales employed, and this doesn't make calibration as easy as it could be.

Nevertheless, we must insert a special word of praise for the condenser makers such as British Radiophone, J. B. and

IMPROVING TUNING

Thousands of "P.W." readers can testify to the improved efficiency which results from the use of iron-cored tuning coils, and the entry of R.I. into this field with the new Micrion coil will be welcome news to constructors.

Ormond. Their work represents the peak of electrical and mechanical achievement.

The home constructor should be in his element when confronted by the many different gang and single types of condensers on view.

And some of the slow-motion dials are truly beautiful productions, and in this connection the name of Igranic must be added. Micrometer movements and silky actions are to be found in combination with perfect panel appearance.

A Marvellous Display.

The mind jumps back to those slipping, jerky contraptions of a few years ago when one handles one of these moderns.

Some of the stands at Olympia are in themselves complete exhibitions for the home constructor. Lissen, for instance, have a marvellous display, which includes components suitable for all kinds of sets, as well as complete kits of parts of their own.

It is there, at the Lissen stand, that one of the biggest crowds of constructors will collect.

The Show clearly reveals the great progress towards really inexpensive home radio that has been made. It is now possible to build a first-class outfit for the price of a cheap portable gramophone.

For this we owe a great deal to those enterprising manufacturers such as Graham Farish, who, bearing the needs of the less wealthy constructor in mind, have bent their enthusiasm and skill towards the development of such things as solid dielectric variable condensers. These play a very important part in the costs reduction of modern sets.

Such components are apt to be overlooked in a colossal Exhibition such as Radiolympia, or if they are not overlooked their tone significance becomes lost owing to the presence of so much that is big and grand in appearance.

But it will pay the home constructor to bear in mind the supreme importance of the small things in radio. Figuratively

GETTING THE BEST FROM RECORDS

Home constructors were able to avail themselves of electrical record reproduction long before radiograms were sold. The Blue Spot pick-up makes sure of the set builder still being able to get record quality equal to the best obtainable.

speaking, he will find nuggets of pure gold in the "gadget" displays.

It would sound most imposing and noble if we could warn him to beware of this or that. However, even if we wanted to be imposing and noble it would be difficult to be so at the expense of anything at Olympia.

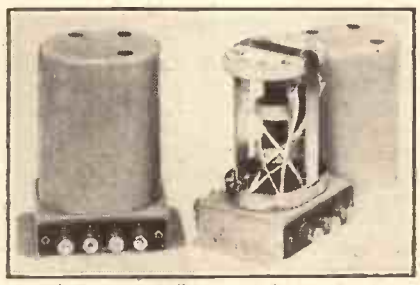
There has been a great weeding out in the radio industry during the past three or four years, and the greater proportion of the survivors have survived because they were able to make radio apparatus of higher quality at lower prices.

Superlative Bargains.

Of course, there are degrees of excellence, and some of the parts on view are better than some of the others. But whatever you order of whatever firm, it is a safe bet that the goods will be sound and fairly good value for money.

And there is a wonderful sprinkling of superlative bargains. We know that sounds like an inspired "boost," but, nevertheless, we are convinced of its truth.

COILS FOR SUPERHETS



Superhets. were built on kitchen tables long before one could be bought, and with Radiophone special intermediates available the home-built super can still hold its own against the manufactured article.

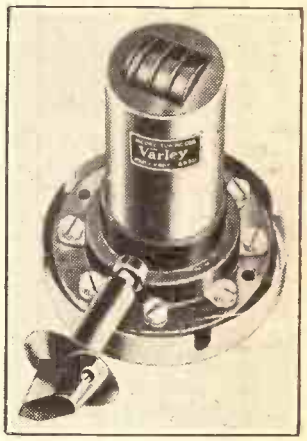
We have already had the opportunity of closely examining and testing a great deal of the apparatus that makes its public bow at Olympia, and we are lost in admiration of the general standard achieved.

Worth Lingering Over.

It is apparatus to handle and linger over just for the pleasure of examining the finer points of design and construction. Yes, the home constructor at Olympia should thoroughly enjoy himself.

A SPECIALIST'S PRODUCT

The expert knowledge of coil-winding methods possessed by Varley's has proved a boon to set builders from the earliest days of the hobby, and, applied to the new technique of iron-cored coils, will again earn the gratitude of home constructors.



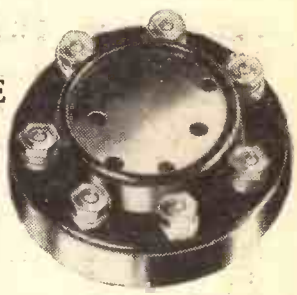
And whatever he does he must not forget to collect as much of the literature offered as he can.

Radio publicity matter differs from that issued for many other things in that it embodies a considerable amount of useful and definitely interesting material.

Where a leaflet for this or that household commodity must usually inevitably contain much that is mere eulogy or lose its usefulness, wireless technical descriptions and "how-to-use" details are definitely instructive.

FOR THE NEW TECHNIQUE

The new "Class B" and double-diode-triode valves have created a need for seven-pin valve holders which has been satisfied by the famous W.B. concern.



No, the great piles of booklets and leaflets available to all, and even being pressed on passers-by at the Show, must not be regarded purely as advertisements and avoided as such.

The constructor should secure one of those handy carrying bags the valve makers are presenting to visitors free of charge and cram it full of literature.

Everything that is offered should be taken. When the day's "bag" is sorted over at home a surprising quantity of extremely readable literature will be discovered.

Explanatory articles on "Class B" amplification, automatic volume control and other modern radio developments will be there, together with booklets on the upkeep of batteries and leaflets dealing with other important radio topics. A veritable mine of information for the home constructor.

All the interesting news and views of current short-wave practice.

IT is too early yet to give one's considered impressions of the Show. We have all formed our own ideas about Olympia a few minutes after we have entered the turnstiles, but they are not always reliable.

For instance, the chief thing that strikes a rabid short-wave enthusiast (such as myself) is the complete indifference and even disdain with which short waves are treated by ninety per cent of the radio public. But that isn't a grumble—it doesn't spoil the pleasure of the other ten per cent.

Sectionalising the Public.

Undoubtedly the division between the two classes of radio user is becoming more and more marked. A man is either an enthusiast or an ignoramus. The former class reads "P.W." and "M.W." and digests scores of technical and semi-technical articles simply for the love of acquiring more knowledge about his pet subject. He makes his own sets, and he accosts designers on their own stands and tells them where their sets might be improved.

So much for the enthusiast. The ignoramus (no offence intended !) goes to Olympia to examine sets, and possibly to buy one, in the same frame of mind that he would go to a furniture store to buy a drawing-room suite. So long as it looks good and does its job well he doesn't care a hang what's inside it. Radio is akin to black magic, anyway, and it isn't healthy to know too much about it. That's his point of view.

There are so many like him about (and I am not attempting to discredit him) that it is easy to see why short waves are not yet in great demand. They are only of interest to the red-hot enthusiasts, who form quite a small percentage of the radio public.

The ignoramus (I wish I could think of a better word !) has *this* point of view, too. "Why should I need to know all about it when I can flood the house with music and entertainment by pressing a switch ?" he says. "My wife doesn't have to know all about her sewing-machine before she can use it."

This, of course, is unanswerable if he really is content with "flooding the house" ! *Our* point of view is that, ultimately, a man can derive more pleasure from any hobby that he takes up by learning more about it.

Anyone can drive a car nowadays without knowing the slightest thing about the works—but oh ! what a driver he usually is ! ; and oh ! what a mess when he has his first "technical hitch" !

So much for this deep philosophy. Now for something more akin to brass tacks.

Short-wave conditions are gradually merging into their "autumn" state. Long-distance reception is more frequently possible ; stations are coming in earlier in the evening on the waves above 30 metres. The 49-metre Americans (and what a crowd of them !) are usually quite good by 10.30 or 11 p.m., except on the really blank nights, which, luckily, are infrequent.

Programmes for Newcomers.

The new season will bring many newcomers to short waves, and it is nice to feel that they will have something to listen to right away. Nothing succeeds like success, and reception from the States, even if it is poor, will whet their appetites for more.

Next week I want to address a few remarks about short waves specially to the newcomers ; I crave pardon from the "old hands," but, with all due deference, would like to point out that they may learn something even *now !*

Speaking for myself, I say emphatically that I learn more about radio by trying to explain things to the merest novice than from all the talks I have with experts.

DOTS AND DASHES ON THE "GANGES"

These wireless operators-to-be are receiving their tuition in H.M.S. Ganges.

THE NEW MULTI-ELECTRODE VALVES

A guide to the newcomers, and a brief account of their advantages.

DURING the past few months a number of entirely new valves have appeared on the market, and there are strong rumours that more are to follow. The list so far includes the "Class B," Double-Diode Triode, and Double-Diode Pentode.

Two more we may confidently expect to arrive soon are the Pentagrid Converter and the "Q.P.P.," as we may tentatively term it.

Those readers who know of these valves only through seeing them buried in the middle of complicated-looking circuits may well consider them to be extremely advanced productions.

Portmanteau Valves.

But actually they are not. No vitally new fundamental principles are involved. In fact, we can safely say that these new valves herald a kind of portmanteau era in valve design.

Nevertheless, they are none the less important for that. These words are not being written with any depreciatory intent, but merely to show the home constructor that he need not jump to the conclusion that with the new valves radio has taken a leap from comparative simplicity into a condition of bewildering complexity.

All the general principles which guide one's understanding of the theory of straightforward circuits using normal valves still apply; but, instead of using separate valves for each separate duty, valves capable of carrying out several tasks each have been introduced.

The "Class B" valve is essentially a pair of ordinary triodes (three-electrode valves) built into one bulb.

"Class B" is, in short, a specialised system of push-pull.

There are several advantages in combining the elements of two valves in one bulb. The most obvious is that one article replaces two, and space and wiring are economised.

A point of even greater importance is that the necessity of matching two valves—for they must both be of identically similar characteristics and operate under exactly similar conditions—is entirely eliminated.

The Double-Diode Triode combines a diode having two anodes with a three-electrode valve. This latter section is generally used as a straightforward amplifier, while the diode part, which can be regarded as quite a separate entity, is available for detecting and for automatic volume control.

The Double-Diode Pentode is the same kind of valve as above, only, as its name suggests, a pentode section replaces the triode.

The Pentagrid Converter (or Hexode) is a special super-heterodyne valve in which a three-electrode oscillator and either an S.G. or Pentode Detector are built into one bulb. The latter is designed so that it has variable-mu characteristics, and these enable automatic volume control to be applied.

The advantages of this "portmanteau" valve are that the "mixing" of the input and oscillator frequencies is purely electronic, i.e. is done inside the valve and a consistent performance over the whole waveband, with practically no coupling trouble results.

The "Q.P.P." is the name we ourselves have given to a new valve which, at the time of writing, is still in the experimental stage. But there is little doubt but that it will in due course appear.

This, too, is a simple enough proposition ; it is a couple of pentodes for quiescent push-pull enclosed within the single envelope.

Nothing New to Learn.

So, you see, all these wonderful new valves are merely combinations of existing types, as it were. We use the word "wonderful" with no sarcastic meaning, however, for they are veritable triumphs of valve design.

The exact positioning (and construction) of all the various elements in these valves calls for almost superhuman precision ; otherwise the results would be hopeless.

But constructors will observe that they haven't got to learn an entirely new technique or theory before they can cope intelligently with the circuits concerned with the use of these innovations.

On the other hand, they must know their radio pretty well before they can fully appreciate the fascinating manner in which the portmanteau valves perform their combined functions.

A FOREIGNER'S IMPRESSIONS OF BRITISH RADIO

By SENOR A. GRANDIOS.

The National Radio Show at Olympia always attracts to our shores a multitude of foreign visitors, who view the Exhibition from an entirely novel angle. This account of experiences and impressions was written by a visitor from Spain, and it presents a vivid and amusing picture of British Radio Progress as seen by a foreigner.

I HAVING been left over from something to do with the so Economica Conference, whereunto I come for knowing the English lingo, I decide to be permanent here for few weeks to observe "dear old London."

By examining museums, pictures, and such things the neck aches. But this is not able to damp me, and I ask an English friend what is the most esplendid spectacle in London. "Olympia! By all means," responded he with certitude, which was for me to resolve the matter on the instant.

Inside Olympia.

In route to Olympia I consider that there I shall witness Olympic Games and the young English disporting theirselfs with runs and jumps. Perhaps, too, the futbol will play, and goals and wickets will fall each minute. I regret that I am not garbed like the English sporting gentleman. I have not even a little bat.

Arrived, I note how Olympia, so far from resembling the mansions of the old Greek deities, approximately looks like the Cannon Street station. What spectacle can this be? What disillusion! But I buck up my socks and enter boldly, for the people are a little impatient behind.

Once inside and—*magnifica!* It is a vision of beauty and light, without to speak nothing of the music which steals across the ears from hidden strings. A single look is enough to teach me that here is an immense exposition of the radio-diffusion in all its roots, and I am truly pleased because I am an *aficionado* (*amateur: Ed.*) of that very interesting art. Here, then, I shall learn much and contract more neck-ache, for they say that the demonstration tables extend nine miles, a veritable marching tour!

Very well, I shall undertake it! I commence to walk, but am at once arrested by the appearance of some very fine bureaux or coffers, all of oak and other precious woods. Zealous officials leap forth and, by rendering them sonorous, make assurance that these hansom pieces are in truth radio recepters.

There is the escritoire which chants! There the wardrobe which stores up all the melodies of the British Breadcasting! Ingenuity unsuspected in the not too vivacious English! Or are these English something other than they pretend? I pass to more exploration of this idea.

"Every Londoner is Here!"

I learn that all these recepters are called "sets," a word which I heard with frequency at the Wimbledown tennis. A lingo of difficulty, truly! Sets, then, are set out by hundreds, blenching the imagination and making to reel the mind. Three millions of sterling value in samples alone! And every Londoner is here! The riches and grandeur of Rome!

Historical contemplations are shattered with suddenness by one who kindly gives me a paper receptacle containing a fan, brochures, and the suchlike. He was, I think, Mullins, and very thorough publicist, with his name on his bags and on banners outside Olympia. Men come with alacrity at all corners, anxious to demonstrate sets or to donate printed descriptions. I take all without partiality, for souvenirs.

An hour passes and yet the tour is to do. Presently I am diverted aside by the post office exhibition. So much scientific apparatus just to say one arrives late or to telegraph a little message! Is it possible? And the courtesy of the experts! Is British officialism, too, a white sepulture? Gigolos could not outvie those posts men in grace and amiability!

Pleasures and attractions multiply with every pace one makes. No device for the comfort of the visitor or of his delight is neglected. Would you bars for beers? Here they are, seductive. The restaurant invites the tired to sit and feast. A great theatre slowly engulfs an endless queue of patrons. Never have I witnessed an exposition so vivid, so vital, and so well arranged.

But below all this superficial there is the deep hum of business transacted. Casual merchants, aslant on chairs within the cubicles, make orders magnitudinous. "Book up for me so many thousands of that set," says one, and seems to regard his deal like a bagatelle. Another, appearing to look into middle space, says, "I will purchase the put-out of your manufacture for so-and-so many months." The seller is so little overcome that he cracks a jest and fails to interrogate sternly about payings and commish.

It was freely said that here will be bought goods of twenty-five millions of sterling. How I am privileged to assist in negotiations so estupendous! Yet perceive the sublime optimism of this race that can, without much noise, envisage and pursue so marvellous a job amid the depressions and tumblings of a distracted world!

On the "P.W." Stand.

Suddenly I come upon the array of the POPULAR, which I have seen in my country. I do not disguise my satisfaction to meet those skilled gentlemen, and after to introduce I am invited to enregister my impressions of this "Show." Making an attempt to outback from so uncustomary practice, I am kindly persuaded over and consent, with terrible fright, yet honoured to number myself with among the *savants* who freight that periodical with such sagacious matter each weekly.

First I must tell of the people of the public which composed the happy, surging throngs. All your Shakespeare's seven ages of man, and in addition those of woman, were represented. Youth in fretful impatience twingled the knobs or peeped greedily into glass screens; age gravely propounded enigmas to the attendant guardians of intricate and unknowable inventions. Amazing to see ladies present in formidable proportion! I do not know any Spanish lady who likes the technical radio; if there is one then surely she must live in Gibraltar! I deduce that radio is at last an overpowering influence on English society, not alone because of the great concourse of people at Olympia, but because of the dashing zest of those pursuers of "the very latest." They sought superhets as lovers their maidens!

Impressed with the People.

Really, I was more notably impressed with the people, public and professional, than with the objects of their interest, for there I saw the English hot-nose after new conquests, ever young and ever fresh in mind. We of Spain are old and perhaps a little behind times.

Next, I believe that the *ensemble* of this "Show" means great powers of forethinking; imagination, judgment, added to superior executive qualities. Nothing

(*Continued on page* 808.)

CUTTING OUT HETERODYNES

—and other practical hints from readers, designed to help every listener and set owner.

DID YOU KNOW ?

DID you know that, if at any time you have a terminal head which turns stiffly on its shank, the quickest way of making it turn easily is to hold it on edge between the first finger and thumb against a hard surface and then severely rap it with a hammer in several different places ?

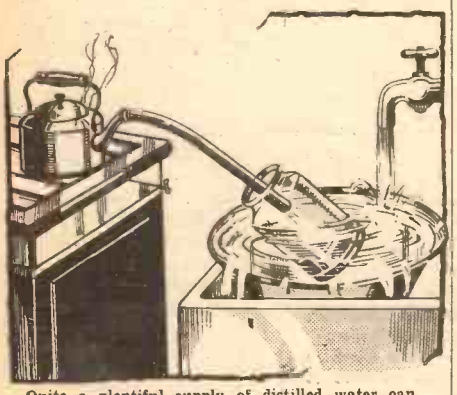
Contrary to belief, as any engineer will tell you, this does not close up the hole—it opens it !

Did you know, too, that only on the rarest occasions will a nail split the wood into which it is driven if the end of the nail is first flattened with a hammer ? W. W.

FOR YOUR ACCUMULATOR.

IT is possible to obtain distilled water plentifully and quickly at home, using nothing but the most ordinary household articles. Here they are: a kettle, piece of garden hose, jam jar, basin and the use of gas-stove and sink.

The hose should reach from the gas-stove to the sink, and is fitted over the kettle spout, being held firm with wire binding. The other end goes inside the jam jar, which



Quite a plentiful supply of distilled water can be made at home when the accumulator needs topping up in a hurry.

rests in a basin of water that is continually changed by a running tap.

A clean weight will help to hold the jar at a suitable angle.

It is as well to put the end of the hose in the jar and start the cold water circulating before the kettle boils. If the jar was heated up by the steam before the tap was turned on, there would be a risk of it cracking. And a length of hose with steam passing through it is not too comfortable to handle. C. M.

LOCAL LISTENING.

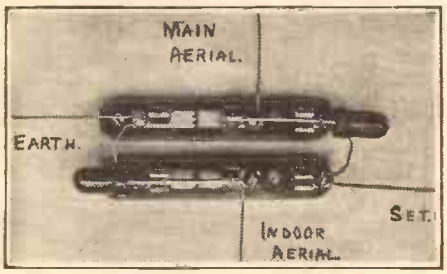
A FEW years ago we were trying out all sorts of circuits in order to get "foreigners." Now we have a job to get rid of them when we want to hear our local station.

We cannot all go to the expense of superhets or even modern selective receivers.

A short time ago my two-year-old set went "off," the trouble being traced to a faulty earthing switch. After being in use a year or two the springs between which the knife rests had got corroded, and in my case one side had actually dropped off. A lot of trouble can be caused by a dud switch —fading, weak reception, etc.

Instead of getting one of the ordinary double-pole, double-throw switches, I bought two single-pole, double-throw type, and connected them up as you see in the photograph.

The earth wire is tapped on to both the screws at one end of the switches, main aerial wire to the centre screw of one of the



The illustration shows how an indoor aerial can immediately be switched in for "local" reception simply by reversing the positions of the two switches.

switches, indoor aerial to centre screw of the other switch, and the wire to the set (aerial terminal) looped across both the screws at the other end of both switches.

In the photograph the main aerial is in use; if you require your local station without a foreigner in the background, reverse both switches and work on the indoor aerial.

This can be a length of rubber-covered wire placed in the picture rail, run round *two* sides of the room, or held up by three insulated hooks, one above the set, and one in each of the two corners of the room. This keeps the aerial an inch or so from the wall, and looks quite tidy. Of course, the earth wire goes also to the set in the usual manner.

If both knives are switched over to the earth side, the aerials are earthed, and the set isolated.

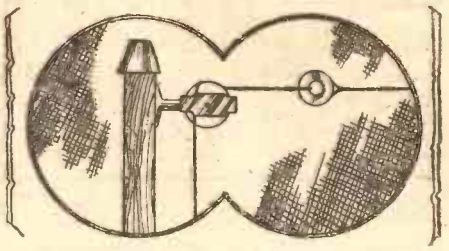
Have a look at your earthing switch (I do not expect you have since you fitted it). If it requires renewing try this little dodge. I feel sure you will be satisfied with the result. W. A. R.

GETTING A CLOSE-UP.

SOMETIMES when a halyard gets twisted, or in some way caught up in the pulley at the top of the mast, it is difficult to see just what is the trouble, especially when the mast is on the tall side.

The decision that the mast will have to be lowered to put matters right is generally arrived at. But quite often, did one but know it, a little jerk in some way or the other might put matters right.

A pair of opera glasses or perhaps field glasses come in very useful here and enable one to see in detail just what is wrong. They may even be used at times to decide



One of those simple expedients of which you might never think ! Examining the top of a radio mast with the aid of field glasses.

whether the aerial wants lowering so that the insulators may be cleaned. A. S. C.

ENERGISING A MOVING-COIL SPEAKER.

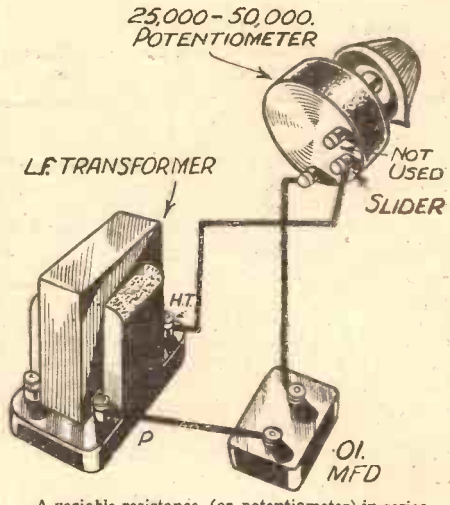
WHEN an all-mains D.C. receiver is used a considerable amount of energy is wasted in the breakdown resistance in the heater circuit.

Part, or in some cases, all of this energy may be used to energise the field of a moving-coil speaker.

It is essential, however, that the speaker field coil is of the correct resistance and is rated to pass the particular current. However, many makers are willing to supply speakers wound with special field coils, and in this case the trouble and cost of using a separately energised speaker may be avoided. C. R.

CUTTING OUT HETERODYNES.

IT is possible to purchase special heterodyne filters in order to cut out the bad whistling that often occurs when listening to distant stations, but a rough-and-ready method can be applied at home.



A variable resistance (or potentiometer) in series with a fixed condenser may be connected across the transformer primary for removing heterodyne whistles.

All that is needed is a variable resistance of about 25,000 or 50,000 ohms (a potentiometer will do quite well) and a fixed condenser of ·01-mfd. capacity.

These are connected in series across the output terminals of the set or across the L.F. transformer primary. Then as the resistance control is turned to reduce the resistance in circuit, the high notes are reduced and with them the interfering whistle. O. F.

ECKERSLEY EXPLAINS-

HONESTLY, the advances that are being made in the design of receivers amazes one—this one—who, after all, spends his life eating, drinking, smelling, feeling, touching and hearing wireless. I must say, however, I've never had any time to be blasé. I hope you feel the same about it all, because the technical side of reception is amazingly encouraging.

* * *

I heard a "super" the other day, but don't run away with the idea that a super is everything (the straight-tuned set is only inferior because it hasn't got such a high-sounding name), and it was grand. Really nice quality automatic control (thanks to double-diode-triode working over a huge gamut of intensities), nice box, a really excellent scale.

I take off my hat and make a profound flourish and give in full measure all my congratulations to the radio trade and their patient, hard-working technicians.

* * *

And you—you who live and learn by the information, sets designed by, and hints and tips given by this journal—you need have no envy, because I suppose the achievements in sets are largely due to the achievements in components. Look at the valves, for example.

I wonder how many of you, rich enough and enthusiastic enough to try for really good quality, indulged a few years ago in a wet battery, a super-cone loudspeaker fed by 8 L.S.5A.'s in parallel? To-day a 30s. moving coil and a good pentode—and behold! the same volume, the same quality, and a mains unit or a cheap battery well within your means.

* * *

The things I want to talk about to-day concerns just the sort of way we may make use of these improvements, particularly in valve design. Particularly the pentode. Particularly the pentode as a combined detector and power output valve—one bottle giving detection, amplification *and* enough power to work a loudspeaker direct.

A pentode will, of course, function as a detector. You see, any grid which is made to go positive sucks electrons into it, and you get grid current. The grid current is, after a certain value of voltage has been passed, proportional to the value of the positive you put on the grid.

One-Valve Amplifier.

If you have a high resistance in the grid circuit *and* you make grid current, then that current which must perforce flow through that high resistance puts negative on the grid. That's the principle of grid-leak rectification.

The signal comes along, makes grid current on the positive swings, this grid current flows in a high resistance which puts negative on the grid and the amount of negative is proportional to the signal intensity.

So the anode current in the valve *decreases* in proportion as the high-frequency signal applied to the grid *increases*. Almost any valve will do this for you, more or less.

A pentode does it beautifully and, moreover, thanks to its high magnification, it does it efficiently. If you can magnify

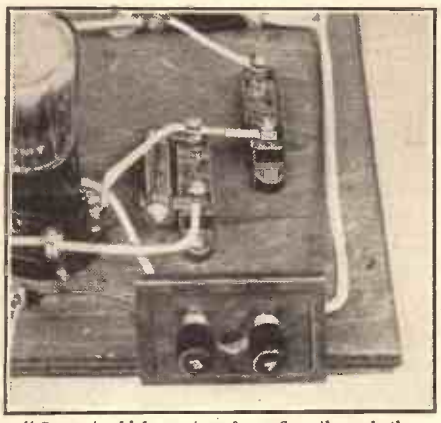
After paying a tribute to the modern technicians, P. P. Eckersley settles down this week to talk about pentodes. He outlines a new type of set which uses a pentode as combined output valve and detector, and also utters a warning about the effect of reshuffling Europe's wavelengths.

your signal to about 3 volts to apply to your pentode grid, you've got a detector plus an amplifier and you can connect your loudspeaker slap in the anode circuit of that pentode.

Visualising a Circuit.

Well, perhaps not quite so slappy as that, because you've got to have a choke

THE GRID LEAK'S FUNCTION



"Current which must perforce flow through the (grid) resistance puts negative on the grid. That's the principle of grid-leak rectification."

to prevent the high frequency from producing nasty dampings on its input circuit.

I see the general outline of a very nice set. It has a four-ganged condenser, peak tuned (I'll tell you why later), two high-frequency magnifiers and a pentode as combined output and detector, 3 valves in all.

Why peak tuned and no band-pass? Well, I've said something about this before, and it's because, with peak tuning, you get a high ratio of wanted carrier to unwanted carrier which you do *not* get with band-pass. But it cuts off the top frequencies of modulation? Yes, but that's where the pentode comes in!

The Birth of a Set.

The pentode is a very high-impedance valve and the loudspeaker transformer rises in impedance as the frequency goes up. So the pentode tries to augment the upper frequencies while the peak-tuned circuits tend to diminish them. Result, if you are clever, an overall flat response.

So here's a set in genesis: a three-valve set and not bad either. One of these days I'll give away all my secrets and design it for you, and you can have something highly modern, highly ingenious and redolent with modern technique. But—and this is a real secret—I'm waiting until two new inventions become public property, and then—we'll see!

* * *

By the way, I see that some manufacturers are going in for the labelled scale, Brussels here, Motala there, Daventry, Regionals, Nationals and the rest clearly marked. What's going to happen when this new plan—purely courtesy title—gets going and there's a reshuffle of wavelengths?

What amazes me is that the manufacturers do not get together and have a voice in these vast governmental conferences in order that the trade may have an influence in deciding the destiny of the service by which they live.

* * *

I am working a new way of doing broadcasting altogether—using the wire, in fact. But that's a baby as yet, and you and I must always hanker after the hobby.

I do not think, as some manufacturers appear to, that the wire will be a serious rival for a long time to come. So it behoves us to think about the majority. But the majority has a right to kick, and should be seriously discouraged by the present state of European broadcasting.

What's the good of pentode detectors and peak tuning and better loudspeakers and all that if the "authorities" cannot put their house in order? I'd like to take a running jump at the politicians of the Union. They're just mucking up everything. But it's not all over yet, and it won't be better before it's worse.

THE MIRROR OF THE B.B.C. By O. H. M.

THE FUTURE OF WIRELESS EXCHANGES

Vacancies at Broadcasting House—B.B.C. Advertising—Reinstituting Piano Interludes—What Would Happen?

IMPORTANT moves are taking place behind the scenes with regard to the future control of wireless exchanges. These have grown to become a considerable industry with subscribers of now about 200,000 and many more to come.

On the face of it the growing popularity of wireless exchanges would seem to indicate corresponding prosperity. The truth, however, is that the standard rates of subscription (from 1s. 6d. per week) really leave a very small margin, and then only when the business is conducted not only on a big scale, but also with great care and economy. Both the Post Office and the B.B.C. follow the progress of the exchanges with keen interest.

The time is not far distant when an attempt will be made to bring the exchanges either into the orbit of the Post Office or that of the B.B.C. I do not see this happening until the new Charter of the B.B.C. for the period beginning January 1st, 1937, has been approved by Parliament.

TO CRITICISE THE FILMS

Mr. Oliver Baldwin, the son of the Lord Privy Seal, is to be the next B.B.C. film critic. If wide experience of films in particular and life in general, coupled with unorthodox views on nearly everything, make a good critic, Mr. Baldwin should be worth listening to.

Jobs in the B.B.C.

Current schemes of reorganisation and development are creating an exceptional number of fresh opportunities of employment in the B.B.C. It is true that the existing staff is being reabsorbed and promoted wherever possible, but vacancies none the less are occurring and will occur in considerable number, mostly on the executive side.

This naturally raises the question of how vacancies are filled. If one asks the B.B.C. one is informed that fortunately that institution is not tied by any civil service red tape or, for that matter, by any rigid regulations in the selection of its staff.

Probably it is a good thing for broadcasting that B.B.C. officials are not civil servants. I am not sure, however, that it is entirely beneficial to broadcasting or to public confidence that there should be no established practice of the public notification of vacancies.

Broadcast Advertisements.

There is shortly to be a new phase in the controversy about broadcast advertisements.

Much has been heard of late of the iniquity of Continental stations broadcasting in English to advertise British goods in England. Now, however, attention has been directed to the persistent advertising by the B.B.C. of its own publications, most of which are in competition with outside enterprises debarred from the microphone.

The B.B.C. will have to consider whether it will not be desirable in the long run to establish a consistent policy towards advertisements by putting its own house in order. Incidentally, listeners would be enormously relieved at the disappearance of this persistent pushing of the B.B.C.'s commercial products.

Programme Gaps.

My correspondence leaves no doubt of the growing irritation of the public with the long, silent gaps in the programmes which apparently the B.B.C. seem to pride themselves about. Gaps are now frequently of from five to seven minutes in duration.

There was a time when these were filled by Cecil Dixon and others playing delightful piano music. These interludes, as they were called, became one of the most enjoyable parts of the programmes.

Suddenly they were dropped without adequate explanation. Since that time the tendency has been for the silent intervals to increase.

Not long ago an attempt was made by the Music Department of Broadcasting House to reinstitute the piano interludes,

(*Continued on page* 803.)

FIRST!

A lady's voice has recently been heard announcing B.B.C. programmes. It belongs to Mrs. Giles Borrett, who has previously acted in radio plays and has now been chosen as London's first woman announcer.

THE LISTENER'S NOTEBOOK

Frank comments on recent programmes and on microphone personalities of the moment.

I WONDER whether Hilaire Belloc chose a Sieveking production for his "Mr. Petre," and, if he did, why he thought it needed the help of an organ, a dozen bars of hurdy-gurdy music repeated *ad lib.*, and a full score of effects to get it over. Or did he have all these things thrust upon him?

Lance Sieveking is a great believer in effects. It says very little for the power of Mr. Belloc's prose that it should be thought necessary to give it any support, if you can call these noisesome things support.

* * *

I do not condemn effects entirely, but they must be used skilfully, otherwise they defeat their own ends. Let me explain what I mean.

Immediately I hear that train, for instance, my thoughts fly to the old G.E.R. line, anywhere between Liverpool Street and Chingford. London has its characteristic smells. L.N.E.R. locomotives make different noises from L.M.S. ones. Boat-train locomotives, on the other hand, have a noise entirely their own; and when Mr. Peter Blagden steps off a Channel boat and boards a train shunting through Wood Street, the chain of continuity is immediately broken.

* * *

If Mr. Sieveking is out for realism he must recognise that, just as there are smells and smells, so there are locomotive noises and locomotive noises. Obviously one smell won't do for all smells nor one noise for all noises. These need proper selection.

I do not object to all the effects employed in "Mr. Petre." The docking at Dover, or wherever it was, was all that could be desired. Nothing was held up to let the gulls do their little bit or the *porteurs* earn their bobs; but when the play is well under way it is annoying to have an Italian organ-grinder, complete with monkey, step right in front of you to obliterate your view and to interrupt your train of thought.

* * *

It is worthy, I think, to record my impressions of the lady announcer in action. A pleasing, resonant voice announced Mr. Christopher Stone's weekly recital of gramophone records, then the broadcast of the chairing ceremony of the Royal National Eisteddfod of Wales, and, lastly, Evensong from Westminster Abbey.

I had to chuckle when she announced the anthem to be sung at this Evensong —"Turn Back, O Man." Strange coincidence, that!

* * *

Imagination is a useful asset where broadcasting is concerned. Personally I would rather have the opportunity of using my imagination to the full than to have the help of effects whose suitability is the opinion of one individual.

* * *

The last time I heard Mr. Lloyd George broadcast (in English) I was convinced he had lost a good deal of his vigour. His presidential address from Wrexham (described by the announcer as one of his rare speeches) corrected that view.

Speaking to his own people, in their own tongue, on this tremendous occasion of the "National," he was able to recapture the spirit and vigour that were his in the heyday of his political career. Well, that's how it struck me.

* * *

Didn't you like the Chairing Song, too? With Madam Evans there was none of the artificiality or affectation characteristic of so many sopranos we hear over the air. Just beautiful singing, pure and unalloyed. She was encored, and she sang again. And was it with a *Scotch* air that she obliged? Surely not!

* * *

Dare I suggest that Christopher Stone is wasted talent as long as he confines himself to gramophone recitals? While scores of people could do this job adequately, very few could have given that preliminary talk on the proms as well as he did.

He revealed such a perfect understanding of the ordinary listener's mind that it seems a tragedy he isn't given wider scope for his rare talent. In manner he was no less successful.

I can offer no greater praise than by saying that in this talk Christopher Stone was reminiscent of A. J. Alan and S. P. B. Mais at their best. The resemblance to these two popular broadcasters was, at times, very striking.

* * *

Talking of understanding reminds me of an incident, now a week or so old, when the B.B.C. showed a complete lack of it. It was the occasion of the Chief Scout's talk from Goedoelloe.

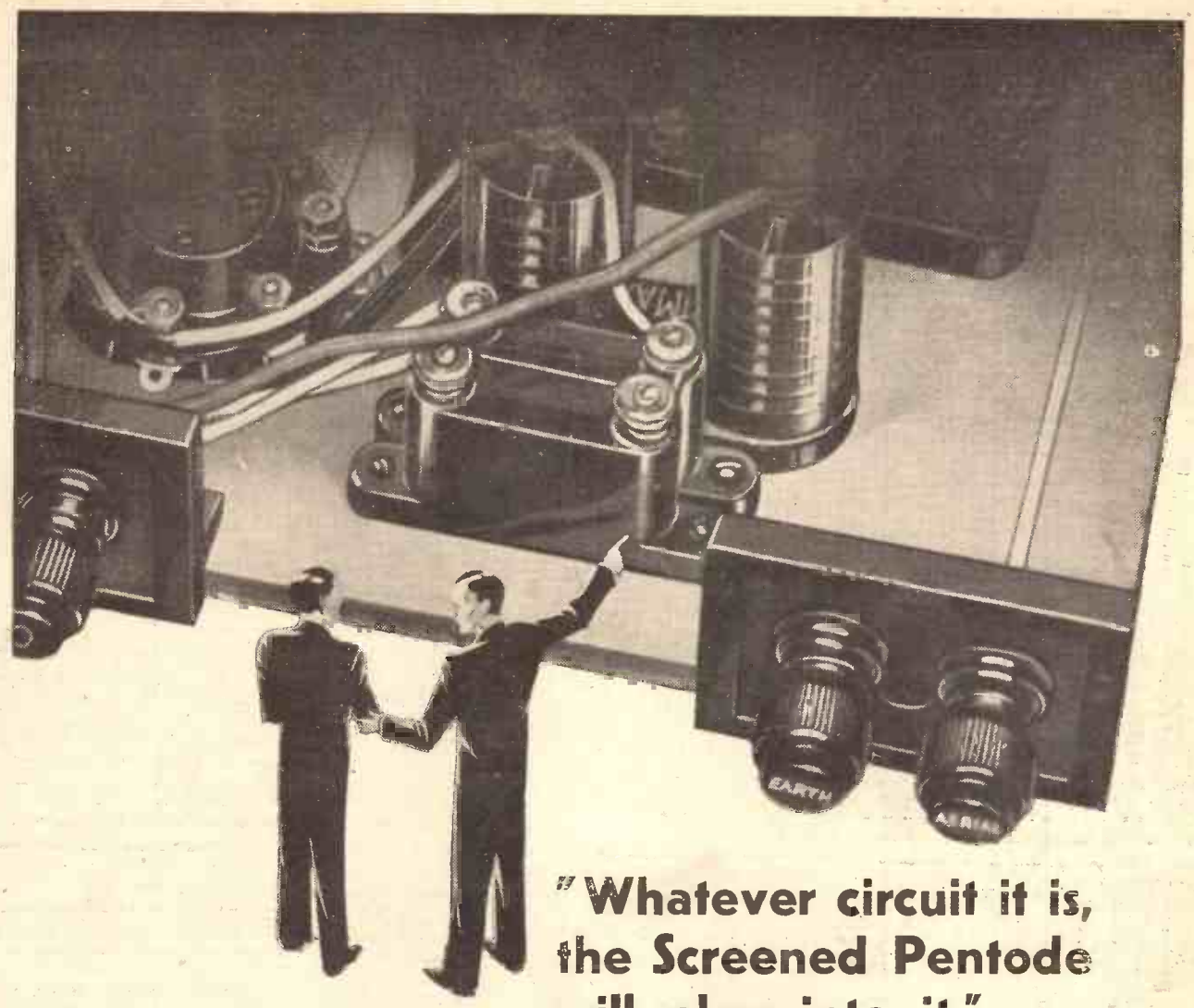
You remember it? The talk that didn't come off in spite of a prolonged wait. It is about the worst incident I've experienced during several years of listening-in.

I suppose it can all be explained satisfactorily; but as the one or two official announcements during the wait were at their best only half-truths, nor was the B.B.C.'s threat to resume the scheduled programme at 9.25 p.m., if the Chief Scout was found, kept, one felt one had been fooled.

* * *

The B.B.C. helped to while away the time by putting on a couple of records —absurd records for the occasion. It

(*Continued on page* 804.)



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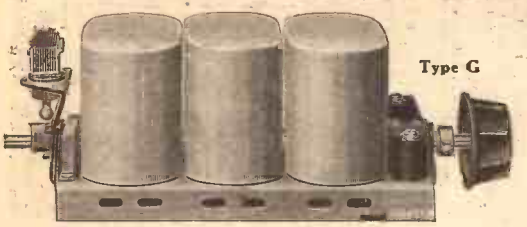

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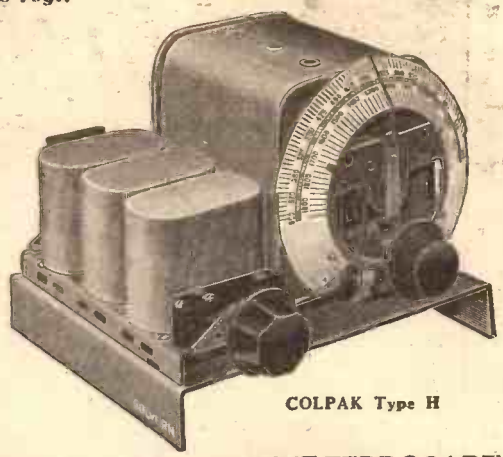
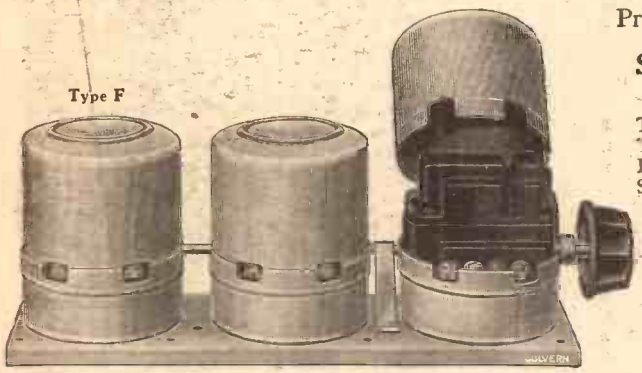


COLPAK Type H



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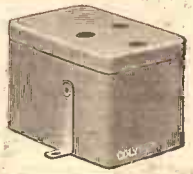

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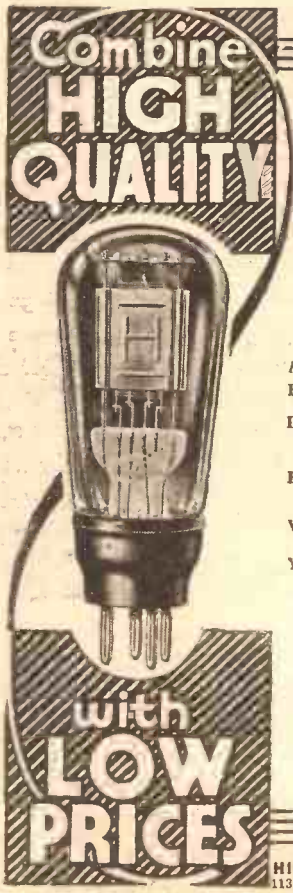

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The ADVANCE in SETS

ONE of the most striking features of the Exhibition this year is the tremendous progress that has been made in the design of commercial receivers.

Never before have so many new principles of reception been concentrated in a single exhibition; never before has the intending purchaser had such tempting bait as that which is offered on the Olympia stands of almost all of the commercial set manufacturers.

Considering for the moment the question of sets alone, the Exhibition is one of which the industry can justly be proud. It will stand out in the annals of radio as one of the most progressive shows that has ever been staged, and not without ample justification.

For quick to seize upon the manifold advantages of all the new valve and coil developments of the past six months, the commercial set manufacturers have worked

THE VARLEY SUPERHET RADIO-GRAM

A fine five-valve superheterodyne receiver employing automatic-volume control and one-dial tuning. It is designed for A.C. mains, using a synchronous motor and specially designed moving-coil speaker. As handsome in appearance as it is excellent in design.

with feverish but exacting haste upon the production of what must now be considered as the finest sets in the world. And they're British!

But the glad tidings do not end there.

What is perhaps one of the most encouraging signs of the times is the present almost amazingly low level of prices. Increased production facilities consequent upon the rapidly expanding demand for good sets have helped to bring down the manufacturers' overhead charges, and the results have been passed on to the public in the welcome form of substantially reduced prices.

An Inspiring Show.

It is desirable to mention that fact because there is a tendency to regard lower prices as an indication of poorer quality. Actually quite the reverse is the case. The standard of commercial receivers generally, as is so strikingly exemplified in the exhibits at Olympia, has never been higher.

From the finish of the cabinet work to the finer details of circuit design the galaxy of sets displayed is second to none. It is a most inspiring show, and those of you who have already paid a visit to Olympia will not have any difficulty in agreeing with us. As for the others—well, there are still a few more days before the doors at Hammersmith are finally closed,

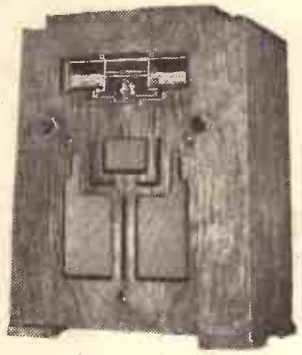
TELSEN

The appearance and performance of this addition to the Telsen show range are well up to the standard, which listeners have come to expect from the famous house which made the "Golden Voice."

Never before have the commercial set manufacturers been able to offer such a remarkable display as Olympia, 1933, provides.

The innumerable developments of the past six months have been combined with an all-round reduction of prices. Cheaper costs—better quality: that is the tendency for the coming season.

By G. T. KELSEY.



MARCONI-PHONE MODEL 260

Battery users are remarkably well catered for by this Marconiphone receiver, which has a moving-coil speaker, and is a fine example of how good really good workmanship can be!

and if you can possibly get along your visit will be amply rewarded.

Meanwhile, a brief survey of the most outstanding changes will not be without interest, especially to those to whom a visit to Olympia is out of the question.

Considering the Exhibition as a whole, there are three major aspects of the present tendencies in commercial receiver design which cannot fail to impress. The first is the tremendous come-back that has been staged by the superhet.

H.M.V. CONCERT SEVEN

Another example of superheterodyne design incorporating automatic-volume control. Static suppressor and threshold-sensitivity control are other features of this worthy product of a famous firm.

Almost all of the leading manufacturers are displaying superhets of one type or another, which, considering the suitability of this type of receiver for modern conditions, is not really surprising. But what *is* a welcome surprise is the fact that you can now buy an all-mains superhet in several of the leading makes for less than what you would have had to pay this time last year for a quite ordinary three-valver.

(Continued on next page.)

FERRANTI GLORIA SUPERHET

An incorporated electric clock and a novel tuning dial help to make attractive this new Ferranti design. Yet another example of the popularity of the superheterodyne circuit in modern design and one of the best of the 1934 receivers.

THE ADVANCE IN SETS

(Continued from previous page.)

Fifteen guineas—the price of a straightforward "Three" of twelve months ago—will now buy a first-class all-electric superhet model in any one of a dozen or more of the leading makes. Ferranti, H.M.V., Ekco, Marconiphone, G.E.C., Varley, etc.—names that are to radio what the lion is to a piece of silver—are all producing models for fifteen guineas or less, and very fine instruments they are, too!

G.E.C. SUPERHET EIGHT

The latest advances in valve technique, including H.F. pentode, double-diode triode and "Catkins," are employed in this new mains receiver, which also uses automatic volume control and noise-suppression apparatus.

But in the wave of enthusiasm for reasonably priced supers of the all-electric type the manufacturers have by no means neglected the battery user. Indeed, the amount of attention that has been given to the requirements of those without mains is strikingly in evidence in the number of excellent designs exhibited. It is the second of the three major impressions which become implanted in the mind of the visitor to Olympia.

It is true to say that Class B is all the rage in so far as commercial receivers of the battery-operated type are concerned; but then, when one considers the manifold advantages of this method of amplification, that is a welcome state of affairs which was only to be expected.

Benefiting Battery Users.

The "Class B" slogan of "mains output from a battery set" is one that is bound to catch on, especially in view of the fact that in all important respects it is true. Moreover, the question of increased economy of operation which results from the use of this method is one that will be considered by many people as of equal, even if not of greater, importance than that of quality of reproduction.

Class B definitely does put battery sets on a par with certain of those of the mains types, and on this score alone the commercial receivers in which it is employed are bound to come very much into the limelight during the coming season.

Notable examples, which you can see for yourself at Olympia, are the Cossor "Class B" console model 3456, a four-valver costing £9 19s.; the Portadyne P.B.5, a five-valve portable in the 13-guinea class; the Clarke's "Atlas Class B" four, an excellent instrument giving an output of 2½ watts and retailing at £11 17s. 6d.; the Ferranti "Mercia," a five-valve superhet portable at 16 guineas; the G.E.C. "Superhet Six," an ambitious battery model at the remarkably low price of £14 17s. 6d.; and the Lissen "Skyscraper 7," which, at £11 10s. complete, is, from the point of view of price, perhaps the most outstanding design of the whole show. In every one of these instances "Class B" output is employed.

COSSOR "CLASS B" FOUR

"Class B" amplification has been used to the very best advantage in the Cossor receiver shown here, a receiver which is more ambitious in appearance than the ordinary run of battery models. Single-dial control, moving-coil speaker and the new Cossor method of wave-changing are other features of a design which will enhance, without doubt, the Cossor reputation.

CLARKE'S ATLAS B4

Here, again, Class B has been well employed in a four-valve receiver with an output of 2½ watts. The cabinet design is significant as showing the complete abolition of convention and an entirely successful attempt to link beauty and utility.

Two other shining examples of the tremendous progress that has been made in the design of battery-operated sets are the Columbia model 1001 C.Q.A. Four and the Marconiphone model "260."

R.I. MADRIGAL SUPERHET RADIO-GRAM

The work that has been put into making this receiver among the very best, in appearance, of the show models has been equally expended on the design and construction. A superheterodyne circuit is again employed, attention has been given to noise suppression and a moving-coil speaker is incorporated. An addition to the R.I. range of which makers and listeners alike may well be proud.

The Columbia set, which is priced at 11 guineas, employs an improved form of quiescent push-pull output; and in the design of the Marconiphone model, which costs £11 17s. 6d., the output takes the form of what, to give it a non-technical description, is a cross between Q.P.P. and Class B.

It is a development by the Marconiphone engineers, and, like the scheme employed in the Columbia 1001, it is every bit as successful as the orthodox "Class B" method.

In the case of almost all of these modern battery-operated sets it is interesting to note that the average H.T. consumption is in the neighbourhood of 10 milliamps, a figure which in many cases is actually less than was required for the operation of a set of twelve months ago, and which was then capable of giving only half the output. No wonder that "Class B" and the other equally successful economy schemes have caught on!

Studying Appearances.

The third welcome feature of this year's designs is purely a domestic one. Never before have such painstaking efforts been made by the manufacturers in the matter of cabinet work.

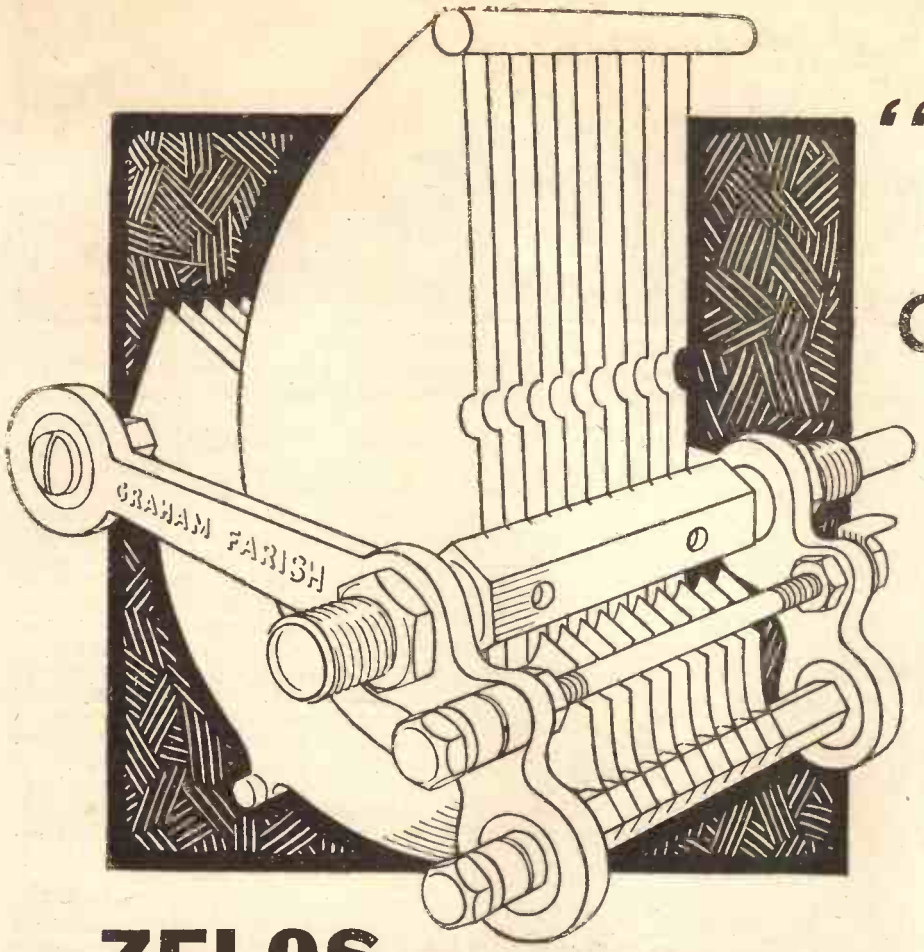
The general tendency seems to be towards cabinets that are restrainedly modern in appearance, but, irrespective of the question of design, real cabinet craftsmanship is evident in almost every one of the models exhibited. A determined effort has been made to establish a complete breakaway from the unconventional and, in many cases, uninteresting-looking designs to which the industry has been fettered for years.

COLUMBIA BATTERY RADIO-GRAM

The first battery radiogram to be produced by Columbia—the "C.Q.A."—employs pentodes in push-pull for both radio and gramophone working. The Columbia pick-up, of course, is used, and the whole instrument is certain to be welcomed as well worthy of the name it bears.

With what measure of success the attempt has been made you can judge for yourself from the pictures accompanying this article, or, better still, by a visit to Olympia. But, under whatever circumstances you examine them, you will be forced to the conclusion that a modern radio instrument is very definitely an asset to any furnishing scheme.

Definitely, this year's sets are second to none, and the intending purchaser who up to now has pursued the "wait-and-see" policy will have to wait a very long time for anything appreciably better than the models which are now available. Buy now, at the present low-price levels, for there is a possibility that prices may ultimately rise.



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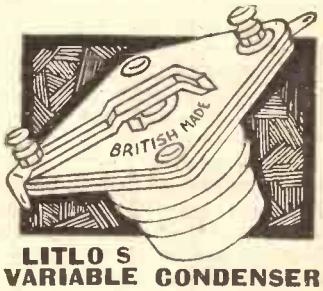
ZELOS VARIABLE CONDENSER

A superb component, possessing extreme rigidity of construction, mechanical perfection of moving parts and high electrical efficiency. Negligible H.F. loss, large accessible terminals, shaft provides easy ganging. Capacity ·0005. EACH 5/-



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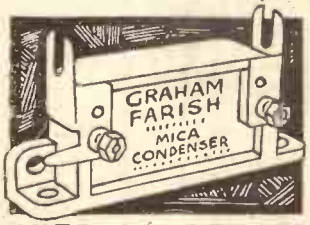
Each **2/-**



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THE NEW GERMAN BROADCASTING

By A.A.GULLILAND

This article gives a short resume of the latest broadcasting developments in Germany, and discusses the effects of Nazi radio on neighbouring countries. It incorporates an interview with Eugen Hadamovsky, Germany's new radio dictator.

SINCE July of last year, when the German government of the day decided to reorganise radio to obtain full control of the broadcasting system, keen observers have been waiting for the new organisation to settle down. Last November new statutes were issued, and almost simultaneously the Political Broadcast Commissioner resigned. Finally the complete reorganisation plan of the time was upset by the advent of the National Socialist government.

On January 30th Dr. Krukenberg took over, and later started a big "cleansing" action. This led to the resignation of some 300 persons hitherto employed by the broadcasters.

Creating a New Regime.

Every one of the old programme directors and a great number of the managing directors and heads of departments were among this number. Well-tried National Socialists took their places.

But the National Socialist broadcasting experts were not content. German radio, they felt, was not wholly theirs. Traces of the old traditions remained. In June, 1933, the post of radio commissioner was abolished, an outward sign of the new relationship between government and broadcasters.

Shortly afterwards Chancellor Hitler, in a decree dated June 30th, put an end to the period of transition by officially placing the control of German broadcasting in the hands of the newly appointed Minister for the Enlightenment of the People and of Propaganda.

A few days later this Ministry obtained full control of all those organisations and persons closely connected with broadcasting which exist outside the broadcasting companies, viz., radio manufacturers, radio trade, radio critics, radio Press, television, listeners as far as they are organised. A National Socialist "Reichs-Rundfunk-Einheit" (a "Unit") was formed, counting the above organisations as members.

And again, some two days later, Dr. Krukenberg was sent on leave and Mr. Eugen Hadamovsky was appointed his successor as managing director of the Reichs-Rundfunk-Gesellschaft. This appointment sets the seal on the old order of things in German radio.

CONTROLS 'GERMANY'S DAVENTRY'

The direction of the German National station's programmes is under Otto G. Stoffregen.

MUNICH'S PROGRAMME DIRECTOR

Richard Kolb, a former radio critic, has now been given the opportunity of translating his theories into practice, as the post of programme director at Munich has been accorded him by the regime.

Mass Propaganda.

Unlike Russian radio, German stations are situated in the centre of Europe. Whatever uses they are put to immediately affect surrounding countries, and also the general development of broadcasting on the Continent.

Now German radio has become wholly National Socialist. Persons not embracing the cause wholeheartedly have been and will be swept away mercilessly, for German radio has been given the most important job that any means of mass propaganda has ever been given: the task of winning over to the cause of National Socialism those parts of the German people which have not already embraced in their innermost hearts the cause of Adolf Hitler.

The very fact that the countries surrounding Germany are opposed to the new rule as far as it would attempt to affect their nationals gives ample ground for present and future friction.

Already Czecho-Slovakia has prohibited the listening-in to German stations outside the immediate circle of the licence-owner's family. Should he have guests in his house he must not switch on a German programme without making himself subject to prosecution. This is only one case in point.

The Men in Control.

Who, then, are the new men in German radio, and what will be the result of their influence?

Dr. Goebbels, the Minister of Propaganda, is the supreme head. He has officially declared that he considers news broadcasts by certain foreign-to-Germany stations to be aimed at Germany; he has termed it "provocative propaganda against Germany," and he has announced "effective counter-propaganda."

Immediately under Dr. Goebbels we have Mr. Horst Dressler-Andress, head of the radio organisation of the National Socialist Party, and at the same time head of the radio department in the Ministry for

(*Continued on page* 772.)

A BROADCAST INTERVIEW

Eugen Hadamovsky, described as Germany's radio dictator, at the microphone, being interviewed by a radio reporter.

Wherever wireless terms are understood "Ohmite" means "The Best Resistance"

"Better than wire wound."

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HEAVY DUTY TYPE 2/3

Safe maximum current carrying capacity of "Ohmites."

100° F Temperature Rise

Ohms.	Milliamps.	Ohms.	Milliamps.
1,000	40	20,000	8
2,000	35	30,000	6·75
3,000	29	40,000	6
4,000	24	50,000	5·5
5,000	20·25	60,000	5
10,000	12	80,000	4·24
Other values pro rata		100,000	3·5

Safe maximum current carrying capacity of "Ohmites" Heavy Duty Type.

100° F Temperature Rise

Ohms.	Milliamps.	Ohms.	Milliamps.
1,000	80	20,000	16
2,000	70	30,000	13·5
3,000	58	40,000	12
4,000	48	50,000	11
5,000	40·5	60,000	10
10,000	24	80,000	8·48
Other values pro rata		100,000	7

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THE NEW GERMAN BROADCASTING

(*Continued from page 770.*)

Propaganda. Next to him we have Mr. Eugen Hadamovsky, Director of Transmissions, managing director of the Reichs-Rundfunk-Gesellschaft, and organiser of all the big German government broadcasts.

Eugen Hadamovsky is 28 years old. He is a native of Berlin, and has been active in politics since his student days. He was the originator of the National Socialist radio listeners' organisation.

In May of this year he published an interesting book in which he lays down his creed on propaganda and political power. In one of the chapters he forecast the development which German broadcasting has just been subjected to.

Explaining His Ideals.

Mr. Hadamovsky has the deep-set, dark eyes and the ascetic features of the fanatic. We believe him when he announced that in future German broadcasting would only harbour "servants of the cause."

In an interview which he kindly granted me, he explained his ideals. Broadcasting is a means of influencing the minds of the masses, and is therefore a force which would make this possible. But beyond that and to the same ends all those concerned with broadcasting must follow the "Leader" (Führer); therefore the "Unit" was created, by means of which broadcasters, manufacturers, trade, critics and listeners are kept together.

GERMANY'S RADIO DICTATOR

Twenty-eight years of age, Eugen Hadamovsky has the destiny of German broadcasting in his hands. His intention is to employ radio as the servant of the National Socialist cause, and no criticism of the new order will be permitted via German microphones.

If he succeeds, and there seems little room for doubt, German broadcasting will certainly become the most important instrument in the hands of the German government, as from first director to last listener, from manufacturer to trader, from publisher to critic all are organised in the big "UNIT."

Does this mean that political broadcasts will occupy the largest part of the programmes? Mr. Hadamovsky told me that this would not be the case. An overdose would be fatal. For what would be the use of programmes which nobody would listen to? On the other hand, no item dare be against National Socialist principles.

Effect on Etheric Peace.

I already stressed the danger of National Socialist broadcasting to the peace of the European ether. Unluckily, or perhaps luckily, broadcasting does not need national frontiers.

So that the moment the Munich station, for instance, starts a series of broadcasts on conditions in Austria viewed from the National Socialist point of view, Austria will retaliate by counter-broadcasts. If the broadcast is found to be seriously offending, some poor ambassador has to protest, and nothing ever happens.

The new régime has been merciless in its treatment of exponents of the old. An old building has been demolished, and no man could do that without breaking something.

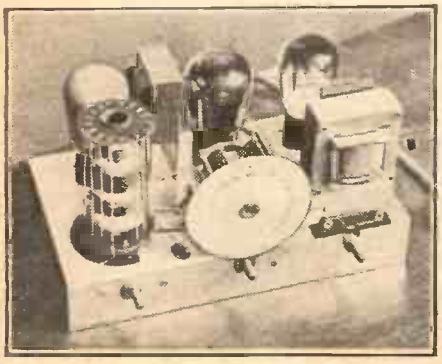
A new building is in the course of construction. Eugen Hadamovsky, Horst Dressler-Andress, Otto Götz Stoffregen (programme director Deutschlandsender), Richard Kolb (radio critic and author since 1924, now programme director in Munich) are the names of the architects.

HITLER'S NATIONAL SET

Our Berlin correspondent gives exclusive information and circuit details of the new broadcasting receiver which the German Chancellor has ordered the radio industry to manufacture at a price within the reach of every German.

THE German Ministry for Propaganda considers radio the best means of keeping in close touch with the people and influencing them. But what is the use of broadcasting if you haven't got a goodly percentage of listeners? Germany only has about six per cent listeners against Great Britain's over ten per cent.

FOR THE GERMAN PEOPLE



It enables Hitler to speak to every home.

The new German government has been unable to lower the licence fee of two marks a month (24 shillings a year at par), but it has exercised its influence with the radio industry to produce a really good low-priced receiver which will enable loudspeaker reception of one regional and the Königs Wusterhausen station, at the very least, in all parts of Germany.

Mass Produced.

The set, which will be manufactured according to a design and drawings issued by the Manufacturers' Association's central office, will cost 76 marks, complete with valves and loudspeaker, and this small sum can be paid in instalments, if desired. All the 28 German firms will produce the set, each firm getting a certain quota. Output will be centrally checked to obtain uniformity. Traders and manufacturers have been asked to cut their profits to a minimum for this set; on the other hand, the design is such that room remains for a better quality set for those who wish to pay for it.

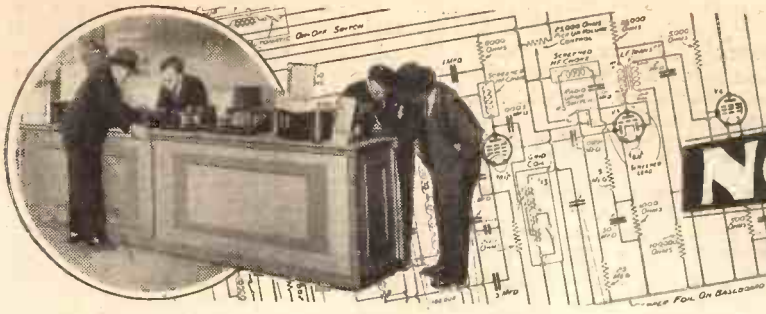
Available in Three Types.

The set will be made in three types, all of which will be on the market in time for the opening of the German Radio Exhibition. The A.C. mains type is to be made in the largest number. The D.C. type follows, and the battery type will be last. The mains sets employ two valves each (D.C. 20-volt type, A.C., one indirectly heated; one directly heated pentode valve), and the battery set three valves.

MODELS FOR MAINS AND BATTERIES

The receivers will be available in mains and battery types, the two mains versions being shown above. On the left is the D.C. Model and in the centre the A.C. Chassis with its cabinet.

The circuit is straightforward with capacity reaction on aerial, leaky-grid detector, and a resistance-capacity coupled pentode output stage, which supplies 3 watts in the case of the A.C. model. Battery manufacturers are producing a special high-capacity (2·5 amp. hour) anode battery at the absurd price of RM. 6.90. A reserve set of valves will cost 17 marks for A.C. model.

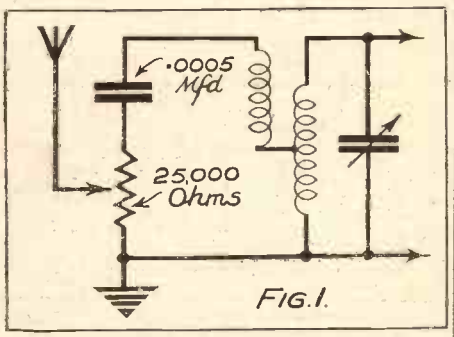


NEW CIRCUITS at OLYMPIA

This is eminently a "breakaway" year, when old circuits are being discarded in favour of new and improved ones. In this illuminating article some of the ingenious arrangements which will provide listeners with better radio are discussed and the intricacies of modern design made clear.

IF all the circuits of all the sets shown at Olympia were collected together in one easy-to-handle book (it would be a pretty big book, by the way) some months would still have to be spent before a complete analysis could be made of them.

NO OVERLOADING



In the H.M.V. "Superhet Selective Five" the aerial input is controlled by a potentiometer, so that there is no likelihood of overloading even on the most powerful nearby transmission.

The wealth of advanced technique and ingenuity embodied in such a collection is staggering to contemplate.

Fortunately for the home constructor, little or no attempt is made to keep all such information secret. Indeed, most of the firms freely publish full circuit details of their sets.

Dissecting Circuits

And the constructor should take advantage of the opportunity afforded by this. With the kind of knowledge gained from a more or less careful study of the circuits published in "P.W." from week to week he will be able to spend many interesting moments browsing through the theoretical expressions of commercial practice.

But he must realise right at the beginning that it is not so much in broad principles as in refinements and details that the various

> "... these refinements and details must not be underestimated. They constitute the major portion of the progress made in the past few years."

circuits of similar classes differ the one from the other.

On the other hand, these refinements and details must not be underestimated. They constitute the major portion of the progress made in the past few years, and their importance is a measure of the advancement of British radio.

But let us, in imagination, wander around the Exhibition and choose quite haphazardly a few circuits and see what they embody.

Here is the "Superhet Selective Five," due to H.M.V.—a compacted medley of vitally useful novelty and refinement if ever there were one. See if you can dissect it, removing sections, as it were, and, stage by stage, unravelling the processes.

Start at the aerial. You will note that either an ordinary aerial or a mains aerial can be used, and that the latter is obtained by joining the aerial terminal, through a ·0003 mfd. condenser, to the mains input of the set.

The "front door" of the circuit is particularly interesting. The aerial input is controlled by a potentiometer (see simplified circuit, Fig. 1), and reaches the combined oscillator and first detector valve via a band-pass arrangement.

Inductances in series with the cathode of this first valve provide for the "mixer"

VALVE ADVANCES

The use of multi-electrode valves as an aid towards simplifying and improving set design is increasing. There are now valves having as many as five grids, while other new types, such as the double-diode, triode and pentode, are of particular value in automatic volume control (A.V.C.) circuits. The valve shown is the latest Cossor double-diode pentode.

coupling. And—— But we will leave the rest for the constructor himself to unravel.

He will note that a similar kind of aerial feed figures in that totally different set, the Columbia C.Q.A. Battery Radiograph, which is a variable-mu S.G. set with quiescent push-pull.

But, as a comparison between Fig. 1 and Fig. 2 plainly shows, the scheme is not applied in identically the same manner.

It is fascinating to note the multitude of different applications of the same thing. Take such a simple example as the field winding of an energised moving-coil loudspeaker.

You all know one use for this, additionally to the building up of a magnetic field for operating the speaker itself. To act as a smoothing choke as well, of course! You find this in the "Varley Square Peak Superhet" and many other sets.

But an inspection of the circuit of the "Cossor All-Electric Receiver Model 533" reveals that here the speaker field winding is also used as an output choke (see Fig. 3).

There is a fairly hefty output valve, and

> "This is styled 'quiet tuning.' That is, as the set is tuned from one station to another there is dead silence, all background being entirely eliminated."

the anode current taken by this is ample for the energising purpose.

Yet another second use for a speaker field winding is to be found in the Ferranti "Gloria" Superhet, where, in an ingeniously simple manner, the voltage drop across it is utilised for providing grid bias. This is illustrated in skeleton form at Fig. 4.

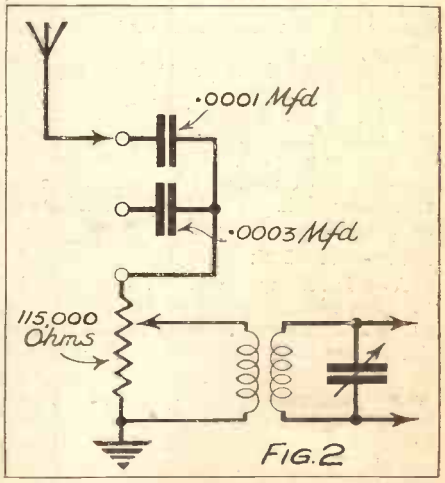
Grids in Profusion

Some of the diagrams look rather complicated at first sight. One or two give the impression of a multi-electrode valve designer's nightmare!

For instance, we have before us as we write a circuit in which the first valve has

(*Continued on next page.*)

INPUT CONTROL



A special resistance-controlled aerial input is also employed in the Columbia C.Q.A. battery Radiograph, a highly-efficient receiver capable of supplying a large output.

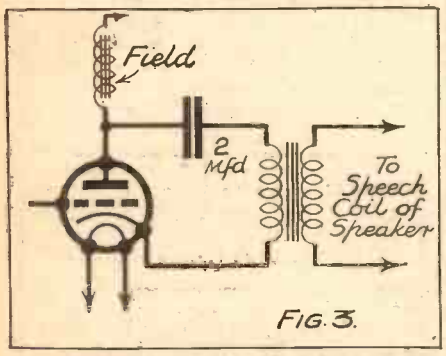
NEW CIRCUITS AT OLYMPIA

(Continued from previous page.)

five grids and the second valve has three grids. The third valve possesses only one grid, but has three anodes. As a fitting finish the fourth valve embodies three grids. Therefore, including the cathodes (for they are all mains valves), there are no less than 22 electrodes shared by the four valves instead of the 12 there would be if they were all triodes!

In the above order the valves in question are a pentagrid combined oscillator and mixer, an H.F. pentode, a double-diode triode arranged to provide automatic volume control and a pentode output valve.

OUTPUT CHOKE ALSO



An examination of the Cossor all-electric receiver, Model 533 circuit reveals the fact that the speaker field winding is also used as an output choke.

You cannot absorb such a circuit en bloc in the way one can a straightforward H.F. Det. L.F. hook-up. There are too many overlapping functions. But, taken slowly and carefully stage by stage, you will not find it difficult to sort it out.

You will facilitate the process if you can achieve the knack of disregarding details not relevant to the main principles of the circuit.

For example, most of these modern circuits are liberally studded with fixed condensers. But the work of the majority is merely that of bypassing.

Then all those electrodes: in the pentagrid two of the grids are nothing but screening grids, and the same applies to the pentode. In the double-diode triode two of the anodes are often joined together to function as a simple diode in conjunction with the cathode, which is common to the other elements in the valve.

As a complete alternative to the above orgy of valve electrodes you will find it in the nature of a relief to turn to a circuit produced by Westinghouse, in which two of their wonderfully useful Westector "Cold Valves" appear.

Novel H.T. Economiser

One of these functions as a detector, while the other operates as an H.T. economiser and reduces the H.T. current when it is not desired in full for the louder passages. A valuable and quite original system.

Another circuital development of importance is to be found in the R.I. superhet. This is styled "quiet tuning." That is, as the set is tuned from one station to another there is dead silence, all background being entirely eliminated.

The way this is done is to paralyse one of the intermediate valves by applying a positive bias. But when a station is tuned in the signal impulse wipes out this bias and the set springs into life once again.

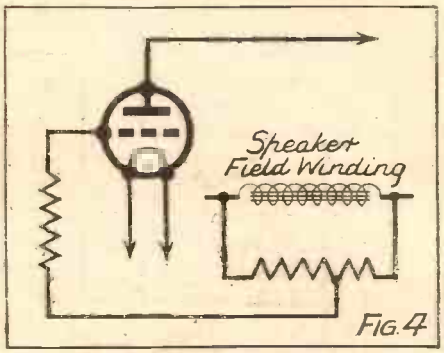
A new symbol appears in many of the circuits. At least, if the actual symbol is not new its significance certainly is. We refer to a tiny inductance symbol that is to be seen nestling close to the inductance symbols denoting the field- and moving-coil windings of loudspeakers.

This symbol indicates a "hum-bucking" coil, the object of which is to prevent hum from getting into the speaker's speech coil from the field winding.

Another feature of the modern circuit diagram is that it tends to employ numerous "earth" symbols instead of the single one that figured invariably in earlier circuits.

This has a special significance beyond the simplifying of the drawing. It indicates, or is often intended to indicate, the many contacts made to the metal chassis and metal screens.

PROVIDES GRID BIAS



In the case of the Ferranti "Gloria" superhet the voltage drop across the loudspeaker field is utilised for providing grid bias.

ADJUSTING A GANGED RECEIVER.

Some notes on how best to perform the essential preliminary operation of trimming a gang-condenser.

PRACTICALLY speaking, it is not advisable to attempt adjusting the trimmers with a naked hand, and in this respect an insulated tool, such as a screwdriver or a pair of pliers, must be employed. If preferred, a piece of wood shaped at one end can be used quite satisfactorily.

With one of the above tools on hand all the trimming knobs projecting from either the side or top of the condenser, according to its type, must first of all be screwed in, as far as is possible, without straining the threads, then unscrewed about three or four turns each. In this way the trimmers are set near enough equal.

A Two-Point Check

At this setting a weak station must be tuned in on the receiver at the lower end of the dial at a wavelength of approximately 230 metres, and the trimmers adjusted for maximum signal strength as though they were ordinary tuning condensers. When satisfactory results are obtained, the dial must be turned to another weak station, but this time higher up at a wavelength of about 450 metres.

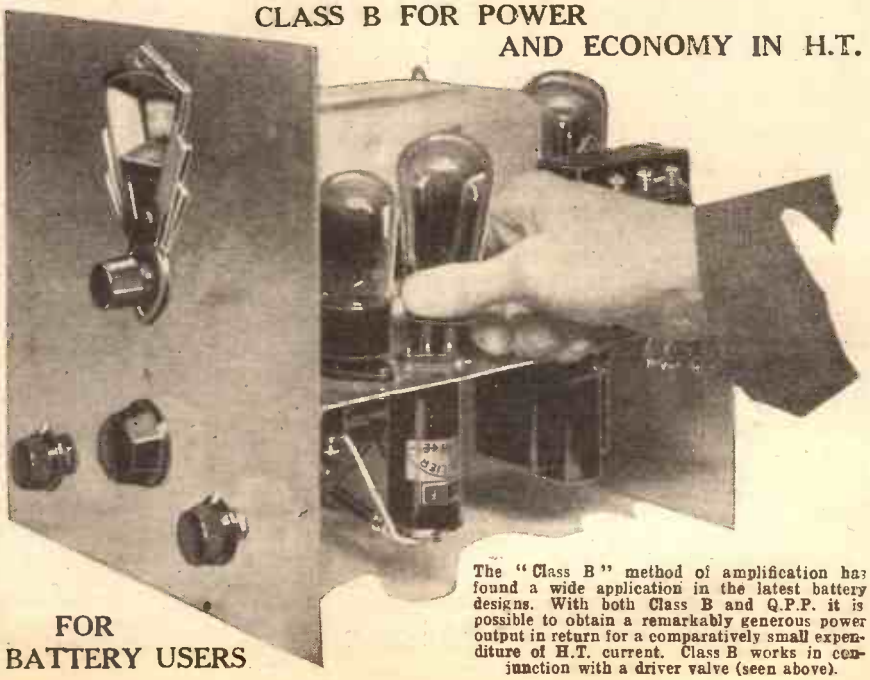
The trimmers must now be slightly re-adjusted, and at the same time the listener should note whether such readjustment improves reception.

Panel Control

The above method can be applied to all condensers where trimmers are provided; and in some cases where the front section is controlled from the panel by means of a small knob, this must be regarded in the same way as one of the trimmers and adjusted as already suggested.

It would, perhaps, be as well to explain that where a multi-H.F. receiver is to be ganged the metal covering provided to fit over the top of the condensers should be fixed in position during the trimming operation.

CLASS B FOR POWER AND ECONOMY IN H.T.



FOR BATTERY USERS

The "Class B" method of amplification has found a wide application in the latest battery designs. With both Class B and Q.P.P. it is possible to obtain a remarkably generous power output in return for a comparatively small expenditure of H.T. current. Class B works in conjunction with a driver valve (seen above).

POLISHING PANELS

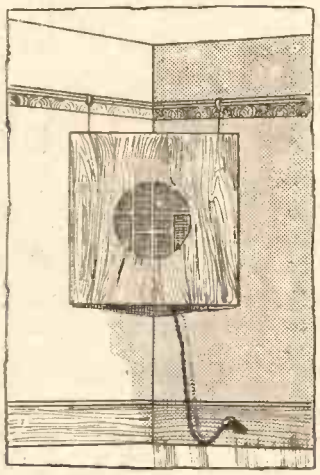
IN repolishing an ebonite panel that has become scratched, I have discovered that after rubbing down with the usual No. 0 glasspaper and then some crocus powder, a real final polish can be obtained by rubbing the then partly polished panel with a soft rag and liquid metal polish.

With a fair amount of "elbow grease" and a liberal amount of patience, I have succeeded in obtaining a polish as good as new.

Rub only in one direction, not forgetting the edges and corners.

LOUDSPEAKER STAND

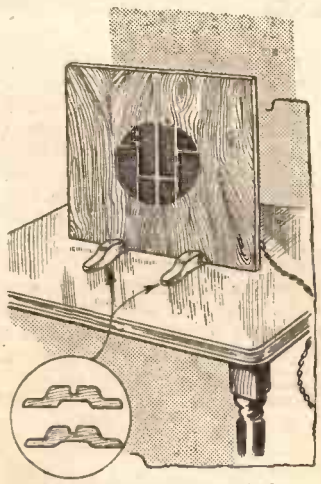
I HAVE just made a speaker, of the corner baffle type, which hangs in my drawing-room, but as I have only



For hanging from the picture rail.

the *one* speaker, I sometimes desire to use it in another room, where there is not a convenient corner to hang it.

I have overcome this difficulty by getting a pair of wooden feet, such as are used in making fire screens, and have slotted each one exactly ⅜ inch

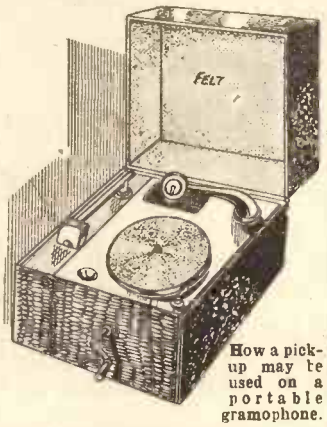


Feet for standing baffle on table.

wide, and deep enough to hold the baffle firmly; the whole can then be stood on the table.

PICK-UP ON PORTABLES

READERS who have a portable gramophone and a pick-up are often faced with the problem of how best to use them. If the pick-up is just screwed on the gramophone, it is found

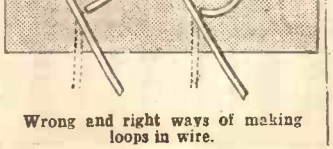


How a pick-up may be used on a portable gramophone.

impossible to put the lid down when playing, and the tinny noise from the pick-up spoils results. I solved the problem this way: I unscrewed the lid off the portable, then put the portable in a box about 3 in. wider and about ½ in. higher. I made a lid 3 in. deep to fit the box. A piece of wood was screwed to the box to fill the extra 3 in. width (see diagram) and at a height to enable it to hold the pick-up. The leather carrying handle is pressed flat. The gramophone is further fixed by two screws through the back of the box into the gramophone. The woodwork is covered with leatherette paper to match the gramophone, and the inside of lid should be preferably covered with felt. The pick-up and sound box can both be put on a record together to try the echo effect mentioned by Dr. J. H. T. Roberts in "P.W." If the portable is wanted in the summer, all one has to do is to take the two screws out of the back, lift the gramophone up and out of the box and screw the lid on again.

MAKING LOOPS IN WIRE

NINE people out of ten make loops in wire the wrong way. They place the point of the pliers near the end of the wire and make a complete circle with the pliers, which makes a loop shaped like object illustrated on left, enlarged. The correct way is to place the pliers as before, but only make about a quarter of a circle. Then release the pliers and take a fresh grip about an eighth of an inch farther back before continuing the loop. Four or five fresh grips like this and the loop will form correctly as shown on right. Hold the wire short with the left hand while proceeding.

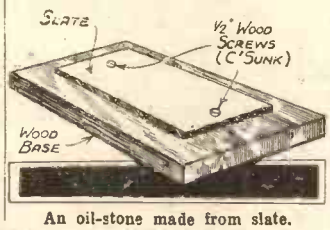


Wrong and right ways of making loops in wire.

CHEAP OIL STONE

MANY readers would, no doubt, be pleased to find an idea for making a cheap oil stone for sharpening small tools. Here it is.

A piece of ordinary slate (as used in tiles), about 5 in. × 2 in., is taken. Being very soft, it can easily be cut to the required size. The smoother face can be smoothed with coarse sandpaper, finishing with a finer grade. About ½ in. from each end two holes are drilled (using an *old* drill) to take an ½-in. wood screw. When these holes are countersunk the stone can be mounted on a piece of wood about ¼ in. By using a fairly thin lubricating oil on the stone it can be used in the ordinary way as an oil stone. Care should be taken in using it, as the slate is very soft.



An oil-stone made from slate.

ONE GUINEA FOR THE BEST WRINKLE!

Readers are invited to send a short description, with sketch, of any original and practical radio idea. Each week £1 1s. will be paid for the best Wrinkle from a reader, and others will be paid for at our usual rates.

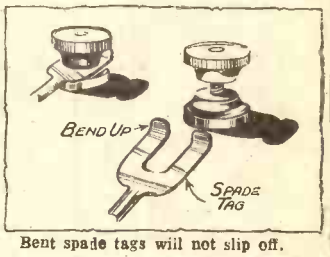
Each hint must be on a separate sheet of paper, written on one side of the page only. Address your hints to the Technical Editor, "Popular Wireless," Tallis House, Tallis Street, E.C.4, marking the envelope "Recommended Wrinkles."

Will readers please note that the Editor cannot, in any circumstances, guarantee to return rejected Wrinkles, and that payment for published hints is not made until ten days after they appear.

The best Wrinkle last week was sent by Mr. L. A. Cooke, 10, Commercial Road, Hereford, to whom a guinea is being awarded.

SAFE SPADE TAGS

SHORT circuits are often caused by spade tags slipping from terminals. This can easily be prevented by bending the ends of the tag perpendicularly to the remainder. Thus, when the



Bent spade tags will not slip off.

tag is attached to the terminal, the prongs prevent its removal until the terminal is sufficiently unscrewed.

DROPPING METER READINGS

IT often happens that when one is about to measure voltages in the neighbourhood of 200–400 volts, it is found that the voltmeters available have only a range of 120 to 150 volts. I find the following method very useful in increasing the range of a 'meter.

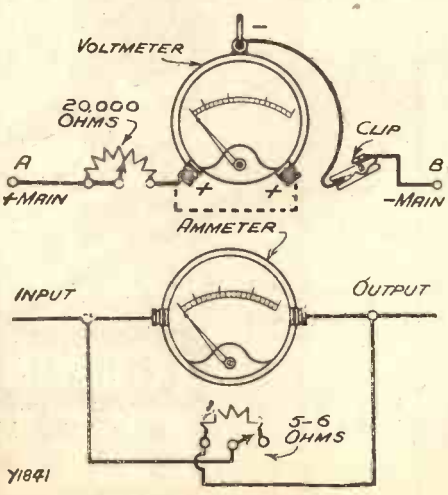
A variable resistance of about 2,000 ohms is joined, as shown, either to the high- or low-scale reading positive terminal. The terminals A and B are placed across an H.T. battery of, say, 50 volts, the variable resistances placed all out, and the number of divisions on the scale past over by the needle noted.

Suppose the needle reads 50 volts *i.e.* 5 divisions, and the 'meter range is to be increased from 120 to 600 volts, *i.e.*, we wish to increase the range five times. The variable resistance is increased gradually until the needle is covering only one division on the scale. The resistance is left at this value and the main terminals connected across the voltage to be measured. Suppose the needle flicks up to the 80-volt mark we can find the actual voltage by multiplying by 5, *i.e.*, there is a potential of 400 volts.

In a similar manner we could increase the range of an ammeter. The connections are as shown, the value of the variable resistance in this case being, at the most 5–6 ohms.

The procedure for increasing range is exactly similar to that for the volt-meter. Care should be taken that the ammeter is placed in series with and not across, or in parallel with the set. The 'meter and resistance can be attractively housed in a small cabinet with the resistance knob covering a "scale-multiplying" scale.

It is thus only necessary to set the knob to a scale covering the voltage to be measured and then take the reading.



Increasing the ranges of meters.

WIRELESS AND YOUR HEARING

Did you know that the response curve of your ear is not straight? That the ear can supply notes not emitted by the loudspeaker, and that it can play tricks with loud and soft sounds? These facts are interestingly dealt with

By J. F. STIRLING.

ONE of the rather unlooked-for results of loudspeaker and electrical-reproducer development in general is the very considerable advance which has been made in the scientific knowledge of certain aspects of the sense of hearing.

Consider the sensitivity of the ear, for instance. Research has established that a normal ear is exceedingly sensitive to changes of pitch, a frequency change of as little as 0·3 per cent. being discernible by the normal (and musically untrained) ear.

Again, it is found that the ear is not evenly sensitive throughout the musical scale. The average ear reaches its maximum degree of sensitivity at notes of approximately 2,000 cycles frequency.

Cut Off in the Ear.

There may be many people known personally to you who are unable to discern any musical note when the top key of a good pianoforte, about 5,000 cycles, is struck. Such folk only hear the blow of the pianoforte hammer.

Similarly, there are many people who, sitting in a church, cannot pick up the lowest note of the organ (about 30 cycles frequency) as sound, but who can readily appreciate it as a species of vibration.

You know, of course, that no musical note is "pure." All notes produced by musical instruments consist of a mixture of vibrations of varying frequencies. The lowest frequency, which, incidentally, determines the pitch of the note, is the *fundamental*.

The higher frequencies (octave, twelfth, double-octave, and so on) are termed the *overtones, harmonics*, or *upper-partials*, and their presence in varying degrees along with the fundamental note gives rise to the "quality" or "timbre" of the note.

For instance, "Middle C" played on the pianoforte and on the violin both have the same fundamental pitch, but they have entirely different characters or qualities, due to their different admixtures of harmonics.

CAN YOU HEAR THEM?

Surprising though it may be, some people are unable to hear the top notes of the piano.

TESTING RESPONSE

It is possible with certain instruments to measure the comparative response of a loudspeaker at different frequencies.

It is a very remarkable fact indeed that the ear is capable of supplying the fundamental to a note when only the overtones or harmonies of the note are present.

Small horn loudspeakers, gramophones of the old type and similar speaking instruments never used to be able to supply bass notes much lower in pitch than Middle C (256 cycles). The fact, therefore, that with their use we did hear lower notes to some extent results from the marvellous property of our ears for actually supplying fundamental tones which were entirely absent from the reproduction.

Curious Property.

Another curious property of the ear is that it can render itself very sensitive to faint sounds and very insensitive to extremely loud sounds.

If, when a certain limit of sound intensity has been attained, further energy is put into the vibrating system or mechanism, there is not much increase in the intensity or loudness of the resulting sounds.

In fact, as the intensity of a source of sound is increased (particularly when the sound is deficient in lower notes) there comes a point at which the sound produces a tickling and even an actually painful sensation in the ears.

Sensitivity of Hearing.

You can easily test the sensitivity of the hearing to variations in sound-intensity by connecting a variable resistance across the terminals of a loudspeaker. Let the subject of the experiment sit with his back to the speaker, and then, when you are gradually varying the resistance placed across the speaker terminals, get your subject to inform you immediately he is aware of any increase or decrease of the sound's intensity.

A few simple experiments in this direction will pretty soon convince you that not only

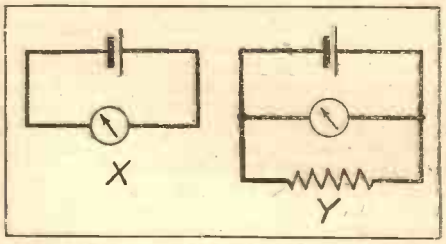
C_3	C_2	C_1	C	C^1	C^2	C^3	C^4
32	64	128	256	512	1024	2048	4096

A table showing relative frequencies of the "C's" of the pianoforte keyboard. Successive octaves below Middle C are denoted by suffixes C_1, C_2, etc.; above Middle C by indices C^1, C^2, etc.

are different pairs of ears of different sensitivities, but also that, as a general rule, their power of differentiating between fine degrees of "loud" and "soft" is very severely limited.

BATTERY RESISTANCE

TO find the internal resistance of a single cell, connect a voltmeter (preferably a moving-coil instrument) across cell to obtain E.M.F. (X). Now join a resistance R of known value across cell, obtaining a new reading which is potential difference across resistance (Y).



How you can find the internal resistance of a cell in a simple manner.

$$\text{Then resistance of cell} = \frac{R(X - Y)}{Y} \text{ ohms.}$$

Reading Y should be taken quickly.

Resistance R can be 2 or 4 ohms.

Interesting results can be obtained from tests of cells in this way. For instance, a cell from a 100-volt H.T. battery showed an internal resistance of 7½ ohms, and as there are some 66 such cells forming the complete battery, the total resistance will be in the region of 500 ohms—think of this!—common to all anode circuits, when working an ordinary non-decoupled receiver.

One H.T. accumulator cell was then tested, and found to have an internal resistance of ·15 ohms. Fifty cells, in this case, make up 100 volts, and the total resistance amounts to a mere 7·5 ohms.

Moral: Decouple—DECOUPLE!

HOW TO MAKE The OLYMPIA SUPER

This highly efficient five-valve A.C. all-electric receiver embodies the very latest developments in superheterodyne technique and will provide a wealth of interference-free entertainment from stations in every part of Europe. Its superlative reproduction, amazingly simple control and enormous power place it definitely in the forefront of modern set design. Constructional details are given below

By the "P.W." RESEARCH DEPARTMENT.

CONTINUING the constructional details of the Olympia Super, commenced last week, we now have to consider some of the main points concerning the assembly and wiring and the operation of the set.

As was seen last week, the majority of the components are mounted on the top of the baseboard, though the fact that the coil unit is fixed below frees a large area which is of value in obtaining a compact yet efficient layout.

Compact Layout.

The three wiring diagrams show clearly how the various parts are disposed, and the exact positions of the different components should be carefully noted. There is no space to spare, for in order to keep the set inside moderate dimensions everything has to be packed carefully into the space available above and below the baseboard.

At first sight there appears to be a certain amount of waste space on either surface of the board; but this is not actually so, for the components are not only arranged to give a compact design: they are placed to give efficient operation. Hence we unavoidably get such areas as that to the left of the gang condenser and that to the right of the under-baseboard diagram, both apparently absurdly free from components.

In a set of this description the wiring between the various parts should be kept as direct as possible, so in your copy of the model do not attempt to alter the layout to make it "prettier" and to fill up the spaces we have mentioned, for by so doing you will lengthen the wiring, alter the orientation of many of the parts and pave the way for possible failure in operation. Keep the layout as given if you want to be sure of the results that the set will give.

At first sight it may not be clear what

(*Continued on next page.*)

HERE ARE THE CORRECT VALVES

Make	1st Det.	Oscillator	Int.	2nd Det.	Outpnt
Cossor	41M.S.G.	41M.H.L.	M.V.S.G.	41M.H.L.	M.P./Pen.
Mullard	S.4V.A.	354V.	V.M.4V.	354V.	Pen.4V.
Mazda	A.C./S.G.	A.C./H.L.	A.C./S.G.V.M.	A.C./H.L.	A.C./Pen.
Marconi	M.S.4B.	M.H.4	V.M.S.4	M.H.4	M.P.T.4
Osram	M.S.4B.	M.H.4	V.M.S.4	M.H.4	M.P.T.4

USE THESE PARTS AND MAKES FOR YOUR OLYMPIA SUPER

Component	Make used by Designer	Alternative makes of suitable specification recommended by Designer
1 triple-gang tuning condenser	J.B. "Nugang," type A	—
1 Set superhet coils	Colvern K61, K62, K63	—
2 Intermediate frequency transformers	Colvern, type 110	—
5 Five-pin valve holders	W.B., large type	Benjamin, Ferranti, Telsen, Lissen
2 2-mfd. fixed condensers	Telsen W226	Lissen, Dubilier, T.C.C., Ferranti
1 2-mfd. fixed condenser	Igranic 2231/73	Ferranti, T.C.C., Lissen, Dubilier
2 1-mfd. fixed condensers	T.C.C., type 59	Lissen, Dubilier, Ferranti, Igranic
2 4-mfd. fixed condensers	Dubilier, type LSB	T.C.C.
1 4-mfd. fixed condenser	T.C.C., type 80	Dubilier
2 ·25-mfd. fixed condensers	Telsen, small type	—
2 ·1-mfd. fixed condensers	Telsen, small type	—
1 ·002-mfd. fixed condenser	Dubilier, type 620	Telsen, T.C.C., Graham Farish, Lissen
1 ·0005-mfd. fixed condenser	Dubilier, type 620	—
1 ·0003-mfd. fixed condenser	Dubilier, type 670	—
2 ·0001-mfd. fixed condensers	Dubilier, type 670	—
1 ·001-mfd. fixed condenser	T.C.C. 34 25A	Dubilier
1 ·0003-mfd. fixed condenser	Telsen W242	T.C.C., Lissen, Dubilier, Graham Farish
1 ·005-mfd. fixed condenser	Dubilier, type 670	—
1 ½-megohm grid leak with wire ends	Dubilier, 1 watt	Lissen, Goltone, Igranic
2 50,000-ohm resistances with vertical holders	Graham Farish "Ohmite"	—
2 20,000-ohm resistances with vertical holders	Graham Farish "Ohmite"	—
3 5,000-ohm resistances with vertical holders	Graham Farish "Ohmite"	—
1 500-ohm resistance with vertical holder	Graham Farish "Ohmite"	—
1 30,000-ohm resistance	Graham Farish "Ohmite"	—
1 5,000-ohm resistance	Graham Farish "Ohmite"	—

Component	Make used by Designer	Alternative makes of suitable specification recommended by Designer
1 350-ohm resistance with terminals or wire ends	Graham Farish "Ohmite"	Dubilier
1 250-ohm resistance with terminals or wire ends	Graham Farish "Ohmite"	Dubilier
1 10,000-ohm resistance with terminals or wire ends	Graham Farish "Ohmite"	Dubilier
1 10,000-ohm potentiometer and switch combined	Bulgin VS32	Lewcos
1 L.F. transformer	Ferranti AF3	Telsen, R.I., Lissen, Varley
1 L.F. choke	Lissen LN5299	R.I., Telsen
1 H.F. choke	Telsen binocular	—
1 Mains transformer	R.I., type EY37	—
1 Metal rectifier	Westinghouse H.T.9	—
1 Thermal delay switch	Varley, type EP17	—
1 Combined mains plug and fuses	Bulgin, type F15	—
1 Mains energised loudspeaker	W.B. (2,500 ohms.)	—
1 Pair terminal blocks	Goltone	Belling & Lee, Bulgin
2 Terminals	Igranic	Goltone, Belling & Lee, Clix, Bulgin
7 Lengths of insulated sleeving	Goltone	—
10 Yards 18-gauge tinned copper wire	—	—
2 Anode connectors	Belling & Lee	—
1 Aluminium panel, 12 in x 10 in. x 16 gauge	Peto-Scott	—
1 Metaplex chassis 14 in. x 10 x 5¼ in.	Peto-Scott	—
1 Baseboard, and baffle-board assembly	Peto-Scott	—
1 Cabinet	Peto-Scott	—
Flex, screws, etc.	—	—

AERIAL AND EARTH EQUIPMENT.—Electron "Superial"; Goltone "Akrite"; Graham Farish "Filt" earthing device; Bulgin lightning switch; Radiophone "Receptru" down lead.

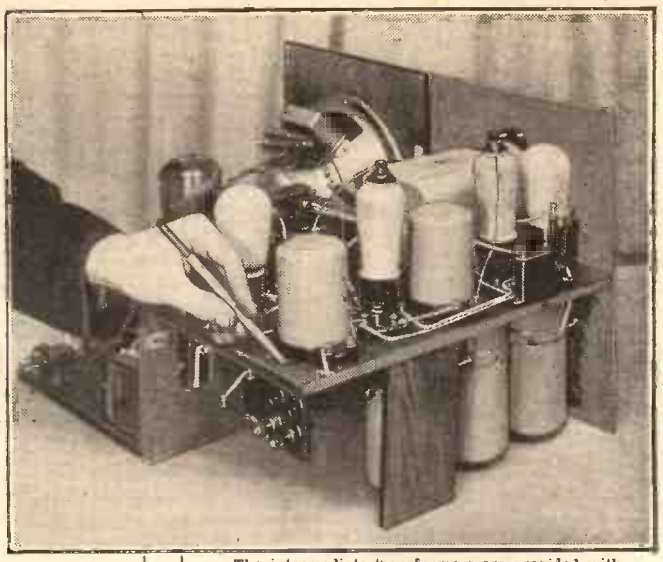
HOW TO MAKE THE OLYMPIA SUPER

(Continued from previous page.)

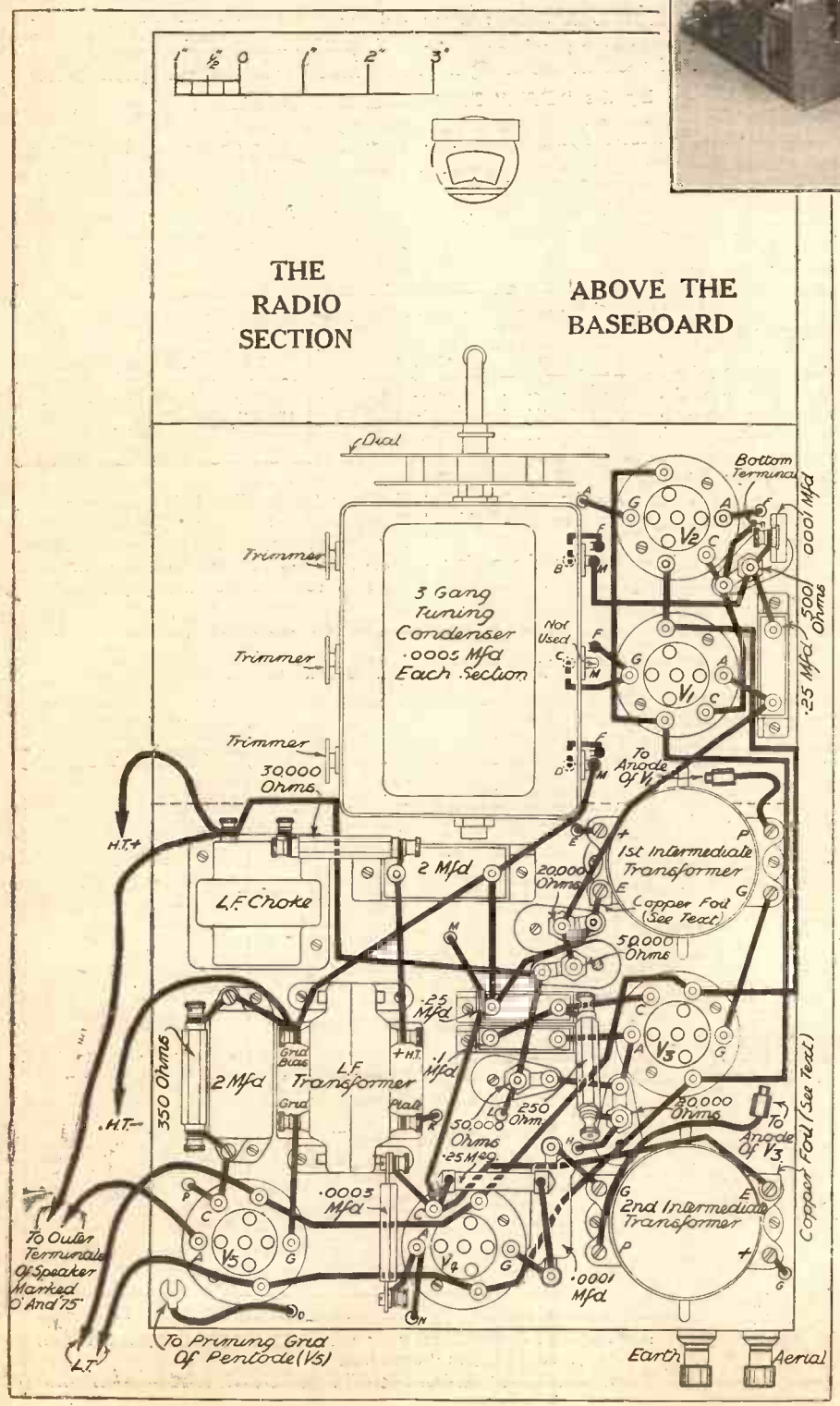
the dotted line running across the wiring diagram by the back of the variable condenser indicates. This is not the edge of metal foil, as it might appear, for a completely metallised baseboard is used in the set. It is the indication of the foot of the metal panel, which is unusually deep.

The mounting of the components is normal, with the exception of the two intermediate frequency transformers. These have underneath them spring contact strips which are for earthing the casing, base and screen of each unit.

In order to ensure that good baseboard earthing is achieved, the earthed terminal of each intermediate is connected to the spring under the coil by means of a piece of copper foil. This is shown clearly marked in the diagram of the above-baseboard wiring, and should not be omitted.



The intermediate transformers are provided with trimmers which enable accurate matching to be achieved, the necessary adjustments being easily carried out with the aid of a pencil or length of wood, as shown in the photograph. The wiring for the above-baseboard radio section of the receiver is given in the diagram on the left.



Correlating Diagrams.

Finally, it will be noticed that the holes through the baseboard are lettered so that the two diagrams, above and below, can be correlated quite easily. One letter may cause slight hesitation of the constructor, however, and that is "E," which denotes the hole through which a lead from the positive terminal of the first intermediate transformer goes to part of the H.T. circuit.

As this hole is close to the + terminal it should not be confused with "E" denoting "earth," the adjacent terminal on the intermediate; but in case there is any such confusion we have spent a little time in explaining the point.

Excellent Accessibility.

It should also be noted that in the construction of the set section the full length of batten is used on one side to support the baseboard, but on the other only a short length is used. This is important because, while it gives ample strength and rigidity, it allows really excellent accessibility for wiring the under part of the set. If full-length battens were used on each side it would be very difficult to wire the under-baseboard components, even if they could conveniently be fixed in position.

The power-pack and loudspeaker section is much easier to build, containing very few components and being extremely simple in circuit.

The loudspeaker employed is of the mains-energised type, being supplied by the anode current of the set flowing through

(Continued on page 782.)

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NEW COSSOR, MODEL 341, S.G., Detector and Pentode, and Balanced Armature Speaker, complete with Cabinet. Cash or C.O.D. Carriage paid. £6 7/6. Balance in 11 monthly payments of 11/9. Send 11/9 only

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NEW W.B., P.M.4A. MICRO-LODE PERMANENT MAGNET SPEAKER

complete with switch controlled multi-ratio input Transformer. Cash or C.O.D. Carriage paid, £2/2/0. Balance in 7 monthly payments of 5/9. Send 5/9 only

NEW SONOCHORDE STANDARD P.M. PERMANENT MAGNET MOVING-COIL SPEAKER, for Class B, with input Transformer. Cash or C.O.D. Carriage paid, £1/17/6. Balance in 7 monthly payments of 5/-. Send 5/- only

NEW BLUE SPOT 66R. STANDARD UNIT AND MAJOR CHASSIS. Cash or C.O.D. Carriage paid. £1/18/0. Balance in 7 monthly payments of 5/3. Send 5/3 only

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KIT "A" Author's Kit of **FIRST SPECIFIED** Parts including Peto-Scott Metaplex Chassis and Baffle and Baseboard Assembly and Ready Drilled Metal Panel, but less valves and cabinet.
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NEW ROLA CLASS-B PERMANENT MAGNET MOVING-COIL SPEAKER AND AMPLIFIER. Complete with Valve and Input Transformer. Two models: A for PM2B, PD220, and 220B; B for 240B and HP2 (state which when ordering). Cash or C.O.D. Carriage paid, £3/11/0. Balance in 11 monthly payments of 6/6. Send 6/6 only

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NEW OLDHAM H.T. ACCUMULATOR (Block Type), 120 volts, 2,750 m.a., complete with crates only. Cash or C.O.D. Carriage paid £3/15/0. Balance in 11 monthly payments of 7/-. Send 7/- only

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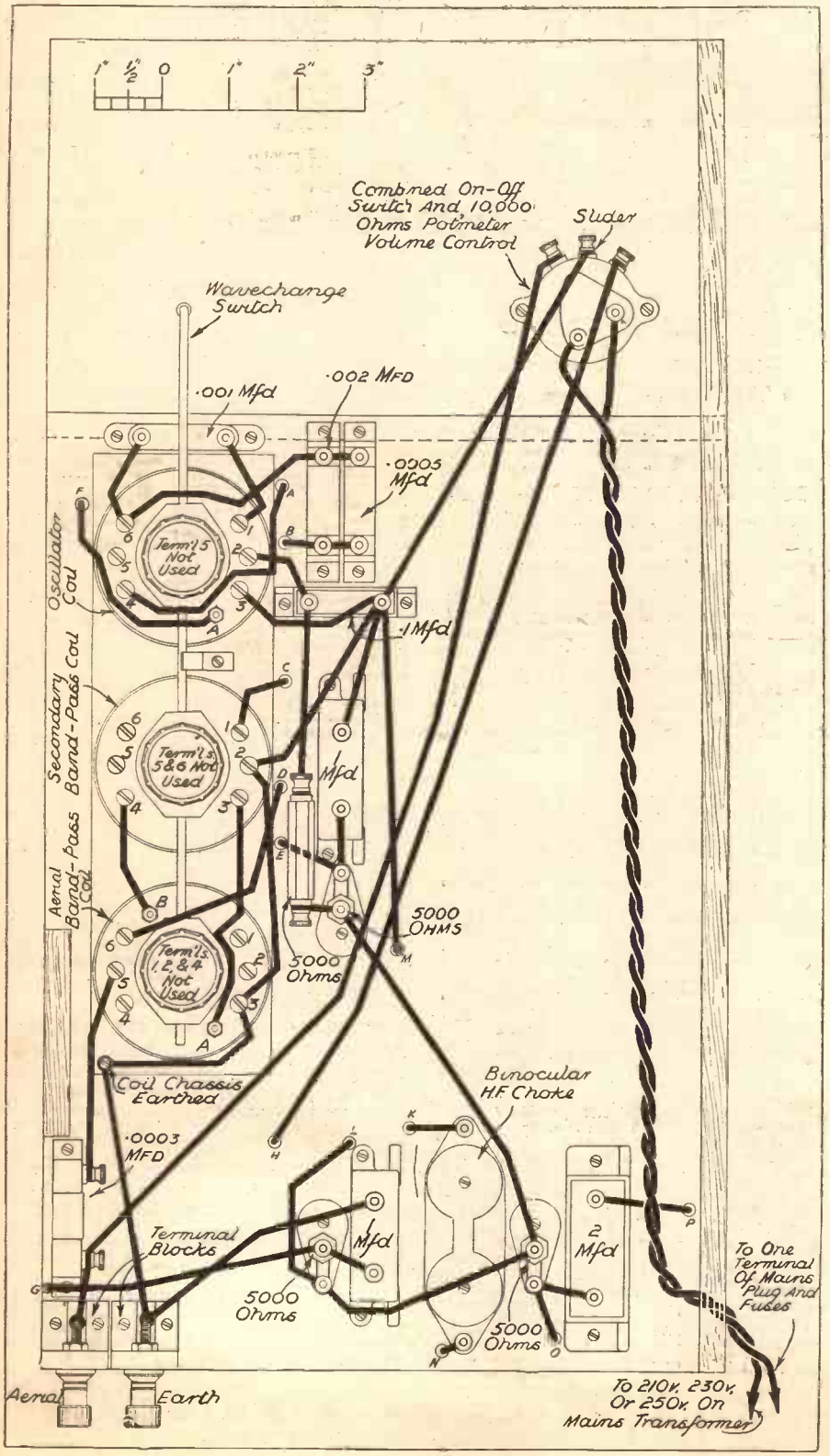
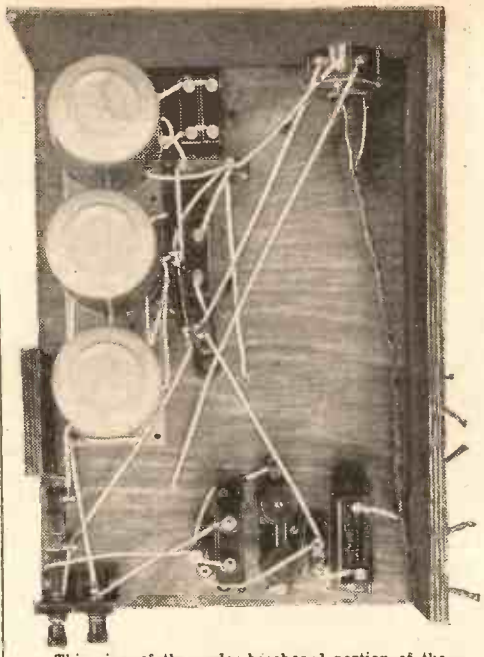
HOW TO MAKE THE OLYMPIA SUPER

(Continued from page 780.)

the field windings. These windings are also used as the main smoothing choke, thereby providing a useful saving of parts, while a secondary smoothing choke, in circuit with the detector of the set, doubly ensures silent operation. This latter choke is situated on the set portion of the receiver.

A thermal-delay switch is an important item in the power pack, for it prevents any H.T. being applied to the set until such time as the valves have heated up. This obviates high voltage build-up due to the application of H.T. with no load.





This view of the under-baseboard portion of the radio section is shown side by side with its wiring diagram. It will be observed that the volume-control potentiometer and "on-off" switch are combined—a feature which makes for easy handling.

Note that the thermal-delay switch is operated by means of the 4-volt heater winding on the mains transformer. Its heating winding is, therefore, practically at earth potential; so, to prevent large difference of potential between the winding and the armature, the switch is connected in the H.T. — lead of the power pack. If it were in the H.T. + feed the potential between the winding and the armature would be of the order of 350 volts when the set was fully working, and possibly some 500 or so volts during the peak period while the valves were heating thus placing an unnecessary strain on the insulation.

Connecting Set and Power Pack.

In the connection of the set and power pack together the two leads marked H.T. + and H.T. — on the set are joined to the two respectively marked terminals on the smoothing condenser next to the loudspeaker on the power pack.

The L.T. leads connect to the two terminals on the power transformer marked 2V., and the loudspeaker leads go to the two outside terminals on the speaker transformer, 0 and 75. The other taps on the transformer do not concern us here, as they are for use when a valve other than a pentode is used for the output stage. The impedance equaliser across these terminals is essential to obtain good balance between high- and low-note reproduction.

On-off Switch Wiring.

The wiring diagrams show exactly how the on-off switch (incorporated in the volume control) is connected to the transformer, the lead which goes to 210, 230 or 250 on the transformer being fixed to that terminal which is nearest above the voltage of the mains. Thus 200-volt mains go on 210, 220 on 230, and 240 on 250.

(Continued on page 801.)

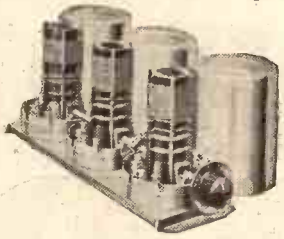
ENORMOUS IN THE PRICE OF

NOW—just when you are thinking again of set-building, Telsen announce almost unbelievable reductions in the price of radio components—reductions which mean that the highest quality components now cost you less than ever before! And in addition to these sensational price reductions, many Telsen components have been completely re-designed and improved—at no increase in price! Buy all the components you want, either for improving your present set, or building a new one, from the wonderful Telsen range—NOW.

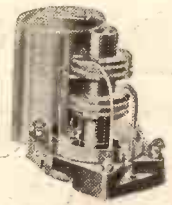
For full details, prices and catalogue numbers of the complete Telsen range (over 500 component parts, many of which have been improved in design at no increase in price), see the new Telsen Radiomag, Issue No. 5, price 3d.

TELSEN BINOCULAR H.F. CHOKES
Were 5/- .. NOW **3/6**

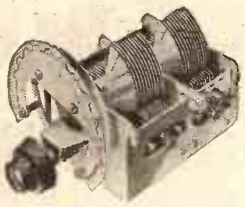
TELSEN INTERVALVE L.F. COUPLING CHOKES
40 hy. Were 5/- NOW **4/9**
100 hy. Were 5/- NOW **4/9**



TELSEN SUPERHET COILS
Were 25/6 .. NOW **21/6**



TELSEN I.F. TRANSFORMER COILS
Were 12/6 .. NOW **7/6**



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Single Units	9/6	**7/6**
Twin Ganged	16/6	**12/6**
(Dust Cover 2/- extra)		
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(Dust Cover 2/6 extra)		

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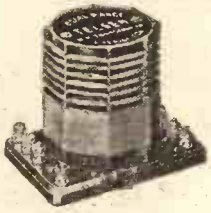
Were 2/- .. NOW **1/6**

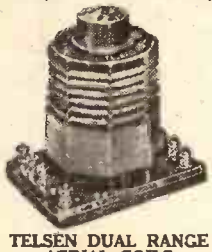
TELSEN OUTPUT CHOKES
Were 7/- .. NOW **6/3**
TAPPED PENTODE O.C.
Were 7/6 .. NOW **6/9**
POWER PENTODE O.C.
Were 10/6 .. NOW **9/6**



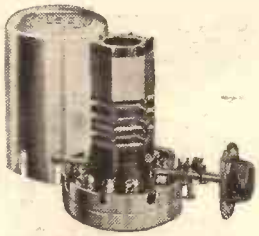
TELSEN H.F. TRANSFORMER COILS
Were 5/6 .. NOW **4/6**

TELSEN BAND PASS COIL UNITS
Were 17/- .. NOW **14/6**
BAND PASS OSCILLATOR COIL UNITS
Were 25/6 .. NOW **21/6**
OSCILLATOR COILS
Were 8/6 .. NOW **7/6**

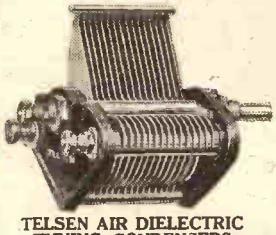
TELSEN SHORT-WAVE H.F. CHOKES
Were 3/6 .. NOW **2/6**



TELSEN DUAL RANGE AERIAL COILS
Were 7/6 .. NOW **5/6**



TELSEN SCREENED COILS
Were 8/6 .. NOW **7/6**
TWIN MATCHED
Were 17/- .. NOW **14/6**
TRIPLE MATCHED
Were 25/6 .. NOW **21/6**



TELSEN AIR DIELECTRIC TUNING CONDENSERS

	Were	NOW
·00025 mfd.	4/6	**2/6**
·00035 „	4/6	**3/6**
·0005	4/6	**3/6**

TELSEN BAKELITE SLOW-MOTION DIALS

	Were	NOW
Black .. Brown ..	2/-	**1/6**

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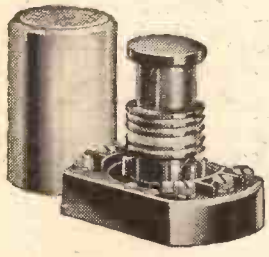
NOT only sensationally reduced prices—not only improved designs and increased efficiency—but also a large number of entirely NEW components! The wonderful Telsen range now covers every radio requirement—from the smallest yet most efficient Iron-Cored Coils, and the latest "Class B" Components, to the most sensational all-mains, battery and constructor sets ever designed. See the complete range on Stand No. 88 at Olympia, to-day.



TELSEN IRON-CORED SCREENED COILS

Employ an iron-dust core, achieving greatly reduced size with considerably increased magnification and selectivity.

Single Coil	.. .. Price	8/6
Twin Matched Coils	,,	17/-
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The metal screen, which is connected to an earthing terminal, entirely prevents interaction.

"All Wave" (10-2,000 metres). Price 4/6

"Standard" (100-2,000 metres) Price 2/6

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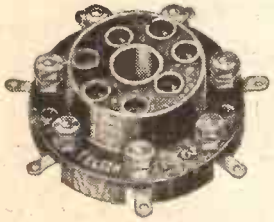

TELSEN 7-PIN VALVE HOLDERS

For the latest types of valve, such as "Class B" valves. The terminals are numbered according to the standard R.M.A. system.

7-pin Solid Type	.. Price	1/6
7-pin Anti-Microphonic Type		1/9

TELSEN "CLASS B" DRIVER TRANSFORMERS

Made in two ratios covering the requirements of all the "Class B" valves available at present.

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For matching to any M.C. speaker having either a high resistance speech coil or a low resistance coil and input transformer. D.C. resistance 220 ohms per half winding. Total inductance 18 henries.

Price 8/6

TELSEN "CLASS B" OUTPUT TRANSFORMER

For matching to M.C. speakers having low resistance speech coils. Primary resistance 200 ohms per half winding.

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TELSEN HIGH VOLTAGE ELECTROLYTIC CONDENSERS

Supplied with special bracket and terminal for mounting on any type of baseboard or chassis.

275 working capacity peak voltage.

4 mfd.	Price	3/6
6 ,,	,,	3/9
8 ,,	,,	4/-

500 working capacity peak voltage.

4 mfd.	Price	4/6
6 ,,	,,	5/-
8 ,,	,,	5/6

TELSEN BAKELITE DIELECTRIC REACTION CONDENSERS

Entirely re-designed. Now incorporate several valuable improvements with no increase in price. Enclosed in a dust-proof bakelite case.

·0003 mfd.	1/9
·00015 ,,	1/9
·0001 ,,	1/9
·00075 ,,	2/-
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TELSEN AERIAL SERIES CONDENSER WITH SWITCH

Similar to the new reaction condensers, providing an ideal selectivity and volume control.

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TELSEN DIFFERENTIAL CONDENSERS

Similar in design and construction to the new reaction condensers.

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·00015 ,,	2/-
·001 ,,	2/-

TELSEN LOW VOLTAGE ELECTROLYTIC CONDENSERS

Very compact, with wired ends for easy suspension in the wiring.

25 mfd. at 25 volts	.. ..	Price	2/6
50 ,, 25 ,,	.. ..	,,	3/-
25 ,, 50 ,,	.. ..	,,	3/-

TELSEN SMALL TUBULAR CONDENSERS

Very small yet highly efficient, with wired ends for easy suspension in the wiring.

Capacity	Price	Capacity	Price
·0001 mfd. ..	1/-	·002 mfd. ..	1/-
·0002 ,, ..	1/-	·005 ,, ..	1/-
·0003 ,, ..	1/-	·006 ,, ..	1/-
·0005 ,, ..	1/-	·01 ,, ..	1/3
·001 ,, ..	1/-	·1 ,, ..	1/6

H.T. UNIT AND L.T. CHARGER FOR A.C. MAINS

For input voltages between 200 and 250 at 40 to 100 cycles. Charges 2, 4 or 6 volt accumulators at 0·5 ampere.

Price £4 17 6

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Similar to above but with the L.T. Charger replaced by a centre tapped transformer winding capable of supplying 2.5 amps. at 4 volts .. .. Price £3 7 6

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For D.C. inputs of from 200 to 250 volts.

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Very small and light, and easily suspended in the wiring of a receiver. Supplied in the following values:—Power rating of ½ and 1 watt: 250, 500, 1,000, 1,250, 5,000, 10,000, 20,000, 25,000, 50,000, 100,000, 250,000, 500,000 ohms resistance . . Price 1/- Power rating of 2 watts: 250, 500, 1,000, 1,250, 5,000, 10,000, 20,000, 25,000, 50,000, 100,000 ohms resistance . . Price 2/- 3 and 6 watt types can be supplied on demand.

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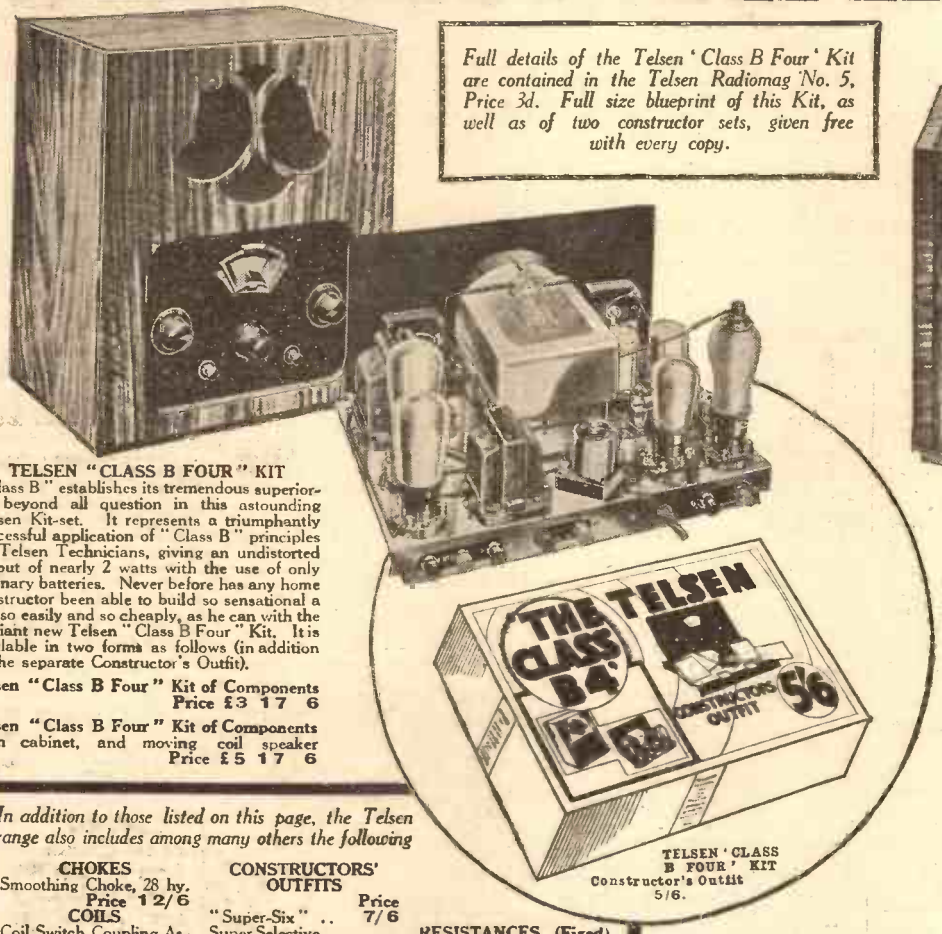
ADDITIONS TO TELSEN RANGE!

Full details of the Telsen 'Class B Four' Kit are contained in the Telsen Radiomag No. 5, Price 3d. Full size blueprint of this Kit, as well as of two constructor sets, given free with every copy.



TELSEN "CLASS B FOUR" KIT

"Class B" establishes its tremendous superiority beyond all question in this astounding Telsen Kit-set. It represents a triumphantly successful application of "Class B" principles by Telsen Technicians, giving an undistorted output of nearly 2 watts with the use of only ordinary batteries. Never before has any home constructor been able to build so sensational a set, so easily and so cheaply, as he can with the brilliant new Telsen "Class B Four" Kit. It is available in two forms as follows (in addition to the separate Constructor's Outfit).

Telsen "Class B Four" Kit of Components Price £3 17 6

Telsen "Class B Four" Kit of Components With cabinet, and moving coil speaker Price £5 17 6

TELSEN 'CLASS B FOUR' KIT
Constructor's Outfit 5/6.

TELSEN "464" A.C. MAINS RECEIVER

Telsen's previous experience in the all-mains field has been an invaluable aid in the production of this superb new all-electric receiver. It has that lasting perfection which means the practical elimination of the "servicing" bugbear. Its brilliant circuit incorporates every conceivable ultra-modern refinement, including the new Telsen Iron-Cored Coils, Variable Tone Control, New Type Moving Coil Speaker, Single Knob Tuning, Wavelength Calibration, etc., in a beautiful Walnut-finished cabinet, providing really astounding selectivity with amazing sensitivity, exceptional volume and wonderful tone.

Price £9 9 0

Or can be had for 15/6 down and 12 equal payments of 16/9.

In addition to those listed on this page, the Telsen range also includes among many others the following

CHOKES
Smoothing Choke, 28 hy. **Price 12/6**

COILS
Coil Switch Coupling Assembly .. **Price 6d.**
Coil Switch Knob Assembly .. **Price 1/-**

TUNING CONDENSERS
Bakelite Dielectric
·0003 mfd. .. **Price 2/-**
·0005 ,, .. **Price 2/-**

FIXED CONDENSERS
Mica

Capacity:	Price
·0001 to ·001 mfd.	6d.
·002 mfd.	1/-
·006 ,, ...	1/3

Tag

·0001 to ·001 mfd.	4½d.
·002 mfd.	6d.

CONSTRUCTORS' KITS

All-Mains S.G. 3, 200/250 volts, 50 cys.	13 8/6
All-Mains S.G.3, 200/250 volts, 25 cys.	15 1/-
All-Mains S.G.3, 100/110 volts, 50 cys.	13 8/6
Super Selective Four	9 3/6
Super-Six	11 8/6
"325 STAR"	3 9/6

VOLUME CONTROLS

Ohms	Price
10,000	3/-
50,000	3/-

CONSTRUCTORS' OUTFITS

	Price
"Super-Six" ..	7/6
Super Selective Four	7/6
All-Mains S.G. 3	7/6
"325 STAR" ..	3/6

COUPLING UNITS

	Price
1–1 ..	7/6
10–1 .. ,,	12/6
R.C. .. ,,	4/-

FUSES
100 m.a. Fuse Bulb Price 6d.
Mains Type

	Price
·5 meg.	6d.
1 ,, ...	6d.
2 ,, ...	6d.
3 ,, ...	6d.

FUSE HOLDERS

	Price
Battery Type ..	6d.
Power Type ..	6d.

GRID LEAKS

	Price
·25 meg. ..	6d.
·5 ,, ...	6d.
1 ,, ...	6d.
2 ,, ...	6d.
3 ,, ...	6d.
4 ,, ...	6d.
5 ,, ...	6d.
Grid Leak Holder	6d.

RESISTANCES (Fixed)
Cartridge Type

	Price
300 to 200,000 ohms	1/-
CartridgeResistance Holder	9d.

Spaghetti Type

Ohms	Price
300 to 1,000 ..	6d.
1,500 to 5,000 ..	9d.
10,000 to 30,000	1/-
50,000 to 100,000	1/6

TERMINALS, ETC.
Terminal Block .. 6d.

TONE CORRECTORS
"336" Unit Price 5/6

TRANSFORMERS (Intervalve)
5–1 Audioformer 11/6

MAINS TRANSFORMERS

Volt. Cys.	Price
100/110, 40/100	32/6
200/250 40/100	32/6
200/250, 25/40	45/-
200/250, 40/100	32/6

H.T. 275-0-275

VALVE HOLDERS

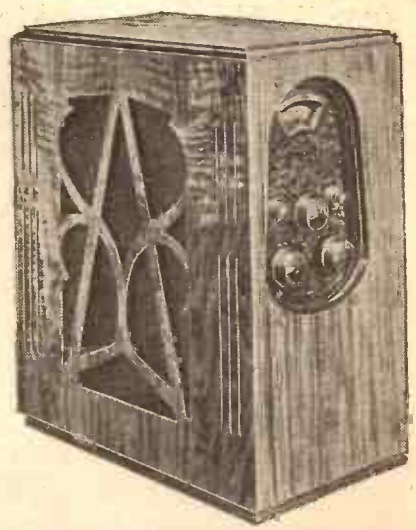
	Price
4-pin Solid Type ..	6d.
5-pin ,, ,, ..	8d.
4-pin Anti-Micro. ..	8d.
5-pin ,, ,,	10d.
Universal	9d.

TELSEN "AIR MARSHAL"

The ultra-selective, ultra modern circuit of this wonderful Telsen three-valver makes it the most efficient set of its type ever produced—yet it is simpler to operate, cheaper to run, and costs less to buy. It is absolutely self-contained in a beautiful cabinet of modern design, finished in Walnut and is supplied complete with valves, batteries and either Moving Iron or Moving Coil Loudspeaker.

With Moving Iron Loudspeaker **Price £4 17 6**
Or can be had for 9/6 down and 12 equal payments of 9/6.

With Moving Coil Loudspeaker **Price £5 5 0**
Or can be had for 10/- down and 12 equal payments of 10/-.



THE MOST SENSATIONAL RECEIVERS EVER DESIGNED!

ANNOUNCEMENT OF THE TELSEN ELECTRIC CO. LTD., ASTON BIRMINGHAM

THE "REACTION" PATENT

An outline of the recent very important legal action in which thirty thousand pounds worth of law was involved.

By A BARRISTER-AT-LAW.

IN the early days of broadcasting the famous reaction patent overshadowed the whole radio industry. Even the home constructor spoke of it: sometimes with bated breath and at other times with considerably more vigour—particularly where he found himself asked to pay tribute at the rate of 12s. 6d. a valve.

The patent was first issued in 1913 to Mr. C. S. Franklin. It was held by the Marconi Co. for the full term of sixteen years, when it lapsed, in 1929, by the passage of time.

Though now as dead as mutton, it has recently enjoyed a brief—and expensive—resurrection in the High Courts, where an action was brought by the Marconi Co. against Philips Lamps, Ltd., for alleged infringements committed during the period when the patent was still in force.

Questioning Expert Witnesses.

The Philips Lamps Co., by way of defence, attacked the validity of the patent, alleging that the invention for which it was granted was not in fact new in 1913, but had previously been known and used. Further, they argued that the patent specification was ambiguous and misleading and contained no subject-matter. Finally, even if the patent was good they had not infringed it.

Obviously both sides were well armed and all prepared for a first-rate scrap. And it was so. The action lasted from June 13th to July 3rd, during which time over 4,000 rounds of ammunition were fired off in the form of questions to expert witnesses, some being so involved that Professor Appleton was called upon to act as technical adviser to the judge. In all, the cost of the proceedings will exceed £30,000.

For the Marconi Co., Mr. H. A. Gill, the well-known patent agent, said that the basis of the patent was Mr. Franklin's discovery that if a valve was back-coupled between the anode and grid currents it could be used in wireless reception to give increased selectivity, without self-oscillation, and a wider "reach."

Known Before 1913.

He referred to an alleged prior publication of the principle of reaction in an article by C. D. Lindredge, entitled "Ionized Gas for Telephone Receivers," which appeared in "The Telephone Engineer" dated September, 1912, but denied that it referred to the kind of valve reaction covered by the Marconi patent.

He agreed, however, that reaction, used deliberately to produce self-oscillation, was known before 1913 as a scientific fact, but it was not, in his opinion, common knowledge.

Major Prince said that, in his opinion, there was a sort of "no man's land" which lay between the use of no back-coupling at all and the point where the circuits were so tightly coupled together that the valve generated continuous oscillations. The latter condition was commonly employed in transmission circuits. The reaction patent, however, was only intended to cover the use of a certain degree of back-coupling—short of the point of self-oscillation, but sufficient to amplify the signals in reception and improve both the range and the selectivity of the set.

For the Defence.

For the defence Counsel urged that the principle of reaction was known some time before the date of the Franklin patent, and that, in any case, the circuits used by Philips Lamps, Ltd., did not come within the patent because they did not use a tuned-anode circuit. He said that Franklin's anode circuit was tuned, and argued that this was an essential feature of the invention.

At the conclusion of the case Mr. Justice Maugham announced that he must reserve his decision in order to give the facts full consideration.

On July 28th he gave judgment. In the first place, he said that the period of time that had elapsed between the date of the patent and the bringing of the action made it difficult for witnesses to speak with confidence as to what was and what was not common knowledge in 1913. It was admitted that the problem of selectivity had been carefully considered long before that date, and it was well known to be bound up with the reduction of damping due to resistance in the circuit.

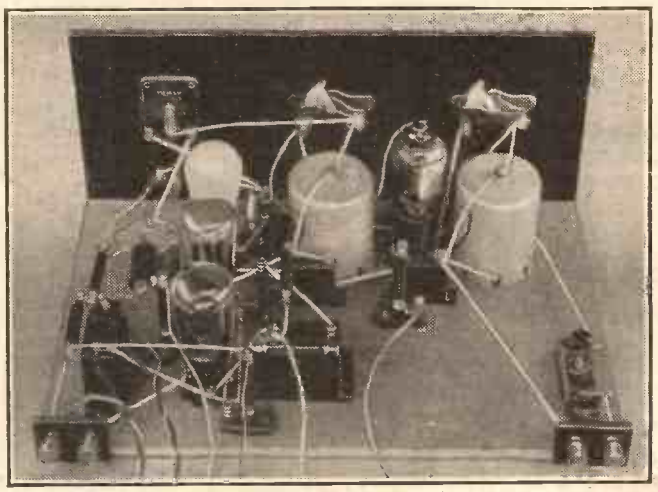
He also held that the principle of feeding back energy from the plate to the grid circuit of a valve was used before 1913 for transmission purposes, but, in his opinion, it had not been applied to receiving circuits.

He therefore decided that the reaction patent was a good and valid patent during its lifetime. It was founded upon an ample and meritorious invention, and considerable ingenuity was involved.

On the other hand, the valve used by the defendant company in the circuits in respect of which they were being sued for infringement was a "hard" valve and had very different properties from the "soft" valve used by Franklin. Further, defendants had not used the tuned anode circuit described by the inventor. He accordingly held there had been no infringement.

The claim for damages would, therefore, be dismissed, one-fifth of the costs to go to the Marconi Co., since their patent was declared valid, and four-fifths to Philips Lamps, Ltd., who succeeded on the issue of infringement.

THEY ALL NEED IT



Every transmitting station and virtually every receiver employs reaction in some form or another, this set being the "P.W." "Economy Four," described in our July 29th issue.

ADDING CLASS B

Almost any battery set can be converted to employ "Class B" output, and the modification is quite simple.

CLASS B is undoubtedly a boon to the battery user, for it provides a remarkably generous output power for a comparatively small expenditure of high-tension current.

It has been estimated that roughly three-quarters of a watt of undistorted power is necessary for really satisfactory quality in an average-sized room.

While it is, of course, impossible to lay down any hard-and-fast rule, it is probable that this figure is about right, and it can be regarded as the minimum amount of power required to give good bass reproduction from a moving-coil speaker under domestic listening conditions. A power output of this order is readily obtainable from a Class B stage, and the battery user need no longer bemoan his misfortune at not having mains available.

Those who possess sets with one L.F. stage can easily convert to Class B by adding the additional amplifier in the form of a separate unit. This unit will consist of a driver transformer, the "Class B" valve and valve holder and a suitable output transformer. The primary terminals on the driver transformer become the input to the "Class B" unit, and are joined to the two output or loudspeaker terminals of the set—the existing output transformer or filter first having been removed.

Thus the existing power stage is arranged to feed into the driver transformer, the "Class B" unit being treated in exactly the same way as an extra L.F. amplifier.

If the power stage in the set employs a super-power valve, this should be replaced with one of the small power type requiring a bias of about 4·5 volts for normal working.

A. J. R.

Are many of these crackles we hear in our loudspeakers due to meteorites entering the earth's atmosphere? Our contributor, Mr. R. E. Blakey, asserts that there is a definite relation between meteors and static, citing practical examples in support of his theory.

DURING the middle of August, 1931, it would appear that I discovered what seems to be an affinity between meteors (and meteorites entering the earth's atmosphere) and static; so definite and convincing does this affinity seem to be that I hope by my writing this article it may be influential in getting scientific men to enter into the subject in their quest of diagnosing sources of radio interference.

Peculiar Noises.

At that time I was listening to local programmes on a six-valve superhet receiver, and at frequent intervals a series of crackling noises came from the set. At first I thought there may be a loose connection or a component breaking down, but a thorough testing of the receiver proved it to be O.K.

However, I borrowed another set—this time a popular American four-valve plus rectifier superhet—and obtained precisely the same results as before.

A few days before I had read in a newspaper of the bombardment of Perseid meteors through which the earth at that time was passing. The Perseids are a swarm of shooting stars appearing annually during August and are thought to be fragments from Swift's comet.

Could there be any connection between this matter and the "crashes" I kept hearing from my set? Well, I decided to try and find out what I could and extended the receiver into the garden; and I then gazed through an old telescope intently into the heavens.

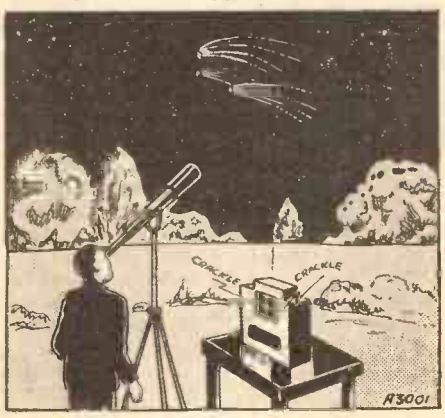
A True Narrative.

Being even less than a raw amateur at "star-gazing," I am handicapped by not being able to relate my observations in truly scientific measure, but the following is a true narrative of what I saw. Each time a meteor flashed through the skies there came a sound like the crash of static through the loudspeaker.

The crashes came simultaneously and not a few seconds later, as in the case of a gun being fired at a distance. I think this indicates the electrical nature of the meteor's friction with the atmospheric envelope of the earth. We all know that, had the noise been friction alone without any electrical content, the noise would not have come through the set.

Since my observations I have been reading up simple astronomical matters and have learned that meteors are supposed to gain visibility at an average height of about 50–75 miles above the earth's surface.

WERE THEY RESPONSIBLE?



". . . . I decided to try and find out what I could and extended the receiver into the garden; and I then gazed through an old telescope intently into the heavens."

From present-day theory we believe that rarification of the air at 50 miles is above 20 inches of mercury and probably much nearer an absolute vacuum. The temperature 10 miles above the earth, as recently determined by German balloonists, was 148 deg. F. below zero; therefore, it does not seem too much to expect a temperature of minus 200 deg. at 50 miles.

Ionized Air.

According to my theory, which I have formed as a result of my discovery, meteors may become luminous not because they are red-hot, but because they are passing through or coming into contact with the rare upper gases about the earth they illuminate this gas by ionization.

Of course, my deductions are, as I have previously mentioned, those of a "radiotrician" and not an astronomer.

However, to substantiate my theory, I have learned that meteors have been found that were covered with ice soon after they reached the earth, and I think this may be taken as definite proof that meteors are not necessarily red-hot.

A very large meteor fell in India some years ago, and this seems to be taken as a classic example of a case where one came to earth with a covering several inches thick of solid ice, thus attesting to the intense cold of the interstellar space.

It is true that meteors have been found consisting of iron, apparently fused with other metals; but, to my mind, this does not definitely indicate that the metals were heated in the earth's atmosphere—not, at least, to melting point. I suggest that the heating may have occurred on the body from which the piece loosed itself, possibly by volcanic action.

An Interesting Theory.

In the Admiralty Handbook of Wireless Telegraphy you will also find information which suggests that static noises can be traced to humidity in the atmosphere. This condensation creates clouds which, in turn, further condense into rain, in either case causing intense electrification of rain or cloud areas.

These "growth" changes cause electrical discharges which are the cause of a vast amount of static.

On cold, frosty nights, when there is little humidity in the air, very little static disturbances are noted; on the other hand, hot, humid nights with the atmosphere surcharged with moisture, or with heavy "thunder heads in the offing," are always bad for static.

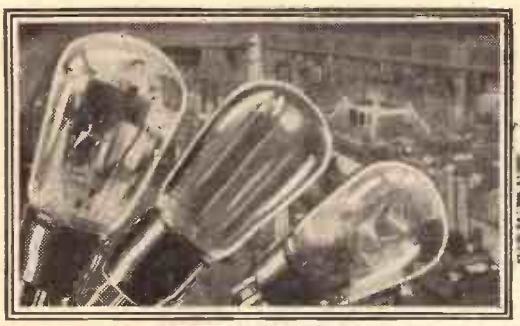
Perpetual Bombardment.

On clear nights, otherwise excellent for reception, it is noted that jarring noises, that have heretofore not been adequately explained, often are heard. I believe that these noises are caused by meteors which are perpetually bombarding the earth's atmosphere, although the huge majority of them would appear to be so small that their effect may be almost unnoticed, individually, in the powerful type of broadcast receiver, but resemble a faint hissing in the aggregate.

At the time of writing I am keeping a vigilant watch on these meteors, but I must admit that the starry heavens are proving a little too much for me.

SYNCHRONISED CRACKLES

". . . . Each time a meteor flashed through the skies there came a sound like the crash of static through the loudspeaker."



VALVES on SHOW

The large number of new valves has had a marked effect on the Radio Exhibition this year, and a great many of the latest set designs must be attributed to recent advances in valve technique. The high lights in the valve exhibits are discussed in the following article.

K. D. ROGERS

AT every radio exhibition there are a few outstanding features in either the home-constructor section or that of the complete sets. This year there are three main things which can be regarded as the keynotes of the Show. These are Automatic Volume Control, Unbreakable Valves and "Class B" Amplification.

The most interesting point, however, is that all three are directly due to advances in valve technique, for neither Class B nor A.V.C. would be possible to any great extent without the provision of special valves, while the unbreakable valves tell their own story.

Let us have a look round and see what wonderful developments have taken place to mould the whole trend of set design for the coming year. There are other attractions to be seen, of course, like iron-cored coils, but the main theme of the Exhibition is undoubtedly centred round the valves.

Popularity of the Superhet.

And some very wonderful valves have been produced during the last few months: valves that could not help but make an immediate mark on the radio industry in general, for they have struck right at the root of two of the most important types of sets—the superhet and the battery receiver.

For a long time mains sets have been tending towards the superhet as the standard design, and with the crowded state of the ether this is not surprising. But the super has offered so much in the way of amplification that the non-technical listener has had none too easy a task in the control of its sensitivity, and therefore volume of output. The home constructor knows how to handle this type of receiver; but the "man in the street" is not so versed in the radio art, and often finds even the one-dial super none too easy to tune properly, and therefore ensure undistorted results.

SOME DISTINGUISHED NEW TYPES

Screened pentodes, large output valves, and double-diode triodes are among the newcomers from Mullard. Here are the D.O.26, the PM 24 M, and three-screened pentodes, V.P.4 and S.P.4.

The Result.

Obviously, what he wanted was automatic-volume (or gain) control to enable him just to turn the tuning knob and get his stations at more or less the correct strength without further adjustment. At any rate, he required a set that would not overload, and thus cause a distortion that he did not understand was due to his mishandling of the receiver, and not to the instrument.

So automatic-volume control was devised, and special valves were designed to provide this with the maximum purity of reproduction and the minimum of trouble and expense from the set maker's point of view. The result is the double-diode triode and similar types of valves.

First in the Field.

These allow various methods of volume controlling to be carried out with pure rectification and without increasing the number of valves needed for the set.

The first were Ferranti with the H4D, followed closely by the Cossor double-diode pentode, which allowed volume control of the L.F. side to be automatically controlled as well as the H.F. amplification. At present we have the Ferranti, Cossor, Marconi-Osram and Mullard double-diode valves, and these will shortly be added to by the Mazda and by possibly another Mullard—a tetrode this time. They are all at the Show and are worth very close examination.

Other valves that have affected the superhet and other sensitive mains-receiver designs are the screened pentodes. These are H.F. valves having tremendous amplifying powers, and are obtainable in either multi-mu or "straight" types.

Battery Versions on the Way.

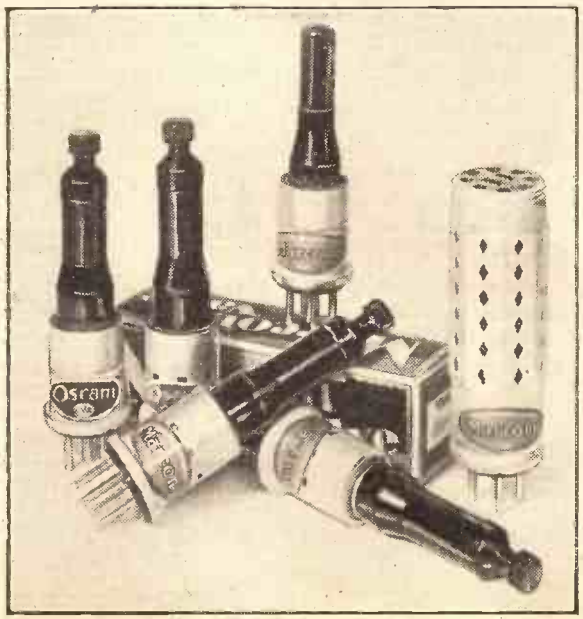
Cossor, Mullard and Ferranti have produced various types of these valves, and again these should come in for a great deal of attention at Olympia. It is likely that the battery types will be included in the Show before it is over, but of that we can say no more at present.

The second main valve feature consists of the all-metal "Catkins," introduced by Marconi and Osram, and shown on many of the manufacturers' stands, as well as those of the valve concerns themselves.

These are most ingenious in design, and render the transport of sets with the valves in situ a practical proposition, while the storage and packing of the

(Continued on next page.)

A SENSATIONAL SERIES TO SEE



The all-metal "Catkin" valves by Marconi and Osram must not be missed by visitors to Olympia.

VALVES ON SHOW

(Continued from previous page.)

valves themselves are very greatly simplified owing to the reduction in size over those of the glass type.

"Catkin" valves have similar characteristics to those of the same types with the glass-envelope construction, and so far there are screened-grid types, multi-mu valves, detectors and pentodes. Other types will be added from time to time, but the above cover the needs of the majority of set designs in a remarkably satisfactory manner.

ENSURES STABLE VOLTAGE

Two of the most recent Cossor developments. The "valve" standing up actually is not a valve at all, but the S.130 Neon stabilising device which ensures correct voltage regulation of mains units feeding sets employing "Class B" amplification

Visitors to the Exhibition should make a point of examining the "Catkin" valve very carefully from the models to be seen on the Osram and Marconi stands, for the mechanical construction is a very fine piece of work and one that is the outcome of many months of intensive research.

Solving a Problem.

The third class of valve is one that has made a very big mark on the radio industry during the past few months—the "Class B" type, which has been the cause of a veritable avalanche of sets and components, to say nothing of loudspeakers designed to operate under the new conditions.

This is only to be expected, for the "Class B" valve has done a very great deal for the set owner who has to use a battery-operated receiver, and therefore for the radio industry in general.

The problem of obtaining economical power from dry batteries has been solved by Class B, and accordingly the Radio Exhibition contains a very strong strain of this type of set.

The New Method.

All the valve manufacturers have brought out suitable valves for the new method of amplification, though the individual instances vary somewhat in characteristics, and accordingly in their circuit-constant requirements. With the exception of the Marconi and Osram B21 valves, these "Class B" valves require no bias for ordinary operation; but the model mentioned, which was the last to be released, is designed very definitely for use with grid bias. The reason for this we cannot go into here, but it will be dealt with later when further details of the new valves are published.

So on the stands of Cossor, Ferranti, Mullard, Mazda, Marconi and Osram you'll find "Class B" valves of various types, all somewhat similar, but all varying in minor points. That is the reason for the glut of "Class B" components on the market and the answer to the apparently uncontrolled turning out of different types of transformers and output chokes.

The Latest Arrival.

"Class B" valves must be matched properly, and they must be driven from suitable driver valves if the best results are to be obtained from them. Hence the Exhibition is the show ground of literally scores of components designed for the new valves.

Other valves of various types are to be seen, of course, not falling into either of the three categories mentioned. These valves are such as the new Mullard indirectly heated rectifiers, the Cossor stabiliser for "Class B" mains units, the Mullard and the Cossor multi-mu S.G. battery valves, which have specially short grid bases so that they do not need much grid bias to enable complete control of their conductance, and all sorts of improved output 2-volters.

One of the most interesting of the steep-slope two-volt valves is the Mazda S.215VM, which is a particularly hot-stuff screened grid valve designed for use in sets that require a great deal of H.F. amplification, such as portables, where frame aerials are employed, or sets that are to be used with small indoor aerials. This valve has a mutual conductance of as high as 2·0 at maximum sensitivity, which is reduced by the application of bias in the usual manner. The valve is extremely efficient, and will fill a much-felt want in battery sets.

A1 "CLASS B" VALVES

A group of various types of "Class B" valves, including Mullard P.M.2B., Cossor 240B. and 220.B., Mazda P.D.220 and Ferranti H.P.4.

NEWCOMERS AMONG THE VALVES

Ferranti are recent arrivals in the valve market, but they have already turned out some notable designs. Here are the D.4, V.P.T.4, S.P.T.4, H.4D. and R.4.

★ ★ ★

FOR FRAME AERIAL SETS.

Illustrated here is the Mazda S.215VM, a screen-grid valve which has been specially designed to possess characteristics making it eminently suitable for use with sets employing frame aerials where the input to the first valve is generally very small. It may, of course, be fed from an ordinary aerial of small dimensions giving a low signal voltage to the first valve.

★ ★ ★

Nine volts are required for full-bias adjustment to obtain the complete variation of conductance, while the H.T. voltages for anode and screen are the normal—namely, 150 and 80 maximum respectively.

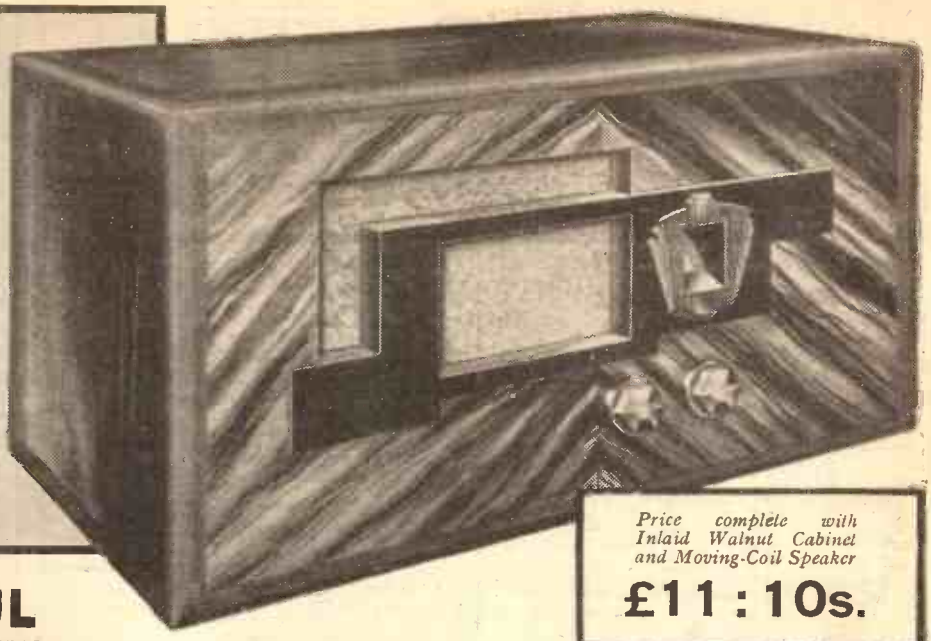
A very late arrival to the British valve market is the Heptode, a multi-grid valve designed for use as a frequency changer in super-het circuits. It is not yet generally available in more than one make, though probably other types will be introduced in the near future.

At the moment Ferranti are the only firm with this type of valve in their range, and it is to be seen on their stand at Olympia.

(Continued on page 803.)

AMPLIFIED AUTOMATIC VOLUME CONTROL

MOVING COIL LOUDSPEAKER



Price complete with Inlaid Walnut Cabinet and Moving-Coil Speaker

£11 : 10s.

IN BEAUTIFUL WALNUT CABINET WHICH YOU PUT TOGETHER YOURSELF

BETTER TO BUILD THAN TO BUY!

SUCCESS IS CERTAIN!

Never before has there been any receiver for Home Constructors on such an ambitious scale as this new Lissen "Skyscraper" Seven Valve Superhet. It embodies every up-to-the-minute advance and refinement of the most luxurious factory-built superhets—it gives the constructor the opportunity to build a £20 receiver for less than half that price.

The circuit of the Lissen "Skyscraper" Seven-Valve Superhet incorporates a 6-stage bandpass filter giving exact 9-kilocycle channels and therefore providing a standard of selectivity never before achieved by a home constructor's kit set and very rarely found except in laboratory apparatus. Amplified Automatic Volume Control is provided, a special valve for this purpose having been produced by Lissen for use in this receiver. The use of this Amplified Automatic Volume Control constitutes an entirely new experience in listening; no "fading," no "blasting"—you will find yourself enjoying every word of every programme, however near or however distant, without the slightest temptation to interfere with the receiver once you have tuned it. This is radio listening as it should be enjoyed!

Lissen Class "B" Output through a new full-power Lissen Moving-coil Loudspeaker—glorious rich tone and majestic volume, actually more faultless in its reproduction than anything you ever heard from even the most powerful mains receiver, yet working economically in this Lissen "Skyscraper" from H.T. batteries.

Tuning is something new in single-knob control—in fact, not only single-knob control but *single station tuning*. You never hear two stations together, you never need to *think* about separation. The 9-kilocycle tuning peak of the circuit ensures "one station at a time" all round the dial, and the Amplified Automatic Volume Control adjusts receiver automatically to provide the same volume from each transmission. This simplicity is the true luxury of listening—and this is the Luxury Receiver for Home Constructors.

CHART FREE POST COUPON

Lissen have published for this great new "Skyscraper" Seven-Valve Superhet a most luxurious Chart which gives more detailed instructions and more lavish illustrations than have ever before been put into a constructional chart. It makes success certain for everybody who decides to build this set; it shows everybody, even without previous constructional experience, how they can have a luxury receiver and save pounds by building it themselves. A copy of this Chart will be sent FREE in return for coupon on the left, or your radio dealer can supply you. Get your FREE CHART now!

SEVEN VALVE SUPERHET 7

THE W.B. MICROLODE LOUDSPEAKER

EVERY single advance in radio reception, particularly in so far as the L.F. end of a set is concerned, emphasises the necessity of correct output matching. Improvements in inter-stage coupling, better valves, loudspeaker advances: all tend to exaggerate the proportion of distortion that can be caused by incorrect speaker-set linkage.

The importance of avoiding this is, however, very widely realised, and manufacturers have placed before us special output transformers possessing special ratios for special purposes, and loudspeakers incorporating a variety of different transformers to suit different conditions.

W.B.'s. Microlode Loudspeaker.

All very complicated, but all most necessary if the listener is to benefit to the full from the marvellous advances that have been made.

But what usually happens when one changes one's output valve or method of L.F. amplification? For instance, supposing we decide to go from Class A to Class B. Why, another output transformer with a new set of ratios is needed! At least, that was the case before the Whiteley Electrical Radio Co., Ltd., introduced their new Microlode type P.M.4A loudspeaker.

But this ingenious and high-quality (but inexpensive) instrument is completely universal in its applications, and is, so far as I am aware, the first loudspeaker to qualify for such an attractive description.

Nevertheless, it must not be thought that it possesses a mere handful of compromise alternative connections. Far from it; as a matter of absolute fact, it enables extremely close matching to be obtained with any kind of output, including ordinary power valves, pentodes, Q.P.P., push-pull and Class B.

No less than 17 different ratios are available in addition to special "centre-tap" arrangements. But you don't have to juggle about with a whole switchboard of terminals and plugs and sockets.

It is all done with two switch arms, and a simple alphabet code enables one at once to obtain the desired ratio.

Even those slight readjustments that ought to, but seldom can, be made to cope with conditions such as alterations due to the use of different H.T.'s and G.B.'s in Class B, are possible, and that clearly proves the closeness of matching given by this new W.B. Microlode speaker.

And as Whiteley Electrical themselves point out, the facility with which the ratios can be changed contributes the incidental advantage that ratio variation can be used in certain circumstances for tone controlling.

The W.B. Microlode retains the now famous Mansfield magnetic system, and in a slightly improved form. In saying that I am again repeating the essence of "W.B.'s" own words, for I agree with them that their previous speakers have been so good that, in general characteristics, they could not be greatly improved.

Their new Microlode type P.M.4A., which is, of course, a permanent magnet moving-coil instrument, reaches a very high standard of performance, and the novel transformer system renders it easy to obtain these results under all conditions.

It is a fine instrument, fully in tune in every respect with the almost ultra-modern era in which it has been introduced.

The Columbia No. 22 pick-up is of unique design.

SIMPLIFYING SET CONSTRUCTION

I have often thought that the wiring of a set is not as easy a task as it ought to be. After all, it is a simple operation fundamentally. There are a number of points in the outfit denoted by screw terminals, and all that has to be done is to join various of these points together with pieces of wire of appropriate length.

But in the modern set, with its ample metal shielding, especially one of the mains type, the connecting wires must be well insulated. That means spaghetti-covered wire.

If the "spaghetti" is *in situ* its toughness makes it difficult to bare the ends of the wire. If it is used separately, then the lengths of lead have to be matched with lengths of spaghetti and then threaded through it.

But all this is rendered quite unnecessary by the British Radiophone material known as "Pull-Back." This is a tinned-copper conductor, having a flexible insulating sleeving on it.

This sleeving can be pushed back with the fingers, thus leaving a clean wire end ready for connecting. And when it is secured under a terminal the covering can be slipped right up to it, and a neat and tidy job completed.

"Pull-Back" is a very handy material for the home constructor, and I can strongly recommend it.

THE COLUMBIA PICK-UP

I have recently concluded a series of tests with the new Columbia Pick-up, the No. 22. It is a fine instrument, and its high technical quality is backed up by several important practical advantages.

For example, it is a short, compact pick-up and, unlike those lengthy and awkwardly shaped ones, is easy to mount on a motor board where space is limited. Nevertheless, owing to skilful design it provides for very good tracking.

Again, needle changing is greatly facilitated by the fact that the whole arm lifts and locks into a vertical position, a scheme I find much preferable to the rotating head. Although in theory this latter seems almost perfect, in practice it usually compares very unfavourably with the new Columbia method.

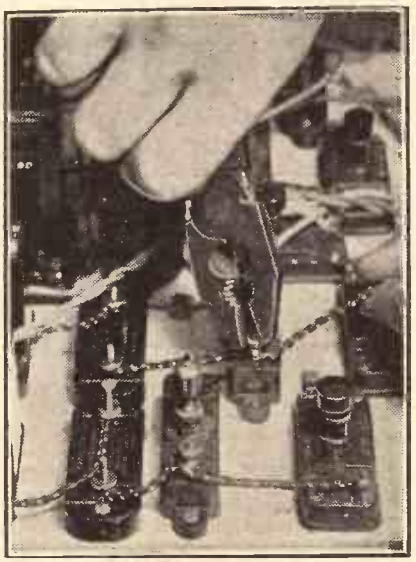
It should also be noted that the No. 22 Columbia Pick-up incorporates a "hum-breaking" coil, the object of which is to prevent hum from being induced in it when a synchronous A.C. motor is employed to drive the turntable.

The pick-up develops a considerable output, and this sensitivity enables it to give ample volume with only two stages of amplification. It can "plug in" to the detector of an S.G.-det.-L.F. set and provide a good margin of power.

Needless to say (in view of the great reputation of the makers), it does not exhibit any of the common faults, such as resonance, either in the head or arm, and its needle pressure has been closely regulated. There is no track jumping at the low frequencies.

The response is exceptionally good, and there is no note splitting or fuzziness at any point in the scale. Indeed, its clearness is nothing short of brilliant. If only some of those early pick-ups had possessed one-tenth of the merits of this Columbia No. 22, radiogram working would not have developed so many somewhat bitter critics.

I would urge all who have failed to obtain satisfaction with a pick-up at least to endeavour to hear the Columbia No. 22 in operation on a good outfit with a good record to back it up. They would find it an inspiring experience.



The new Radiophone "Pull-Back" connecting wire in actual use.

The LINK BETWEEN

BY G. T. KELSEY

Weekly jottings of interest to buyers

AS the link between the manufacturer and the purchaser, there *is* only one type of advice I can give you this week. If you can possibly see your way clear to pay a visit to Olympia, by all means go.

You will certainly not come away disappointed, for this year it is true to say that the Exhibition is the finest that has ever been staged under the auspices of the Radio Manufacturers' Association. Never before in the whole history of Radio Exhibitions have so many new things been on show: new valves, new coils, new accessories—in fact, new *everything*! And all at prices which are in many cases appreciably below those of last year.

Veritably this is the show of shows. It is much too good to be missed; and if you do manage to get along, don't forget to pay a visit to Stand No. 11, where "P.W." will be waiting to welcome you.

Class B at Olympia.

One of the things that will strike you, if you are able to visit the show, will be the tremendous amount of interest that is being shown in Class B amplification. All the leading people are showing apparatus of one kind or another for use in Class B output stages, which is proof, if proof is wanted, of the way in which the scheme has undoubtedly caught on.

The G.E.C. are the latest people to take an interest. During the "teething months" of this great new scheme they have been quietly conducting experiments, and they have now emerged with a

(*Continued on page* 804.)

RADIOTORIAL

The Editor will be pleased to consider articles and photographs dealing with all radio subjects, but 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 Editorial communications should be addressed to the Editor, POPULAR WIRELESS, Tallis House, Tallis Street, London, E.C.4.

All inquiries concerning advertising rates, etc., to be addressed to the Sole Agents, Messrs. John H. Lile, 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 specialties described may be the subjects 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

ON FIVE METRES.

R. C. (Shepherd's Bush, W.).—"I am very interested in getting down to five metres. Is it a fact that the frequency of the currents in a five-metre receiver is over *fifty million per second?*

"If so, is the apparatus very out of the ordinary to handle such a remarkably high frequency?"

The frequency in kilocycles can always be found when wavelength is known by dividing the latter into 300,000.

In this instance the figures will be 60,000 kilocycles, i.e. 60 million cycles per second.

The apparatus used is far less extraordinary than one might expect.

As you are interested we suggest you should seize the opportunity of seeing the 5-metre transmitter and receiver which will be showing on the "P.W." Stand (No. 11) at Olympia until the Radio Exhibition closes on the 24th.

CATHODE-RAY TELEVISION FOR HOME CONSTRUCTORS.

J. W. L. (West Wickham, Kent).—"My last venture into television experimenting was nearly a year ago. I had a certain amount of success, but not enough to justify the expense and time.

"Then I went to Germany, where I have been too busy to attend to the subject. And on my return I find that this country has not been asleep, but has experimented with the cathode-ray tube and applied that to the problem, with 'P.W.' designing the necessary apparatus for home construction.

"Is there any chance of seeing the cathode-ray apparatus in your laboratory? I understand from my brother that you occasionally permit readers to visit Tallis House, and I should greatly appreciate a look over the apparatus if it can be granted."

Normally, we cannot arrange for visitors, but owing to the interest in the cathode-ray television apparatus for home constructors we are giving readers the opportunity of seeing this at our stand at the Radio Show at Olympia.

It is on view on Stand 11, and, as members of the Technical Staff will be there all day, this will afford you a better opportunity of examination, etc., than a visit to a necessarily busy laboratory.

RECEIVING ON SHORT WAVES WITH AN ORDINARY SET.

D. M. (Bognor Regis).—"My set is S.G., Det. and Pentode, with closed-in coil units on a metal chassis, covering 250 to 550 metres and 1,000 to 2,000.

"Happening to remark to a friend that I wished I could have the very short waves

(*Continued on page* 798.)

IS YOUR SET BEHAVING ITSELF?

Perhaps your switching doesn't work properly? Or some mysterious noise has appeared and is spoiling your radio reception? Or one of the batteries seems to run down much faster than formerly?

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

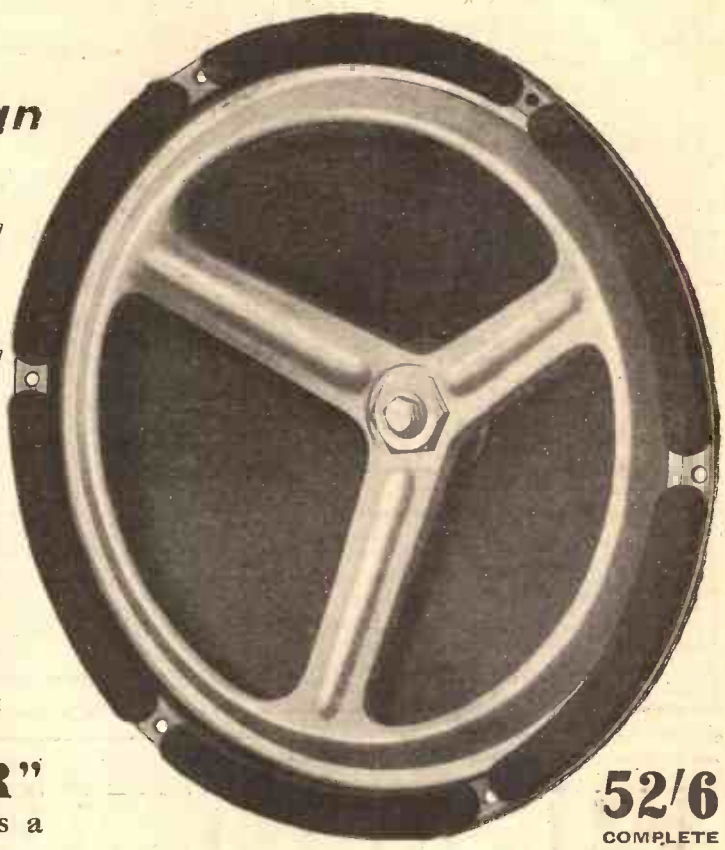
LONDON READERS. PLEASE NOTE: Inquiries should NOT be made by 'phone or in person at Fleetway House or Tallis House.

The R&A "Alpha" has created a sensation—

"The forefront in design and construction."

"Definitely ahead of all others."

"Performance exceeded all expectations."

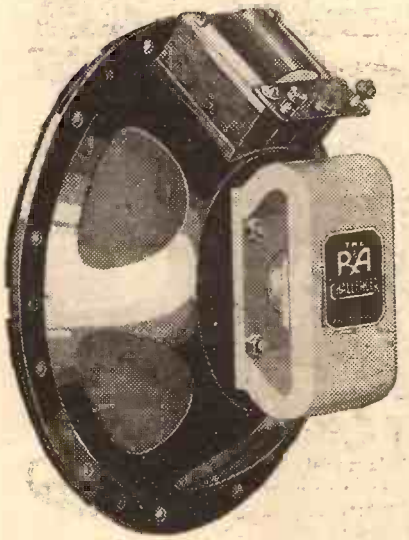


Here is realism in very truth; speech and music with all the character of the original—amazingly natural. Music is reproduced with brilliance and attack; a delight to listen to the crispness of solo instruments, the rich fullness of bass, and the clear-cut notes of the violin.
Ask your dealer to demonstrate the ALPHA. You will then appreciate its superiority, and how indispensable it is if you want the best that broadcast provides.

52/6
COMPLETE
Diameter 10¼"
Depth 5¼"

—and the 1934 "CHALLENGER"

Series of P.M.M.C. Reproducers includes a model for every output.



The CHALLENGER is the accepted "best" moving coil reproducer at its price. Its popularity is world-wide, and a model is now available for every output.

STANDARD fitted with a 3-ratio Transformer suitable for use with the majority of power super-power and pentode valves.
TYPE B8—For Class "B" Amplification this unit is identical in appearance and performance to the "Standard" model, but is fitted with a special Transformer having a centre tapped primary. The transformer is designed to operate correctly with the Cossor 210 Class "B" valve, or other valves having similar characteristics.
TYPE B 15—For Class "B" operation. The Transformer is designed to operate correctly with the Cossor 220B, Mazda PD220 and Mullard PM2B valves, or other valves having similar characteristics.
TYPE P—Many commercially built receivers now on the market necessitate a special high-priced reproducer to match the load of the output from the extension terminals. To meet the demand we have produced this model, which is identical in appearance and performance to the "Standard" model, but which has available 3 impedance ratios for matching purposes, i.e. 1·2 ohms, 2·3 ohms and 5·25 ohms.
TYPE Q—As "Standard" model, but fitted with a Transformer having a centre-tapped primary intended for a Quiescent Push-Pull output. The plate to plate load of the primary is 15,000 ohms, and it is, therefore, suitable for use with all valves most commonly used for Q.P.P. operation.

EACH MODEL
35/-
Diameter 8½"
Depth 3½"

Your dealer can supply. Write us for new Leaflet, sent post free.

R&A REPRODUCERS

REPRODUCERS & AMPLIFIERS LTD. WOLVERHAMPTON.

Holdens

RADIOTORIAL QUESTIONS AND ANSWERS

(*Continued from page* 796.)

as well, I was told, to my surprise, that such sets as mine can easily be "adapted" to short waves. And I am to have particulars of a set exactly like my own which is being used in this way as soon as my friend can get them.

"In the meantime, he suggested I should write to you and get confirmation of what he tells me—that is, the possibility of easily converting an ordinary set into a short-wave set, even when closed-in coil units are employed.

("I should like to know how it is done, too, but I suppose that the method is a bit too complicated to describe?")

We can confirm the efficiency of short-wave adaptors, and you will find that they are easily added to a set like yours, and easily operated.

Contrary to what might be expected, too, they are easily explained so far as the fundamental idea behind them is concerned.

What happens is that an entirely new tuning and reaction circuit for short-wave work is made up into a small unit, and connection to it is provided by means of a flex lead that terminates in a plug which fits your set's detector valve holder.

So all you do with an adaptor is to take out your detector valve, insert the unit's plug into the valve holder, place the detector in the unit, and then take the aerial to the A terminal on the unit.

It will then be found that the set's ordinary tuning controls are inoperative. But instead the set will answer to the tuning of the new unit, which covers the interesting short-wave bands.

At any time the set can be immediately restored for ordinary reception, merely by removing the flex lead and plug that belong to the unit, and replacing the aerial lead and detector valve.

Loss of Emission.

R. M. M. (Winchelsea).—"Whilst on the subject of valves, may I inquire the correct method of testing for loss of emission by means of a milliameter?

"I know that in a general sense the latter is used to check the plate current of each valve in turn, to ascertain if it differs seriously from the figure given for that particular type by the maker of the valve. But *where* is the milliammeter connected?

"The suggestion that I should undo the inside of the set and insert it in turn in each valve holder's anode lead does not appeal to me, because, although I am told it is the only way, I distinctly remember having seen a much simpler procedure followed successfully.

"On that occasion the expert connected up the milliammeter in the external leads to the battery, and without interfering with the inside wiring at all he was immediately able to pronounce that the detector was a dud, which it proved to be.

"Asked whether it would not be as well to check the other valves as well, he said, 'I have,' and although I did not know much about wireless then I do know he diagnosed that trouble correctly in about two minutes, without altering wiring or set-fiddling in any way.

"Now that I own a milliammeter myself I should very much like to know how that piece of quick work was done."

To anyone equipped with the necessary experience and a sensitive milliammeter the test for emission is but the work of a few moments.

The procedure is to connect the milliammeter in the negative H.T. lead, through which all the plate current of each valve must pass. (The "screen" currents of S.G.'s, etc., must also be taken into consideration).

If the voltages are O.K. when the set is switched on the total anode current should equal the sum of the currents taken by the individual valves, worked under the conditions applicable in the particular case; and it is here that experience counts, for the current for many valves will vary within limits according to the circuit conditions.

Knowing exactly what current to expect, the expert immediately notices if there is a low-current reading, and he then ascertains where the cause of this lies by pulling out the valves one at a time.

If, for example, the power valve should be taking

(*Continued on page* 800.)

DO YOU KNOW—

The Answers to the following Questions? There is no "catch" in them; they are just interesting points that crop up in discussions on radio topics. If you like to try to answer them you can compare your own solutions with those that appear on a following page of this number of "P.W."

(1) What is the name of the new station with a woman announcer which has appeared on Kalundborg's wavelength, 1153·8 metres?

* * *

(2) To what nationality does it belong?

* * *

(3) What are the three ways of expressing Ohm's law?

* * *

(4) In what order are the electrodes of an A.C. S.G. valve placed between heater and plate?

"P.W." PANELS. No. 133. MARSEILLES.

The Marseilles station, 624 miles from London, works on a wavelength of 315 metres, its dial reading being about half-way between the Breslau and West Regional readings.

* * *

The power employed is 2·5 kws., and the station is not often heard in this country except on very sensitive sets. It frequently relays the Paris (P T T) programme.

* * *

The air played as an opening and closing signal is from an old Provencal folk-song.

RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 798.)

10 milliamps, the total anode current should drop by that amount when the power valve is removed from its holder. And if the drop is less than 10 it is obvious that this part of the circuit is at fault.

Similarly, if the expert gets a drop of perhaps only half a milliamp, instead of an expected two milliamps, on removing the detector, he knows that that is where the trouble lies, especially as he had probably already suspected it because of failing reaction or some such symptom.

When all the valves but one are removed the current for that particular valve is shown by the meter, so the connection in the negative battery lead is just as good as undoing the separate leads to the anodes of the valves.

When the above procedure is followed by an expert it looks ridiculously easy, but you will note that there are two or three important points which are vital to quick success in locating the faulty valve. One is the experience which alone can tell if the plate currents are normal for the valves under the conditions obtaining. And another important point is a sufficiently sensitive milliammeter, for there is a very wide difference in plate-current amplitudes, and it needs a very good instrument to show clearly the drop due to loss of emission in, for instance, a detector valve which is R.C. coupled to the following stage.

RESISTANCE AND TRANSFORMER COUPLING AFTER THE DETECTOR.

J. D. D. (Shaftesbury).—"Having all the necessary components, I want to go back to the old arrangement of detector with resistance-capacity coupling, followed by a transformer-coupled stage of L.F.

"I know it is supposed to be out of fashion with all this Class B, Q.P.P., parallel-feed and what-not; but, for curiosity, I want to try it again.

"Please give the connections for the following components: One H.F. choke, two 2-mfd. fixed condensers, two resistances (80,000 and 30,000 ohms), one ·5-meg. grid leak, one ·01-mfd. fixed condenser, one L.F. transformer, one output choke.

"The detector portion of the set with lead from differential reaction is O.K.; it is only the L.F. coupling and output connections that I want. (Valve holders and odds and ends in plenty.)"

Assuming that the valve holders have filaments correctly connected across the L.T. supply, and that the detector valve holder is also completely wired on its grid side, but with the differential reaction

THE ANSWERS

TO THE QUESTIONS ON PAGE 798 ARE GIVEN BELOW.

(1) Monte Ceneri is the name of the station.

(2) It is a Swiss station, and the language used is Italian.

(3)

(A) $I \text{ (current in amps.)} = \frac{E \text{ (volts)}}{R \text{ (ohms)}}$

(B) $E = I \times R$.

(C) $R = \frac{E}{I}$

(4) Next to the heater is the cathode; then come the control grid, the screening (or "priming") grid, and finally the plate.

DID YOU KNOW THEM ALL?

moving vanes lead "in the air," you can complete the wiring as follows:

One end of the H.F. choke and the lead from the differential's moving vanes to the anode terminal of the detector valve holder.

Other side of H.F. choke to one end of 80,000 ohms resistance, and to one side of ·01 fixed condenser.

Remaining side of 80,000 ohms resistance to one side of a 2-mfd. condenser, and also to one side of the 30,000 ohms resistance.

The remaining side of the 2-mfd. goes to L.T. —.

The grid of the first L.F. valve holder is joined to the other side of the ·01 fixed condenser, and also to one side of the ·5-meg. grid leak, the other end of which goes to first L.F. grid bias.

The remaining side of the 30,000 ohms resistance goes to H.T. + (detector).

The plate terminal of the first L.F. valve holder goes to P (or A) on the L.F. transformer.

H.T. + terminal on this goes to H.T. + (first L.F.).

Grid terminal of the output valve holder goes to the G terminal of the L.F. transformer.

The G.B. terminal of the transformer goes via the usual flex lead and plug to G.B. (output valve).

The plate terminal of the output valve holder goes to one terminal of the output choke, and also to one side of the other 2-mfd. condenser. The remaining condenser terminal goes to one L.S. terminal. The other L.S. terminal goes to L.T. —, H.T. —, etc.

Finally, the remaining terminal of the output choke goes to maximum H.T. +, this completing the connections.

NO H.T. THROUGH THE PRIMARY.

H. H. (Ilford).—"Is the following method correct for shifting an L.F. transformer to shunt-feeding, so that no H.T. goes through its primary?

"Leave anode circuit of detector as before, except to wire a suitable coupling resistance in the place formerly occupied by the transformer primary.

"From the anode side of this coupling resistance take a lead to the L.F. coupling condenser, the other side of which goes to A terminal of L.F. transformer. H.T. terminal of transformer goes to the L.T. — H.T. — earth line.

G terminal of transformer to grid of following valve holder. G.B. terminal of transformer to grid bias."

Your suggested method should be quite O.K.

SUPER OR STRAIGHT.

Messrs. Varley have asked us to point out that the attractive cabinet illustrated on page 692 of last week's issue forms a housing for either the firm's 3 valve A.C. Receiver A.P. 34 or Superhet A.P. 46 (4 valve) and not the Superhet A.P. 48 as stated.

HOW TO MAKE THE OLYMPIA SUPER

(Continued from page 782.)

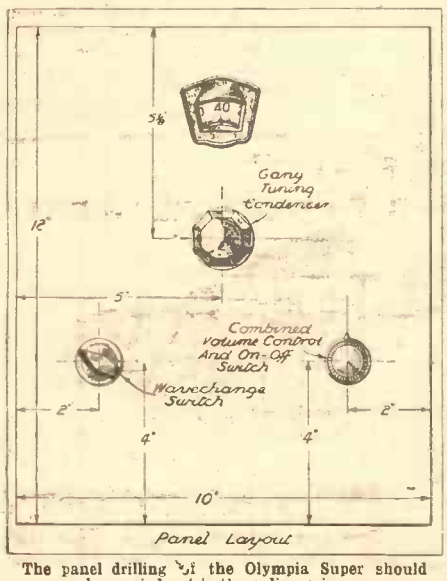
The aerial and earth are connected in the usual way, and the valves given in the list are inserted in order in the sockets V_1, V_2, V_3, V_4 and V_5.

To set the receiver it is best to connect up everything without the cabinet, adding this latter when all is ready for normal working. The female portion of the mains plug is connected by flex to a light adaptor plug or a wall power plug, and the "liveness" of the set is tested by turning the volume control clockwise a fraction till the switch is heard to operate. Then a few seconds will suffice to see if the valves light up, and are followed some thirty seconds later by the clicking over of the thermal-delay switch.

Preliminary Adjustments.

After this test switch off and get ready to set the trimmers of the three-gang condenser and to adjust the intermediates. These are sent out with the coupling of the coils adjusted for best normal operation, so this feature should not be altered until after the set is working well and if it is desired to try different coupling. What should be done now is to push all the adjusting levers on the intermediates to one side, moving them fully anti-clockwise as viewed from the top of the units.

EASY DRILLING



The panel drilling of the Olympia Super should be carried out to these dimensions.

Then screw up the three trimming wheels fully, followed by a slacking off of one complete revolution. The preliminary setting is now complete, and with aerial and earth connected the set can be switched on.

Turn the volume control three-quarters to the right and rotate the tuning dial. Search for a station as low down the medium-wave scale as possible. You will know when you are on medium waves by the fact that the flat portion of the Colvern wavechange switch rod will be

(Continued on next page.)

HOW TO MAKE THE OLYMPIA SUPER

(*Continued from previous page.*)

in a horizontal plane. It is in a vertical plane when the coils are switched to long waves.

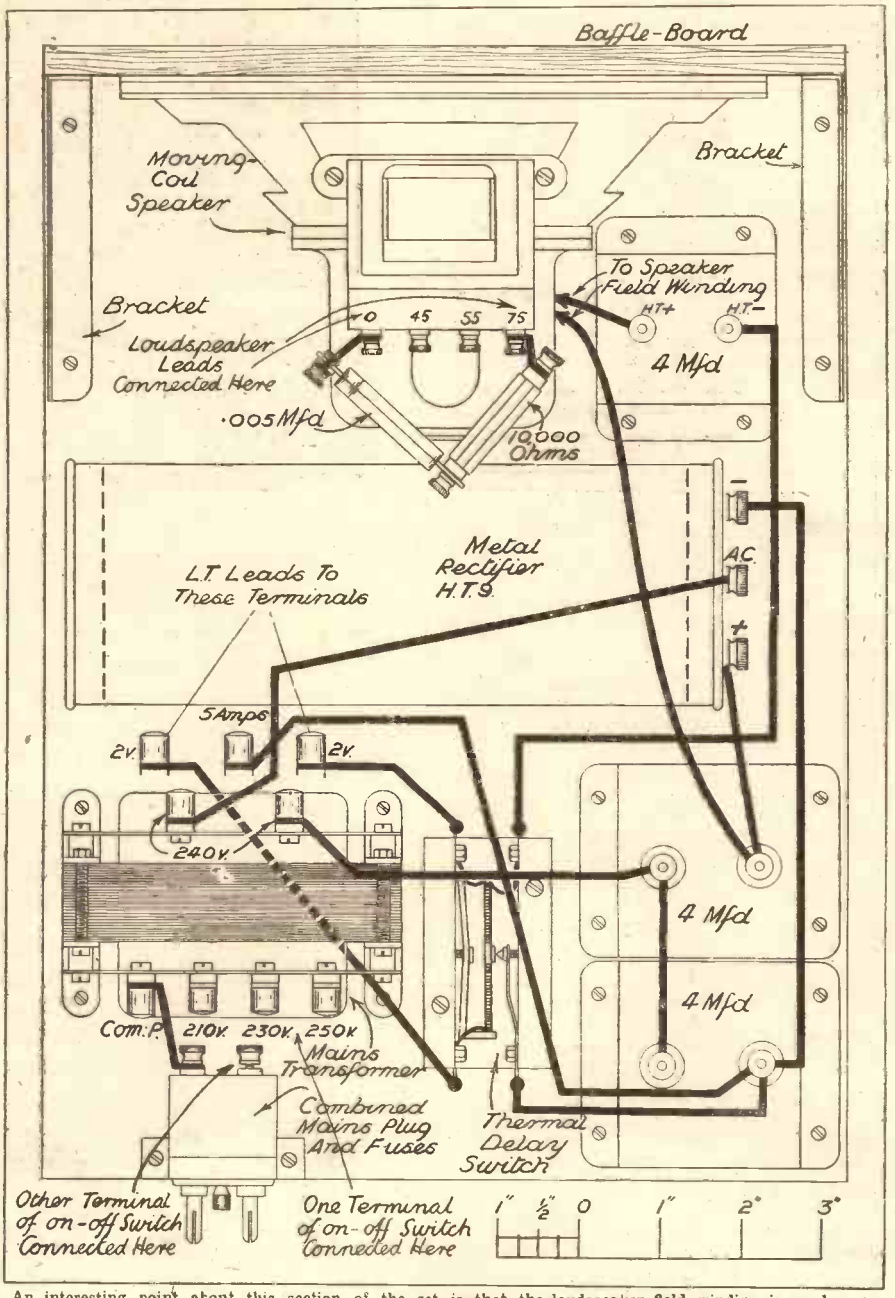
After finding the station reduce volume to just comfortable audibility and rotate the two back (furthest from panel) trimmers slowly to get the positions of maximum strength. If necessary, reduce strength by volume control after each adjustment to keep the level of volume down to a reasonable limit. Do not alter the adjustment of the trimmer nearest the panel.

When the tuning here is complete, switch over to the long waves and trim the intermediates—on, say, Radio-Paris or Daventry—until best results are obtained. The trimmers on the condenser are not touched during this procedure.

One final word. The valves used in the original set, and for which the bias resistances specified are chosen, were those mentioned at the top of the list of valves with the exception of the pentode, which was a Mazda A.C. Pen.

If you change from these you may have to make slight alterations in the bias resistances for V_1 and V_2 (common resistance) and V_5. For V_3 the resistance is variable, so no change is required here, but V_5 resistance should be chosen according to the makers' recommendations for bias.

In the case of the V_1—V_2 common resistance it is not likely that any alteration will be required, for the value is not at all critical. A rough guide is to use a resistance of about ⅔ that specified for the normal bias of the type of valve used in V_2.



An interesting point about this section of the set is that the loudspeaker field winding is used as a smoothing choke.

VALVES ON SHOW

(Continued from page 791.)

The VHT.4, as it is termed, is a most interesting valve, and should be examined very carefully, for it represents probably the most complicated piece of valve mechanism, from an electrical as well as a mechanical point of view, yet devised for the use of the ordinary broadcast listener.

The mechanism of the modern valve is a thing at which to wonder, and most of the valve firms are showing detailed models of their various products, so that the exact construction can be clearly seen. Have a

★ ★ ★

FOR DUAL PURPOSES

A couple of Osram double-diode triode valves—M.H.D.4—which are designed to carry out H.F. rectification and L.F. amplification as separate operations.

good look at them, especially such models as those of the screened pentodes, double-diode pentodes and triodes, Catkins and so forth. The intricacies of design and the accuracy with which they are carried out speak volumes for the skill of the modern valve engineer.

The valves at Olympia are truly the basis of the trend of the whole Exhibition, and on them has been founded the main features of the set designs for the coming season.

MIRROR OF THE B.B.C.

(Continued from page 764.)

or something as good. I am told that this suggestion was turned down, but that it will be raised again in the autumn. For the sake of listeners I hope that common sense prevails to give us back the interludes, and *not* gramophone records, please!

If Britain Went Nazi.

The internment of the leading broadcasting officials of Germany and the dismissal of many others by Nazi authorities have been made the opportunity of some interesting speculations by a German journal as to what would happen to the B.B.C. under a similar regime in England. The journal shows astonishing knowledge of the personnel, personalities and politics of individual members of the B.B.C. staff.

It is easy, of course, to say that all Jews, and those of Jewish name, would be

(Continued on next page.)

MIRROR OF THE B.B.C.

(Continued from previous page.)

interned forthwith. Then the paper goes on to give the list of those who would suffer for their private opinions without being Jews. Certain directors of departments and eighteen important officials would be proscribed on this count. The commentator makes it clear that, although the whole of the Board of Governors would have to go, Sir John Reith would survive if he cared to do so.

THE LINK BETWEEN

(Continued from page 794.)

Class B valve which, in a sense, is unique in that it combines advantages of Q.P.P. with those of positive-grid-drive Class B.

The Osram "B.21," as it is called, requires to be operated with a negative grid bias; but, as the G.E.C. rightly points out, since bias has in any case to be used with the "driver" valve, there is no hardship about it.

For Nottingham and District Readers.

Nottingham's own Radio Show is being held this year in the Greyfriars Hall from September 6th to 14th inclusive.

Several of the leading manufacturers are to be represented, and between twenty and thirty local traders have also promised their support.

This is the second occasion on which Nottingham has had its own Radio Show, and a visit by readers living in the locality should be well worth while.

Further details may be obtained from the organiser, Mr. R. D. Hought, the Branch Manager of Messrs. T. Beadle & Co., Ltd., at 12, Fletcher Gate, Nottingham.

A New Mullard Leaflet.

When Mullard's do things they do them well!

I have just received a copy of a pamphlet that they have produced on Class B amplification, and it is one of the most commendable efforts that I have seen on the subject.

OUR POSTCARD SERVICE

Applications for trade literatnre mentioned in these columns can be made through "P.W." by quoting the reference number given at the end of the paragraph. Just send a postcard to G. T. Kelsey, at Tallis House, Tallis Street, E.C.4. Any literature described during the past four weeks may be applied for in this way—just quote the number or numbers.

It describes in simple terms what Class B amplification is, and in addition to telling you how to use this method with existing sets, it gives a lot of really useful information about the Mullard P.M.2B. Class B valve.

"P.W." readers desirous of obtaining a copy of this leaflet can do so through the medium of our postcard service. Just send the usual postcard to us, and we shall be pleased to make the necessary arrangements. **(No. 45)**

THE LISTENER'S NOTEBOOK

(Continued from page 764.)

must have occurred to the B.B.C. that thousands of Scouts had tuned in to hear their Chief, besides parents and friends of Scouts. They must have been a disappointed crowd, with their disappointment growing as the wait was prolonged.

And the best the B.B.C. could do was to put on two *foreign* musical records—definitely *not* the fare for such an audience.

* * *

There is some satisfaction in knowing that I wasn't the only one fooled over the Café Colette joke. Monsieur X.'s identity has been revealed. He is Mr. Walford Hyden, and the Café Colette orchestra is *his* orchestra. Though I am prepared to laugh at it all, I would like to make two observations.

Mr. Walford Hyden has achieved the impossible with his perfect impersonation of the Frenchman, and the B.B.C. has established a very dangerous precedent.

Broadcasting demands a mutual confidence between the peoples each side of the microphone. The B.B.C. can't have forgotten the doubts some people entertained as to the reality of the nightingale broadcasts.

I am not one of those, but I should hate to think that it wasn't Keith Falkner I was listening to the other evening, but a village baritone from Wiltshire instead. You see my point?

TECHNICAL NOTES

Some diverse and informative jottings about interesting aspects of radio.

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

Cutting Out the Local.

WHEN you are troubled with a strong local station, and you want to pick up a distant or weak station through it —as so often happens—there are various dodges you can try, some of which I have touched on before. If you do not already use a wave-trap, this is worth trying, as it will give you a great increase in selectivity and help you out of a difficulty. I should, however, explain that there are some methods which improve the selectivity of the set as a whole—that is to say, over a wide range of wavelengths; but the wave-trap system is more particularly intended to give you selectivity at a particular part of the frequency range.

Another point to remember about a wave-trap is that it will generally cover a certain waveband so that you can hardly expect to cut out one station and then receive at full strength another station which is very closely adjacent in wavelength to the one which you have suppressed. Generally the wave-trap will cut out wave-lengths on both sides of the intended one.

Wave-Traps.

This "spreading" effect, however, can be largely reduced—in other words, the influence of the trap can be confined to some extent—if you use a type of trap employing a tapped coil. The aerial is connected to one of the tappings, whilst one end of the coil is connected to the aerial terminal of the set (in other words, the aerial is connected to the aerial terminal *via* a portion of the coil), whilst a variable condenser (of, say, 0·0005 mfd.) is shunted across the whole of the coil. You now tune in the station which you want to get rid of, and then adjust the condenser until this local station disappears, or practically so. This virtually gets rid of the undesired local station, and you are then free to tune in the weak station which the local was previously over-powering But, as I have already mentioned, the *wanted* wavelength must not be too close to the *unwanted* one.

Bandpass Arrangement.

Altogether, apart from the wave-trap system, if you want to get a *general* improvement in selectivity, it is better to go in for the bandpass arrangement. This in principle consists of a tuned circuit extraneous to the set, or rather extraneous to the *circuit* (it may be incorporated in the set, of course), which is coupled to the tuned circuit by means of a small condenser. If your present tuned circuit is of the dual-range type, as is most probable, then it is just as well to have the extra tuning circuit also dual-range, so that it can be used with the existing circuit, whether this is tuned for long or medium waves.

(*Continued on next page.*)

TECHNICAL NOTES

(Continued from previous page.)

Unwanted Coupling.

Another point I should mention in passing is that the coupling between the extra tuned circuit and the present one must be limited to that due to the coupling condenser. In order to prevent unwanted coupling, therefore, you should screen the two circuits; this can be done by means of an ordinary simple screen.

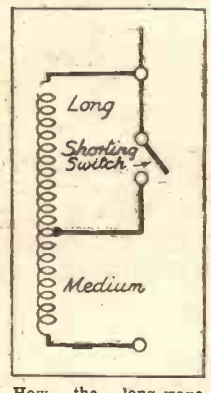
Having got this arrangement fixed up, you will, of course, have to tune both the normal tuned circuit and also the additional one, and the tuning of both circuits will vary with different stations; but this little extra trouble is well worth while if you are badly in need of extra selectivity.

Another important point is that no alteration of the present circuit is required, and therefore it is a very simple matter to disconnect this extra bandpass unit if at any time it is not required. For instance, if you want to put the set into the hands of someone not so initiated in tuning, where simplicity of tuning becomes more important, you can disconnect the additional tuning circuit and the set will be as it was before.

Dual Coils.

The simple arrangement of long- and medium-wave coils in series which I referred to in these notes recently is indicated in the accompanying sketch.

SIMPLE SWITCHING



How the long-wave winding is cut out of circuit.

The two coils are in series, and the long-wave coil can be shorted by means of the switch. When the switch is open the whole of the coil is in use, whilst when the switch is closed only the lower part of the coil is in circuit.

Bear in mind, however, the various points and precautions which I mentioned, especially with regard to absorption and interference effects between the coils.

Screening.

Screening of coils has become so common in present-day multi-valve receivers, especially of the compact mains type, that many people are apt to jump to the conclusion that screening in itself makes for extra efficiency.

This question of efficiency may be looked at in two different ways. First of all, if there is unwanted coupling and interaction between different components, this puts a limit to the efficiency which can be got out of some of the stages, owing to instability setting in; and therefore it is obvious that if screening is going to prevent this instability it will enable us to operate the stages at a higher efficiency. So that, looked at in this way, the screening gives us—or rather I would prefer to say *allows* us—a higher overall efficiency than we could obtain without it.

(Continued on next page.)

TECHNICAL NOTES

(*Continued from previous page.*)

Inefficiency.

Looked at in another way, however, the screening is in itself a source of *in*efficiency. The very method by which a screen acts is to absorb and dissipate energy, so to that extent it definitely operates on the principle of *reducing* efficiency.

The result of the whole thing is that by reducing efficiency at particular points it enables the overall efficiency of the circuit as a whole to be improved. This sounds rather contradictory on the face of it, and I can best sum it up by saying that what you lose on the swings you *more than* gain on the roundabouts.

Screening Not Always Necessary.

An important practical point arising out of the above considerations is this: that if you are using a fairly simple type of circuit, in which you are not likely to be troubled with interaction, then you would be much better advised *not* to go in for screening the components. If you do, you are sacrificing efficiency in order to guard against a difficulty which is not there. Screening should only be resorted to when it cannot be done without, and before you adopt screened components you should make sure that the screening is really necessary. Otherwise, as I say, you are making quite unnecessary sacrifices.

Coil Switching.

A question closely associated with the use of coils is that of wave-change switching. There was a time, not so long ago, when wave-change switches were rather in disgrace, because they always seemed to cause such a lot of trouble. Many people, even to this day, have a prejudice against multi-switches when used in connection with coils, and I must say that I have never entirely got rid of this prejudice myself. In my case it is not directed against wave-change switches in particular, but against switches in general, and especially multi-point switches. I do not know why it should be so, but I always have a feeling that there will be sure to be a few bad contacts knocking about and plenty of room for trouble!

Coil Types and Layout.

But to be quite fair, wave-change switching has been very greatly improved, and there is really no serious reason why one should not be satisfied with it in its present-day form. The question of the type of switching to go in for, whether push-pull switches or the rotary type, or whether the coil should have the switches built in, and so on, depends largely on the type of coils you use and also on the general layout. Sometimes you will find the push-pull type of switch fits in very neatly with your scheme, whilst in other cases you may find it more convenient to use the rotary type.

Distortion.

Distortion can occur at different points in the circuit, and if you are going to control volume it is a good plan to put the control at a point *before* the place where the distortion arises instead of *after* it. You see, it is no use letting the "weak spot" where the distortion occurs take the full brunt

(*Continued on next page.*)

TECHNICAL NOTES

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of whatever volume is coming through—thereby increasing and aggravating the distortion—and then cutting down the volume afterwards. If you are going to cut down the volume you had far better do it before the weak place, in which case the load which is thrown on the spot where distortion arises is reduced, and so distortion itself is reduced.

Multi-Mu.

With a multi-mu valve, which, of course, is a screen-grid valve of special design, you can adjust the valve so that it will not be overloaded, in this way avoiding distortion so far as the valve is concerned, whilst the output can be so adjusted that the detector valve is capable of handling it. In the multi-mu screen-grid valve the magnification given by the valve depends upon the grid bias, and so, by varying the grid bias, the magnification can be made to vary correspondingly. The full range of variation is generally given by about 9 volts in the case of some valves or about 15 volts with others.

Effect of Grid Bias.

The screen-grid multi-mu must have its grid bias so adjusted that it does not overmagnify and so overload the detector, whilst in the next stage the valve following the detector must be arranged to handle whatever is passed on to it by the detector without distortion.

No Interference with Tuning.

If these conditions are properly carried out the whole chain of stages from the multi-mu to the output will be free from distortion, at any rate so far as overloading is concerned. An important point to notice about this form of volume control by means of the grid bias on the multi-mu valve is that it does not interfere with the tuning.

As you know, if you attempt to get any sort of volume control by detuning on an ordinary set, and especially if the set is very sensitive, you will almost certainly be in trouble with tuning in neighbouring stations and also distortion. With the multi-mu system, however, that does not arise.

A FOREIGNER'S IMPRESSIONS OF BRITISH RADIO

(*Continued from page* 761.)

was forgot. Yet—I do not feel certain—yet perhaps the organisers did not remember too well the foreigner. It is true that a linguist was provided, but I would respectfully ask if the foreigner was, effectively, invited. Par example, was announcements made of Olympia in my country, Spain ? But it is nothing ! They will sell their millions to the English with triumph.

In the sixty centimos "Official Catalog," Lord Sir Reith exposes that the British Wireless industria is not a "luxury trade." Pardon me, I believe to the opposite. Ago some years, and wireless apparatos had the appearance of electrical machinès ; but now the shoes are on the other boot, for all is beautiful furnitures with the radio "thrown in," as you say.

All the cunning of English artifices has lent itself to breed the illusion that a radio "set" is in reality a chair, a cuppard or a chest of drawers, done in work most magnificent. Necessity, which radio may be, has been clothed as luxury, as though to apologise for so primitive a desire as the lust for learning and news.

"Fever After Technical Excellence."

Despite the luxury of the decorations, you English give away the game perfectly well by your fever after technical excellence. Under all the mahogany carvings you must possess "the very latest" circuits and contrivances. Therein you demonstrate your bewildering, your essential, Anglo-Saxonism. You hold with one hand the beauty-striving-after of the renaissance ; with the other fist you cling to "the very latest." In effect one has Marconi embedded in the piety and conscientious art of the Norman cathedral carvers.

I encounter my visit to Olympia as a cold bath ; invigorating, yet transient of effect. Soon I shall be in Spain, where, doubtless I shall speak at length of this Olympia and its wonders, and my friends will say, *Dios mio.* But there it ends !

I congratulate you English, not without a tinge of envious, on your "Show." It reveals your character ; that invincible, boylike resilience to outward adverse conditions, that without-the-power-to-imitate youthful confidence and audaciousness, which endowed you with three-quarters of the earth and which, I hope, will keep you, you "mad English," the strong power for good which I have learned you to be, in a world of disordered and unstable tendencies.

NEXT WEEK

How to Make

A Low-Cost High-efficiency Receiver

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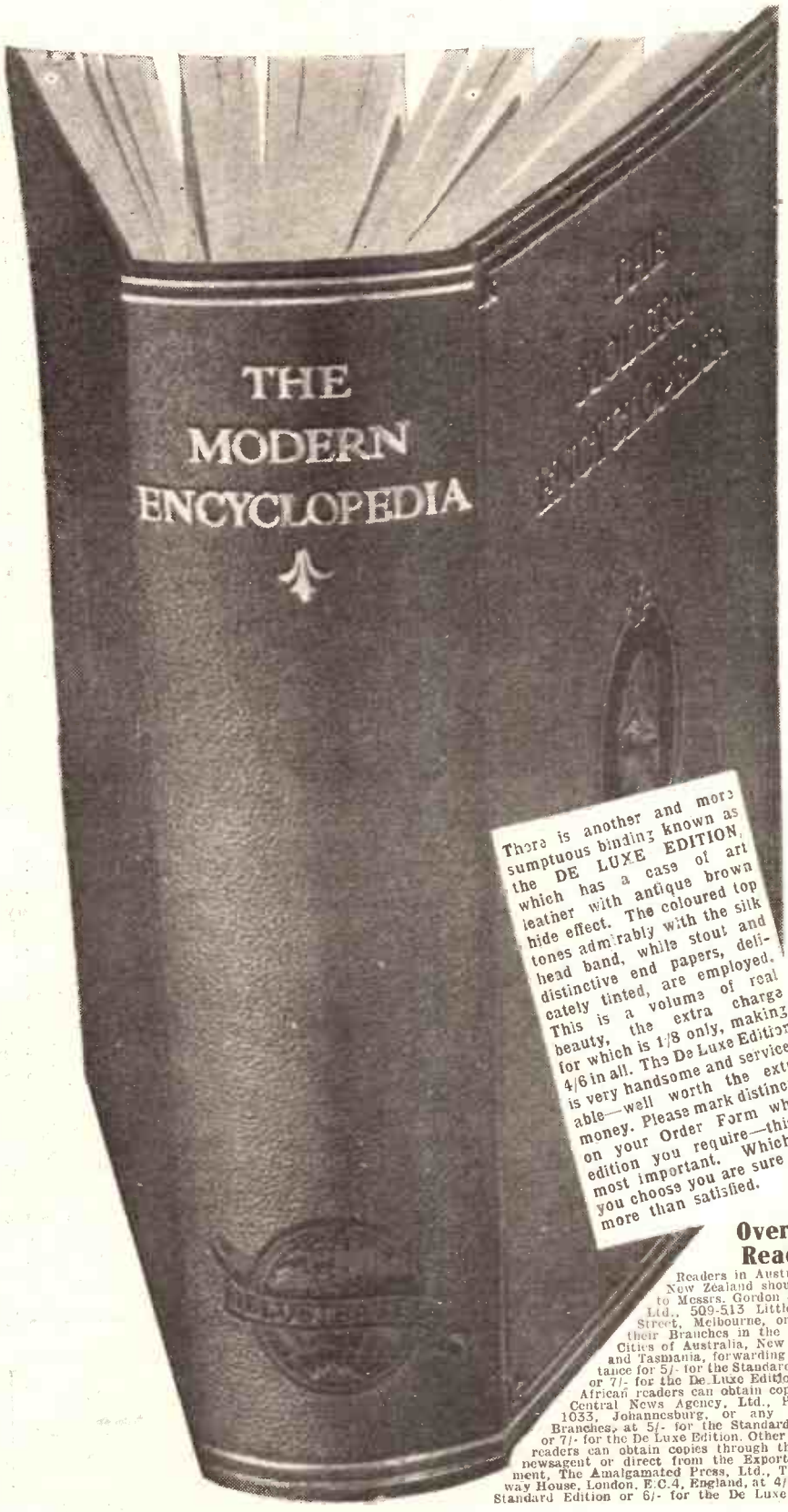

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