

Practical Wireless, October 7th, 1933

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Practical Wireless

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Published every Wednesday by

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Vol. 3. No. 55

OCTOBER 7th, 1933.

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

EDITED BY F.J. CAMM.

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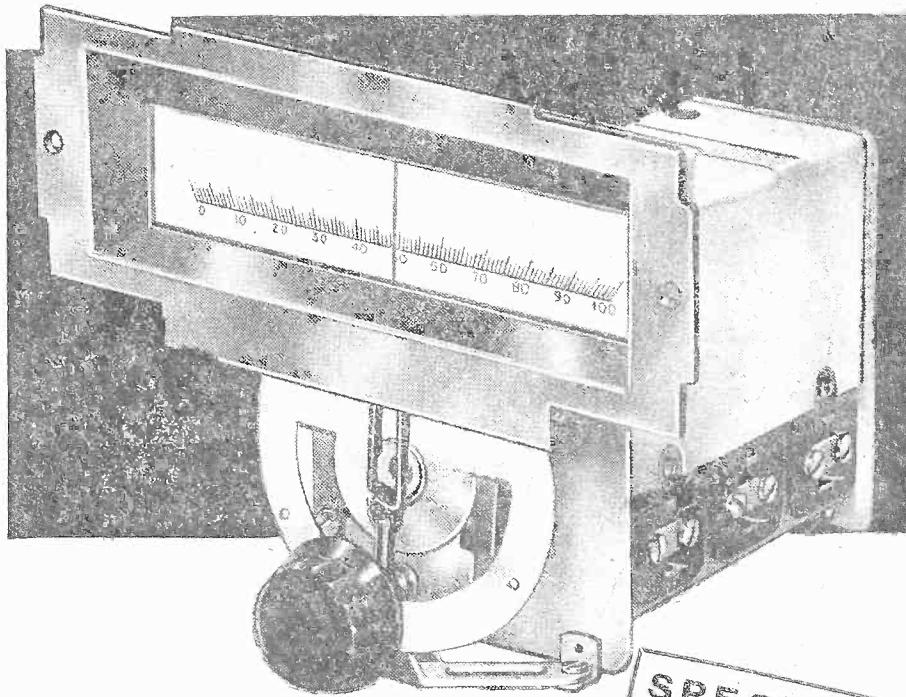
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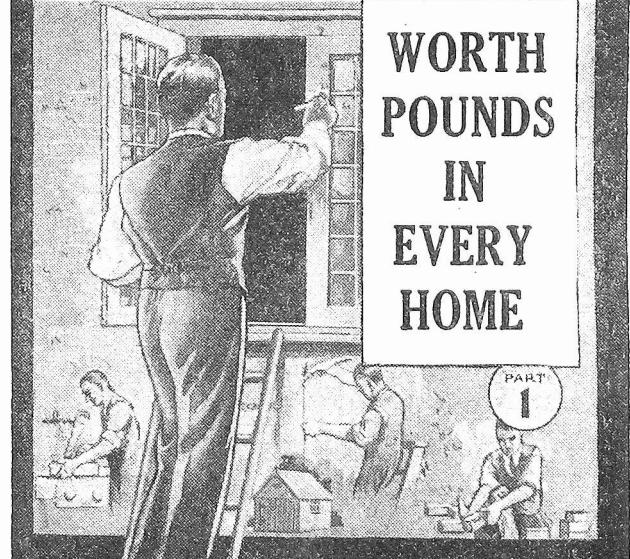
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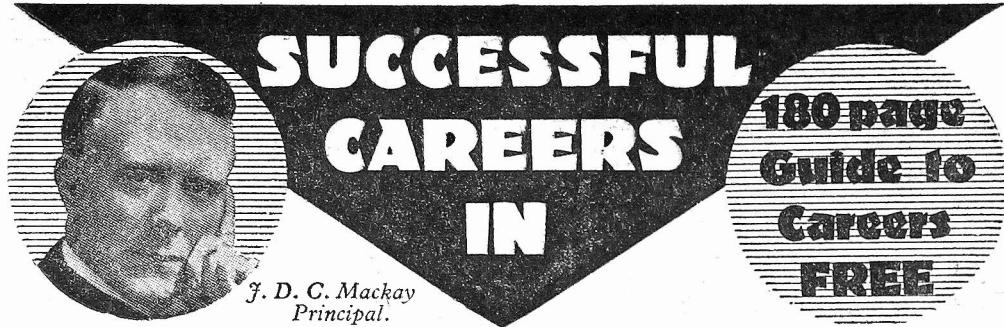
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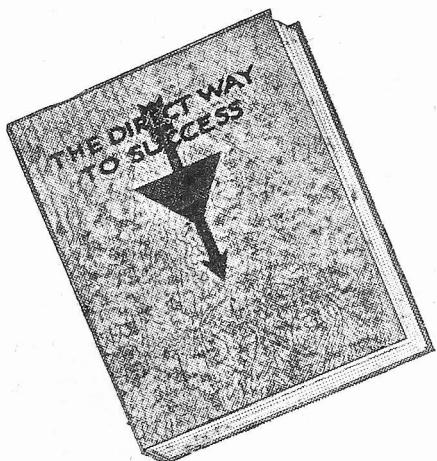


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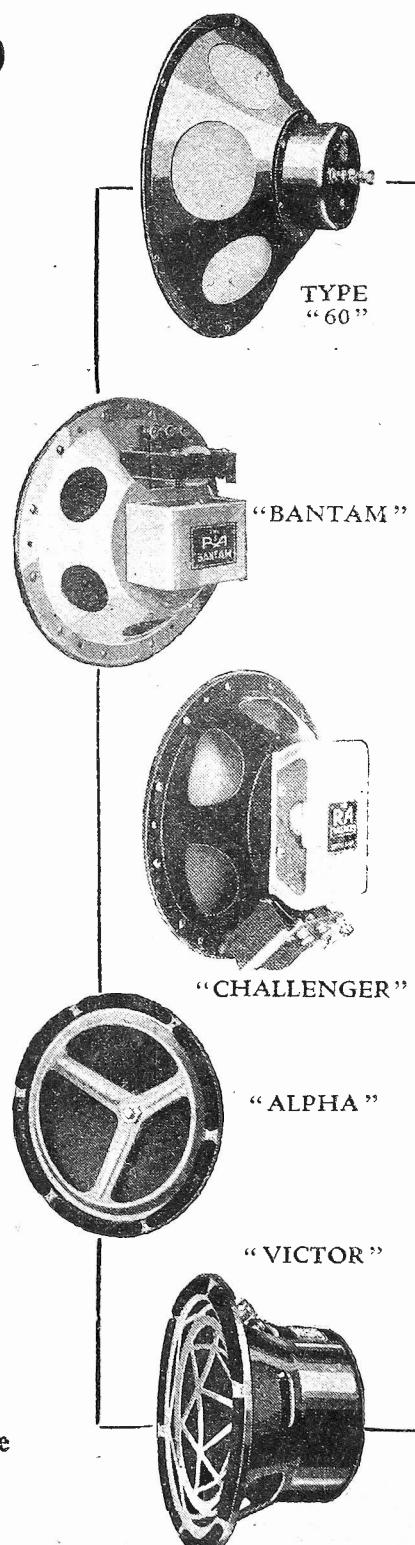
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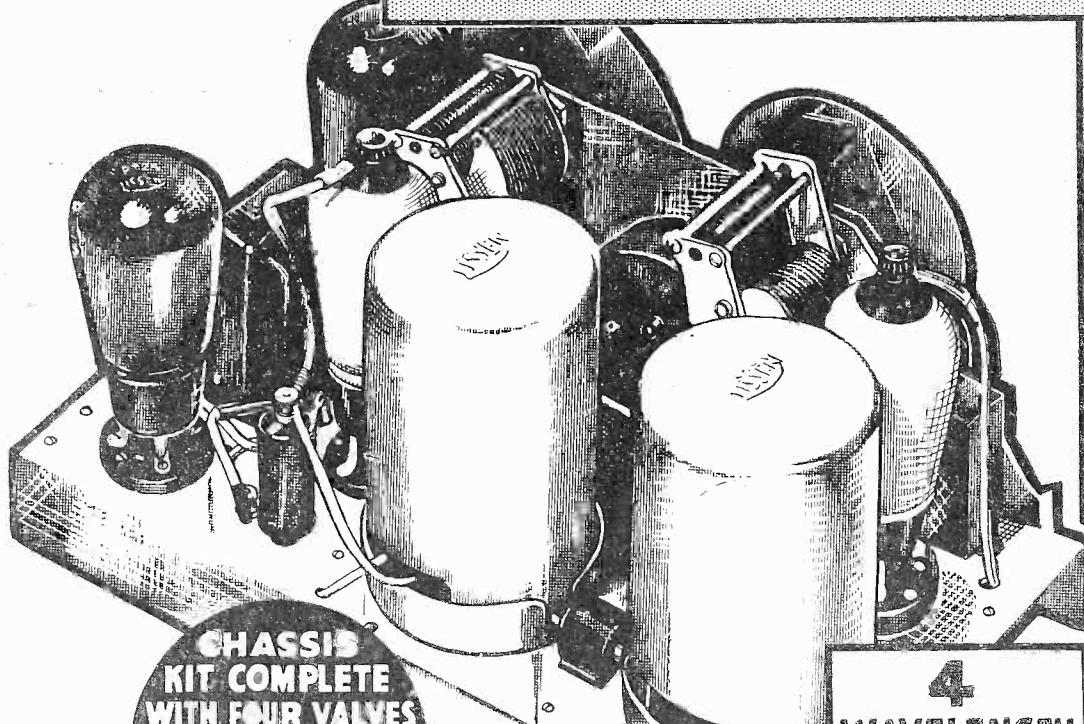
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"SKYSCRAPER"
4

RESERVE YOUR POCKET TOOL KIT NOW! SEE PAGE 143

Practical Wireless

EDITOR :
Vol. III. No. 55 || F. J. CAMM || Oct. 7th, 1933
Technical Staff :
W. J. Delaney,
H. J. Barton Chapple, Wh.Sc., B.Sc. (Hons.), A.M.I.E.E.,
Frank Preston, F.R.A., W. B. Richardson.



ROUND the WORLD of WIRELESS

The New Lisbon Station

TESTS are being carried out by the 20 kilowatt transmitter now nearing completion at Lisbon; the wavelength allotted to this station by Lucerne is 476.9 metres (629 kc/s), but between October 5th, when it is hoped to bring it into operation, and January it will work on 282.2 metres (1,063 kc/s). The call is: *Radio Lisboa*.

France's New Station

THE high-power transmitters already under construction are those of PTT, Paris (120 kw.), Nice (60 kw.), Lyons PTT (100 kw.), and Toulouse PTT (120 kw.). Orders have now been placed with French makers for stations to be erected at Lille (60 kw.), Rennes-Thourie (100 kw.) and Marseilles (60 kw.). The first four are to be ready by the spring of 1934.

Egyptian Broadcasting System

AT the Lucerne Conference the Egyptian Government was granted six channels for the working of broadcasting stations. The 20 kilowatt transmitter now being built at Abu Zabal, near Cairo, will operate on 483.9 metres (620 kc/s), a wavelength shared with Brussels. The programmes will be relayed by Alexandria on 267.4 metres (1,122 kc/s), a channel on which the high-power North Scottish Regional will also work later. Tests by the Cairo station are expected to take place towards the end of November. Further stations will be installed in upper Egypt when required.

To Combat German Propaganda

IT is reported that the Polish Authorities intend to erect a station at Gdynia, a port on the Gulf of Danzig; it is to be used as an antidote to the anti-Polish propaganda broadcast through the German Königsberg and Heilsberg studios.

Sundays Only

BLOEMENDAAL (Holland) owns a small 200-watt transmitter which is only used on Sundays; it relays a sacred service from the local Reform Church at 9.40 a.m. and again at 4.40 p.m. The station has been in existence for the last five years; it works on 245.9 m.

Wireless Picture Transmissions

AS many readers will have noticed, the daily papers frequently contain illustrations which have been telegraphed from foreign countries. In some instances the transmissions are made over landlines and submarine cables, in others by wireless, *via ether*. There are at present established services operating between London, Rome,

sions are carried out on 277 metres (1,083 kc/s) and on 77 metres (3,890 kc/s); it is on the short wavelength that the Observatory is in touch with the French National Meteorological Office, to assist in the compilation of weather charts.

Roma-Napoli-Bari

THE Italian broadcasting station of Bari (269.8 metres), which up to the present has always broadcast local programmes only, has now been linked up by special cable with Rome and Naples. Italy possesses two networks for the interchange of programmes, the Northern one comprising the studios of Milan, Turin, Genoa, Trieste and Florence. The Palermo transmitter will be added to the Southern net shortly.

Cincinnati's Giant Transmitter

WLW, the new 500 kilowatt station which is being built at Mason, Ohio, is expected to be ready to test in February. Its wavelength will be that of the present transmitter (428.3 metres). An idea of the size of the plant is given by the fact that to cool the 100 kilowatt valves the daily supply of water required is that used by six thousand average families!

To Assist Foreign Listeners

IT is often very difficult for British listeners to pick up programmes from Belgrade and Ljubljana. So far no alternative channel has been available. In future Czechoslovakia and Yugoslavia will exchange a series of evening entertainments, and in this manner the latter's best broadcast will be well heard through Prague.

Classification of Short Waves

IN view of the Marchese Marconi's experiments with micro waves, an endeavour is being made to give descriptive names to the higher frequencies now used for transmissions below 200 metres. Down to the 10 metre wave band, it is suggested that the channels be designated as *short waves*; from 10 metres to 1 metre, "metre" waves; from 0.99 to 10 centimetres (0.10 metres) "decimetre" waves; 0.99 centimetres to 1 centimetre as "centimetre" waves, and the lower wavelengths down to 0.001 as "millimetre" waves.

ROUND the WORLD of WIRELESS (Continued)

International Programmes

ARRANGEMENTS have been made by the U.I.R. (Geneva) for a series of International concerts to be relayed by a number of Continental stations. They are to be contributed by Bucharest (October 3rd), Budapest (November 4th), Vienna (December 8th), and to be followed in 1934 by Prague (January 6th), Brussels (February 7th), Belgrade (February 23rd), London (March 25th), and Stockholm (April 4th).

Fall in German Listening Licences

IN August, 1933, Germany possessed 4,480,278 licensed listeners, or 37,828 fewer than on the corresponding date in July. Over 531,000 free licences have been distributed by the authorities to unemployed and war invalids.

Radio for Snake Charmers

At the Algiers (Radio Alger) studio, before an invited audience, an Arab performer made his snakes sway rhythmically to the music of a broadcast transmission. It was demonstrated that the conventional reed pipes were not a *sine qua non*, but that even the relay of a foreign syncopated dance band was able to charm the reptiles!

Luxembourg's Midday Programmes

IN addition to the concerts broadcast every evening at 7.0, 8.30 and 10 o'clock, Radio Luxembourg is now on the air daily with a lunch-hour transmission from 12.30 until 2 p.m. The wavelength is 1,190.5 metres; the power 200 kilowatts.

German Amateur Transmitters

FOLLOWING a total cancellation of all licences, the German authorities have now granted permits to 184 amateurs to carry out experimental broadcasts. Stringent conditions have been imposed. All licensees must be recognized members of the National Socialist Party, and are required to advertise Nazi aims in all their broadcasts to foreign countries! In order to encourage the movement the cost of the licence has been reduced by 75 per cent.

Extended Sunday Broadcasts

ACONTINUOUS programme is now offered to listeners by the B.B.C. on Sundays from 12.30 to 10.30 p.m., as the hitherto silent period between 6 and 8 p.m. has been filled with musical items and talks.

Site of North Ireland Regional

IN view of the fact that Belfast is surrounded on three sides by hills, the site chosen for the installation of the B.B.C. North Ireland Regional high-power station is in the immediate neighbourhood of Lisburn, a small cathedral city some eight miles south-south-west of Belfast.

League of Nations Short-waver

THE political and news bulletin hitherto broadcast by the League of Nations through the Prangins (Switzerland) transmitter on Sunday nights are now given on

INTERESTING and TOPICAL PARAGRAPHS

Saturdays on 31.3 and 38.47 metres. The English version is timed to start at 23.30, and is followed by the French and Spanish translations at respectively 23.45 and midnight B.S.T.

THE LATEST COLUMBIA FOUR-VALVE RECEIVER



Trying out the new Columbia "CQA Battery Four." This powerful receiver provides "mains" reproduction through its moving coil loud-speaker although it operates from batteries. The dials are calibrated in wavelengths and stations. The cabinet is of specially picked walnut and its price is 11 guineas.

For the Safety of Alpine Climbers

AT Biella (Italy), situated some fifty miles north-east of Turin, a five-metre transmitter and receiver has been installed for direct communication with the Margaret Hut on the Monte Rosa (Switzerland). The distance covered by these short-wave telephony transmissions

BALANCED PENTODE OUTPUT AND MOVING COIL SPEAKER

emission, and the fuse was replaced still without result. The S.G. circuit was tested and found in order, as was the detector circuit, but when the grid bias was varied on the L.F. valve no change in anode current was recorded. What had happened? Three books will be awarded for the first three correct solutions opened. Address your envelopes to The Editor, PRACTICAL WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2, and post to reach here not later than October 9th. All envelopes should be marked Problem No. 55.

SOLUTION TO PROBLEM No. 54.

Whitaker overlooked the fact that there would be a voltage drop due to the current passed through the smoothing choke; and also forgot that the grid bias voltages had to be added to the total high tension voltage. He therefore required at least 250 volts in order to satisfactorily operate his receiver.

List of Prizewinners for Problem No. 53:

Mr. Wm. Adderley, 82, Scotia Road, Burslem, Staffs; Mr. S. W. Salman, 44, Constance Road, Colchester; Mr. R. K. Hulsing, Blankenberge, Cite des Genets.

is, roughly, forty miles. Listening posts have also been erected by the authorities at the base of the mountain with a view to bringing assistance quickly to climbers in the event of accidents.

Is This a Record?

JEAN ROY, the Radio Toulouse (France) announcer, in a recent interview, stated that from April 1st, 1925, when he first took up his duties, he has presided at the microphone for more than 22,000 hours!

Berlin's Deutschlandsender

As the Germans are anxious that transmissions from their high-power station should be heard not only throughout Germany but also in neighbouring countries, the power is to be increased to 150 kilowatts. At the same time a new system of aerial towers is to be used to eliminate fading effects in the broadcasts. There exists also the possibility that a more favourable site than Zeesen may be found for the new station.

Record Short-wave Transmissions Between Aircraft in Flight

REMARKABLE instances have been forthcoming lately from the Empire routes of Imperial Airways of long-range wireless communication between aircraft in flight, and also between aircraft and ground stations. The other day, while one of the new "Atlanta" type air-liners was flying near Mpika, on the Africa air-mail, its

operator got into touch and maintained communication for several minutes with another aircraft of the same type which was then in the neighbourhood of Victoria West, approximately 2,000 miles away. Even at such a distance—representing a record for communication between aircraft on the Empire routes—both operators found reception excellent, with no fading or interference. Recently, also, while

the air-liner *Astraea* was making an Empire "Skyscraper" 4,000-mile survey along sections of the to work it and why it agreed at once that it two-way communication from the air was rather than buy a factor established with Sydney over a distance you these new and intr CHART simplifies every without difficulty for some time.

with every wire number identified. YOU CAN'T B.C. Public Concerts Season

THE Promenade Concerts end on October 7th, and the B.B.C. has announced the opening of its winter season of Public Concerts on October 18th. There will be the season of eighteen Symphony Concerts on Wednesdays, starting on October 18th and continuing weekly until December 13th, after which there will be a break until January 31st. During this break there will be a series of Six Concerts of British Music on January 1st, 3rd, 5th, 8th, 10th and 12th. The London Music Festival will be held again on May 4th, 7th, 9th, 11th, 14th and 16th. All these concerts will be at Queen's Hall. A series of twelve Public Chamber Concerts will be given fortnightly on Fridays, at the Concert Hall, Broadcasting House, the first of which will be heard on October 20th.

(Continued on page 158)

All About

ALL-WAVE TUNERS

The Principles Underlying the Design of Combined Short and Long-wave Tuning Coils and Receivers.

THE arrival on the market of another tuner designed to cover the short waves as well as the normal broadcast band arouses the interest of the home-constructor, and to many the question no doubt arises, "Is it worth it?" So far, there are very few of these tuners, and in view of the many difficulties which have already been explained in these pages regarding the reception of short-wave stations, it is only natural that to many minds it will appear that the use of a combined tuner will only result in a compromise upon one or other of the wavebands covered. Up to a point this is quite true. The losses which are introduced by switching, etc., can easily destroy all gains which are effected in clever design and workmanship, but there are certain features which may be introduced and which will enable a very good all-round result to be obtained on any wavelength. Suppose, therefore, we examine the requirements of an "all-wave tuner" and see just what is required and how best to utilize the various features which are found essential on each waveband.

Short-wave Work

As has been repeatedly stated in these

pages, losses on the short waves must be reduced to an absolute minimum in view of the very high frequencies which are in use. Perhaps to understand this better it is necessary once again to point out the desirability of thinking in frequencies instead of wavelengths. When we refer to the London National station transmitting on a wavelength of 261.6 metres, and then state that Boundbrook, New Jersey, transmits on 46.69 metres, we do not realize the vast difference that exists in the actual frequency which is used for these stations. The frequency of the London transmitter is 1,147 kc/s, but the frequency of the Boundbrook station is 6,425 kc/s. You will remember, from the various beginner's articles, that by frequency is meant the number of vibrations, or changes of direction, per second. Obviously, with the lower frequency variations there is little risk of the signal jumping across small gaps or otherwise finding its way to earth. With the high frequency, however, the slightest capacity will serve to provide a path where it is not

wanted, with the result that the signal will either disappear or partly do so before being fully rectified and amplified. In addition to this, another feature of the short waves is the sharpness of tuning, or number of stations which can be heard over a given portion of the tuning dial. On a normal tuning condenser of .0005 mfd. capacity, the London National will tune at approximately 15 degrees on a 100 degree scale, and the Regional will tune at approximately 30 degrees. The difference between these two stations in metres is 94.4, but the difference in kilocycles is 304. In other words, at this part of the wave-band a difference of 94 metres equals 304 kc/s. When, however, we enter the 30 to 100 metre wave-band we find a vastly different state of affairs. Thirty metres equals 10,000 kc/s, and 50 metres equals 6,000 kc/s. We have, therefore, a difference of 4,000 kc/s, equalling 20 metres, and as the separation between stations to permit full reproduction of side-bands is 9 kc/s, we find that many more stations will be obtainable over the same number of degrees on this band.

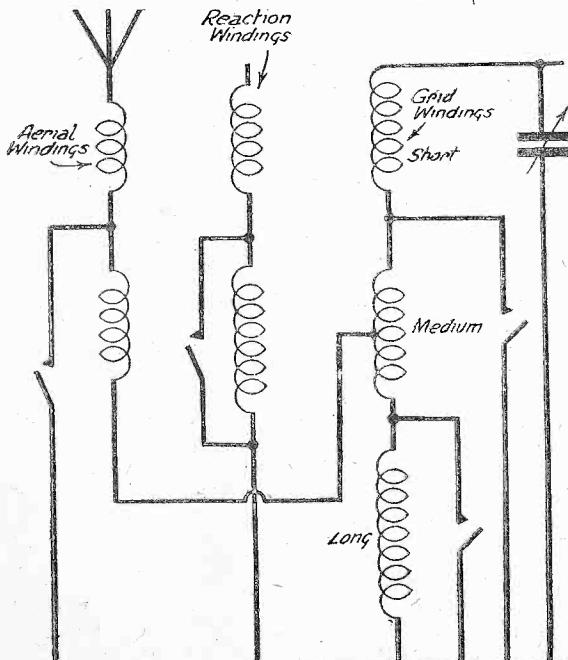


Fig. 2.—A simple arrangement for an all-wave tuner.

Tuning Arrangements

This introduces our second difficulty. Some form of tuning will have to be adopted which will enable us to select one of these stations, and in a receiver designed especially for short-wave work it is customary to employ a very low capacity tuning condenser (.0001 mfd. usually), and in addition to use a slow-motion dial.

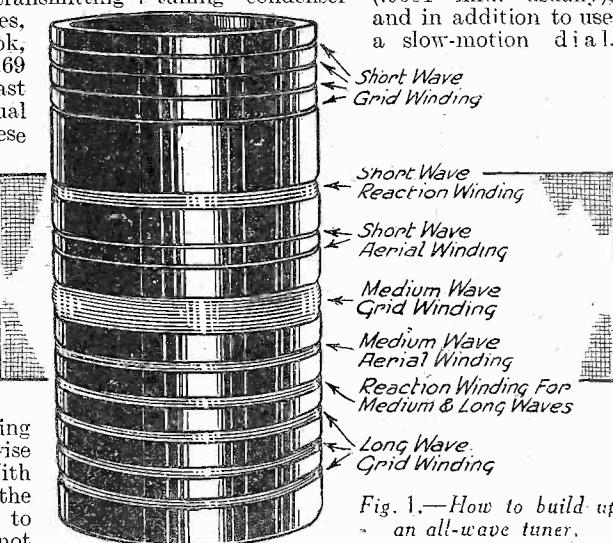


Fig. 1.—How to build up an all-wave tuner.

For the long waves, however, such a value would not enable us to tune from Luxembourg to Huizen on a single coil, so we must compromise. Careful design, by which is meant careful choice of coil turns and their disposition on the former, will enable a winding to be adopted which may be used for various wave-bands without introducing the unwanted capacities referred to in the opening part of this article, and which at the same time may be tuned by a .0005 mfd. condenser in a fairly satisfactory manner. Obviously, however, a good slow-motion drive will have to be used in order to assist station selection on short waves.

Reaction Arrangements

A further point of difficulty arises in arranging reaction windings. For the medium and long-wave windings it is customary on a dual-range coil to use a single reaction winding of such a size that it provides smooth control for the long waves. This is usually too great for the medium waves, so it is disposed on the coil former in a position close to the long-wave winding, in which position it offers greater coupling to that coil than it does to the medium-wave winding, and the result is that smooth control may be obtained with a single (Continued overleaf)

ALL-WAVE TUNERS

(Continued from previous page)

reaction condenser over both bands without the difficulty of introducing switching. When, however, we wish also to include the short waves we find that it is not easy to dispose a single winding to provide adequate control over three bands. The best method of arranging the winding is to split it, and use a few turns for the short waves, coupled to the short wave grid coil, and utilise the remainder of the winding in the usual way. This can give splendid results if the turns ratios are correctly chosen. The design of the H.F. choke affects the reaction control, and although there are several chokes available which will work with efficiency on all waves from 20 metres upwards, I find it preferable to employ two chokes, one especially designed for the short waves, and one standard choke. These are joined in series and they each come into effect on their respective wave-bands.

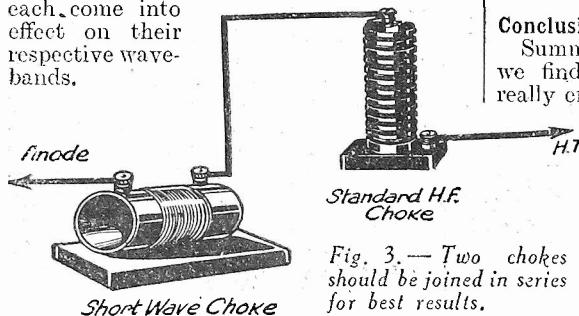


Fig. 3.—Two chokes should be joined in series for best results.

The Lay-out

It is a great mistake to imagine that one of these all-wave tuners may be purchased and built into a receiver designed for normal

broadcast reception and that all the short-wave stations will then be at your fingertips. Nothing is farther from the truth. It is quite possible that you may be lucky in hearing one or two stations, but unless the receiver is well-designed you will probably find that not only will the sensitivity be low but that those stations which can be heard are only obtainable when reaction is pushed so far that it is only C.W. or a heterodyned carrier which is heard, and that speech and music cannot be satisfactorily resolved. Of course, if the receiver had been designed on sound lines in the first case, and was efficiently wired and arranged, it is quite possible that the addition of the all-wave tuner in place of the existing tuning coil will result in quite a good short-wave selection, but the best will not be obtained from the coil unless the above-mentioned points have been attended to.

Conclusions

Summing up the above remarks, therefore, we find that it is possible to design a really efficient coil which will satisfactorily tune over short, medium and long wave-bands, and that in order to obtain maximum results on all bands it is essential to use a really good tuning condenser operated by means of a good slow-motion dial. That for smooth reaction it is preferable to use two H.F. chokes in series. That the

lay-out must be very carefully chosen and a certain amount of care and experiment is necessary in order to obtain maximum results. That the receiver must really be

designed as though it were a short-wave receiver, when the medium and long-wave stations may be left to look after themselves. It will no doubt interest our readers to know that we have spent a great deal of time and thought on the subject of all-wave receivers, and the results of our tests are embodied in a single-valve receiver which employs one of the latest tuners, and it will be described in next week's issue. Although only a one-valve set it will bring

in a large number of short-wave stations at remarkable strength, and on certain occasions the loud-speaker has been connected to the set, without the use of any amplifiers, and good results have been obtained. In addition, medium and long wave stations have been tuned in direct on the speaker. Full details will be given next week.

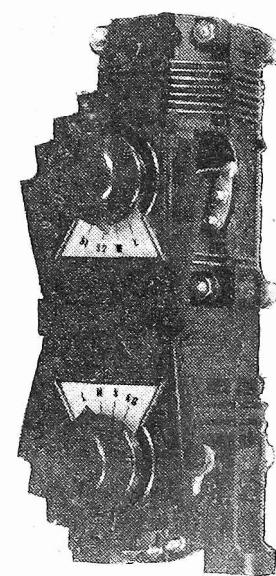


Fig. 4.—A neat commercial tuner which covers short and the normal broadcast bands.

A TREASURE-SEEKER

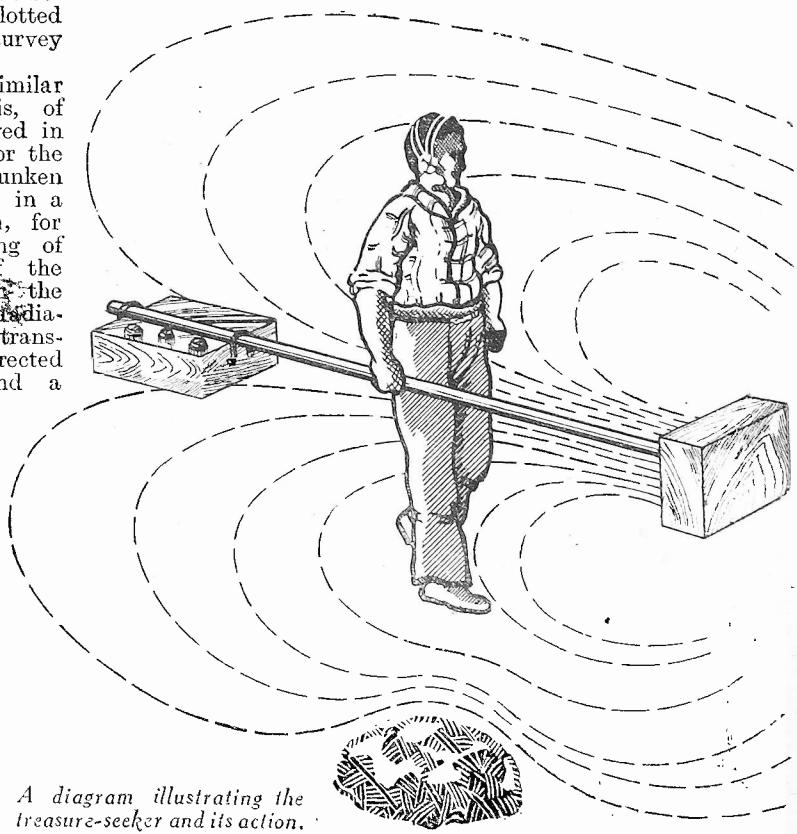
If you are thinking of taking a holiday on Cocos Island, or in the land of the Incas, or at any other spot where vast treasure is reported to be securely hidden, here is your chance to locate it, and return to your native land rich beyond the dreams of avarice. The great idea comes from the land of the almighty dollar, and consists of a portable wireless apparatus which will indicate the near presence of a secret hoard or, presumably, any other mineral deposit. As will be seen from the illustration, the searcher after wealth trails a long pole, at either end of which is carried a type of portable set. The forward one is a transmitter, and is adjustable as to its angle with the receiver at the rear end of the pole. The transmitter consists of a one-valve Hartley oscillator, the radiating aerial being a "loop" or frame wound around the outside of the containing case. The receiver at the other end has a three-valve straight circuit, with tuned loop, and a tuned coupling between the screened grid and detector valves. The latter is coupled by transformer to a pentode output. A variable series resistor controls the H.T. supply to the screening grid as well as oscillation. The theory of operation is simple. Radiation from the transmitter heterodynies the oscillations of the receiver, which is tuned to a wavelength slightly above or below that of the transmitter, so causing a whistle or beat note in the headphones. If the prospector walks over or near a metallic deposit, the deflection of the waves radiated, or the absorption of power by the metal, alters the note to a greater or less extent according to the magnitude and distance of the "find." The receiver may also be worked in a non-

oscillating state, but adjusted to be "on the edge." In this condition any disturbance of the surrounding electrical or magnetic conditions causes oscillation and a consequent note in the 'phones. The wavelength used may be between 100 and 200 metres, that being the band allotted to geological survey in the U.S.A.

A very similar arrangement is, of course, employed in naval circles for the location of sunken craft and also, in a modified form, for the ascertaining of the depth of the ocean bed. In the latter case the radiations from the transmitter are directed downwards and a special type of directional aerial is employed. The radiations are reflected when they touch the ocean bed, and the direction of radiation is arranged so that the returning wave from the ocean bed strikes the ship. A receiver is placed in this position, and by

working out the length of time for the wave to return the depth can be ascertained.

HAVE YOU RESERVED YOUR GIFT?
See page 143



A diagram illustrating the treasure-seeker and its action.

The A.C.-D.C. TWO

By
W. J. DELANEY

A Simple Universal Receiver Which may be Used on either A.C. or D.C. Mains, and Which Gives Results Equal to an Ordinary Three or Four Valve Set

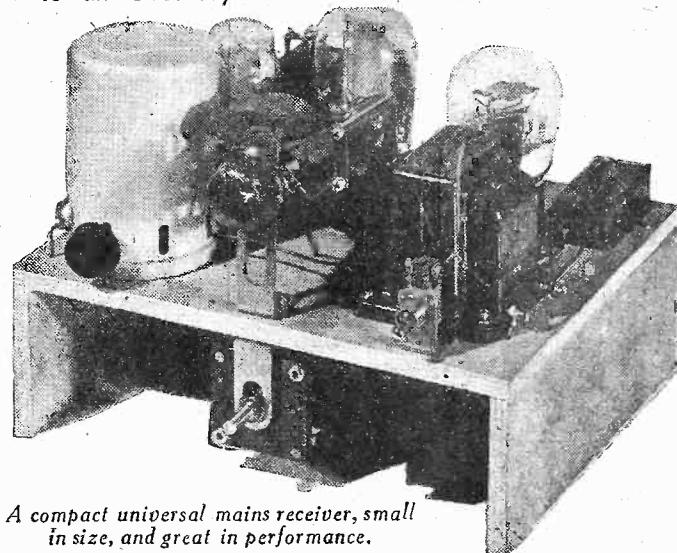
NOT so very long ago I described a simple two-valve set which operated entirely from A.C. mains, and which gave results which had hitherto not been obtainable with such a small number of valves. In this case a pentode valve was used as a detector. Many listeners who are in the position of only having the D.C. mains at their disposal asked for a similar type of circuit, and unfortunately this was not a practicable proposition, owing principally to the difficulty of obtaining the large output with the D.C. valves then obtainable. There have been introduced into this country recently some special valves which operate with 200 to 250 volts direct on the heaters, and these valves are of what is known as the universal type. That is to say, they may be used with either A.C. or D.C. on the heaters, and, providing that the circuit is correctly designed, hum is non-existent. In addition to this valuable feature, the valves have most remarkable characteristics. For instance, a detector valve is obtainable which has the remarkable amplification factor of 100, as against the more conventional 20 to 40. After a little experiment I have developed the circuit shown in Fig. 1, which is a great improvement on my previous A.C. Twin, and which may be used on any type of mains without alteration, and which will provide sufficient volume to almost fill a small hall.

Owing to the few components which are required in this receiver, it has been found possible to get all the components on a

baseboard measuring only 10ins. long by 8ins. deep. The receiver is also remarkably cheap, and will no doubt prove immensely popular to those who desire an easily-constructed, powerful mains set for use with D.C. or A.C. mains.

The Construction

The construction of the receiver should be a matter of only one evening's work, and will occasion no difficulty even to those who have never before built a wireless receiver. Apart from



A compact universal mains receiver, small in size, and great in performance.

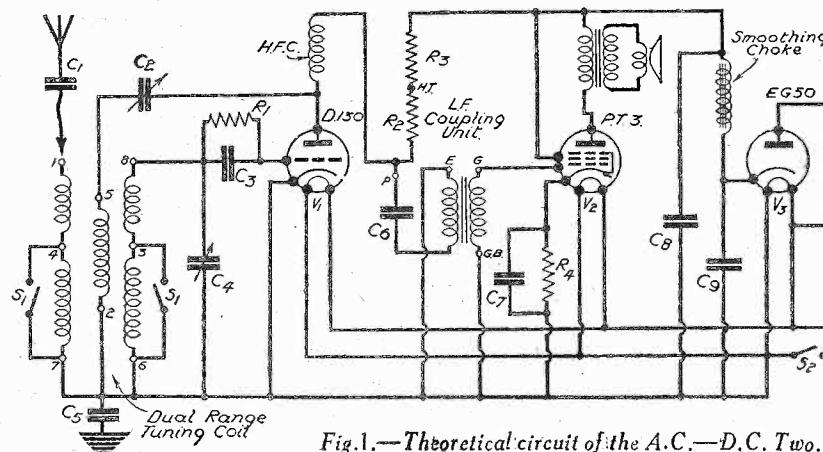


Fig. 1.—Theoretical circuit of the A.C.-D.C. Two.

one or two soldered connections—which unfortunately are unavoidable—there are only two points which require any explanation. The first is in regard to the assembly of the special 6-pin valveholder for the detector valve. When you purchase this you will find that there is a bakelite disc and a tin disc in addition to the actual valve-holder. These two discs have holes arranged in the same manner as the valve legs, and they must be assembled in a certain way in order to obtain perfect screening between the heater and grid legs. Take the valve-holder in the left hand, with the connecting lugs at the bottom, and on top of

this place the bakelite disc. Now on top of this place the tin disc, and when all the holes are accurately lined up turn the complete assembly over and bend round the long soldering lug which is to be seen near to the vertical strip of metal running across the valve-holder. There are actually two of these lugs, but only the one nearest the anode terminal should be bent, and the exact position may be seen from the wiring diagram. Bend it right round until it lays flat on the tin disc, and then screw

the valveholder to the *under side* of the baseboard. The other valveholders are screwed on top of the base in the usual manner. The other point requiring mention is the 2 mfd. fixed condenser which is mounted on top of the base. This is coated with green enamel all over, but in order to provide a return earth connection to the chassis the enamel should be scraped off both top and bottom of the projecting lug at one end, and this condenser should then be screwed down with this bared lug nearest the earth terminal. Again, reference to the wiring diagram will make this point quite clear.

Mounting the Components

It will be seen from the wiring diagram that there are very few parts to be screwed down, a saving having been effected by using the special Telsen coupling unit, comprising a resistance, condenser, and

(Continued overleaf)

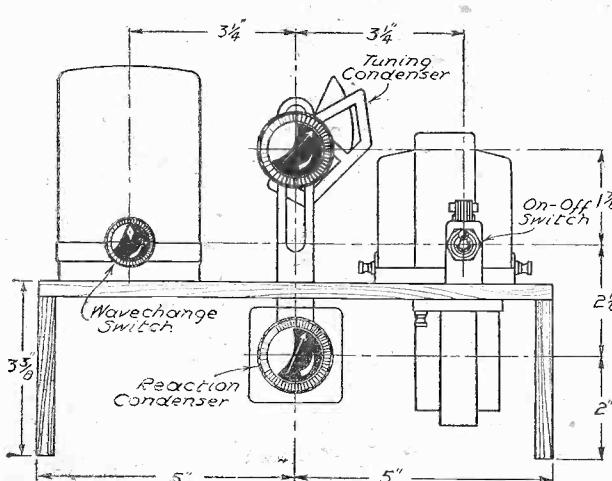


Fig. 2.—Disposition of controls.

(Continued from previous page)

transformer in one housing. The resistance is, however, of too low a value to give maximum results with the particular valve employed for detection, and it is therefore necessary to increase the value by connecting a further resistance in series. This is joined between one terminal on the choke and the H.T. terminal of the coupling unit. To prevent any risk of a short-circuit to the chassis, a small piece of insulated sleeving should be slipped over one of the wire ends of the Dubilier resistance, and then this wire should be passed through the hole in the chassis to make connection with the coupling unit. The other end of the resistance is joined direct to the choke. Before screwing down the Telsen unit make certain that there is sufficient clearance for the small bracket which accommodates the on/off switch. To simplify the wiring this is mounted upside down, which means that instead of pushing the dolly down to switch on (as in the majority of ordinary house-lighting switches) it operates in the reverse direction. This should be borne in mind when the receiver is first put into use. Mount the three brackets in their respective positions, then the Telsen unit, following these by the fuse-holder, condenser, H.F. and L.F. chokes. The small fixed condensers may then be screwed down, and finally the tuning coil.

The Wiring

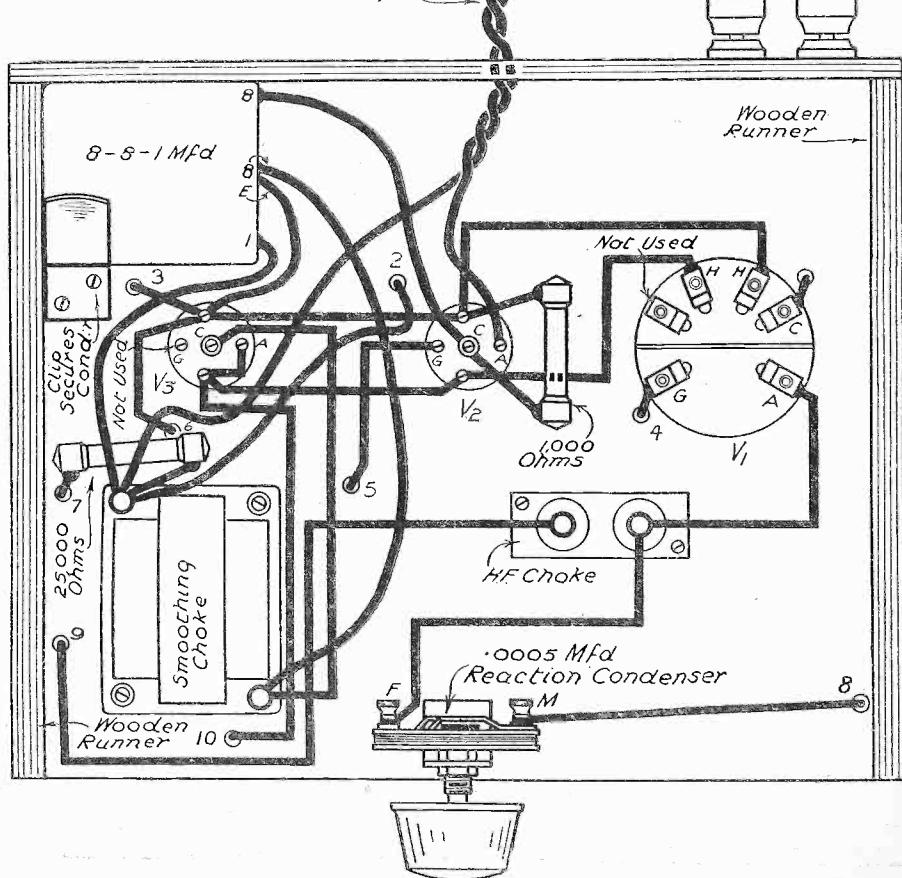
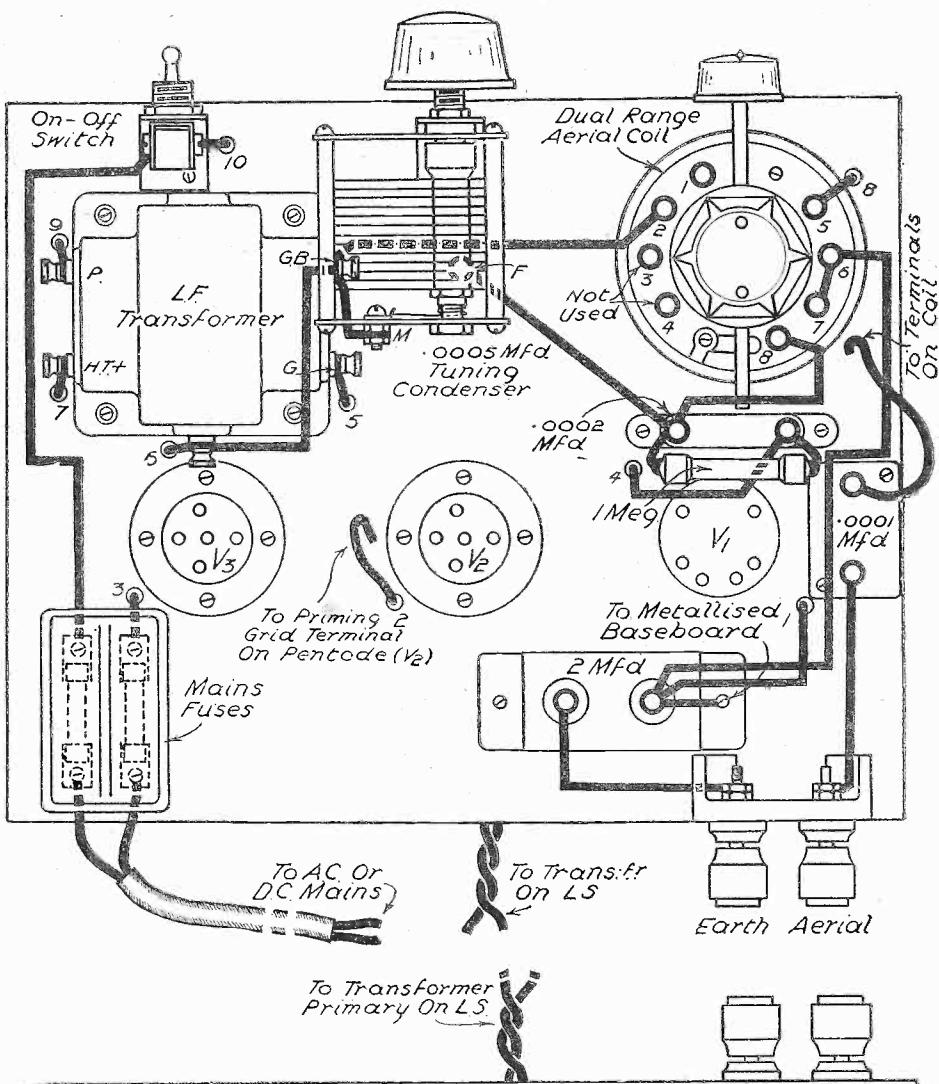
If you have never made a receiver before you may find it preferable to remove one or more of the components when putting the wires into position, as some of the contact points are a little difficult to get at. A little patience, however, will soon help you out of any seeming difficulty, and the wiring should be completed within an hour. Leave the variable condenser until the wiring is practically finished, and fix the two leads for this component before mounting it on its bracket. To ensure a neat appearance the condenser should be held in position whilst the leads are measured, and then it should be removed whilst the wires are fitted. Upon replacing it on the bracket the wires will then reach just to the coupling unit and coil.

(Further Note Next Week)

LIST OF COMPONENTS FOR THE A.C.—D.C. TWO.

One Tuning Coil, Type W.216 (Telsen).
 One .0005 mfd. Tuning Condenser with slow motion dial, Type No. 1046 (Jackson Bros.).
 One 10/1 Coupling Unit (Telsen).
 One .0005 mfd. Reaction Condenser (Graham Farish).
 One Smoothing Choke, Type D.Y. 22 (R.I.).
 One .0002 Condenser, Type 34 (T.C.C.).
 One .0001 Condenser, Type S (T.C.C.).
 One 2 mfd. Condenser, Type 80 (T.C.C.).
 One Double Fuse-holder (Belling Lee).
 One Terminal Block (Belling Lee).
 Two Terminals (Aerial and Earth), Type B (Belling Lee).
 One Electrolytic Condenser Block, Type A.D. (Helleseens).
 One Minor Binocular H.F. Choke (B.R.G.).
 Two 5-pin chassis type Valveholders (Clix).
 One 6-pin chassis type Valveholder (Ostar Ganz).
 One 1000 ohm resistance (Dubilier).
 One 25,000 ohms resistance (Dubilier).
 One 1 Megohm Grid Leak (Dubilier).
 One Mains On-Off Toggle Switch, Type S. 80 (Bulgin).
 One Component Bracket, Type 23 (B.R.G.).
 One Component Bracket, Type 22 (B.R.G.).
 One Component Bracket For Mounting Toggle Switch (B.R.G.).
 Two Coils Insulated Connecting Wire (B.R.G.).
 One Valve, D.130 (Ostar Ganz).
 One PT.3. Valve (Ostar Ganz).
 One EG.50 Valve (Ostar Ganz).
 One Baxtam Moving Coil Loudspeaker (R. and A.).
 One Metaplex Chassis (Peto Scott).
 One Cabinet (Peto Scott).
 One "Aeroefficient" Kit (Graham Farish).
 One Combination Mains Connector, flex, screws, etc.

TOP AND SUB-BASEBOARD WIRING DIAGRAM



Cutting Out INTERFERENCE!

WITH the great increase in all kinds of electrical appliances and machinery which has taken place within recent years interference with radio reception has gradually become more serious.

It is now no longer possible to ignore the problem—it must be recognized and tackled accordingly. Believing that an ounce of practice is

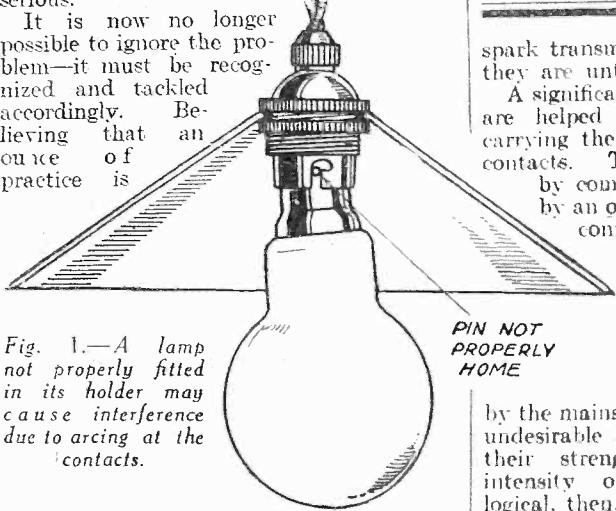


Fig. 1.—A lamp not properly fitted in its holder may cause interference due to arcing at the contacts.

worth a ton of precept we shall attempt here to give some practical hints on overcoming this objectionable form of interruption.

Some of the commoner sources of man-made static include electric signs, trolley buses, accumulator charging plant, electric motors, fans, vacuum-cleaners, etc. The effects they produce on reception usually take the form of harsh irregular crackling noises which are equally persistent on any wavelength.

There are clearly two methods of tackling the problem (1) At the source and (2) At the receiver. Obviously the former is the better method. Not only is it usually more effective, but if successful will benefit other listeners in the neighbourhood. Of course, in some cases this is not possible, and then recourse must be made to devices applied to the receiver itself.

The Cause of the Crackles

The actual cause of electrical interference is the sparking at brushes or contacts of the offending piece of apparatus. Perhaps the most obvious example is that of a motor-car engine. Here each spark, as it jumps across the gap of the sparking plugs, will cause a crackle in a nearby receiver. The faster the engine runs, the more rapid are the crackles until at high "revs" they merge into one continuous roar. Another example is that of an ordinary house-lighting switch. When the lights are switched on or off a crackle is heard in the loud-speaker. This is due to the slight spark which occurs at the contacts of the switch. The spark radiates damped waves similar to those produced by a

Ways and Means of Effectively Dealing with Unwanted Noises

By W. B. RICHARDSON

spark transmitter with the exception that they are untuned.

A significant point is that the radiations are helped very largely by the wires carrying the current to the spark gap or contacts. This fact may be illustrated by comparing the disturbance caused by an ordinary electric bell or buzzer connected to a battery with very short leads with the same instrument when operated by a battery connected by long leads. In the latter case the radiations will be considerably stronger.

Apart from the part played by the mains or leads in propagating these undesirable radiations it is obvious that their strength depends also on the intensity of the spark. It is only logical, then, that efforts at the elimination of the interference should be directed towards (1) A reduction of the sparking itself and (2) The elimination of the radiation of its energy by means of the wires carrying the current.

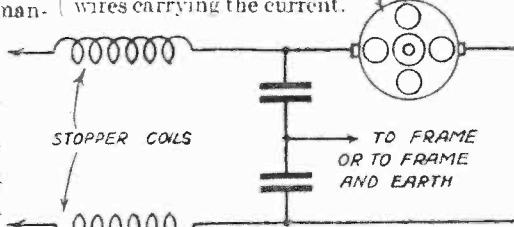


Fig. 3.—Interference suppressor which may be fitted to various domestic appliances.

Before describing the methods which are used to accomplish this let us consider the source of the interference itself. Although this might be caused by outside agencies, such as tramways, power stations, charging plant, etc., it is just as well to first ascertain that the trouble does not lie nearer at home. For instance, amongst some of the commoner causes of crackling noises emanating from the domestic supply system are the following: Faulty switch contacts, electric bulbs which have not been properly pushed home in their holders (see Fig. 1), bad contact at terminals of switches, ceiling roses, fuses, etc. The reason for radiations in cases of this sort is due to "arcing" at the offending contact. A wire con-

nected to a binding screw or terminal may be making only intermittent contact owing to, say, a loose grub screw. This will cause an arc to bridge the gap during the periods when there is no direct contact. Walking across the room may provide sufficient vibration to "make" contact and so start the arc. In the case of wall switches, the trouble may be caused by the contacts losing their springiness after some years of use. Pinching the copper springs slightly closer together with a pair of pliers, as in Fig. 2, may be all that is needed to effect a cure.

Little faults of this sort, besides being usually easy to overcome, are also fairly easy to trace. Switching off the various lamps, appliances, etc.,

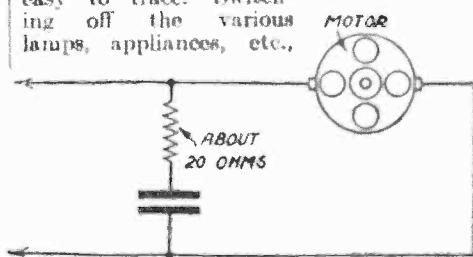


Fig. 4.—Another suppressor circuit.

in the house one by one will soon determine the source of the offending crackles.

The Use of Condensers and Chokes

Of course, such domestic appliances as electric fans, vacuum-cleaners, ice cabinets, etc., may cause trouble, although all the connections, switches, and so on, are in perfect order. The radiations here are due chiefly to the sparking which occurs at the commutator and brushes of the motor. Although cleaning the parts carefully with a rag dipped in petrol may help considerably, it may be necessary to fit some sort of suppressor device as well. Quite an effective circuit is that shown in Fig. 3. It consists of a choke or "stopper coil" in each lead to the motor of the fan, cleaner, or whatever the machine is, and two condensers in series across the leads. The centre point of the condensers is joined to the frame of the motor. It is

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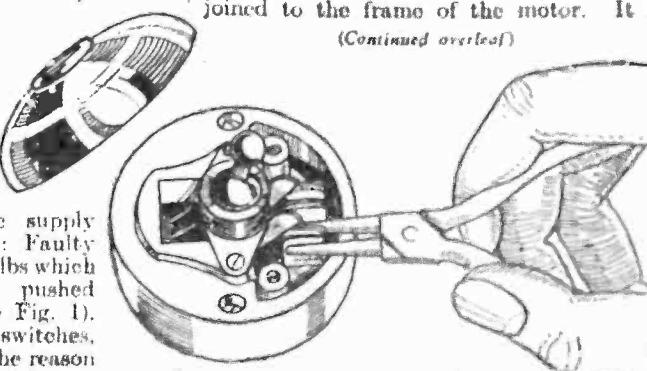


Fig. 2.—Sparking in wall switches may often be overcome by pinching the contacts closer together.

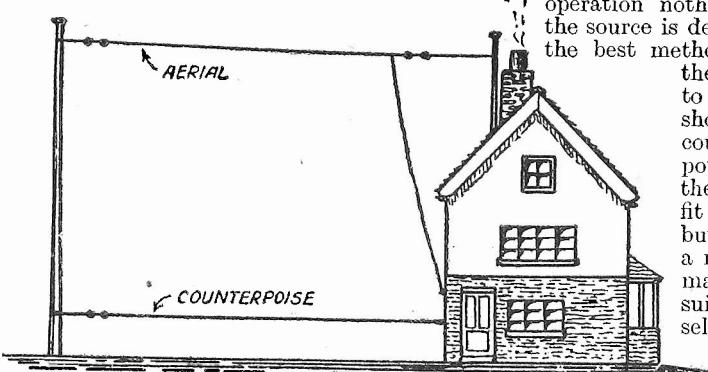


Fig. 5.—A counterpoise is sometimes useful in reducing interference.

(Continued from previous page)

sometimes an advantage to earth this point as well. If possible, this should be tried. The object of the coils is to prevent radiation along the mains, and that of the condensers to reduce the intensity of the sparks at the brushes. The coils and condensers should be fitted as close to the motor as possible in order to subdue the interference at its source. Suitable sizes for the coils are as follows: 50yds. (about 100 turns) of 18 or 20 gauge D.C.C. wire wound on a 6in. diam. former. The former will have to be 8in. long, but a less cumbersome arrangement can be made by winding a hank of about 50yds. of single flex and binding it round with insulation tape. The coils will stand up to 5 or 6 amps. For smaller consumptions correspondingly finer wire may be used. The condensers should be .01 mfd. capacity for A.C. mains and 1 mfd. for D.C., and should be rated at a working voltage not less than that of the supply.

A less elaborate circuit which is often quite satisfactory consists simply of the two condensers without any stopper coils, or even one condenser connected direct across the leads may be quite sufficient. With this last arrangement it sometimes happens that the interference still persists on one waveband due to the condenser forming, in conjunction with the coils of the motor, an oscillatory circuit. This can be overcome by connecting a resistance of about 10 or 20 ohms in series with the condenser, as in Fig. 4.

Tramways and Flashing Signs

So far we have only considered the case of interference caused by plugs, switches, electrical appliances, etc., in the house itself. This can usually be fairly easily traced and remedied as we have already explained. Now often the most annoying and persistent disturbance is caused by outside agencies, such as trams, electric signs, and battery-charging plant, and here the question of suppression is rather different. First of all, if the trouble is to be tackled at its source, it means approaching the owners of the offending apparatus. Naturally, without their consent and co-

operation nothing can be done. If the source is definitely traceable then the best method of approach is via the Post Office authorities, to whom application should be made. Of course, they have no powers as yet to force the parties concerned to fit suppression apparatus, but many firms will take a reasonable view of the matter, and either install suitable suppressors themselves or allow you to have them fitted. Often a pair of condensers is all that is necessary to

cut out the crackle.

Failing satisfaction in this direction (and, curiously enough, where one would naturally expect the most courteous treatment, that is from local authorities, it is sometimes that the greatest opposition is met), the only thing is to attempt to barricade all possible channels by which the interference may find access to the receiver. Obviously this is not always easy, especially as usually the interference arrives by the

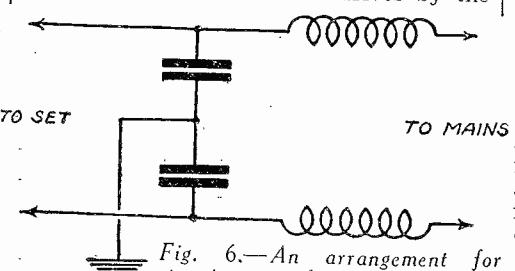


Fig. 6.—An arrangement for stopping interference arriving via the mains

same path as the wanted signal, namely, down the aerial.

It may appear rather obvious to mention that the direction of the aerial may have some effect on the degree of pick-up from interference sources, but for the benefit of those who have not heard of it before it may be stated that it is always advisable to run the aerial at right angles to tram or trolley-bus wires, electric train lines, etc.

What is often a very effective device is a counterpoise earth. The more orthodox form is shown in Fig. 5. It consists of a wire similar to the aerial wire suspended directly under the aerial and a foot or so from the ground. It is insulated from the earth either

by using bare aerial wire and porcelain insulators, or else by using rubber-covered wire. An alternative arrangement which is very easy to fix up consists merely of a length of flex laid along the floor of the room in which the receiver is used. Its position should be varied until the best place is found, when it can be concealed under the carpet.

Screening the Aerial

Sometimes interference may be caused by currents induced in the aerial by nearby gutter piping, metal stove pipes, corrugated iron roofs over workshops, etc. Naturally the aerial and lead-in should be kept as far away from these as possible. Failing this a screened lead-in may be useful. These may be obtained from radio dealers and consist of a central lead-in wire surrounded by a metal sleeve which is insulated from the central wire. The sleeve should be earthed. In the case of the iron roof just mentioned a good plan is to earth it at one or two points by soldering wires to it, the other ends being connected to earth tubes, or pieces of old metal buried in the soil. The roof will then become an earthed screen to any electrical machinery in the building instead of an inductor to create currents in the aerial above it. All joints in the roof should be electrically as well as mechanically sound.

Apart from the aerial-earth system the other most likely pathway for interference is down the mains. This, of course, only applies to mains sets. Here the best device for barricading the entrance consists of a similar arrangement to that used to reduce radiation from the source, namely, chokes in each of the mains leads and two condensers in series across the leads, with the centre connection earthed. (See Fig. 6.)

In this case the current which has to pass through the chokes is comparatively small, and can be wound with thin wire and are, therefore, quite compact. Chokes and condensers specially made for this purpose can be obtained from various manufacturers. Examples of those marketed by Messrs. Bulgin and Co., Ltd., are illustrated in Fig. 7.

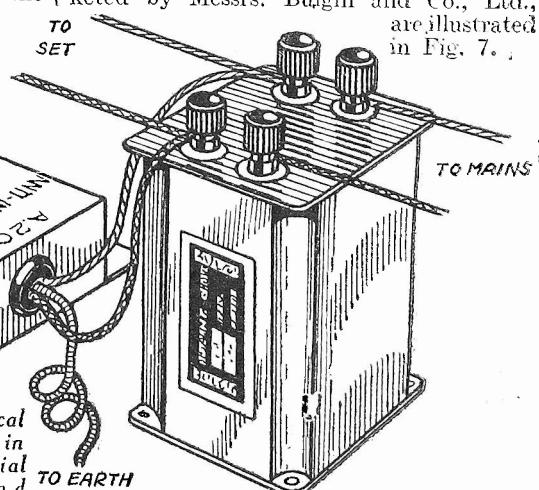


Fig. 7.—The practical layout of the circuit in Fig. 6, using a special condenser block and TO EARTH double choke.

Broadcasting in British India

ALTHOUGH the total population of British India is roughly 350,355,000 souls, the broadcasting system has received comparatively little support. The number of listening licences has only increased from 3,000 in 1928 to a figure in the neighbourhood of 10,000 to-day. One of the principal difficulties with which the broadcasting authorities have had to contend is the diversity of languages. Indian programmes

are broadcast in Urdu, Gujarati, Bengali, Hindu, Telugu, Marathi and Tamil, but in all, in the Indian Empire, 222 languages are spoken, of which twenty-three only by more than one million natives.

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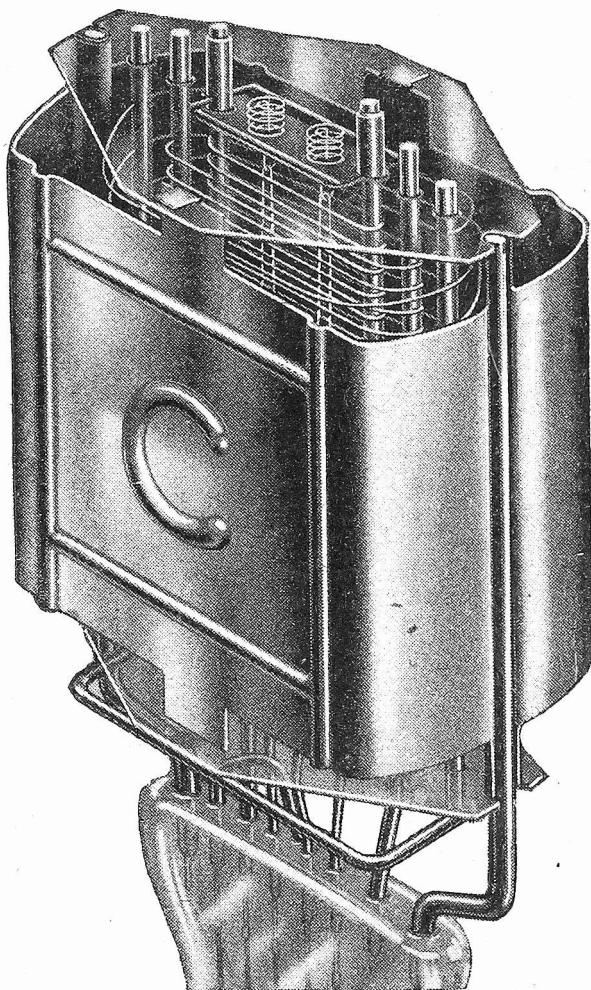
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3714

October 7th, 1933

(Continued from previous page)

the usual filament, the emitted element is an independently heated cathode similar to those employed in A.C. mains receiving valves. Thus the cathodes of both receiving and rectifying valves heat up simultaneously, and the voltage surge associated with switching the rectifier on to an open circuit is avoided.

Another alternative is the use of a thermal delay switch which closes the filament circuit of a directly heated rectifier valve at a definite time, usually half a

The only reason for using Class "B" with an eliminator is that one certainly obtains a greater maximum output than could otherwise be obtained with a single battery valve—but no H.T. saving is effected thereby.

Fuses

A matter about which I am always receiving inquiries, and upon which a great diversity of opinion seems to exist, is the question of fuses in the rectifier circuit. Listeners as a whole seem to be

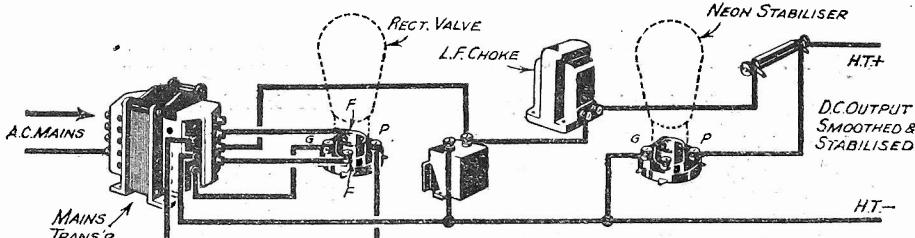


Fig. 14.—Adding a neon tube voltage stabilizer for an eliminator supplying a Class B valve.

minute, after the main receiver has been switched on, and thus renders the rectifier inoperative until the receiving valves have had time to warm up.

A Special Case

A very special case of the variation in anode current affecting the performance of the set occurs in receivers where the output stage comprises two valves operated in quiescent push-pull, or a single Class "B" output valve. In such cases the "standing current" in the output stage is a matter of a few milliamperes only, while the peak values of the anode current may be ten times as great, or even more.

Such a receiver, operated from an ordinary H.T. eliminator, could not be expected to be stable. Of course, Q.P.-P. and Class "B" are really devices for obtaining a large maximum output with battery H.T., and there is actually little point in employing an eliminator. Still there are a few people who desire to use an existing H.T. unit with Class "B" output, and it is therefore necessary to show how this may be satisfactorily achieved.

In the case of a metal rectifier it is frequently sufficient to feed the Class "B" valve through a separate smoothing system which is particularly generously designed in the matter of choke inductance and condenser capacity.

Where a valve rectifier is employed, however, further steps must be taken. The best solution, in addition to providing very efficient smoothing, is to connect across the H.T. positive and H.T. negative terminals a "gas discharge" tube, of which several reliable makes are on the market. (See Fig. 14.) It must be remembered, however, that the effect of such a tube is merely to maintain a constant drain from the eliminator by taking additional current when the anode current of the valve drops. Thus the actual H.T. consumption approximates to the maximum value of the anode current of the valve, and the high-tension economy, which is one of the prime advantages of Class "B," is lost.

divided roughly into two main groups—those who are over anxious to be on the safe side and simply plaster their mains equipment with fuses, and those happy-go-lucky people who hope for the best and omit fuses altogether. There is, of course, a small minority who form the happy medium.

From an examination of a large number of shop-made mains sets of different designs, and sold at different prices, one forms the opinion that in the case of expensive and high-quality apparatus it is standard practice to incorporate fuses only on the input side, while the less expensive sets have no protection at all. Possibly the argument is that the set will be plugged into the house mains and will therefore be adequately protected by the sub-circuit fuses. This, however, is a fallacy, because sub-circuit fuses are seldom lighter than five amperes rating, and in the event of a short circuit or other mishap in the receiver quite a lot of damage may be done without blowing a five amp. fuse.

My personal practice is to fit a double-pole fuse, rated to blow at one ampere, at the

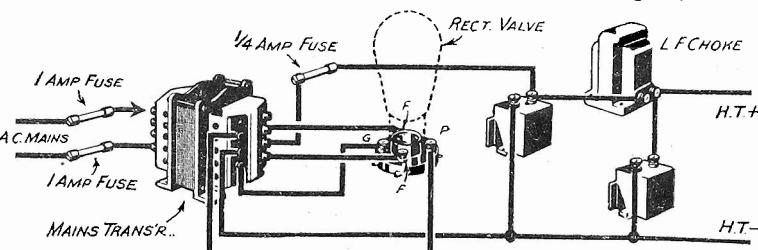


Fig. 15.—A rectifier unit showing suggested position of fuses:

mains terminal of the receiver. These fuses may be fitted in a baseboard mounting fitting, of which several good types are available, or in a neat combined inlet plug and fuse, which is a very handy arrangement. Then I fit a smaller fuse—usually of $\frac{1}{2}$ amp. capacity, in the H.T. positive lead, as close to the valve as possible—i.e. before the smoothing circuit, as indicated in Fig. 15. The object is to provide protection for the rectifier and transformer in the event of any short or earth, wherever it may occur in the apparatus, be it a breakdown of one of the smoothing condensers, breakdown of insulation in a choke winding, or elsewhere. To my mind this gives all the protection needed in the event of all likely contingencies.

L.C.R. AND L.S.D.

(Concluded from page 99, Sept. 30th issue)

A SIMPLE power pack scheme was shown in Fig. 2, the rectifying valve V being either of the directly or indirectly heated cathode type. According to the rectified power demanded by the set, so the type of rectifier valve will vary, but it derives the voltages for feeding its anodes and own filament from separate secondary windings on the mains transformer. Power will be consumed by each of these windings, and then we have to consider one or more additional secondary windings that feed the filaments of the mains valves in the set itself.

For Practical Purposes

Now for all practical purposes we can consider the "load" applied by the rectifying valve V as being purely resistive, and since the resultant impedance in ohms is much smaller than that applied by the branches of the smoothing equipment we can, for rough calculations, assume that the wattage consumed by the valve V constitutes the secondary load. It might be thought that since the full voltage across the secondary winding is twice the rectified output voltage, then double the rectifier's output must be taken by the secondary. One half of the secondary winding is inoperative during each half cycle, however, and, in consequence, the assumption is not correct.

Furthermore, owing to the predominance of this rectifier resistive load in comparison to the inductive and capacitative loads we can, for all ordinary purposes, neglect the difference in phase between current and voltage. Our problem is, therefore, simplifying itself. Of course, we should take into account the losses and efficiency of the mains transformer, but with a good class component incorporated in the receiver this efficiency is quite high. To counterbalance the transformer efficiency factor the maximum wattage output of which this rectifier valve is capable. The set seldom draws this full power, but I have found this method a very good one for offsetting any losses which are difficult for the amateur to measure.

To this figure we must add the consumption of the valve filaments, but by tackling the problem in this way we have simplified matters and overcome the difficulties of phase angle differences.

An Example

To learn the consumption, therefore, the course to follow is simply this. Ascertain which rectifier valve is being employed—say a D.W.2, D.W.3, D.W.4, etc., and see what its maximum output is rated to be. For example, with a very powerful set using a D.W.4 rectifier valve we have an output of 120 milliamperes at 500 volts, that is, 60 watts. Add to this the rectifier filament power consumed, namely 2 amps. at 4 volts, giving us 8 watts, and finally, the filament consumption of the set. This latter could be, say, four valves at 4 volts 1 ampere, together with one valve at 4 volts 2 amperes, giving a total wattage consumption of 24 watts. Our total is, therefore, $60 + 8 + 24 = 92$ watts, which means that the set will work for nearly eleven hours before one unit of electricity is consumed.

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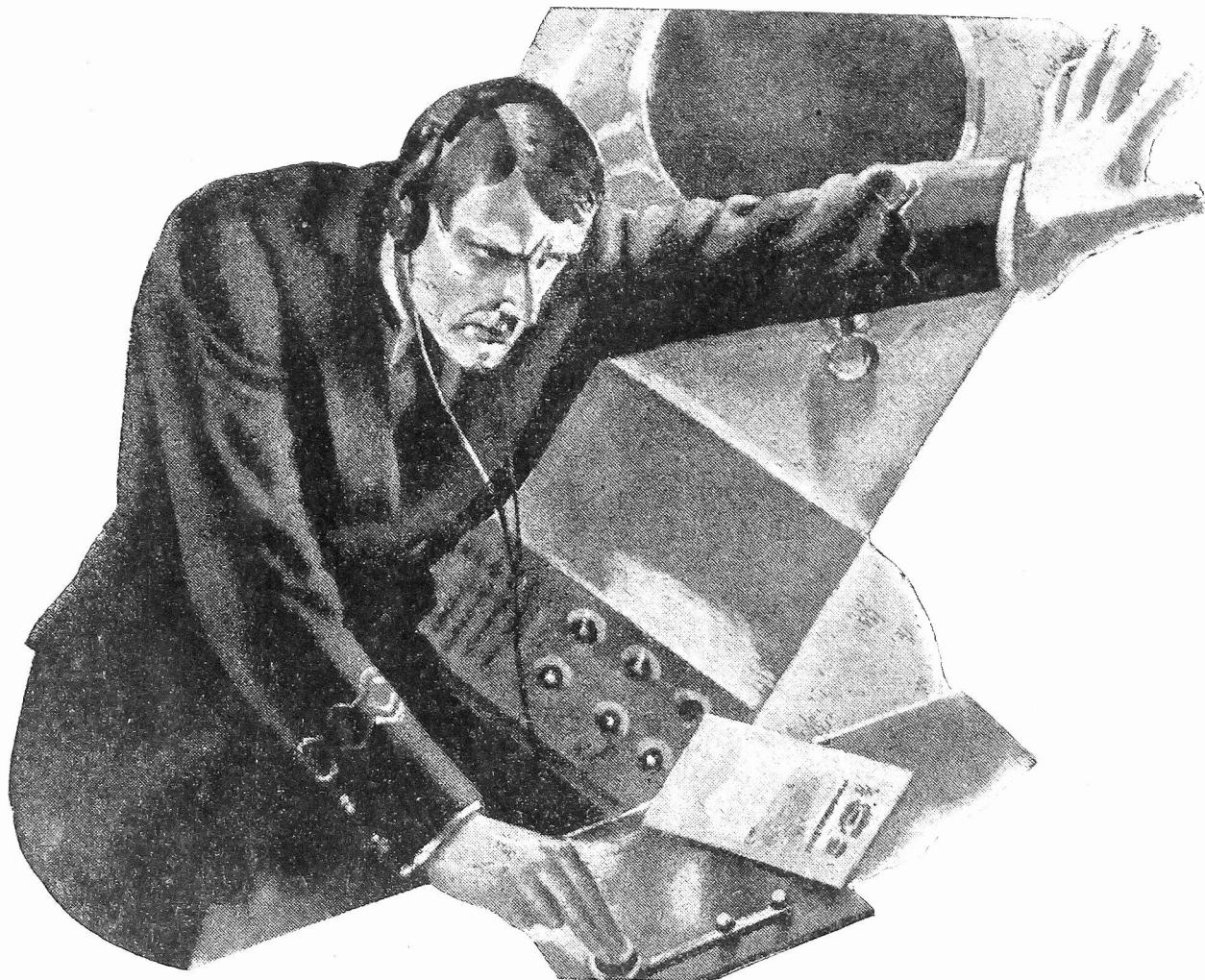
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3,000	29	40,000	6
4,000	24	50,000	5·5
5,000	20·25	60,000	5
10,000	12	80,000	4·24
Other values pro rata		100,000	3·5

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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
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ABSORPTION WAVEMETER

In This Article the Writer Describes a Simple and Efficient Instrument Suitable for Use in Conjunction With Modern Short-wave Receivers. By ALF W. MANN

THIS fundamental principle of this wave-meter, of course, is not new, and is a variant of the popular absorption wave-meter used by amateurs the world over. It is, however, a definite improvement over the aforementioned type, and is universal in application, and can be used with any type of short-wave receiver—unscreened, partly, or totally screened. Screening makes absolutely no difference whatever, and providing it is possible to magnetically couple the four turn coupling coil to the detector grid coil, or, in the case of aperiodic coupling being used in the receiver, to the aperiodic coil, this wave-meter will function efficiently. The same applies with reference to the various types of tuning coils employed in short-wave receivers, two, four or six pin, and dual-wave coils. The coupling coil may be wound on the same former if there is room, on the mounting or plug-in base, or above the coil itself, according to the design and the position of the coil it is desired to couple with.

Details of Construction

It will be noticed that the cabinet is of desk type construction, and if made exactly to the dimensions given, it will be found that the angle at which the panel is set will enable the user to take accurate dial readings either in daylight or artificial light.

The coil screen obviates direct pick-up

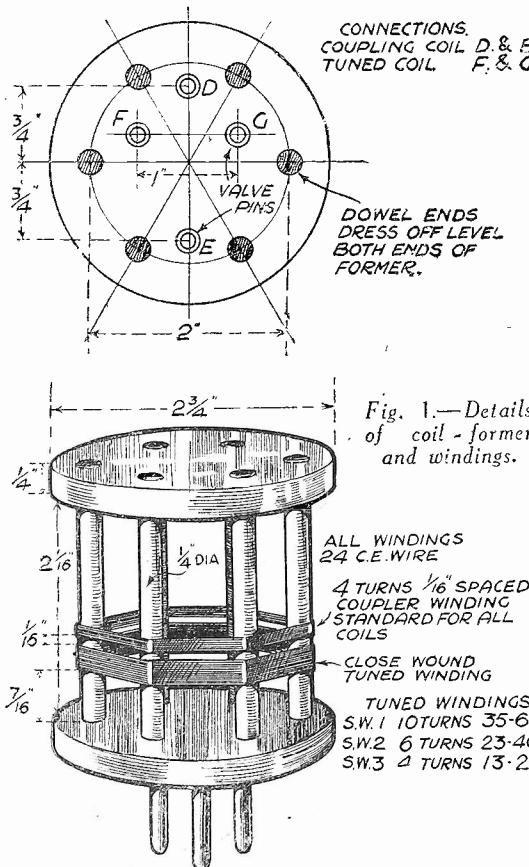


Fig. 1.—Details of coil-former and windings.

Mounting the Components

The components should be next fitted up, also the socket strip. Remove terminals from coil base, also aluminium spigot around which screen fits. Screw base to underside of cabinet (top) with 5M sockets protruding through hole A (Fig. 5). Keep them central. Now mount spigot on top of cabinet and screw in place. If base and spigot

wind the permanent coupling coil. The constructor will devise his own method of cabinet construction, but should rigidly adhere to dimensions given.

COMPONENTS REQUIRED.

COMPONENTS REQUIRED.

- 1 .0003 mfd. variable condenser (SL or LML).
- 1 vernier dial, 0—100° or 180°.
- 1 .0003 mfd. fixed condenser, unless .00015 variable is used.
- 1 six-pin coil base and screen.
- Length of twin flex (good quality; see text).
- 2 2 ft. 6 in. length of wood dowelling $\frac{1}{4}$ in. diameter.
- 14 valve legs and 2 valve holder sockets.
- 4 banana plugs and sockets. 2 red, 2 black.
- 2 ounce reel 24 gauge copper-enamelled wire, or sufficient to wind coils, if on hand.
- 1 piece 3 in. diameter by $\frac{1}{8}$ in. six-ribbed former. Shellac varnish for wood former.
- 2 pieces of ebonite, $\frac{2}{3}$ in. by 11 in. by $\frac{1}{8}$ in.
- Drill and mount as in Fig. 5, in back of wavemeter, and back of detector end of receiver cabinet, wired to coupling coil, Fig. 3.

2 pieces of ebonite, $2\frac{1}{2}$ in. by $1\frac{1}{2}$ in. by $\frac{1}{8}$ in.
Drill and mount as in Fig. 5 in back of
wavemeter, and back of detector
end of receiver cabinet, wired to
coupling coil, Fig. 3.

the cabinet, thus drilling holes for leads in cabinet top is avoided. Fit tuning condenser in centre of panel and make sure the moving vanes clear the sides.

Fix slow-motion dial in place, and then wire up the tuning condenser, fixed condenser, and coil base and sockets, as shown in Fig. 3. Screw on bottom of cabinet and the wavemeter is complete.

The coil construction can next be taken in hand. The twin flex lead may be of any length, so that the wavemeter can stand close to the set or some distance away, according to the requirements of the individual. Variation in length does not affect the calibrations, as the coils and coupling flex form a complete untuned link circuit.

(Continued on page 158)

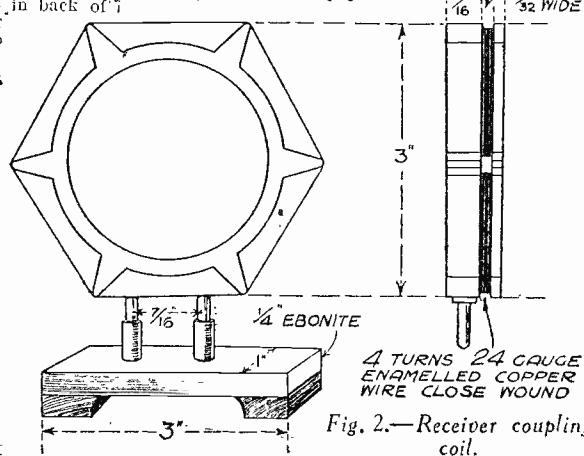


Fig. 2.—Receiver coupling coil.

TELE-TALKIE TOPICS

By H. J. BARTON CHAPPLE, Wh.Sch., B.Sc. (Hons.), A.C.G.I., D.I.C., A.M.I.E.E.

WE are now approaching the most interesting stage of our discussion on the simple disc television receiver, namely, assembly; but before dealing with that, let me first of all have a word to say on the question of lenses for magnifying the image.

Lenses

The image, as it is built up by rotating the spiral of holes in the disc before the modulated neon glow of the lamp, is limited in its size by the dimensions of the disc. For example, with a disc having an external diameter of 20ins., the actual image area size is slightly less than 2ins. high and just over $\frac{3}{4}$ in. wide. For most practical purposes this is too small to watch for any length of time without eye strain, so a lens or a pair of lenses must be mounted before the image so as to enlarge it optically.

Do not attempt to magnify the image too much, or with the present thirty-line transmission it will lose definition. A limit

from the disc itself can be ascertained by observation, but about $2\frac{1}{2}$ ins. will be found to be the approximate distance.

Assembly

The assembly of the various components is quite a straightforward matter, and in view of my previous articles will present no difficulty to the reader. Of course, there are several variants according to the aesthetic taste of the constructor, but in every case one or two points must be observed. First of all, screw the motor to a wooden mount so that when the disc is placed on the shaft it will clear the table or bench on which the mount is resting. One example of this is shown roughly in Fig. 2. The neon lamp must be fitted in the usual type of bayonet-type holder at the back and on the right of the disc so that the centre of the neon glow area is on the same horizontal line as the motor shaft and coincides with No. 15 hole in the disc. This precaution will ensure that the whole light area will be scanned by

the disc apertures as they rotate. By the

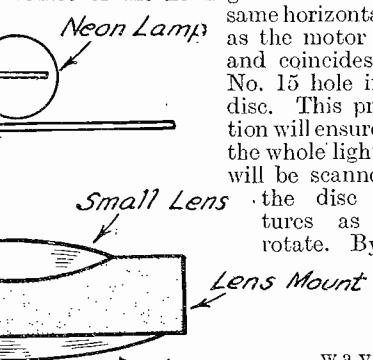


Fig. 1.—Showing the relative positions of disc, neon lamp, and lenses.

of four to five times will, as a general rule, be found ample. Suitable lenses may be obtained at any opticians. An ordinary reading glass will serve, but usually a combination of two lenses will be productive of better results. One very good combination is a 6in. diameter single convex and one 4in. diameter double convex with focal lengths of 17ins. and 11 $\frac{1}{2}$ ins. respectively. These should be clamped or fixed on to a mount 1in. apart with the smaller or double-convex lens nearer the disc and the larger or single convex lens farther from the disc. This is shown in Fig. 1 and the exact distance of the mount

right way round on the motor shaft—that is to say, when facing the front the spiral of holes should progress towards the centre in a clockwise direction. Then, if the motor is made to rotate in an anti-clockwise direction, the scanning movement will be as the B.B.C. standard—namely, hole movement bottom to top and strip movement right to left.

Further Suggestions

If the motor is mains or accumulator-driven it will require both a fixed and variable resistance in series with the leads. These can be mounted as shown, the variable resistance being adjusted to make the motor run at its correct speed of 750 revolutions per minute. The same mount that is used to screw down the motor can be employed

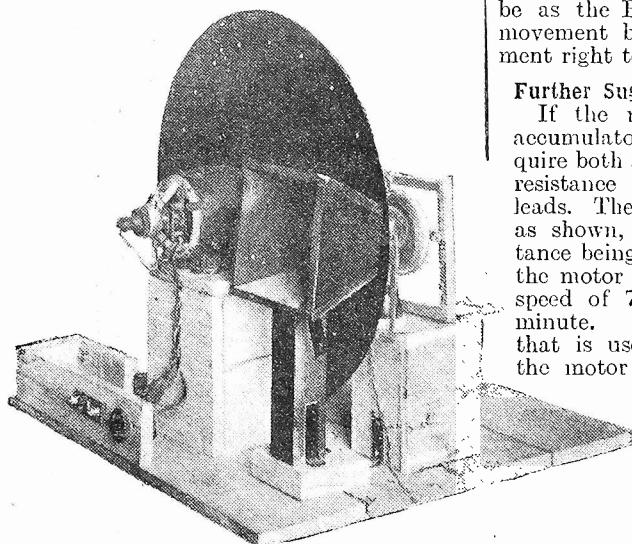


Fig. 3.—A good amateur effort of building disc television apparatus from rather crude materials.

to hold the lens or lenses which are positioned immediately in front of the disc and neon.

You will notice that I have not made any mention of synchronizing apparatus at this juncture, as this is a subject which must be treated separately at a later date. I am concerned now only with the simplest of instruments and the correct motor speed must be maintained by a delicate handling of the variable resistance or, alternatively, introducing some form of friction brake on to the motor shaft.

Examples

By referring to Fig. 3 the reader will obtain a very fair impression of how a machine of

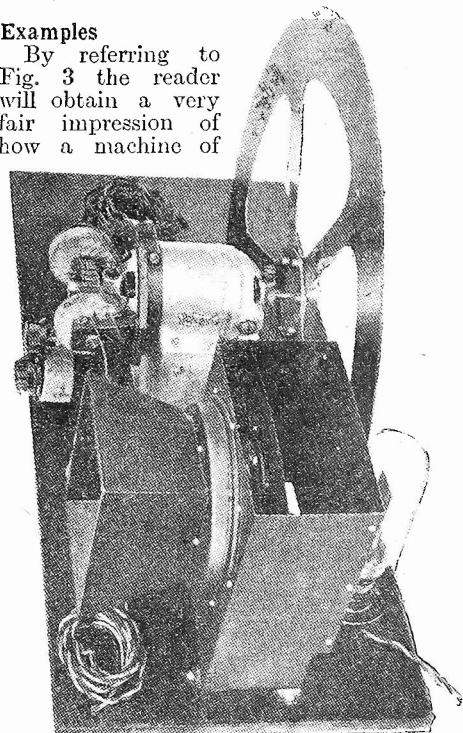


Fig. 4.—Another suggested design for a disc television receiver made up from standard parts.

this character can be built up from relatively crude apparatus and yet made to function quite well and give hours of pleasure. Notice the "tunnel" in front of the lenses so as to screen off any extraneous light, and also the reflector at the back of the neon lamp to concentrate the neon glow. Fig. 4 shows yet another variant, this time a machine made up from commercial parts.

The next important point for us to study concerns the various methods of connecting the neon lamp to the output circuit of the wireless receiver, and I am making this the subject of a special article which will appear in a subsequent issue.

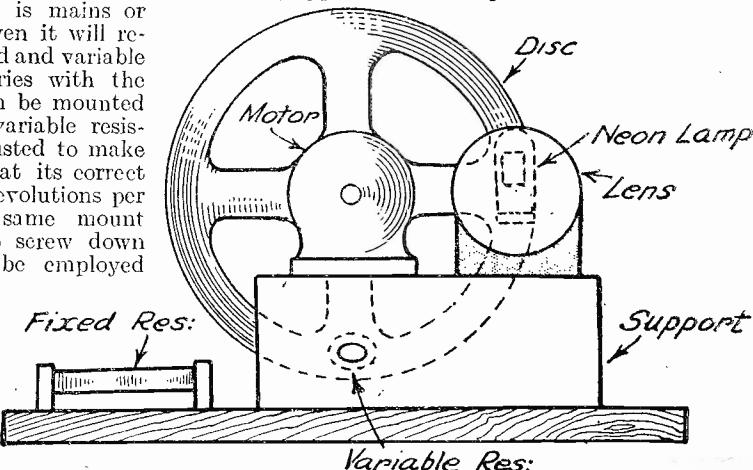
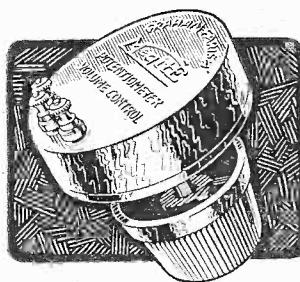


Fig. 2.—A rough layout of the disc model television apparatus.

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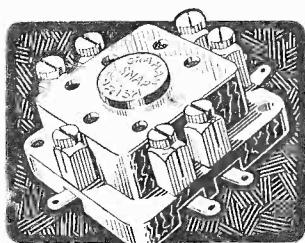


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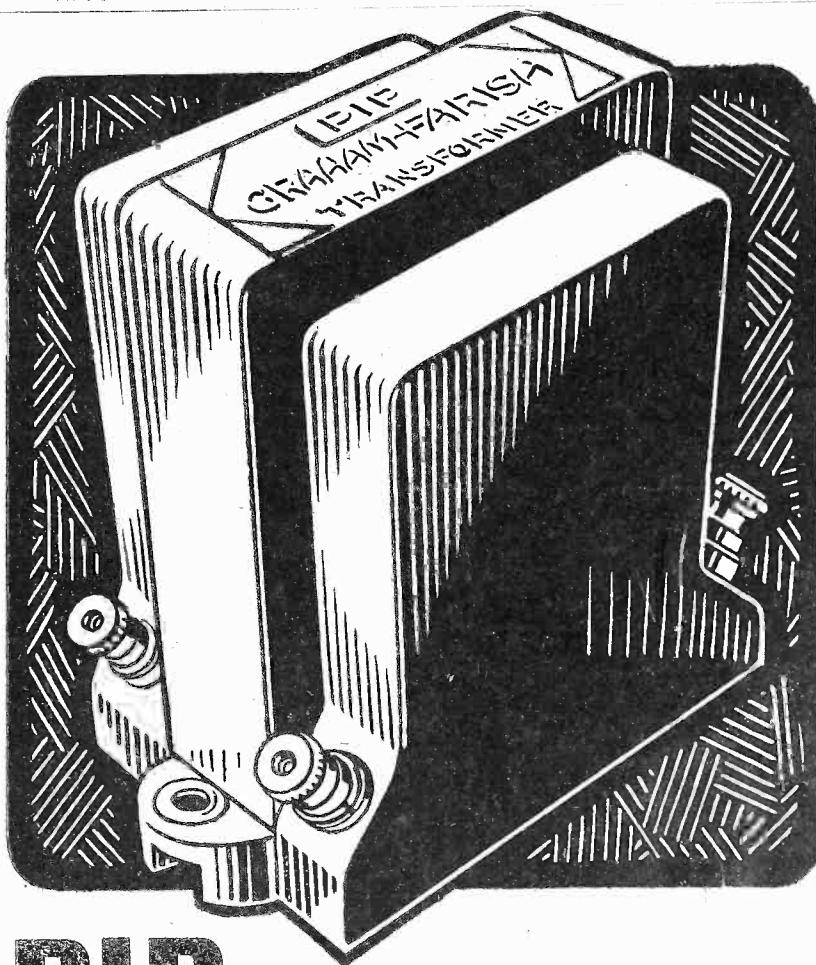
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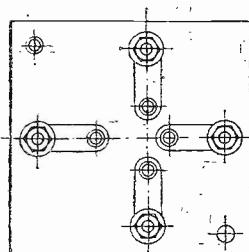
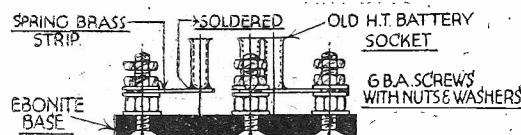
THE HALF-GUINEA PAGE

A Valve-holder from Scrap Material

THE accompanying sketches show a valve-holder made entirely from scrap material. Old high-tension battery sockets serve as valve sockets, and these are soldered to pieces of springy strip brass. Each socket complete with strip is mounted on a block of ebonite, cut to the shape required, and fastened thereto by a countersunk head screw and lock-nuts in the manner illustrated.—GEORGE R. BENT (Reddish).

Cutting Out the Aerial Condenser

WITH the majority of dual-range coils a difficulty presents itself. A fixed condenser of approximately .0001 mfd. is placed directly in aerial lead, but the

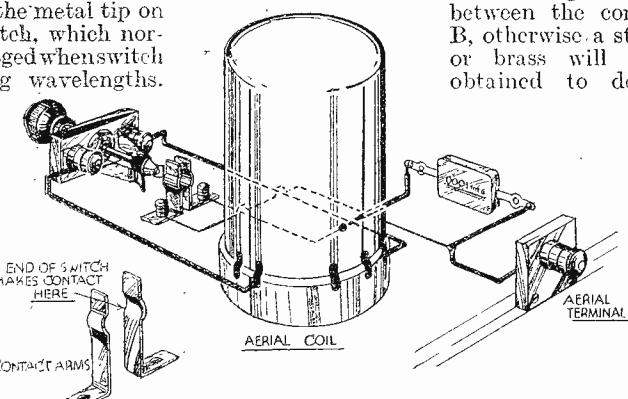


Details for making a valve holder from scrap metal

problem is how can one cut the condenser out when on long waves, as reception on this wave-length proves better without it.

The usual method is to have two aerial terminals, or else the lid of the cabinet needs lifting to make an adjustment. By referring to the accompanying diagram it will be seen that the necessary adjustment is done automatically when switching to long waves. Furthermore, there is no financial outlay, owing to the fact that the same switch does the work by making use of the metal tip on end of the switch, which normally is disengaged when switch is set for long wavelengths.

The only materials required are two pieces of tin cut and shaped as shown and two pieces of wire, and these can be connected up in a few minutes.—L. T. W. SMITH (Chelmsford).



Cutting out the aerial condenser.

THAT DODGE OF YOURS!

EVERY reader of "PRACTICAL WIRELESS" must have originated some little dodge which would interest other readers. Why not pass it on to us? We pay £1-10-0 for the best wrinkle submitted, and for every other item published on this page we will pay half-a-guinea. Turn that idea of yours to account by sending it in to us addressed to the Editor, "PRACTICAL WIRELESS," George Newnes, Ltd., 8-11, Southampton Street, Strand, W.C.2. Put your name and address on every item. Please note that every notion sent in must be original. Mark envelopes "Radio Wrinkles." Do NOT enclose Queries with your Wrinkle.

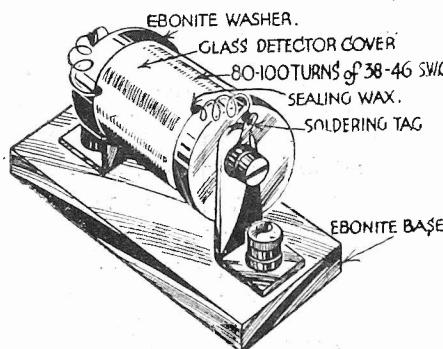
Short-wave Choke from a Crystal Detector

A CHEAP but efficient short-wave choke can be made from an old crystal detector of the glass tube type, two 4 B.A. nuts and bolts, two soldering tags, and a small quantity of wire (silk or enamel covered). First remove the cup and the cat's whisker arm and on the glass tube, starting about 3 1/16 in. from the end, wind a choke of approximately 80-100 turns of 38-46 S.W.G. Put a spot of Chatterton's compound or sealing-wax on the first and last wires to keep them in place. Solder a tag to each end of the wire for connecting purposes. Then take a 4 B.A. bolt, pass it through the end soldering tag, the brass bracket, and the large ebonite washer, put on a nut and tighten. After unscrewing the other brass bracket from the base, repeat the above process at the opposite end, and then slip the glass tube into position between the ebonite washers. Re-fix the bracket on the base, and the choke is complete.—J. IRWIN (Blackburn).

An Aerial Earthing Switch

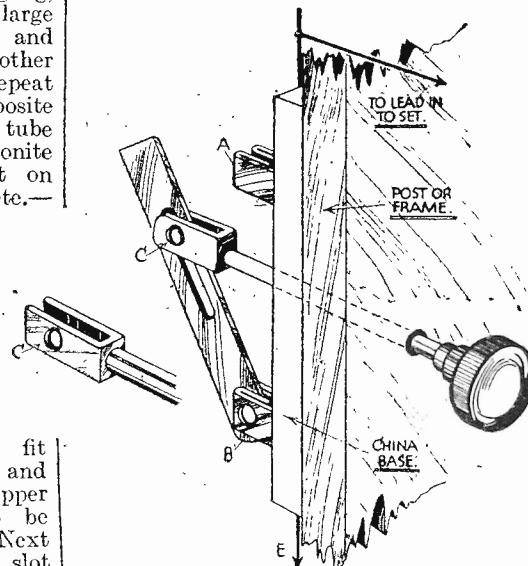
A VERY efficient aerial earthing switch, which can be fixed outdoors and operated indoors, can be made from a china base single-pole double-throw switch. First remove switch blade from centre of base and it will in all probability be found long enough to fit between the contacts A and B, otherwise a strip of copper or brass will have to be obtained to do so. Next cut a slot about 1/16 in. long and 1/16 in. wide in the centre of the blade, then place blade in contact B and drill a small hole right through so that contact and blade can be bolted to-

gether. Now obtain a length of metal rod, about 1/16 in. diameter, of a sufficient length to pass through door-post or window-frame, and solder or screw to one



Making a short-wave choke from a crystal detector.

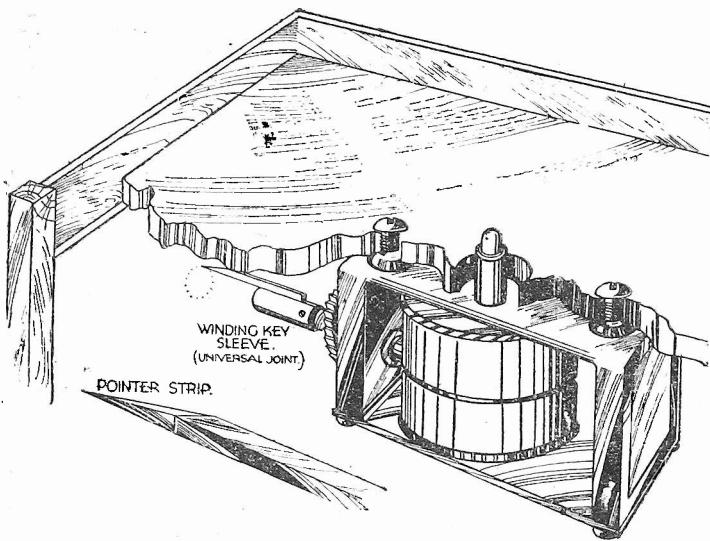
end a U-shaped piece of metal, as shown in the illustration at C, and drill for a small bolt and nut. The rod is then passed through centre hole in switch base and operating rod attached to the blade with a small bolt and nut. It is essential that this should be a loose fit. It only remains to drill a small hole right through the



A simple aerial earthing switch.

door-post or window-frame where it is desired to fit the switch and screw knob on the indoor end of the operating rod. The illustration is almost self-explanatory, and no doubt the majority of readers will have sufficient material in their junk boxes to make up one of these switches. It will be found that the switch is "self-cleaning," owing to the spring contacts A and B.—W. J. A. DAVIES (Uxbridge).

(Continued overleaf)



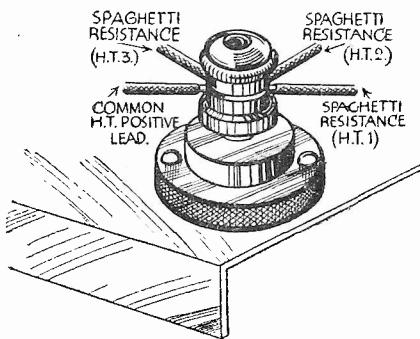
Marking out the hole in a radiogram cabinet for the winding handle.

READERS' WRINKLES (Continued from previous page)

Marking Out Hole for Winding-Key

AFTER having fitted a spring motor to the motor-board in my radiogram cabinet, my next job was to drill the hole in the side of the cabinet to take the winding-key escutcheon. The winding sleeve on this motor having a universal joint made it difficult to find the centre position for the hole in the side of the cabinet. It can easily be done in the following way: Cut a piece of strip metal about $\frac{1}{2}$ in. wide by $\frac{1}{16}$ in. thick, having a straight edge at the bottom. The length of the strip must be the distance from the end of the sleeve to the inside of the cabinet. File one end of the strip to a sharp point as indicated in the sketch. With one hand push the sleeve as far out of centre as it will go, holding it firm. Place the pointer flat on the sleeve and slide forward until the point pricks the wood panel. Repeat this all round the sleeve, taking care to push it out of centre at each position.

You will then have a circle of prick marks on the panel. The centre of this circle is the dead centre line. Drill a small hole from inside the cabinet and enlarge from the outside to take the winding-key escutcheon.—F. MORLEY (Hayes).



A simple terminal insulator.

A Simple Terminal Insulator

DIFFICULTY is sometimes experienced in making fully insulated connections on a metal chassis. The following suggestion will be found very helpful and an excellent means of using up old-type condenser knobs which are to be found in almost every constructor's junk box. One of these knobs should be inverted and two holes drilled in the flange. It should then

grip. The component contains a former for the choke, and the grid condenser and grid-leak are also contained in the former.

The condenser and grid-leak are enclosed in a cap in the form of a ring in which a circular groove is cut. The dielectric and condenser leaves are in the form of a part circle as shown, and the grid-leak is wound on a flat former which fits in the groove, one end being attached to one terminal of the condenser. No difficulty will be experienced in connecting up the grid-leak, either in parallel or in series with the condenser. This arrangement may be made up by any experimenter, and attached to any set, and the space saved allows a better arrangement of the rest of the components. This idea incorporated in the valve-holder is much more convenient than the method shown, but it is easier for the amateur to make and fit to the valve socket as shown. The idea was first carried out by attaching the same arrangement to a valve socket from which the globe had been taken or broken.—W. H. GRAYLING (Cambridge).

A Cheap Universal Tester

THE following particulars relate to a universal tester which I have made and found reliable. The components required are 1 moving coil milliammeter reading 1 to 5 milliamps, 7 resistances, values as shown (strip Coverstats were used as these are 5-watt type), $3\frac{1}{2}$ ft. 26 D.C.C. wire wound on a card for a 1 ohm resistance, 13 sockets (11 red, 2

black), 1 black and 1 red plug, 4½-v. G.B. battery, and a strip of tin for bus bar. The other end of the leads have crocodile clips which may also be clipped on to two prods. The tests available are as follows:

For Volts use neg. socket with:

Socket B for 1 to 5 volts	reading is actual	
" C for 3 to 15 "	" " × 3	
" D for 10 to 50 "	" " × 10	
" E for 50 to 250 "	" " × 50	
" F for 100 to 500 "	" " × 100	across supply.

For Milliamps use neg. socket with:

Socket A for 1 to 5 mA.	reading is actual	
Black plug in G ₁ and Socket G for 5 to 50 mA.	reading is × 10	

Black Plug in H₁ and Socket H for 20 to 100 mA. reading is × 20 in one of the leads.

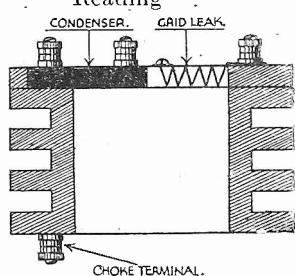
For Continuity test use Sockets J and K with:

For high resistance tests red plug in A red plug in B or C For low resistance tests across circuit to or filament tests be tested

For Ohms (1) Read off exact voltage of battery with red plug in B by shorting J and K

(2) For resistances 1,000Ω to 10,000Ω red plug in A. Place resistance across J and K

$$(3) \text{ Then Res.} = \frac{\text{Reading}}{\text{Voltage} \times 1,000} \text{ ohms}$$



A useful component of compact design.

For Resistances less than 1,000Ω red plug in B Then Res. =

$$\frac{\text{Voltage} \times 1,000}{\text{Reading}}$$

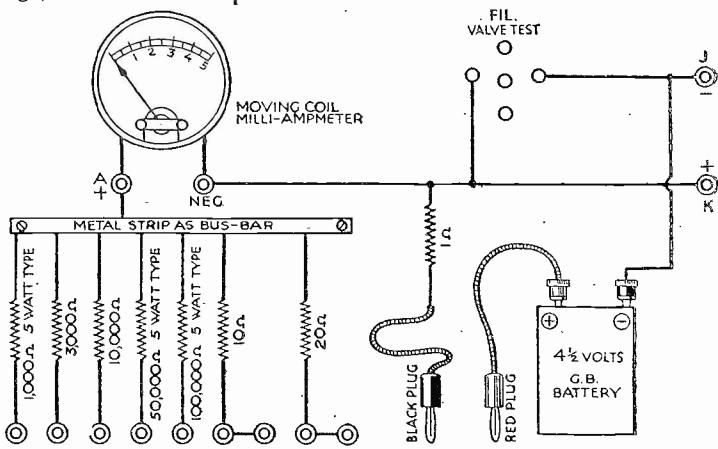
—1,000 ohms

Resistances of higher value than 10,000Ω

may be placed in series with higher voltages across A and neg. sockets.

$$\text{Then Res.} = \frac{\text{Voltage} \times 1,000}{\text{Reading}} \text{ ohms}$$

By winding the 1 ohm resistance with .94oz. No. 18 S.W.G. Eureka wire, and using black plug in B, 1 to 5 amperes can be read on the meter.



A cheap universal tester.



Offer closing immediately—reserve
Your Kit AT ONCE!

THIS is your last chance to obtain the PRACTICAL WIRELESS Pocket Tool Kit to which, as a reader of PRACTICAL WIRELESS you are entitled in accordance with the Simple Conditions set out below.

Every home constructor will appreciate the value of this Kit—which if sold in the ordinary way would cost at least 12s. 6d. Each tool is specially designed, made from best quality steel and fits snugly in its place in the neat metal case—which slips easily into the pocket.

If you have not yet reserved your Kit a glance down the list of Tools and at the illustration (much reduced) will surely make you keen to possess it. Fill in the Forms at once!

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- (a) Complete the Forms on right in ink.
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When your Subscription Voucher is complete, send it, together with a Postal Order for 3s. 6d., to include registration, postage, packing, insurance, etc., to PRACTICAL WIRELESS Presentation Department, and your Pocket Tool Kit will be despatched to you immediately.

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This offer applies to persons residing in Great Britain and Ireland. Readers in the Irish Free State must pay any duty imposed.

LIST OF TOOLS IN THE "PRACTICAL WIRELESS" KIT

One 4in. spring steel Chesterman rule No. 300D-2.

One special steel scriber with adjustable chuck for scrib-
ing point renewal.

One pair of special ebonite test prods with wander plug socket ends and brass test points.

One special 4in. trammel with one fixed and one sliding head enabling circles to be scribed from O up to 3 $\frac{5}{8}$ in. in radius. This tool may also be used for cutting holes in ebonite and baseboards too large to be drilled in the ordinary way.

One 60 degree 16-gauge steel set square with finger fret, for easy use.

One special viewing mirror for inspecting obscure parts of the set. This viewing mirror fits into the scriber chuck.

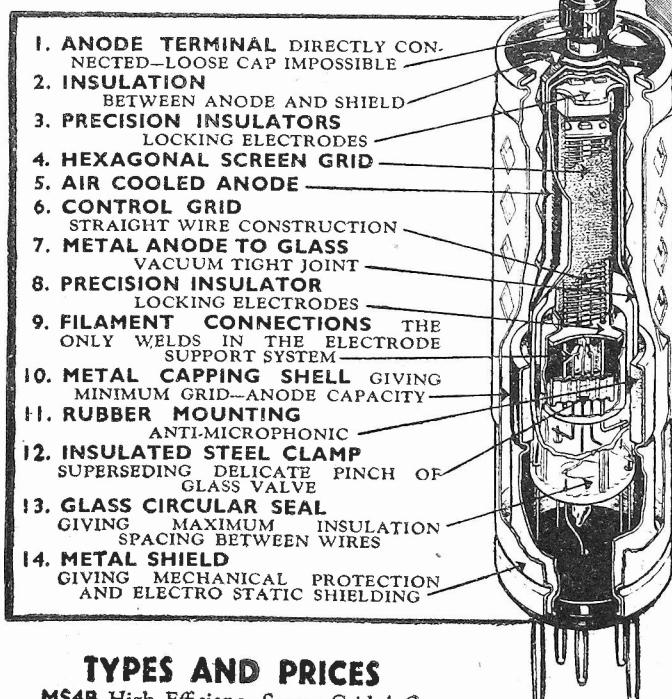
One steel screwdriver with brass ferruled handle, extremely useful for locking screws, securing components to baseboard, etc.

And the three steel spanners
O-B.A., 2-B.A., 4-B.A., 6-
B.A., 8-B.A., 10-B.A., given
Free to every reader of
PRACTICAL WIRELESS fit in a
special recess beneath the
set-square.

<p>If undelivered please return to Geo. Newnes, Ltd., W.C.2</p>	<p><i>Id. Stamp</i> must be affixed here.</p>	<p>Name.....</p>	<p>Street</p>	<p>Town & County</p>
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a GIANT in performance and output

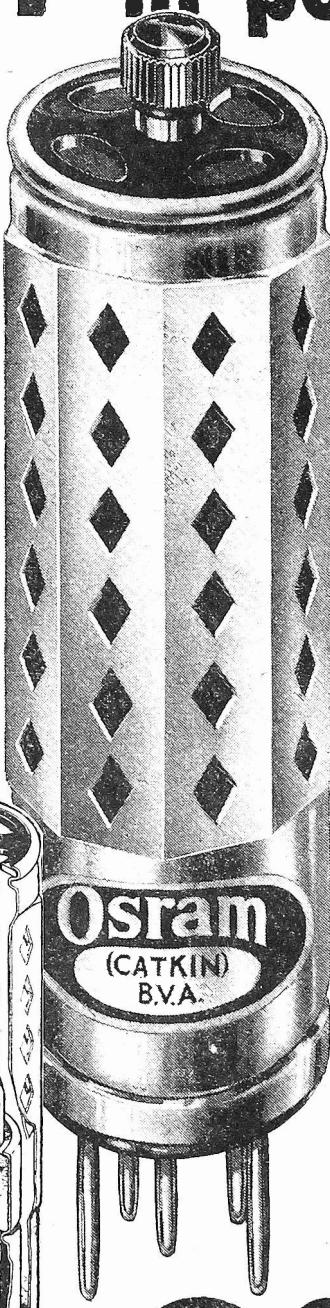
**A DWARF
IN ACTUAL
SIZE**



TYPES AND PRICES

MS4B High Efficiency Screen-Grid A.C.	
Mains Valve	17/6
VMS4 Improved Variable Mu Screen-Grid A.C. Mains Valve	17/6
MH4 High Magnification Detector A.C. Mains Valve	13/6
MPT4 Power Pentode A.C. Mains Valve	18/6

(OTHER TYPES TO FOLLOW)
Sold by all Wireless Dealers.



A small valve is an asset in to-day's space-saving wireless sets. The OSRAM "CATKIN" VALVE is a small valve with a stout heart. It is conceived and built to give a higher standard of performance. Highest uniformity is made possible by metal construction. A 'picked' valve becomes a thing of the past—every OSRAM "CATKIN" VALVE is made with absolute accuracy and uniformity of characteristics.

WRITE for the OSRAM VALVE GUIDE (1933 Edition) sent post free.

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FOR A.C. MAINS RECEIVERS.

METAL INSTEAD OF GLASS

THE MANCHESTER RADIO EXHIBITION

OUR STAND No. 11—

GROUND FLOOR

The Stand-to-Stand Report given here is arranged in alphabetical order of exhibitors' names to facilitate quick reference.

STAND No. 85, Gallery
AERIALITE LTD., Amber Street, Manchester

THIS firm specializes in aerial materials and accessories, and have on show an interesting display of the now well-known "Levenstrand" aerial wire, invisible aerial strip, percolative earth tubes, and complete sets of aerial-earth components.

The "Levenstrand" aerial wire is somewhat unique in that a £200 insurance against lightning is given with every length sold. It can be obtained in lengths 100ft., 75ft., and 50ft., at 3s. 6d., 2s. 6d., and 1s. 9d., respectively. The price of the complete aerial equipment, which includes every accessory required, from the aerial wire to the earth lead, is only 7s. 6d., and this equipment is attracting a considerable amount of interest.

STAND No. 34, Tonman Hall
AMPLION (1932) LTD., 82-4, Rosoman Street, London, E.C.1

ONE of the most interesting items on this stand is the new "Sonette" permanent magnet moving-coil speaker selling at the low figure of 27s. 6d. This is a really excellent line, and is truly one of the best low-priced speakers on the market at the present time. There is also a larger P.M. speaker on show, which is named the "Audiola." Selling at 40s. 6d., it is an excellent adjunct to a powerful receiver or for small public address amplifiers.

Although in the past Messrs. Amplion have devoted their attention almost entirely to the production of loud-speakers, the position is now somewhat different, for they are making a full range of Class B components which are worthy of the reputation which the name of Amplion has attained. There is a three-ratio driver transformer, which can be matched to any Class B valve, listed at 9s. 6d., as well as a tapped output choke retailing at the same price.

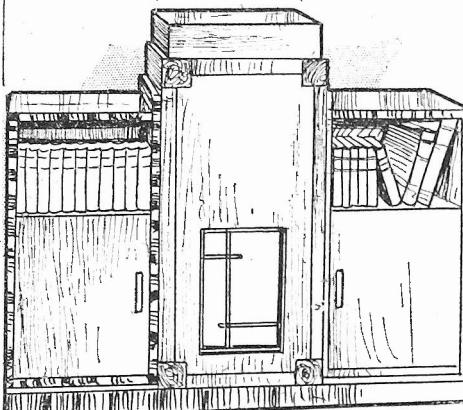
Yet another line of outstanding merit is the new screened H.F. choke, priced at 3s. 6d. This is an excellent component, having a low D.C. resistance, combined with extremely high inductance and low self-capacity.

STAND No. 11b, New Hall
AUTOMATIC COIL WINDER & ELECTRICAL EQUIPMENT CO., LTD., Winder House, Douglas Street, London, S.W.1

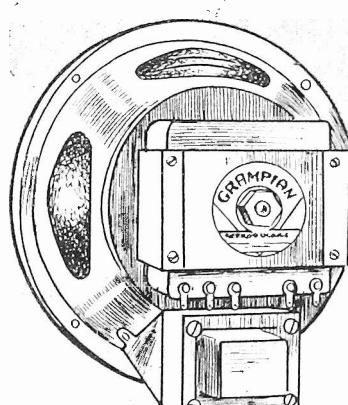
THE well-known and very popular "Avometer" is exhibited on this stand, in both A.C. and D.C. types, selling at 12 guineas and 8 guineas respectively. Additionally, there is the "Avodaptor," a useful unit for use in conjunction with the multi-range "Avometer" when taking measurements on valves. A combination of these two instruments nowadays forms the full testing equipment of nearly every radio engineer.

Another interesting exhibit is the "small brother" of the "Avometer," namely the "Avominor." This is a very accurate multi-range meter that can be used for measuring three different ranges of milliamperes, three voltage ranges and four resistance ranges. It sells at the very remarkable price of 40s., and is so compact that it can easily be carried in the pocket. Do not miss this stand if you are interested in high-grade measuring instruments.

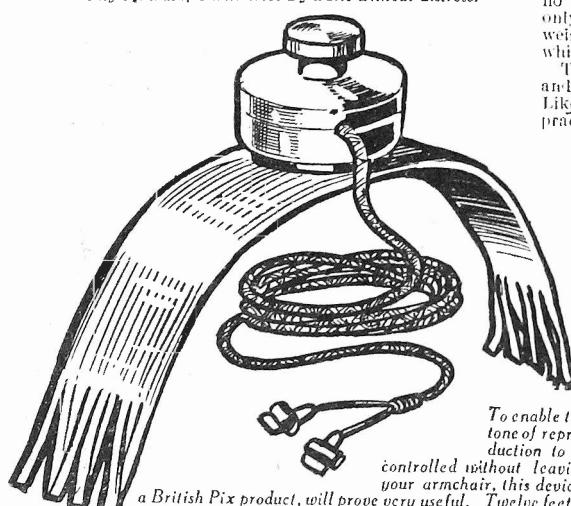
COMPLETE REPORT
BY OUR
TECHNICAL STAFF
With Copyright Illustrations
by Our Own Artists



A neat modern cabinet, showing how utility is being considered by makers of wireless cabinets.



A new midget speaker, one of the interesting Grampian range. Priced at 25s., this speaker is only 2½in. deep but handles 2½ watts without distress.



Messrs. Bellings-Lee have produced this mains-disturbance suppressor which is simply connected to the mains and removes troubles from electric cleaners, fans, etc.

STAND No. 73, Main Hall
BALCOMBE, A. J., LTD., 52-8, Tabernacle Street, London, E.C.2

A FULL range of "Alba" receivers is to be seen here, and the wide variety of superheterodynes of modern design, in both battery and mains form, calls for very favourable comment. The novel tuning control, which consists of twin tuning scales for long and medium-wave reception, mounted one on each side of the operating knob, gives a particularly good appearance to the receivers, and is worthy of every visitor's attention.

A self-contained four-valve Class B battery set has a wide appeal to battery users in view of many refinements which it incorporates. It is shown in both console and radiogram form, the cabinet work in both cases being particularly pleasing.

STAND No. 27, Main Hall
BELLING & LEE, LTD., Cambridge Arterial Road, Enfield

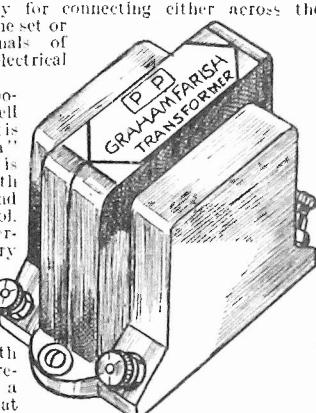
CONNECTING devices of every kind, for which Messrs. Bellings and Lee have been known so long, are shown in an attractive setting, and the visitor cannot fail to observe the excellent finish that even the smallest wander plug carries. An item of especial interest is the newly introduced interference suppressor. It consists of an arrangement of condensers mounted in a neat bakelite case all ready for connecting either across the mains leads to the set or to the terminals of interfering electrical machinery.

Another component which is well worth inspecting is the "Clip-On" pick-up, which is complete with track arm and volume control. This is for converting an ordinary spring-motor gramophone to an electrical instrument when used in conjunction with the broadcast receiver. It is a handy gadget that is proving very popular indeed, not only because it is novel and ingenious, but because it is so extremely efficient.

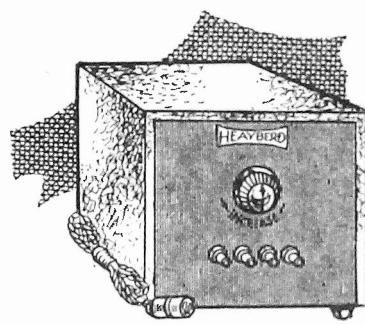
STAND No. 54, Main Hall
BLOCK BATTERIES, LTD., Abbey Road, Barking Essex

THIS firm has made a definite and successful attempt to overcome the problem of high-tension supply for the person whose house is without electric lighting. They have produced a new "Block" high-tension accumulator that is light, robust, compact, and electrically efficient. As an example, it might be stated that the 60-volt size (it has a capacity of no less than 5,000 m.a. hours by the way), measures only 14½in. long by 4½in. wide by 5½in. high, and weighs about 16 pounds. The price of this is 37s. 6d., whilst a 30-volt type costs only 21s.

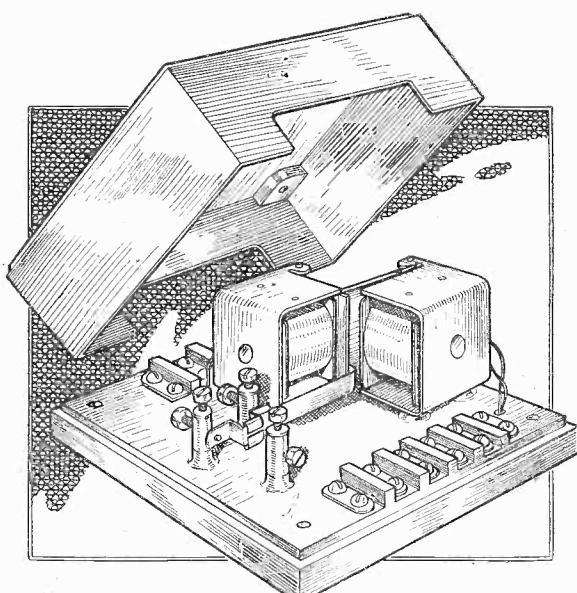
The "Block" L.T. accumulator is also on show, and is attracting a good deal of careful attention. Like the H.T. ones, it is plate-less, and therefore practically immune from the usual ills which beset



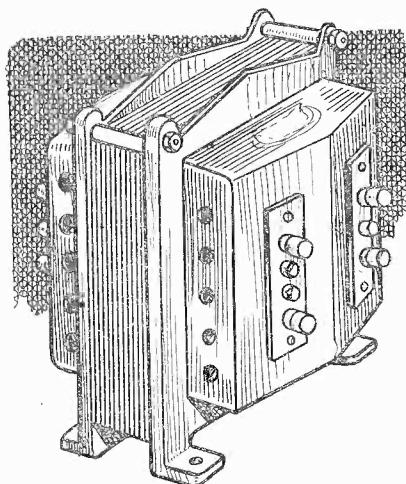
The Graham Farish "Pip" L.T. Transformer, obtainable in ratios 5-1 and 3-1 at 6s. Ed.



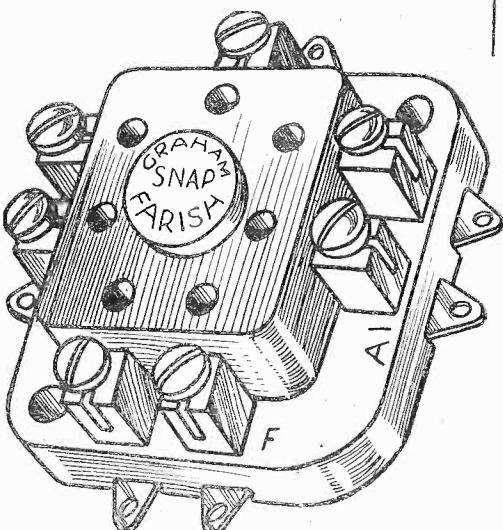
One of the Heayberd Mains Units especially developed for Class B receivers. There are two models, one for A.C. and the other for D.C. mains.



A Universal Distant-Control Relay, manufactured by Messrs. Bulgin. This costs 25s. and may be used with any type of receiver, D.C., A.C. or battery-operated.



This illustration gives a good idea of the sound construction of Heagberg mains transformers.



A new type of valveholder, manufactured by Graham Parish. The new idea in terminals enables a number of wires to be accommodated without the trouble of the wires becoming loose owing to the nut untwisting the loop. The wire ends are accommodated in the slots in the terminals.

THE MANCHESTER

accumulators of normal type. All patterns of "Block" batteries are housed in beautiful containers made of green bakelite and are fitted with neat leather carrying straps.

STAND No. 2, Main Hall BRITANNIA BATTERIES, LTD., 233, Shaftesbury Avenue, London, W.C.2

THIS firm is widely known as makers of the popular "Pertrix" high-tension batteries and accumulators so, as one would expect, these are very much in evidence on this stand. The high-tension batteries, which are unique in that they do not contain any sal-ammoniac, are to be seen in all types and sizes. One of the most interesting is that specially designed for Class B receivers. It has a high output rating, and is capable of delivering peak currents up to 35 millamps or so without any undue voltage drop.

Batteries and accumulators of various sizes and for every purpose are available for inspection.

STAND No. 50, Main Hall BRITISH BLUE SPOT CO., LTD., 94-6, Roseman Street, London, E.C.1

A MOST comprehensive range of loud-speakers in balanced armature, moving-coil, and inductor patterns is displayed here and, whatever his needs may be, the constructor can find an instrument to meet them. Any type of Blue Spot speaker can be obtained in a form suitable for use with a Class B amplifier, and several of the moving-coils are available in either permanent magnet or energized form.

Besides the range of speakers, the Blue Spot Pick-up is also shown, and is worthy of careful examination by the intending purchaser of one of these accessories.

STAND No. 86, Gallery BRITISH PIX CO., LTD., 118, Southwark Street, London, S.E.1

THE "Pix" aerial-selectivity device needs no introduction to our readers, but those who wish to see it will find that it is well displayed on this stand. There is also the famous "Pix" indoor aerial material, which consists of a strip of metallic conductor made up in an adhesive covering so that it may be fixed round the wall of a room, under the carpet, or in any odd place, with the minimum of trouble. The material can be obtained in a variety of colours to match the furnishings.

A complete range of "Pix" valves of both battery and mains types is also to be seen and is attracting attention in view of the low prices at which the valves are listed.

STAND No. 14, Tonman Hall BRITISH RADIOPHONE, LTD., Aldwych House, W.C.2

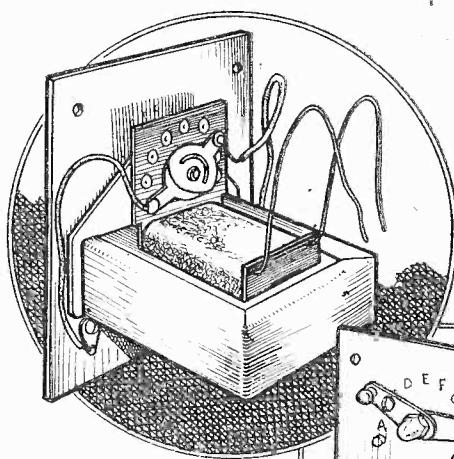
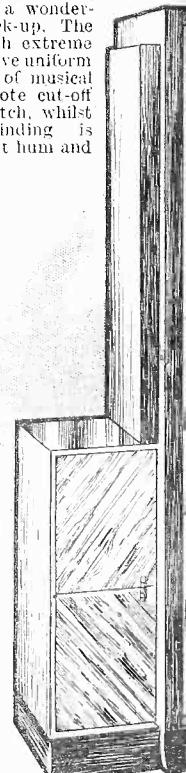
SOME new models of the really excellent "Radiopak" complete tuning units are shown. Types for either "straight" sets or superheterodynes can be seen and are very interesting to the home constructor,

due to the fact that the coils and gang condensers are matched with perfect accuracy before the units are despatched from the works. Other components (the full range is too great to enable us to mention them all) are a range of straight line condensers, midget shielded gang condensers, super-intermediate frequency transformers, short-wave condensers, and a wonderfully efficient gramophone pick-up. The latter has been designed with extreme care, to ensure that it shall give uniform response over the full range of musical frequencies. A sharp top-note cut-off ensures against needle scratch, whilst the medium-impedance winding is carefully arranged to prevent hum and excessive bass.

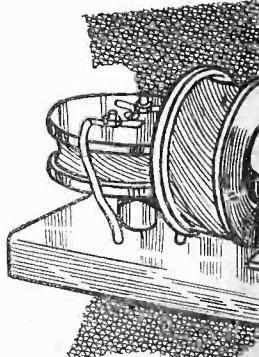
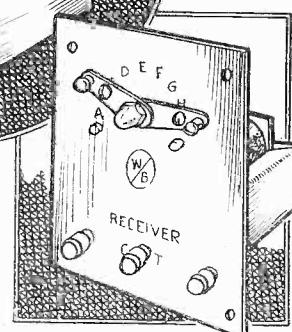
STAND No. 75, Main Hall BRITISH ROLA CO., LTD., Minerva Road, Park Royal, London, N.W.10

SPEAKERS of every type are to be seen here. From the new midget to the large auditorium types they are obviously well made, and are well-nigh perfect electrically. The miniature speaker, which is specially intended for use in small or motor-car sets, is of especial interest, whilst battery users will be pleased to see the new combined P.M. moving-coil speaker and Class B amplifier. Nearly every type

A fine example of radio cabinet design—a combined cocktail bar, electric clock and wireless receiver.



The transformer and selector switch which is fitted to the new W/B speakers. The two arms are adjusted to obtain any ratio in order to correctly match the output valve or valves.



RADIO EXHIBITION (continued)

Rola speaker can be obtained in either Class B, pentode, or triode form, and there is no doubt that your speaker requirement can be met by one from the Rola range.

A feature which is proving of especial interest is the variety of speakers which are being supplied in matched pairs for buyers who are seeking for perfect reproduction.

STAND No. 69, Main Hall BULGIN, A. F., & CO., LTD., Abbey Road, Barking, Essex

THE most extensive range of home-constructor components and gadgets, for which Messrs. Bulgin are so well known, is attractively displayed on this stand. In addition to last year's designs that are being continued there are several brand-new ones. Among these special mention should be made of an ingenious unit for fitting to the tuning control of almost any receiver. Known as the "Mechanical Colour-Change Wavelength" unit, this useful accessory automatically shows a different coloured light when the set is turned from, say, medium to long wave.

Other interesting components include a convenient range of tone control units; these are known as "Controlatones," and consist of a small bakelite moulding with adjusting knob arranged for one hole panel mounting. An illuminated signal device is yet another fascinating feature of this stand. The signal is intended for connection in the L.T. leads of the set, and lights up when the set is switched on. The device is of particularly attractive appearance and consists of a beautiful bronze figure which is illuminated by diffused light. Do not miss this stand if you are a home constructor.

STAND Nos. 94/7, Gallery BRITISH BROADCASTING CORPORATION, Portland Place, London

STAND No. 44b BEARDSALL, W. E., & CO., Victoria Bridge, Manchester

STAND No. 44 CARRINGTON MFG. CO., LTD., Camco Works, Sandstead Road, South Croydon

HERE we find a very excellent range of cabinet work suitable for every radio requirement. In addition to various console and radiogram cabinets, a feature is made of a newly-designed foot-rest, which is particularly well suited for use when listening in. All the exhibits are of modern design and make an excellent display.

STAND No. 1, Main Hall CELESTION, LTD., London Road, Kingston-on-Thames

CELESTIONS have been

C very popular manufacturers of loud-speakers for

Heterodyne Whistle Filter, which is made by Messrs. Wright and Weaire. This enables the annoying whistle which often accompanies a station to be cut right out and uninterrupted signals to be heard.

several years, and ours is not disappointed in the wonderful range of instruments now shown. There are speakers of both energized and P.M. moving-coil types, and all the latter are available fitted with a Class B transformer. The smallest Celestion speaker, the "Soundex," is worthy of inspection in view of the extremely good value which it represents.

The Celestion pick-up is also featured, and should be as popular as the speakers, in view of the extremely good response which it gives to the full range of musical frequencies.

STAND No. 114 CIFEL PRODUCTS, LTD., 134, Pentonville Road, London, N.1

THE chief features of interest here are a number of attractive receivers in both mains and battery-operated types. Perhaps the one which attracts most attention is the four-valver, fitted with two efficient variable-mu stages, but the smaller sets will also prove worthy of examination.

Of the components exhibited there are a number of L.F., Class B and Q.P.P. transformers, in addition to a full range of fixed condensers.

STAND No. 29, Main Hall CLARKE, H., & CO. (Mcr), LTD., Atlas Works, Patricroft

BESIDES the very complete range of high-tension units shown by Messrs. Clarke, there are some very interesting new receivers on view. The most popular of these is the A.4, a mains-operated four-valver giving an undistorted signal output of no less than 3 watts. Another receiver which is of equal interest to the battery user is the four-valve Class B instrument, which is fitted in a console cabinet and has a really good moving-coil speaker.

STAND No. 16, Main Hall CLIMAX RADIO ELECTRIC, LTD., 59, Parkhill Road, Hampstead

A WIDE range of particularly handsome and modern receivers comprise the Climax exhibit. The most interesting of these are perhaps a three-valve band-pass receiver, styled the "T.C.III" and a four-valve (plus rectifier) superheterodyne for mains operation. The former instrument is of the completely self-contained transportable type, and is offered at the modest figure of 12 gns., or at 14 gns. complete with an attractive pedestal.

STAND No. 18, Main Hall COLE, E. K., LTD., Ekco Works, Southend-on-Sea

MESSRS. COLE have been known to all wireless enthusiasts for several years as makers of mains units, and the new season's models are well up to the high standard of those which have been so popular in the past. In addition to these there is an entirely new range of receivers, built into futuristic bakelite cases, and which can be supplied with suitable chromium-plated pedestals of pleasing appearance.

An item of especial interest is a new car radio outfit, which is claimed to be more than usually efficient. It is certainly very neatly designed and can be fitted to almost any kind of car.

STAND No. 32, Main Hall COLVERIN, LTD., Mawneys Road, Romford

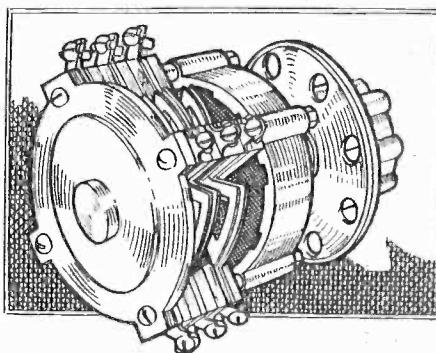
NOT only are Messrs. Colverin showing their extensive range of tuning coils of both "Ferrocart" and air-core types, but they have now a number of well-made complete tuning assemblies comprising the necessary "Ferrocart" coils, gauged tuning condenser and multiple switch. All these components are mounted together on a rigid aluminium chassis which can be adapted to numerous forms of set construction. Some models are provided with a four-way switch which serves for wave-changing, connecting a pick-up, and for switching the set on and off.

Altogether a most interesting display.

STAND No. 6, Main Hall COSSOR, A. C., LTD., Highbury Grove, London, N.5.

THIS stand is of particular interest in view of the giant-scale

The contents of the new Graham Farish Kit. In addition to an aerial, insulators, lead-in tube, Filt., and a tuning chart, this kit includes an insurance policy.



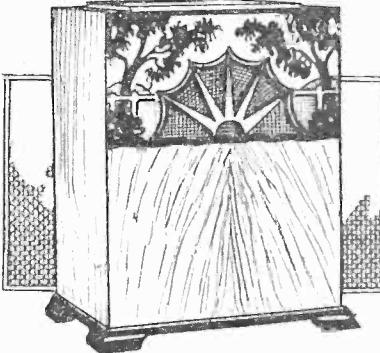
A Multiple Q.M.B. Rotary Switch manufactured by Messrs. Bulgin. This is obtainable in single, bi-polar or tri-polar types, at prices from 3s. 6d. upwards. Definite positions are given by an ingenious type of contact maker.

models of various types of Cossor valves which are shown. These models are cut away to show the internal electrode assembly and are an education in themselves.

There is also a really wonderful display of home-constructor kit sets, some of which are mounted on a rotating axle to enable the visitor to inspect them with ease. Besides the kit sets, however, there are also the complete Cossor sets which are indicative of the very wonderful value for money which Cossor are offering.

STAND No. 104, Gallery Bridge COSMOCORD, LTD., Cambridge Arterial Road, Enfield

A NEW and extremely good potentiometer volume control is shown here in both the plain type and also fitted with a ganged Q.M.B. switch. This is a



Something new in cabinet design. This is one of Messrs. Osborn's new season's products, and strikes a new note.

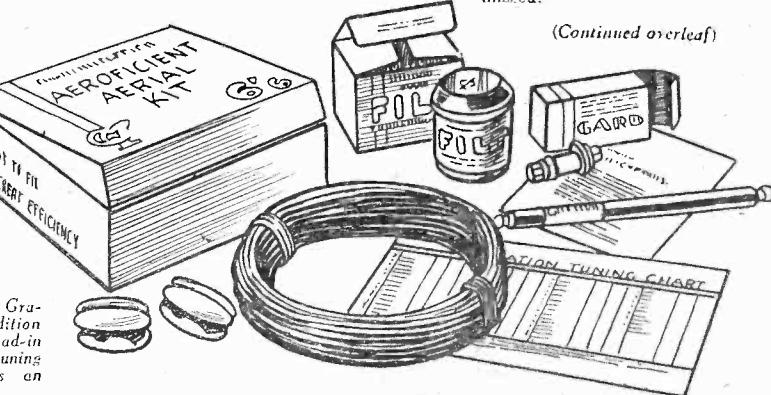
line which we have tested recently and which was found to have a perfectly smooth movement and to show a steady resistance variation over the complete scale.

The new "Universe" pick-up is also given a prominent position, and is of outstanding interest in that it gives the extremely high signal output of 4 volts. It is a well-designed unit and gives an almost perfectly even response to the full range of frequencies.

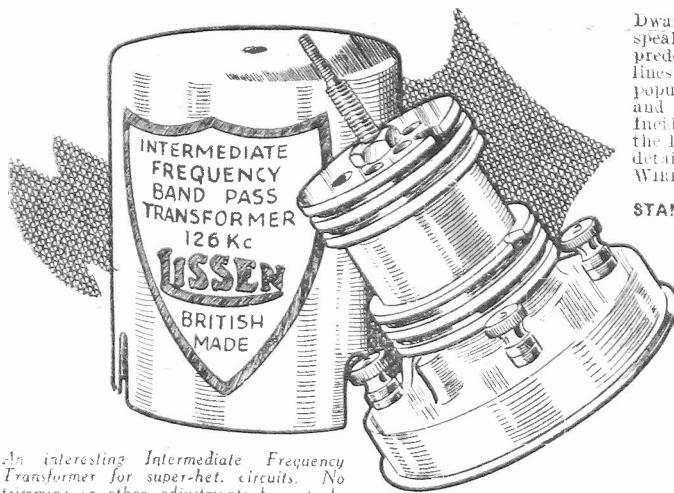
STAND No. 30, Main Hall CROMWELL (SOUTHAMPTON) Ltd., 32, Brinton's Terrace, Southampton

THIS firm has fairly recently devoted its attention almost solely to the production of high-grade receivers. These are shown in various types, one of which must surely be suitable for everyone's needs. The prices are attractive and the sets should not be missed.

(Continued overleaf)



October 7th, 1933



An interesting Intermediate Frequency Transformer for super-het. circuits. No trimming or other adjustments have to be carried out, and the coils are pre-set to the best position. It is a Lissen product.

(Continued from previous page)

STAND No. 79, Gallery
CITY ACCUMULATOR CO., LTD., 7, Angel Court,
Strand, W.C.2

THIS stand is notable for the wide variety of high-grade cabinets which are shown. There are types for any kind of receiver, be it of the table, console, or radio-gram variety. The appearance and finish is in all cases very commendable.

STAND No. 9b, New Hall
CLIFFORD PRESSLAND SALES, LTD., 80, Eden
Street, Kingston]

STAND No. 107, Gallery Bridge
DAWES, F., London Road, Manchester

STAND No. 84a, Gallery
DIGGLE, A., & CO., Jane Street, Rochdale, Lancs

STAND No. 36, Tonman Hall
DYSON, J., & CO., LTD., Godwin Street, Bradford

STAND No. 9a, New Hall
DENT, R. H., 309, Oxford Street, London, W.1

STAND No. 81, Gallery
ECONASIGN CO., LTD., 92, Victoria Street, London, S.W.1

STAND No. 12, Tonman Hall
EDGE, W., & SONS, LTD., Bolton, Lancs

HERE you can see a new range of "Drummer" receivers. These are of modern design, and all are housed in most attractive cabinets. A special feature is a really *de luxe* set built into a large cabinet which is fitted with twin gramophone turntables, accurately balanced multiple loud-speakers and two convenient cupboards. This is one of the most effective exhibits in the whole show and was the centre of many admiring crowds at Olympia.

STAND No. 28, Main Hall
EDISON SWAN ELECTRIC CO., LTD., 155, Charing
Cross Road, London, W.C.2

THE exhibits on this stand include all the articles sold under the trade names of "Ediswan" and "B.T.H." Both these names are synonymous with quality apparatus, so the visitor is sure to find the exhibits of interest. In addition to the popular R.K. moving-coil speakers, there is a full range of Mazda valves, the well-known B.T.H. pick-ups, and a cathode ray apparatus. The latter will be found very interesting.

STAND No. 109, Gallery Bridge
ELECTRO DYNAMIC CONSTRUCTION CO., LTD.,
Devonshire Grove, London, S.E.

HERE we find a range of excellent battery chargers which will appeal mainly to the service engineer. Additionally, however, there are shown several models of H.T. generators specially designed to use in conjunction with car radio sets. They can easily be fitted through a small hole in the floor boards and work entirely from the starter battery.

STAND No. 53, Main Hall
EVER READY CO. (GT. BRITAIN), LTD., Hercules
Place, Holloway, London, N.1

THIS firm is known throughout the world for its dry batteries and accumulators and a very comprehensive range is exhibited. They cover every battery requirement and include some special H.T. batteries designed for use with Class B receivers.

STAND No. 6, Tonman Hall
EXPRESS RADIO FACTORS, LTD., 25, Great Eastern
Street, London, E.C.2

STAND No. 83, Gallery
EPOCH RADIO MFG. CO., LTD., Exmouth Street,
London, E.C.

SPEAKERS for every requirement and at a price that all can afford," describes fairly well the exhibits on the Epoch stand. From the "Super-

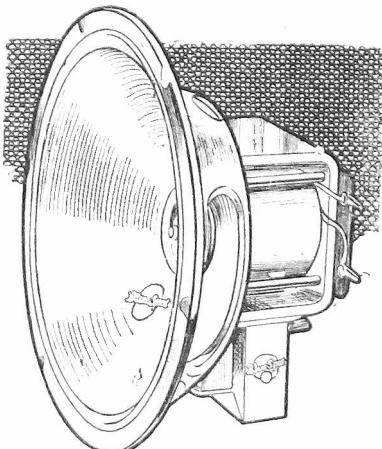
"Dwarf" to the large auditorium speaker high quality and good value predominate. One of the newest lines which is already proving very popular is a combination Class B unit and permanent magnet M.C. speaker. Incidentally, it might be added that the Epoch range was described in some detail in last week's issue of PRACTICAL WIRELESS.

STAND No. 20, Main Hall
FERRANTI, LTD., Hollinwood,
Lancs

MESSRS. FERRANTI need no introduction to our readers, and their stand is exemplary of the high-grade components and receivers for which the makers are so highly respected. In addition to the extensive range of transformers, resistances, condensers, etc., the loud-speakers and superheterodyne receivers are of outstanding interest. Electric clocks in various patterns are also shown, and these are made in case type and also in forms suitable for the inclusion in the cabinets of wireless sets.

STAND No. 19, Main Hall
GENERAL ELECTRIC CO., LTD., Victoria Bridge,
Manchester

ALL the various types of "Osram" valves can be seen here, as well as the new "G.E.C." super high-tension battery. The latest kit set, called the "Three-



A Blue Spot energised speaker which can be obtained in three different voltage ratings. The price in each case is 27s. 6d.

Thirty," which is a worthy successor to the "Music Magnet" series will also appeal to a large number of visitors.

Of the complete receivers, the latest five-valve superhet fitted with wavelength calibrated tuning scales, tone control, and other up-to-date features is, perhaps, the most interesting, but an eight-valve *de luxe* A.C. superhet is bound to attract those who are in search of a really high-grade instrument.

STAND No. 52, Main Hall
GRAMOPHONE CO., LTD., 98-108, Clerk-
enwell Road, London, E.C.1

THE excellent range of H.M.V. receivers do not need any introduction, but all should see the new season's models on this stand. One of the most interesting is the "Super Ten Autoradiogram." This is a real aristocrat, and though it costs 95 guineas, it is sure to be sought after by the discerning buyer. It is a superhet with delayed automatic volume control, automatic record changer, tone control, mains aerial device and innumerable other modern features. A number of other sets at almost every price

are also to be seen in conjunction with several moving-coil speakers and a really excellent pick-up.

STAND Nos. 23-6, Main Hall
GRAHAM FARISH, LTD., Masons Hill, Bromley, Kent

THIS stand might well be described as the Mecca of home constructors. A most comprehensive range of excellent components at prices quite out of comparison with the quality offered are exhibited. It would not be possible to refer to them all here but mention must be made of the latest tuning condenser—called the "Zelos." We have already specified this component on more than one occasion and know it to be a most excellent article. A recently new type of valve holder, fitted with a new type of split terminal, is also to be seen. Its designers are to be congratulated upon the production of so fine an article at so low a price as 10d. The terminals are designed to take up to six connecting wires with ease, and this alone is a feature which the constructor cannot help but appreciate.

Other new lines are the "Aeroficient" complete aerial-earth equipment selling at only 6s. 6d., and a range of small L.F. transformers which are being sold under the trade name of "Pip."

STAND No. 33, Main Hall
GRAMPIAN REPRODUCERS, LTD., Station Avenue,
Kew Gardens, Surrey

GRAMPIAN speakers are made in a wide variety of types, and the display on this stand is intended to show the intending purchaser which instrument is most suitable for his particular requirements. Very complete technical details in regard to every type are given, and there is in attendance a competent staff who are pleased to advise any visitor in regard to the choice of a suitable instrument.

STAND No. 103, Gallery Bridge
GOODMANS, LTD., 69, St. John's Street, Clerkenwell,
London, E.C.

ALTHOUGH there is shown here a very wide range of speakers, for which Messrs. Goodmans have become so well known, the midget speaker with shallow cone, and which is specially intended for use in car radio equipments, is probably the most interesting. The chassis is actually part of the magnet system and the form of construction adopted results in the production of a most rigid unit.

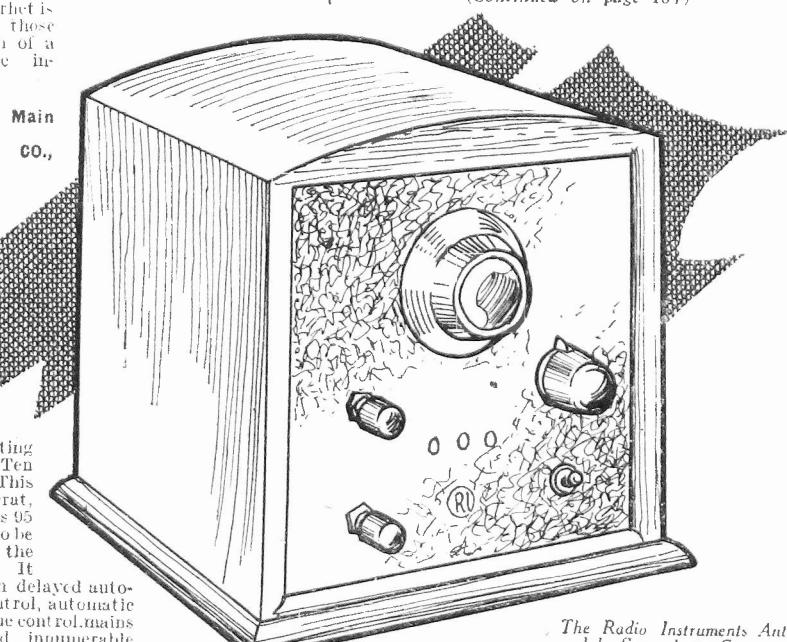
STAND No. 39, New Hall
HEAYBERD, F. C. & CO., LTD., 10, Finsbury Street,
London, E.C.2

MAINS transformers and kits of components for complete main-units are the centrepiece of attraction on this stand, but other interesting exhibits include a portable 5-watt public address amplifier. A portable battery charger from one to thirty 2-volt cells at 1.65 amps. is also shown, and is proving very popular with those dealers who wish to charge a small number of batteries for the convenience of their customers.

STAND No. 6a, Tonman Hall
HELLESENS, LTD., Hellesens Works, Morden Road,
London, S.W.

HIGH-TENSION batteries occupy a large portion of this stand, but there is also a complete range of electrolytic condensers in every conceivable type.

(Continued on page 164)



The Radio Instruments Anti-nodal Super-het. Converter. This possesses many interesting features and avoids all the normal short-wave troubles, such as dead-spots, etc.

PETO-SCOTT

Peto-Scott are pioneers in Radio and Television. Our service to the British public was introduced in 1919, and during fourteen years of Solid Service and Satisfaction we have established a reputation for fair dealing that defies competition. Customers in all parts of the globe come to us regularly for all their radio requirements.— Sets, Kits of all descriptions, Part Kits, Miscellaneous Components, Speakers,

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NEW LISSEN P.M. MOVING-COIL SPEAKER with input transformer. Cash or C.O.D. Carriage Paid, 21/5/0.

Balance in 4 monthly payments of 5/6.

NEW LISSEN WALNUT CABINET MOVING-COIL SPEAKER, with input transformer. Cash or C.O.D. Carriage Paid, 22/10/0.

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NEW BLUE SPOT PERMANENT MAGNET MOVING-COIL SPEAKER 29 P.M. With input transformer. Cash or C.O.D. Carriage Paid, 21/12/6.

Balance in 6 monthly payments of 5/-.

NEW BLUE SPOT 99 P.M. PERMANENT MAGNET MOVING-COIL SPEAKER. Complete with tapped input transformer. Cash or C.O.D. Carriage Paid, 22/19/6.

Balance in 10 monthly payments of 6/-.

NEW W.B. P.M. 4.A. MICROLODE PERMANENT MAGNET SPEAKER

complete with switch controlled multi-ratio Send input transformer. 5/9 Cash or C.O.D. Carriage only Paid, 22/2/0.

Balance in 7 monthly payments of 5/9.

EPOCH MODEL 20C, 20CB and 20CQ PERMANENT MAGNET MOVING-COIL SPEAKER for ordinary power, "Class B" and Q.P.P. respectively, complete with input transformers. Cash or C.O.D. Carriage Paid, 21/15/0.

Balance in 6 monthly payments of 5/6.

NEW FERRANTI MOVING-COIL SPEAKER (type M.5.T.) with input transformer suitable for Power, Pentode or "Class B" output. Cash or C.O.D. Carriage Paid, 21/17/6.

Or 7 monthly payments of 5/-.

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, 22/11/0.

Balance in 11 monthly payments of 6/6.

F.G.P.M. PERMANENT MAGNET MOVING-COIL SPEAKER, with input transformer. Cash or C.O.D. Carriage Paid, 22/9/6.

Balance in 8 monthly payments of 6/-.

NEW AMPLION SONNETTE PERMANENT MAGNET MOVING-COIL SPEAKER, with Universal Transformer. Cash or C.O.D. Carriage Paid, 21/17/6.

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NEW GARRARD MODEL 202A. 12-in. Turntable. Electric Motor for A.C. mains. Cash or C.O.D. Carriage Paid, 22/10/0.

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B.T.H. MINOR PICK-UP AND TONE ARM. Cash or C.O.D. Carriage Paid, 21/1/0.

Balance in 4 monthly payments of 4/6.

NEW MARCONIPHONE MODEL 19 PICK-UP. Cash or C.O.D. Carriage Paid, 21/12/6.

Balance in 6 monthly payments of 5/-.

Send 5/- only

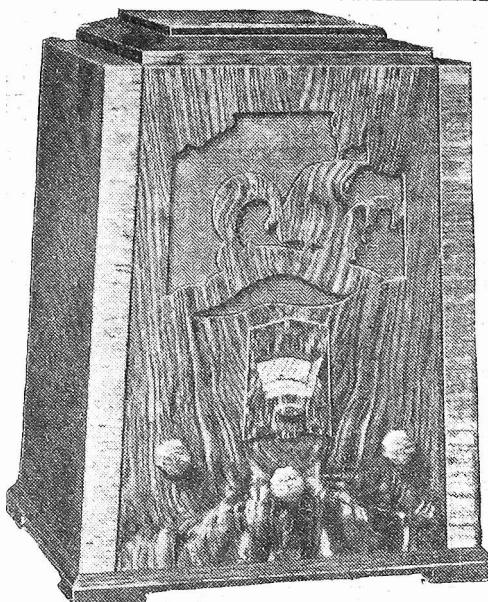
Send 6/6 only

Send 6/- only

Send 4/6 only

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Send



The new Varley Square Peak "4."

IN this receiver we have one of the most modern types of superheterodyne circuit. Four valves only are employed, the first being of the latest H.F. Pentode type and acting as a combined first detector and frequency changer. The second is a variable-mu H.F. Pentode, and is employed as the intermediate frequency amplifier, being coupled to the second detector, a Mullard 354V, through the normal type of I.F. transformer. The output valve is an Osram Pentode. Before further discussing the circuit arrangements we must mention the particular design of the cabinet and controls, in which this receiver shows more than the average thought and care in design.

The Cabinet

As may be seen from the illustration, the cabinet presents a somewhat unusual appearance and is a really substantial piece of work. At the top a large hole is cut in the wood, and a small baffle piece inserted below to assist in preventing the passage of dust, etc. Let into the hole is a solid metal handle for carrying purposes. This falls flush when the cabinet is standing down, but the fingers are easily inserted round the handle through the medium of the hole and it comes up sufficiently far to enable a really firm grip to be obtained and the cabinet transported with comfort. The back of the cabinet is fitted with a neat removable door, with holes cut to prevent resonance, and the usual gauze to prevent dust, etc. A pair of metal brackets are fitted at the lower end of this back in the form of a cleat, and the mains flex, which is of more than usual length, is wound round this cleat out of the way. This is the first good point which strikes one on looking over the receiver, as too often the flex provided with commercial receivers turns out too short to enable the receiver to be stood in a suitable position in the home and connection to be made to the nearest mains socket. In this case the unwanted flex may be left wound round the cleat, and this provides a neat job. An opening in the back reveals two toggle switches and seven well insulated sockets, all of different colours and clearly identified. One is for a mains aerial connection, with an appropriate plug; whilst the usual aerial and earth connections are made to two of the remaining sockets. Two sockets are for pick-up connections, and the

OUR VIEWS ON RECEIVERS

VARLEY SQUARE PEAK "FOUR"

remaining sockets are for the use of an external loud-speaker, for which purpose one of the toggle switches is provided to disconnect the speaker already fitted to the cabinet. The remaining toggle switch is for the normal purpose of switching the set on and off.

The Controls

On the front of the cabinet there are only apparently three controls in addition to the usual escutcheon. The lower central knob controls the station selection, the left-hand knob is the normal volume control (working on the I.F. valve), whilst the right-

RECEIVER: Varley Square Peak "4," Model AP.46.

MAKERS: VARLEY (OLIVER PELL CONTROL, LTD.).

CIRCUIT: Four-valve superheterodyne. H.F. Pentode as first detector and frequency changer; variable-mu H.F. pentode for Intermediate frequency amplification; power rectifier, and pentode output. Class B valve rectification, with mains field and electrolytic condensers for smoothing. Provision for pick-up and external loud-speaker. Reaction control provided.

RESULTS: Selectivity and sensitivity of a very high order, and perfect separation of the normal broadcasting stations obtainable at all parts of the dial.

PRICE: £15-15-0.

hand knob provides a reaction control for boosting the strength of weak stations. So far no mention has been made of the wave-change switch, and this is apparently, at first sight, absent. An ingenious arrangement is incorporated in the escutcheon by means of which the wave range is changed and at the same time the station identifications are also changed. The tuning dial is engraved with the normal degree scale, and above this is printed the names of the principal European medium-wave stations, whilst the names of the long-wave stations are printed below the scale. The opening in the escutcheon is of such a size that only the figures on the scale and one row of names are visible. Thus, when tuned for the medium-wave stations, the names appear above the scale which appears just above the lower edge of the window. When it is desired to listen on the long waves the whole of the escutcheon is pulled downwards, when the scale occupies the top of the window and the names of the

long-wave stations appear at the bottom. This is a very simple device and works most efficiently.

The Circuit

As already mentioned, four valves are employed for the purpose of providing a super-het circuit of modern design. The variable-mu intermediate I.F. valve works very efficiently with its associated volume control and enables the most powerful local to be reduced to inaudibility. The reaction control also works very well and has no effect on the tuning settings. All exposed leads in the wiring are metal sheathed and earthed, whilst the I.F. valve is also of the metallized type and earthed. There is thus no direct pick-up on the wiring, the majority of which is carried out inside the metal chassis. The mains side of the receiver is furnished by means of a Varley transformer and a Class B rectifier, whilst the field of the moving-coil loud-speaker is provided for smoothing purposes. Adequate smoothing is provided by two 8 mfd. electrolytic condensers, and a pilot light is wired to the heater leads to provide an indication that the receiver is alive, as well as to facilitate tuning by illuminating the dial.

Test Results

The receiver was tested in North-West London, first with the outside aerial and then with the mains aerial. On the normal outdoor aerial the local London stations provided adequate volume with the control at its minimum setting, and it was found quite possible to obtain adequate strength with the aerial removed altogether and left hanging near the set. Some indication of the actual efficiency of the circuit may be obtained when it is stated that Fécamp may be heard in the particular district mentioned, with the volume control turned to a position less than two-thirds on and with no reaction whatsoever. The only point to mention with regard to tuning is that the markings on the dial do not correspond with the actual stations, unless the short length of flex which the makers provide is used for an aerial. On the full outside aerial, for instance, the actual station settings are two or three degrees off the actual indication. Upwards of fifty stations are readily obtainable on this aerial, and very few of the good European stations required the volume control full on. Some of the very weak Italian stations were selected in order to test the reaction control, and one was found which was only just audible with the volume control at maximum. The reaction control was then advanced, with only the very slightest alteration in the tuning point and provided a comfortable signal. The tone of reproduction is very good indeed, and complete absence of cabinet resonance is one of the principal characteristics. Hum can only just be discerned when the receiver is set to a point just off oscillation, a condition which, of course, should not occur in normal use.

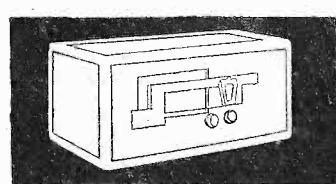
This Lissen 7 valve Superheterodyne is absolutely UNIQUE!



SEE the Constructional Chart giving most comprehensive, most detailed instructions and you will want to build the **MOST AMBITIOUS** Kit Set, ever made available for Home Constructors!

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 six-stage bandpass filter, giving exact 9-kilocycle channels and, therefore, providing a standard of selectivity never before achieved by a home constructor's kit 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 Loud-speaker—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. 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!



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A NEW FLAT SWITCH

This is the most compact switch we have yet produced, and as efficient as any made. It is the ideal switch for matched coil units or any other components requiring a combined change-over or make-and-break.

Nickel silver contacts engage on silver points, avoiding all risks of corrosion, and the sliding action ensures at all times a perfectly clean contact. There is virtually no inter-capacity between the points, thus avoiding the use of elaborate screening.

Any number of circuits can be controlled by this new switch, from a single make-and-break or change-over upwards.

Prices

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342/2	2 Pole Change Over	1'6
342/3	3 Pole Change Over	2'0

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CONVERT YOUR SET INTO AN ALL WAVE SET

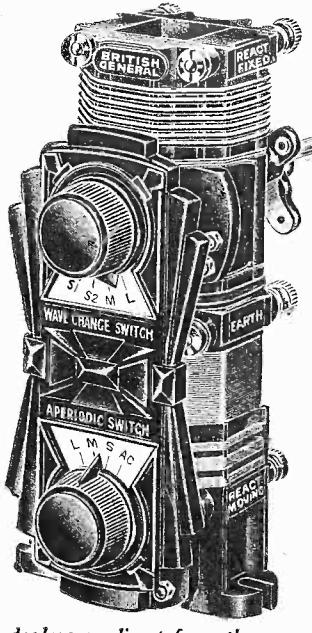
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All wave lengths from 14.5 to 2,000 metres covered by this British General All-Wave Tuner.



Free wiring diagrams showing how you can build or convert your set supplied Free. State circuit when ordering.

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CRAMMED WITH EXTRA CHEMICALS!

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Grosvenor Mercury Batteries are made in three grades for every Radio Need :-

Grosvenor Red Line 5/6 to 11/-
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Grosvenor Blue Line 7/- to 20/-

THE life of a battery is the life of its cells. That is where the Grosvenor MERCURY process works such wonders. It guards the cells against corrosion—makes them last so long that they are crammed by hydraulic pressure with extra chemicals to use them up

Next time you buy a battery, remember the amazingly long life, the extra reserves of power that are packed into Grosvenor. Insist on Grosvenor—and get the most for your money !



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THE BEGINNER'S SUPPLEMENT

HOW YOUR RECEIVER WORKS.—V

In the Concluding Article of this Series, FRANK PRESTON, F.R.A., Explains the Function of the L.F. Amplifying Valve and of the Loud-speaker.

(Continued from page 96, Sept. 30 issue)

Transformer Coupling

HERE is another method of feeding the audio-frequency voltages to the L.F. valve, which is by means of a low-frequency transformer. This latter component, as you well know, consists of two coils of wire placed on an iron core. One coil, called the primary winding, takes the place of the L.F. choke shown in Fig. 21, whilst the other, or secondary, is connected between the grid of the amplifying valve and a tapping on the G.B. battery (see Fig. 22). Audio-frequency currents flowing through the primary set up a magnetic field which varies in sympathy with the signal impulses. This field is "concentrated" in the iron core, which offers considerably less resistance to magnetic lines of force than does air. And since the secondary winding is also on the iron core the lines of force pass through it and cause currents similar to those in the primary to flow in it. The currents produce a voltage between the ends of the secondary and this is passed on to the L.F. valve.

Transformer Step-Up

The transformer does much more than merely pass on the signal voltages from one valve to another, though, for it is actually made to increase (or amplify) them. By using a greater number of turns on the secondary than on the primary the voltages are increased in proportion to the ratio of the numbers of turns. For example, if the secondary had

twice as many turns as the primary the voltages would be doubled; if three times as many they would be trebled, and so on. Although the latter statement is perfectly true in theory it does not quite

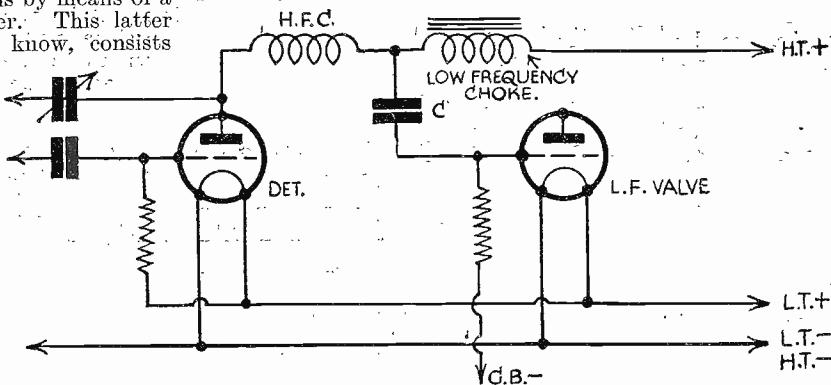


Fig. 21.—Choke-capacity L.F. coupling.

hold in practice since there are certain losses in the windings and in the iron core. Nevertheless, the transformer does give an appreciable "step-up" effect, which is of decided advantage.

It might appear to the reader that the amount of amplification afforded by a transformer could be increased to any desired extent by increasing the ratio of secondary to primary turns, but there are definite practical limits; too few primary turns give too low an impedance for satisfactory operation of the detector valve,

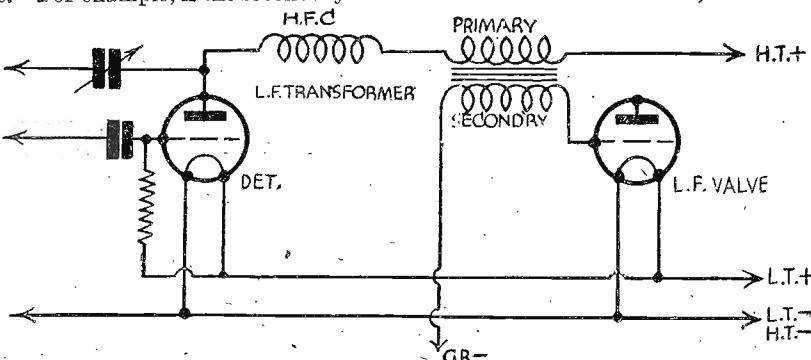


Fig. 22.—Method of feeding the L.F. valve through a transformer.

whilst too many turns on the secondary will produce a loss of top notes due to the increase in capacity of the winding. Generally speaking the secondary contains from two to five times as many turns as the primary winding.

Last week we saw how signals are rectified by the detector valve and how the high-frequency component—or carrier wave—is disposed of. We also considered different methods of feeding the audio-frequency impulses to the L.F. valve so that they may be amplified before being made to operate the loud-speaker. Our present problem, then, concerns the mode of functioning of the low-frequency amplifying valve.

The general principle follows closely on that surrounding the working of an H.F. amplifier, since the object is to apply fluctuating voltages to the grid so that they might produce a corresponding anode current fluctuation. This sounds all very simple, but there are a number of factors to consider, because

we require, not merely amplification of the signal, but distortionless amplification. To obtain a thorough understanding as to how the latter may be secured we must perforce make a brief study of the valve's "characteristic curve," which takes the form of that shown in Fig. 23. The curve is not difficult to understand for, after all, it is merely a line which shows how the anode current of the valve varies in sympathy

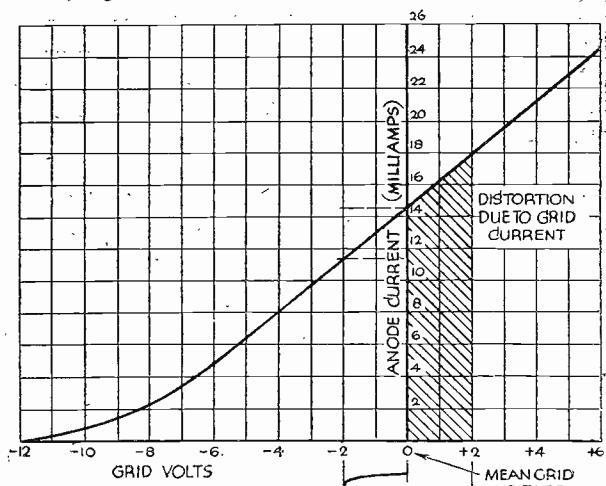
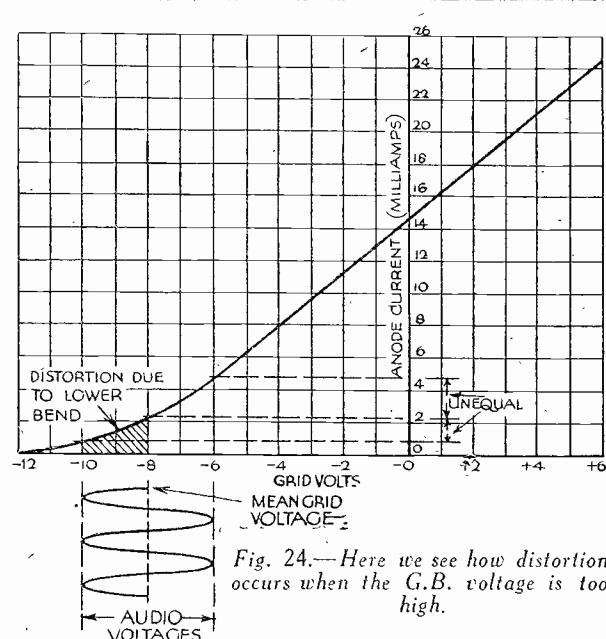


Fig. 23.—This figure shows how distortion occurs when the grid bias voltage is too low.

with the voltages applied to the grid, assuming the anode voltage to be constant (as it is in practice). We can see, for instance, that when the grid potential is zero the anode current is 15 milliamps, whilst when a negative potential of about 9 volts is applied to the grid the anode current falls to only 2 milliamps.

Grid Current Distortion

For a moment let us imagine that the



grid voltages were made to be zero, by connecting the end of our transformer secondary or grid leak (according to the method of intervalve coupling employed) to L.T. negative instead of to a grid bias battery. And now let us represent our signal voltages as shown by the line drawn below the curve—it is assumed that the latter voltages attain a maximum of 2 volts on each side of their mean value. The effect of the signal voltages is to vary the grid potential between 2 volts negative and 2 volts positive. In practice the result of this would be hopeless and terrible distortion, because as the grid becomes positive some of the current which should pass from the filament to the anode will flow to the grid instead. Without going fully into the subject, it can be stated that when grid current flows, distortion results, due to a voltage drop being set up across the grid circuit coupling component. Besides this, however, it can be seen that the anode current would reach a very high figure and in consequence a big strain would be put on the high-tension battery and on the valve, with a result that both would be damaged.

Distortion due to the "Bottom Bend"

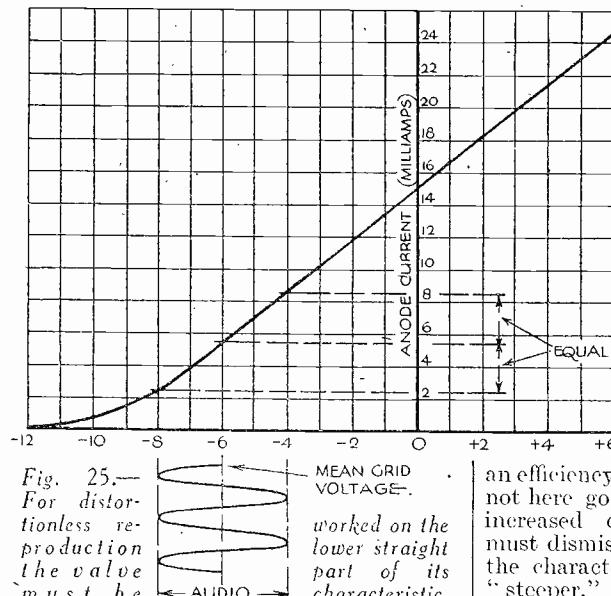
Suppose now we go to the opposite extreme and apply a negative bias voltage of 8 volts. The signal voltage will be added to this, as shown in Fig. 24, so that the grid voltage will vary between minus 10 and minus 6 volts. Here again we should get distortion, due to the "lower bend" in the characteristic curve. To be more explicit, the change from minus 8 to minus 6 volts would produce a variation in anode current of rather more than 2 milliamps, whereas the change from minus 8 to minus 10 would only vary the anode current by about $1\frac{1}{2}$ millamps. Obviously, the amplification of positive and negative

halves of the signal voltages would not be uniform and therefore we should get distortion.

Correct Grid Bias

I think it will now be clear that the L.F. valve should be negatively biased to a point somewhere between the two extremes which we have considered. The exact point must be chosen so that the signal voltage can never be so great as to make the grid positive, or to make it so negative that the valve will operate on the "bend" of its characteristic curve. This ideal (which is easy of attainment, by the way) is represented in Fig. 25, where the grid bias voltage is minus 6. Under such conditions of operation we can obtain

distortionless amplification for a moderate expenditure of high-tension current. We can now understand the common expression that "an L.F. valve should always be operated on the straight portion of its characteristic curve," and we are able



to appreciate the value of grid bias.

Large and Small Power Valves

In the above explanation a fairly typical small power valve has been assumed, but the very same thing applies in the case of any low-frequency amplifier—the valve must always be biased so

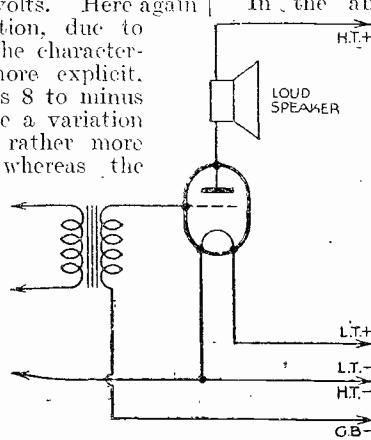
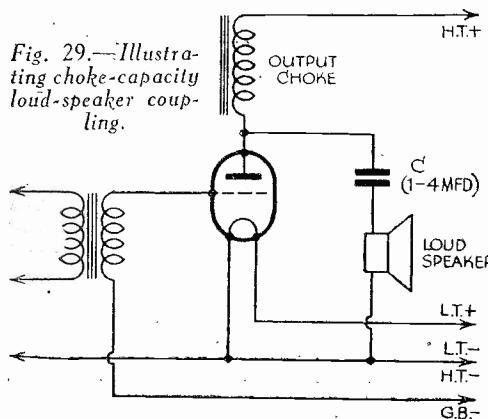


Fig. 26.—The simplest (but not the best) way of connecting a loud-speaker.

Fig. 29.—Illustrating choke-capacity loud-speaker coupling.



that it will operate entirely on the straight part of its characteristic. It is for this reason that the valve must be chosen according to the amplitude of the signal voltages which are to be applied to its grid, and it will be clear why we have "large" and "small" power valves. As a further explanation of this point, it might be added that if, for instance, the signal voltages applied to the valve taken as an example were of 8, instead of 4, volts, the valve would be "overloaded," since the negative half cycles would drive it on to the bend in its curve; for such comparatively large variations in grid voltage it would be necessary to employ a valve having a characteristic with a longer straight portion, or in more usual parlance, to use a "larger" power valve.

Efficiency

Unfortunately, the "efficiency" of an average three electrode power valve is only about 14 per cent., so that of the total power taken from the high-tension battery, something like 86 per cent. is wasted. There is no way of avoiding this waste, except by employing a pentode, an average sample of which has an efficiency of over 30 per cent. We cannot here go fully into the reasons for the increased efficiency of pentodes, but must dismiss the question by saying that the characteristic curve of a pentode is "steeper," so that any given change in grid voltage produces a larger change in anode current than it does with a triode.

Turning Anode Current Variations into Sound

We have now reached the last link in our chain, and are ready to consider how the variations in anode current caused by fluctuations of grid voltage, can be turned into sound. We know that (Continued on page 174)

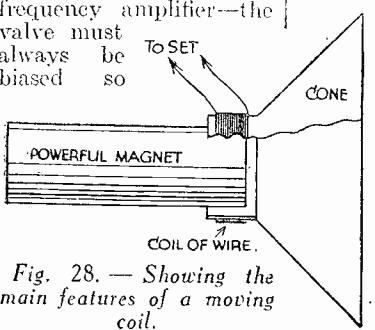


Fig. 28.—Showing the main features of a moving-coil.

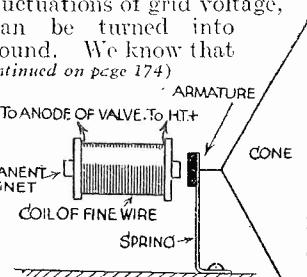
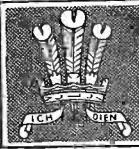


Fig. 27.—This sketch illustrates the general principles of a moving-iron speaker.

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PRACTICAL POINTS ON DECOUPLING

The Correct Values of Resistances and Capacities to be Used

By ERIC JOHNSON

BROADLY speaking, the whole art of decoupling consists of nullifying the effect of a resistance or impedance common to two circuits. This effect is very pronounced when a source of H.T. supply having a very high internal resistance is employed. Being common to all valves, undesirable voltages are set up across the impedance, and thus transferred from stage to stage, giving rise to motor-boating and other forms of L.F. oscillation. Fortunately, the cure is a simple one; upon

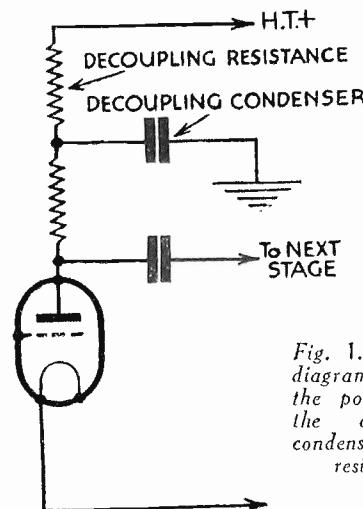


Fig. 1.—This diagram shows the positions of the decoupling condenser and resistance.

reference to Fig. 1, it will be seen that a high resistance is deliberately inserted in the anode circuit, and a bypass condenser connected from the side remote from the H.T. to earth. The resistance forms a very effective barrier to the varying voltages. On the other hand the condenser offers an easy path to earth. It will be perfectly obvious that efficient decoupling may only be assured if the reactance of the condenser is low as compared with the resistance. Let us enlarge on this somewhat.

Resistance and Capacity Ratios

We will assume that it is necessary to have a decoupling ratio of 20-1. In other words the condenser must not offer a greater reactance than twenty times the value of the resistance. Consider, for example, a case where the decoupling resistance has a value of 20,000 ohms. Our by-pass condenser must therefore offer an equivalent resistance not greater than 1,000 ohms. As, however, the reactance of a condenser rises with a decrease in frequency, we must be sure that our 20-1 ratio holds good at the lowest frequency for which our receiver is designed. It is customary to accept 50 cycles as such. The nearest standard size condenser which fulfils these requirements in this particular example is 2 mfd. (the reactance of a condenser is given by $R = \frac{10^6}{2\pi f C}$ where "C" is capacity in mfd. and "F" is frequency in cycles per second). For a given value of resistance the condenser may be as large as one likes, and, in fact,

the larger the more complete is the decoupling. It is equally true that for any given condenser, decoupling will be more effective for an increase in value of resistance over that necessary to achieve the correct ratio. Generally speaking, however, it will be found more economical to keep the resistance fairly low and use a large condenser, because we cannot afford the consequent large voltage drop which must result from using a high resistance. This is especially important in battery sets where every volt of H.T. has to be conserved. On the other hand mains users will often find that their decoupling resistance acts in a dual rôle, and will replace the usual voltage dropping resistance in the eliminator, for almost invariably the H.T. output is in excess of the requirements for stages prior to the final one. In battery sets it may be found profitable to install some system of decoupling which does not absorb valuable volts.

Bearing in mind the conditions necessary for decoupling, we find that as long as we have an impedance in the anode circuit in conjunction with a by-pass condenser little trouble will be experienced. In cases where the usual voltage drop must be guarded against, therefore, it should be remembered that the resistance may be

essentials of grid-circuit decoupling. Fig. 2 shows a conventional output stage with automatic bias, the latter being obtained by resistance "R" in the cathode lead, a condenser being fitted to bypass the L.F. component. Now the value of this condenser is commonly quite small—home-contractors rarely use anything larger than 2 mfd. The important point to remember, therefore, is that the L.F. voltage drop across this capacity is quite high at low frequencies, i.e., where its reactance is high. Unfortunately, this voltage is fed back to the grid out of phase with the normal applied voltage. The net result is to very effectively damp out the low frequencies, and thus reduce our bass response. There are two remedies we may apply. The first one which naturally suggests itself is to replace our bypass condenser with a larger one which would have a low reactance to the bass frequencies. To meet this requirement, we find that anything under 50 mfd. would cause a distinct attenuation to the lower notes. A year or so back this would present an impossible solution, but now that we have electrolytic condensers with capacities of this order in a container as small as the more commonly used sizes, the problem no longer exists.

The second and most effective remedy for the trouble is to thoroughly decouple the grid circuit. The method is identical with anode circuit decoupling; a high resistance is inserted in the grid lead, and a 1 mfd. condenser joined from one end to the cathode. As the resistance carries no appreciable current it may be made quite large, 100,000 ohms being customary. As a consequence there is no point in using a condenser larger than that specified, as these values give very complete decoupling. A wire-wound resistance would be a luxury in this position, but care must be taken to see that one of the reliable metallised type is used, as should the resistance open circuit, the output valve may be seriously damaged by the consequent removal of bias. For this reason the ordinary non-descript grid-leak variety is not recommended.

Reserve Your Pocket Tool Kit
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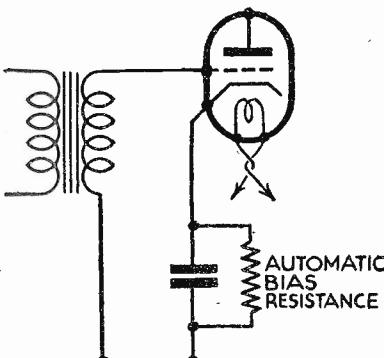


Fig. 2.—The circuit of an indirectly-heated power valve with automatic grid bias.

replaced by an L.F. choke whose reactance to the lowest musical frequency shall be equal to this resistance. Now the reactance of a choke is given by $R = 2\pi f L$, "f" being the frequency in cycles per second and "L" the inductance in henrys. Substituting the values given in the previous example, we find that the nearest standard choke is a 60 H. one. As before, the larger this is, the more complete the decoupling, and as the d.c. resistance will in no case be more than 1,000 ohms the voltage drop is negligible. Care must, of course, be taken to see that the choke maintains its rated inductance at the largest anode current likely to be experienced. Although this method of decoupling is likely to find more favour among battery users, it may be found a distinct advantage in mains receivers, for the extra choke will add its quota of smoothing where it is most needed.

Grid-circuit Decoupling

Before concluding, let us discuss the

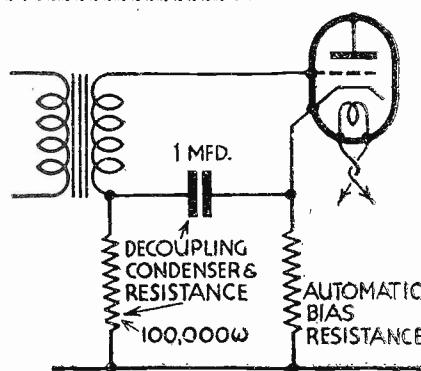
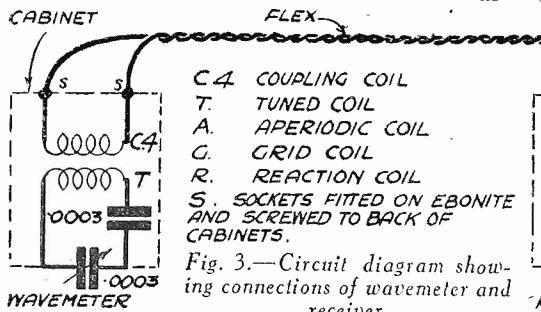


Fig. 3.—Complete decoupling has been added in this modification of the Fig. 2 arrangement

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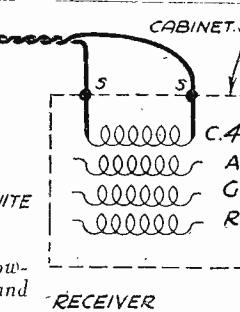


Making an Improved Absorption Wavemeter (Continued from page 137)

Using the Meter

The operation of the meter is exactly the same as the usual type of absorption wavemeter, tuning being carried out until the familiar "cluck" is heard in the headphones, as the wavemeter is tuned to resonance with the receiver. Calibrations also are obtained and plotted on a graph in the usual way, and further comment is therefore unnecessary upon this subject.

The complete instrument is well within the constructional abilities of the average



The tuning coils used by the writer cover the following wavebands when tuned by a .00007 mfd. variable condenser:

SW1—35 to 60 m.
SW2—23 to 40 m.
SW3—13 to 25 m.

The wavemeter coils are wound to cover the same spreadover. The tunable range is, of course, slightly above and below, so far as the wavemeter coils are individually concerned, but only those bands as specified above are covered for wavelength measurement. Do not confuse tuning range with tunable range. Variation of coil and tuning

experimenter, and if care is exercised during the calibration period, very accurate results will be obtained. Whenever possible, transmissions which are crystal-controlled should be used as a means whereby accurate reading may be obtained.

condenser values will call for slight modification to suit individual requirements. Coupling coils, however, remain unaltered.

It should be noted that when the receiver incorporates one or more H.F. screen-grid

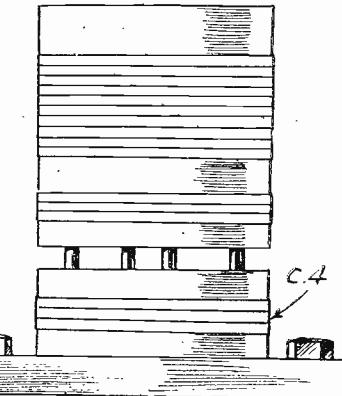


Fig. 4.—Mounting the coupling coil on the same base as the tuning coil.

stages, the coupling is exactly as when aerial series capacity condenser is used—i.e., to the grid coil.

ROUND THE WORLD OF WIRELESS (Continued from page 124)

The New Russian Wavelengths

WITH the bringing into operation of the Lucerne Plan, Moscow's 500-kilowatt station will work on 1,714 metres (175 kc/s) and her second high-power transmitter on 1,107 metres (271 kc/s). Leningrad, Minsk and Kharkoy will continue to use the long channels, but will adopt respectively 1,224 metres (245 kc/s), 1,442 metres (208 kc/s) and 1,345 metres (223 kc/s), the latter being a wavelength which must be shared with Huizen (Holland).

According to a Norwegian report the U.S.S.R. intends to build a number of stations in Siberia and in Asiatic Russia, one of which may be actually planned to radiate some twelve hundred kilowatts, and therefore surpass any other transmitter in the world.

Listen to Copenhagen

WITH the opening of the new 60-kilowatt transmitter at Kalundborg, the Copenhagen wireless programmes can now be well heard even in the early hours of the afternoon by listeners in most districts

of Great Britain. Note the call: *Kalundborg-Kjøbenhavn og Danmarks kortbolgesender* (short-wave station). Before the news bulletin is broadcast you will hear the announcer say: *God aften, her er Pressens radioavis* (Good afternoon, here is the press (news) transmission). The interval signal consists of a musical box melody resembling a small carillon; it plays the theme of an old Danish folk-song of the twelfth century. In the evening, details of the programmes are frequently given out in English and German as well as in the Danish language.

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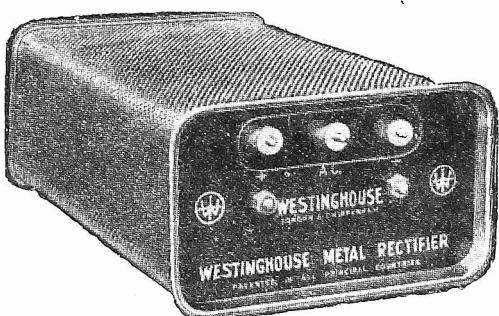


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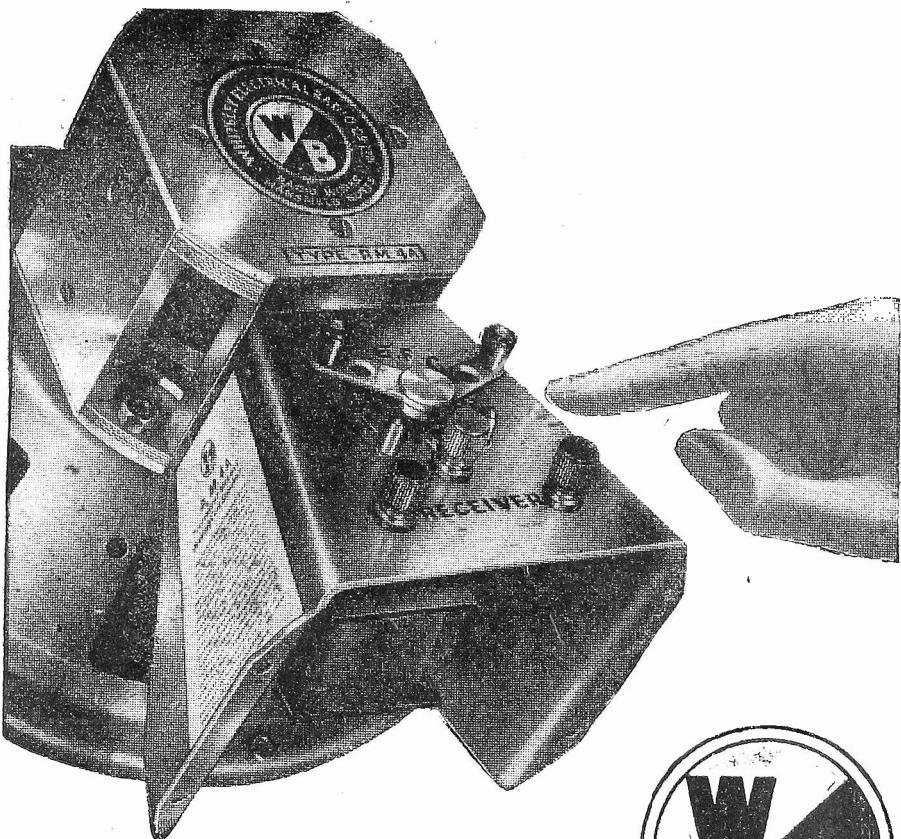
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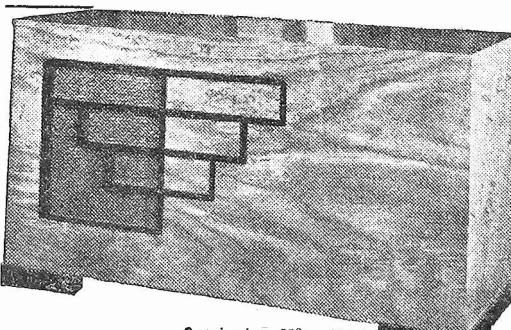
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RADIO RAMBLINGS

By JACE

Jottings from my Notebook

Background Sounds for Operatic Records

RADIO listeners who have heard the recent B.B.C. transmission of complete operas from gramophone records may have been puzzled by hearing the usual noises of an opera house, including the sounds of the orchestra tuning up, applause, coughing of the audience, etc. It is now revealed that these sounds are reproduced from special "His Master's Voice" records, which are stored in the great record library at Broadcasting House.

Festival of Radio Drama

ONE of the first plays to be broadcast by the B.B.C. in the early days at Savoy Hill will be revived when the Festival of Radio Drama opens in October. This is Richard Hughes' thriller, *Danger*, which he wrote specially for broadcasting. Another play in the series will be *The White Chateau*, by Reginald Berkeley, which also achieved fame several years ago. The author wrote the play for the microphone, and later it was adapted for the films and the stage.

British Batteries for Tibet

UNTIL 1904 no foreigner had ever set foot in Lhasa, the "Forbidden City" and capital of Tibet, and the news that The Chloride Electrical Storage Co., Ltd., has received an order for an Exide battery of 220 cells, for the Palace of the Dalai Lama, Ruler of Tibet, is a tribute to the prestige of British goods. Getting the battery there will be no easy task, since the only means of transport is by mule, yak, or coolie, and the 300-mile journey under these primitive conditions will involve special precautions in the packing of the glass boxes; moreover, the passes into Tibet are usually closed by snow from about the end of November, so that the shipments must reach Calcutta not later than the first week in November.

Record G.F. Orders

BUSY factories are the usual aftermath of Olympia, but Graham Farish tells me that the orders the firm has received since the Show (set designers have apparently fired every constructor with their own enthusiasm over the new additions to the G.F. range) makes the 50 per cent. factory extension at Bromley look like being quite inadequate.

More new lines at the Manchester Show... a heavy advertising campaign... Graham Farish, Limited, seem to be gathering speed for a record year. They are publishing a new catalogue this month, I hear, and I suggest that you drop them a postcard for this and the G.F. Station Tuning Chart, before you forget it—they're both worth having.

The New Hellesen Hi-Life High-Tension Batteries

VERY interesting tests have recently been made by a famous radio set manufacturer of the new Hellesen Hi-Life high-tension batteries. We understand that they were shown to give no less than 50.2 per cent. longer life than other batteries on the same test. This is the more startling as this new Hellesen Hi-Life range sells at popular prices. All Hellesen batteries are now made entirely in England with British labour, and the big factory at South Wimbledon is working at full pressure. These Hi-Life batteries are packed in attractive cartons in a new design of orange and black.

Selling at rather higher prices, the new Super Range maintains the long-standing reputation enjoyed by this firm for durable heavy-duty batteries. These Hellesen super batteries make use of a new patent which gives them a greatly increased capacity without adding to their weight or overall size.

"Ace" Radio Kits

ACE Radio Kits is the new trade name of Marcus Overton Radio, Ltd. The principals of this new company have had considerable experience of the needs of the home constructor, and are, in fact, already well known to many readers of PRACTICAL WIRELESS.

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The "Superset" — Correction

A SLIGHT draughtsman's error occurred in the wiring plan for the "Superset" on page 696 of the issue dated August 19th. The lead from terminal "I.S." on the L.F. transformer was inadvertently marked "H.T.+I" instead of "G.B.—3." It is obvious from the circuit diagram, of course, that this lead is for biasing purposes, but the error has apparently caused a little confusion in the minds of a few readers. The plug attached to the lead in question should be taken to a tapping socket on the grid bias battery giving either 6 or 7.5 volts negative; the better of these two is most easily found by trial. It need scarcely be pointed out that the set should be switched off prior to making any adjustment to the grid bias voltage.

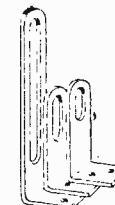
We hope that this correction will clear away any difficulty which might have arisen.

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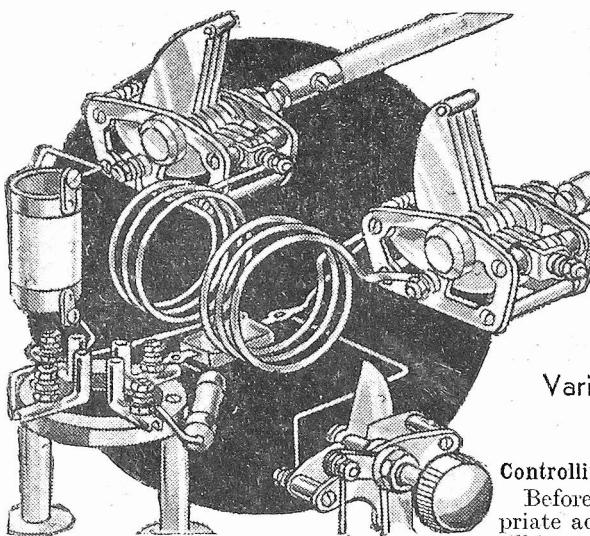
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Short Wave Section

ADJUSTING THE SHORT-WAVE DETECTOR

Various Points to be Borne in Mind in Order to Obtain Maximum Results

By K. E. BRIAN JAY

Controlling Reaction

THE adjustment of a detector valve to obtain optimum performance is important in any receiver, but doubly so when there is no preceding H.F. amplification and the sensitivity depends wholly on the detector, which is usually the case in a short-wave set. This adjustment is complicated by the fact that when a valve is used as a grid leak detector it has to perform three functions, viz., those of rectifier pure and simple, amplifier, and oscillator, and, unfortunately, the best conditions for one function are not usually best for the others. Rectification actually takes place between the grid and filament only, i.e., in a two-electrode arrangement, the rectified voltages being then amplified by the whole valve acting as a triode; part of the current flowing in the anode circuit is then fed back into the grid circuit in order to provide reaction, and as the reaction control is advanced the valve becomes more and more sensitive until it finally acts as an oscillator. The detector is not required actually to oscillate when receiving telephony transmissions, but it must be possible to approach right up to the fringe of oscillation in order to have the maximum sensitivity available. This is generally described by saying that the reaction control must be as smooth as possible so that oscillation begins gently and without any noise or thud, and on reducing reaction the set stops oscillating at the same setting at which it began, i.e., there must be no backlash.

Before saying anything about the appropriate adjustments to obtain this desirable silkiness of control, let us first discuss the possible methods of controlling reaction. Figure 1 shows the most popular circuit, a modification of Reinartz's arrangement, in which a small variable condenser of about .0002 mfd. is used in series with the reaction coil to control the impedance of

mon to all reaction circuits—their tendency to affect the tuning of the grid circuit so that altering reaction detunes the station being received and thus complicates the tuning process. The use of a variable resistance in series with the H.T. positive lead to control reaction is an alternative method that suffers far less from this defect, while at the same time being capable of very smooth action. A circuit is given in Figure 3, in which R_3 is the reaction control resistance; any good instrument of about 50,000 ohms will be satisfactory provided it is silent in operation, the 2 mfd. condenser C_4 helping to ensure this. The amount of reaction obtainable depends on the condenser C_2 , which is about .0003 to .0005 mfd. capacity; the larger this condenser the stronger the oscillations obtainable with a given reaction coil, c_r ; conversely, the smaller the reaction coil need to be to obtain sufficient oscillation. This is another point in favour of the arrangement, since a small reaction coil reduces the amount of detuning caused by the control. If a very wide range of frequencies is to be covered with one reaction coil it may be desirable to make C_2 variable in case the variation allowed by the resistance is not great enough to give controllable reaction at both ends of the frequency range.

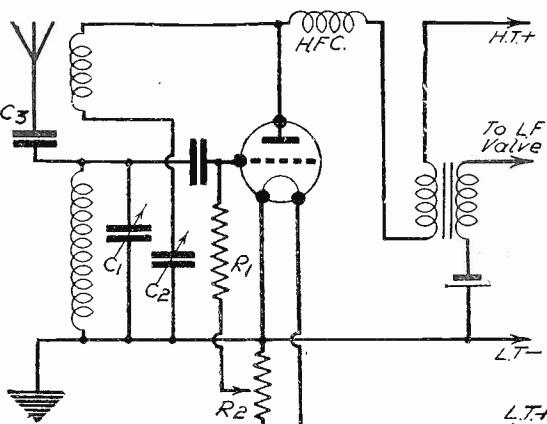


Fig. 1.—A simple reaction arrangement.

the circuit and so vary the feed-back current through the coil. Figure 2 shows a method that is somewhat older and not so much used nowadays, but is still a great favourite with the writer; it is called the "throttle" condenser method because the reaction condenser C_2 is used to provide a variable path to earth for high-frequency currents, so that at the minimum setting of the condenser the reactance of this path

is high and the H.F. currents are throttled back, as it were, and prevented from flowing through the reaction coil; increasing the capacity then permits more H.F. to flow so that there is a larger current through the reaction coil and the feed-back is increased. Both of these circuits are capable of very smooth control, but it is not easy to eliminate from either of them another fault com-

Adjusting H.T. Voltage

In order to obtain the maximum amplification from the valve the H.T. voltage should be as high as possible, but, unfortunately, this often leads to harsh reaction control; the H.T. should therefore be varied until the loudest signals are obtained

(Continued overleaf)

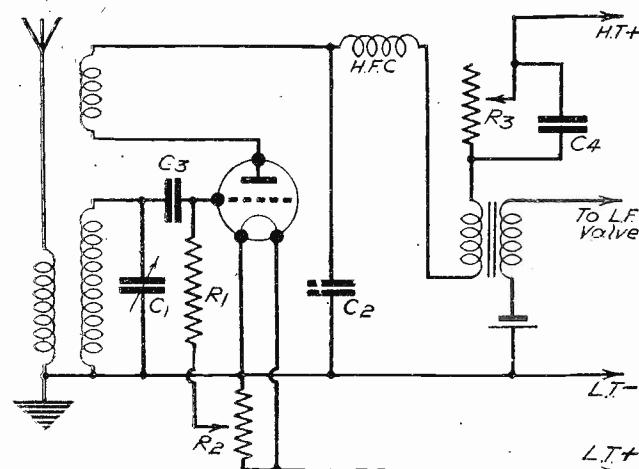


Fig. 3.—Controlling reaction by means of a resistance (R_3).

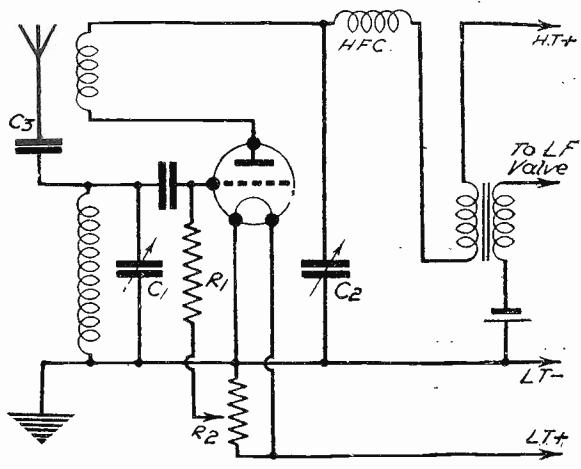


Fig. 2.—A modification of Fig. 1.—This is the throttle reaction control.

SHORT WAVE SECTION
(Continued from page 162)

consistent with smooth reaction, and in making this adjustment it is desirable to try the effect of varying the number of turns in the reaction coil, since the increased H.T. volts will make a smaller coil possible, and this often leads to greater smoothness and less effect on the tuning of the set. It will be noticed that in all the circuits given the grid leak is not taken direct to the L.T.+ as usual, but to the slider of a 400-ohm potentiometer R_2 ; this is a refinement that is sometimes helpful in improving reaction by making possible a slight variation of the bias applied to the valve. The knob is rotated until an improvement in reaction control is obtained, but it should not be taken too near the negative L.T. or signal strength will be materially reduced. A higher value of grid leak is usual on short waves than on long and generally leads to greater sensitivity, but it may also adversely affect the reaction, causing it to be very thumpy; if smooth control is unobtainable with reasonable values of H.T. volts it may be worth while to try another grid leak of about 2 megohms, if the one already fitted is from 5 to 7 megohms, but this should only be done as a last resort when all other methods of improving the control have failed.

Trying-out Different Valves

Before settling on one particular valve for the detector in a short-wave receiver it is always worth while to try out all the valves available in this position; even if one class is best for the purpose it often happens that one specimen of a certain type, even from the same maker, works better than another or is quieter in operation. Quietness is perhaps the greatest virtue in a short-wave set, for it is no use having loud signals if they are made unreadable by hisses or battles in the background arising from either a noisy valve or bad connections, dust in variable condensers or run-down batteries. Some of the small power valves of the LP2 class, or the old 2-volt power valves of a few years ago, having an impedance of 6,000 ohms or so, often make very good, quiet detectors, although naturally one would expect the newer special detector types or the HL2 class to be more efficient. Another possible source of noise is the aerial, especially in picking up mains hum; the method of coupling the aerial by a very small fixed condenser C_3 to the grid end of the coil, shown in Figures 1 and 2, while being very convenient and simple, sometimes tends to accentuate this trouble, and a change over to the aperiodic coupling coil shown in Figure 3 may improve matters, especially on wavelengths above 60 metres; the number of turns should be about one-half to three-quarters of the number in the grid coil, and it is convenient to make the coupling variable.

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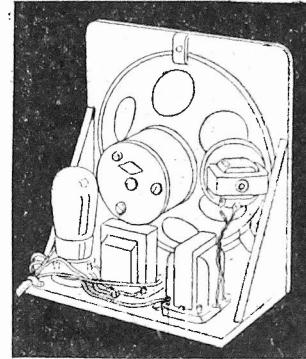
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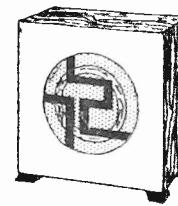


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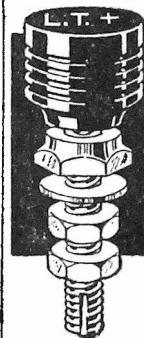
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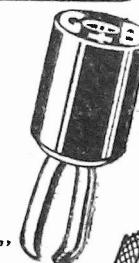
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THIS stand is very notable for the extremely neat and "tasteful" arrangement. The very complete range of "Hivac" valves is shown and it is very apparent that these are of advanced design and of particularly sound mechanical construction. An interesting feature is the "strip-form" booklet which is being given away, and which contains useful and valuable information regarding every valve in the "Hivac" range. A new variable-mu and a high-amplification pentode are especially attractive.

STAND No. 72, Main Hall
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STAND No. 64, Main Hall
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THIS stand is of particular interest to the home constructor in view of the new "Skyscraper" kits which are being shown. These include the "All Wave Battery Four," "All Wave A.C. Four," the "Skyscraper Three," and the latest Seven-Valve Superhet Kit. Broadsheets giving detailed particulars in regard to the construction of all these receivers are to be obtained free of charge, and it can be seen from these that Messrs. Lissen have reduced the task of set construction to a fine art.

There is also on view the wide range of excellent Lissen components and valves which have earned such a good reputation in the past; the latest models show distinct advances on their predecessors.

STAND No. 70, Main Hall
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THE wide range of high-grade receivers for which this firm have become so well known is here displayed. The latest four-valve receiver is noteworthy in that it is accommodated in an entirely new style of cabinet, fitted with twin moving-coil speakers, one of which is mounted on each side of the tuning controls. A new edition of the suitcase portable receiver is also shown; this is even better than the earlier models, and is now recognized as the "standard" in portables.

THE MANCHESTER RADIO EXHIBITION

(Continued from page 148)

STAND No. 108, Gallery Bridge
MILNES RADIO CO., Bingley, Yorks.

MILNES H.T. units are now known throughout the country as forming an economical source of high-tension current. They consist of banks of nickel-iron accumulator cells which can be connected in series or in parallel in an instant by the operation of a switch mechanism. When they are in parallel they can be charged overnight by the ordinary low-tension accumulator, whilst by putting them in series they provide the necessary H.T. voltage. The units are shown in various sizes and at most reasonable prices.

STAND No. 17, Main Hall
MULLARD RADIO VALVE CO., LTD., 111, Charing Cross Road, London, W.C.2

THIS is indeed one of the most carefully prepared stands in the whole exhibition and is designed as a fort, of which valves form the battlements. Model guardsmen are constantly "marching" round the fort, whilst a real guard stands sentry on the stand!

Quite apart from the "display" side of things, the Mullard stand is well worth visiting, since all the latest types of valves are on show and any required technical information is readily available.

STAND No. 3, Main Hall
NEW LONDON ELECTRON WORKS, LTD., East Ham, London, E.6

AS may be anticipated, aerial equipment forms the main feature on this stand. In addition to the "Electron" aerial wire for outside use, there is also a variety intended for erection indoors. Another new device is the "Variel," which is an unusual type of selectivity device for connecting in series with the aerial lead-in.

STAND No. 11, New Hall
NEWNES, GEO., LTD., 8-11, Southampton Street, Strand, London, W.C.2

THIS stand is, of course, the "home" of PRACTICAL WIRELESS and all readers should remember that the Technical Staff is in attendance to answer their queries. Every reader is welcomed, no matter how simple or how involved his enquiry might be. Readers should also take this opportunity to examine a number of the famous PRACTICAL WIRELESS GUARANTEED receivers which are exhibited and may be inspected by any visitor to the exhibition. The two features referred to above were extremely popular at Olympia and are proving no less so at Manchester; in fact, the Northern readers appear to be making still more use of the excellent service which is offered to them free of charge.

There are also very many books on all branches of wireless, the most called-for of which is the "Wireless Constructors' Encyclopaedia." Other books include "Finding Foreign Stations," "Wireless, the Modern Magic Carpet," "Wireless Step by Step," "The Mathematics of Wireless," "Accumulator Charging, Maintenance and Repair," "Fifty Tested Wireless Circuits," and "Ralph Stranger's Wireless Library."

Do not forget to call on STAND No. 11—you will be welcome.

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STAND No. 78, Main Hall

OSBORN, C.A., Regent Works, Arlington Street, London, N.1

HERE we find a variety of well-finished cabinets of both the console and radiogram type. A number of the new horizontal cabinets in which the speaker is mounted alongside the receiver are attractive and favourable comment.

A point of special interest in regard to Osborn cabinets is that any of them can be obtained complete and polished, unpainted, or in sets of easily assembled parts.

STAND No. 78, Main Hall

OSDUR MANUFACTURING CO., 26, Adam Street, London, W.1

THE feature of this stand is the new "Biflo" anti-interference unit which is claimed to prevent electrical and atmospheric interference of any variety. By connecting the neat unit in different ways it can be made to produce alternative effects according to the particular kind of interference which is experienced.

STAND No. 4, Main Hall

PARTRIDGE, WILSON & CO., Daventry Works, Daventry Valley Road, Leicester

A WIDE variety of mains transformers, mains units and charging plants are displayed on this stand. They are all of the excellent quality which has come to be associated with the name of "Daventry" and are even better in appearance than were the last year's models.

STAND No. 66, Main Hall

PORTADYNE RADIO LTD., Gorst Road, North Acton, N.W.10

AS manufacturers of high-class receivers, Messrs. Portadyne have become justly famous during the last few years. The latest models have many novelties, not least of which is an ingenious system of tuning in which accurate tuning is secured when two portions of a red line are brought end to end. A new Class B receiver is worthy of attention.

STAND No. 55, Main Hall

PYE RADIO, LTD., Africa House, Kingsway, London, W.C.2

THE name of Pye has become synonymous with quality radio receivers and the many instruments displayed showed that the latest models are even more attractive than their forerunners. A new Class B battery set employing a novel method of L.F. coupling is of particular interest.

STAND No. 65, Main Hall

RADIO INSTRUMENTS, LTD., Purley Way, Croydon

"MADRIGAL" receivers occupy a good deal of the space on this stand and the outstanding set in this range is the six-valve superhet radiogram. This is fitted with automatic volume control, a noise

(Continued on page 167)

SOVEREIGN FIRST TO PERFECT TUNING WITHOUT CONDENSERS

SOVEREIGN

PERMEABILITY
TUNER

15/-
COMPLETE

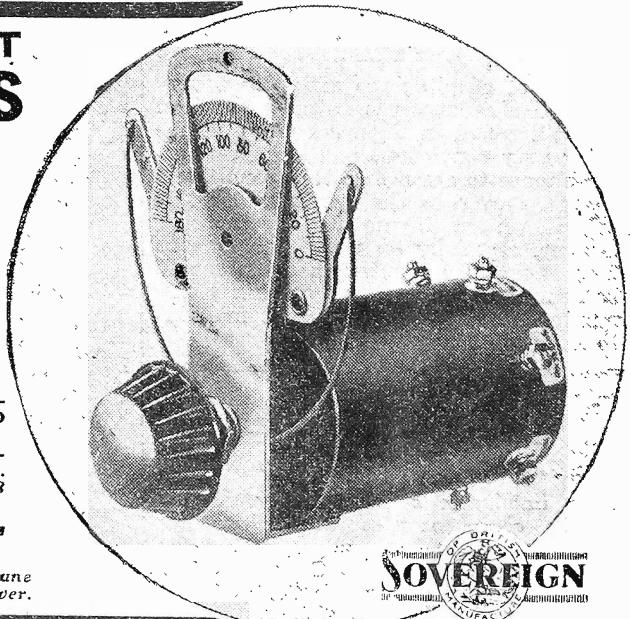
TONE CONTROL AND SCRATCH FILTER

Essential in Modern Sets.
Enclosed smooth action. 3
Terminals made
in all standard values.
4/-

JUNIOR VOLUME CONTROL
With bakelite pointer knob,
patent diaphragm contact and
sturdy, silent action, three ter-
minals, one-hole fixing. In
all standard values.
Complete 2/9
Graded-track Type, 3/-

Send to Dept. Pr.W. for 1934 Sovereign Components Catalogue, and "Simplitane Three" Blueprint showing how to build a Permeability Tuned Three Valve Receiver.

Manufactured by Sovereign Products, Limited, Sovereign House, 57, James St. Camden Town, London, N.W.1



MODEL No. 253. A very modern Table Model radio cabinet with speaker combined. Inside measurements 24 in. long, 11 in. high, and 11 in. deep. Ample accommodation for H.T., L.T., and G.B. Batteries.

PRICES: Machined Kit of Parts. Oak 12/6, Mahogany or Walnut 15/-, Assembled Ready to Polish, Oak 17/6, Mahogany or Walnut £1. 0. 0. Assembled and Polished, Oak £1. 2. 6., Mahogany or Walnut £1. 5. 0. CARRIAGE PAID U.K.

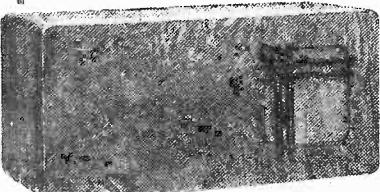
a new modern **OSBORN** cabinet

NORTHERN NATIONAL RADIO EXHIBITION, Manchester, September 27—October 7. Stand No. 78, Main Hall.

Solo manufacturers of the OSBORN BAFFLE BOX, 18in. by 18in. £1. 0. 0, 24in. by 24in. £2. 0. 0.

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CHAS. A. OSBORN (Dept. P.), Regent Works, Arlington St., New North Road, London, N.I. Tel.: Clerkenwell 5093. Showrooms: 21, Essex Rd., Islington, N.I. Tel.: Clerkenwell 5034.



UNIVERSE

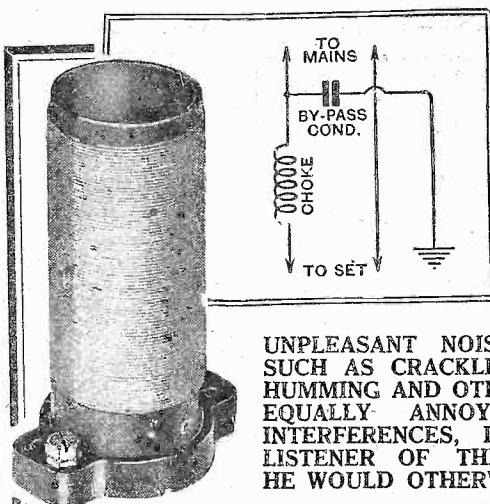
**1934
PICK-UP**

Complete with volume control and connecting leads.
20/-

Output nearly 4 volts. Average output 3 volts. Base can be used in any position. Impossible for pick-up reed to go out of adjustment (pat. applied for). Special ball-catch swivel head for easy needle changing. In attractive brown bakelite moulded case. Ask your dealer for demonstration or write us for catalogue.

**NORTHERN
NATIONAL
RADIO
EXHIBITION.**
Manchester, Sept. 27—Oct. 7.
STAND NO. 104, GALLERY.

COSMOCORD LTD. DIV. P., CAMBRIDGE ARTERIAL RD., ENFIELD MIDDX.



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UNPLEASANT NOISES, SUCH AS CRACKLING, HUMMING AND OTHER EQUIALLY ANNOYING INTERFERENCES, DEPRIVE THE LISTENER OF THE ENJOYMENT HE WOULD OTHERWISE RECEIVE.

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(For A.C. and D.C. Supplies) as illustrated W.H.F., 3/6.
INTERFERENCE COMPENSATORS, HIGH-VOLTAGE CONDENSERS, SCREENED AERIAL DOWN LEADS, SCREENED TRANSMISSION LINES, SCREENED TUBINGS are some of the wide range manufactured. Obtainable from all First-Class Radio Stores. See the name "GOLTONE" on each component before purchasing, and refuse substitutes. If any difficulty write direct.

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Large 56-page
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OSTAR-GANZ

For the

"UNIVERSAL" HIGH-VOLTAGE VALVES

With these valves you can build yourself a "UNIVERSAL" All-mains set—convert battery sets to all-mains—alter present mains set to work off either A.C. or D.C. supply. No transformers or resistances needed. Easy and economical. Write for latest lists and circuits.

Sole Agent for Great Britain:

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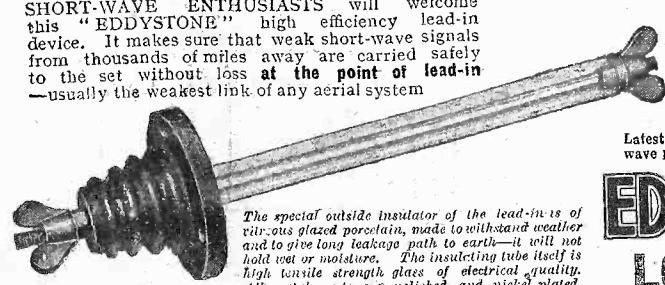
"A.C.—D.C. UNIVERSAL TWO"

described in this issue you require D.130, 17/6; 6 Pin Valveholder, 1/-; P.T.3, 19/9; E.G.50, 12/6. KIT of Parts for above Set also supplied; also Special Model Sets—Kits and Amplifiers.

Write for Free List of Complete Range of Valves.

• IMPROVE YOUR SHORT WAVE RESULTS

SHORT-WAVE ENTHUSIASTS will welcome this "EDDYSTONE" high efficiency lead-in device. It makes sure that weak short-wave signals from thousands of miles away are carried safely to the set without loss at the point of lead-in—usually the weakest link of any aerial system.



"EDDYSTONE" LOW LOSS LEAD IN
CAT. No. 946,
Price 2/6.

Latest list of "EDDYSTONE" short wave parts now ready, free on request.
EDDYSTONE
LOW LOSS
LEAD IN

STRATTON & CO., LTD., BROMSGROVE ST., BIRMINGHAM.
LONDON SERVICE DEPOT—WEBB'S RADIO STORES, 104, Charing Cross Rd., W.C.2.

WIRELESS COMFORT

No longer is it necessary to get up and down to adjust the set. From your seat anywhere in the room you can fade out uninteresting stuff to a whisper with a MODULA and by a turn of a knob adjust the volume just as you like it, a real boon to wireless users—complete MODULA as illustrated, with 12ft. cable 2/11 or with armchair leather strap, 4/-.

The British Pix Co., Ltd. (Dept. S), 118, Southwark Street, London, S.E.1.



MODULA
ARMCHAIR CONTROL.
2/11
COMPLETE.

MARCUS, OVERTON RADIO, LTD.

62, Borough High Street,
London Bridge, S.E.1.

GUARANTEED
EFFICIENCY



EXPRESS
SERVICE

"PREMIER SUPER" DE LUXE KIT

SPECIFICATION:-

	E.S. d.
1 British Radiophone Superhet 3 gang Midget variable condenser, complete with full vision disc drive, Type 582a	1 11 0
1 Set Lissen matched Superhet coils	1 10 0
2 Lissen Intermediate Frequency Transformers	1 15 0
1 Bellng Lee w.w. 50,000 ohm Potentiometer	1 4 0
1 Bulgin 3-point switch	1 0 0
1 Bulgin Push Pull Radio-Gram switch	1 9 0
3 Chassis Brackets	1 0 0
1 P.L. "New Hypermu" L.F. Transformer	1 5 0
6 Erie 1 watt resistances 20,000, 10,000, 20,000, 30,000, 100,000 ohms and 2 megohms	1 9 6
2 Dubilier .1 mfd condensers type BB	6 0 0
2 Dubilier .2 mfd condensers type BB	3 7 0
1 Dubilier .0001 mfd condenser type 670	1 1 0
1 Dubilier .0002 mfd condenser type 670	1 4 0
1 Dubilier .0003 mfd condenser type 670	1 4 0
2 Dubilier .01 mfd condensers type 670	2 0 0
1 Polar Preset condenser .002 mfd	1 4 0
4 Clix 4 pin chassis valve holders (airspaced)	1 4 8
1 Clix 5 pin chassis valve holder (airspaced)	1 3 3
3 Bellng Lee Terminal mounts	1 6 0
6 Bellng Lee "R" type terminals	1 3 0
6 Bellng Lee "Bowspring" wander plugs	1 0 0
1 "ACE" drilled and foil covered chassis	3 0 0
1 Bellng Lee fuse and holder	1 0 0
5 Cossor valves to specification	3 1 6
Connecting wire, flex, screws, etc.	1 5 0
Kit B, including valves	£10 1 0

Any component supplied separately.

Kit A, as above Specification, but without valves	£6 19 6
or 12 monthly payments of	12 6 0
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AC-DC. TWO.

1 "ACE" foil covered chassis	3 0 0
1 Teisen Coil No. W.216	3 7 0
1 J.B. .0095 mfd Slow Motion condenser No. 1046	6 0 0
1 R.L. Paraffed Coupling Unit	11 9 0
1 J.B. .0003 reaction condenser	2 6 0
1 R.I. smoothing choke Type DY 22	17 6 0
1 Dubilier fixed condenser type 620 .0002 mfd	1 3 0
1 Dubilier fixed condenser type 670 .0001 mfd	1 0 0
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1 Bellng Lee Twin Fuse holder with fuses	2 6 0
1 Bellng Lee terminal block	2 6 0
2 Bellng Lee terminals	6 0 0
1 Hellesens Electrolytic block condenser 8-8-1 mfd	7 6 0
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2 Clix airsprung 5-pin chassis mounting valve-holders	2 6 0
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3 Erie resistance 1,000, 25,000 and 250,000 ohms	3 0 0
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Flex, connecting wire, screws, etc.	1 0 0

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3 AC-DC. Valves to specification	£4 2 0
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"ACE" Kit A, as specification	1 12 6
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Westinghouse A.C. Mains Superhet. Blue print, constructional details and price list of official kit. Post Free	1 3 0
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Old sets rewired and modernised.
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We stock everything connected with Radio.
Component parts—Speakers—Manufactured Receivers—Mains Units, etc. Cash, C.O.D. and Easy Terms.

TRADE SUPPLIED



IN the preceding "Photon" article we dealt with the tuning-coil in the open, and demonstrated a simple method of calculating the inductance.

We are now ready to consider the question of the potted coil. Firstly it may be stated that when a coil is "potted" the whole field is virtually confined to the space within the "pot." Owing to the high A.C. frequency and the fact that the pot provides what is really a short-circuited secondary very little of the magnetic field can escape from the pot, in fact the amount of the external field is negligible; that is what the pot is for—to prevent interference. The form of the field is consequently totally different from when the coil is in the open; it is not as shown in Fig. 1 (as has sometimes been represented), but as shown in Fig. 2. The lines of force must form closed curves without passing through the wall of the pot; obviously this restriction of the field results in a greater reluctance and lowering of the inductance and consequent increase in the ohmic resistance, that is the price paid for potting the coil.

It is not possible to calculate the inductance with any degree of accuracy unless the pot be *designed* to make calculation easy; this will be best illustrated by one or two examples. Let the pot be laid out on the basis that there is a constant flux area "flow and return"; then the internal diameter of the pot will be $\sqrt{2}$ times the diameter of the winding. And to avoid any ambiguity at the ends let the area be designed so that the flux area is at all points the same; this is as drawn in Fig. 2. Then the length of the magnetic path may be taken as that indicated by the heavy line, namely the mean; we call this l_3 , and, let N equal the number of turns, and D be the diameter of the winding as before, then the mean magnetic flux per c.m.² will be:

$$\frac{0.4 \pi N}{l_3} \text{ the total flux } \frac{0.4 \pi^2 N D^2}{4 l_3} \text{ and the inductance } \frac{0.1 \pi^2 N^2 D^2}{l_3 \times 10^3} \text{ henries or } \frac{N^2 D^2}{l_3 \times 10^2} \mu\text{h (approx.)}$$

It is evident that the field is unnecessarily cramped by a pot of the proportions given. Thus, if we take the case of the numerical examples given in the preceding article the diameter of the pot is: 5 c.m., $\sqrt{2} = 7$ c.m., and the length of the path denoted by l_3 is 12 c.m. Taking the number of turns as before—65 we have:

$$N^2 = 4,200 \quad \text{Inductance} \\ D^2 = 25 \quad = 4200 \times 25 \\ l_3 = 12 \quad 12 \times 10^2 \mu\text{h}$$

= 88 microhenries instead of 200 for the same coil un-potted. To restore the inductance to its old value we shall require to increase the number of turns to 98, and assuming that both coils are closely wound a finer wire has to be used and the resistance has been increased in the relation of 1 to 2 $\frac{1}{2}$.

Take another example. Let the pot diameter be twice that of the winding, then the return path is three times the area of the "Core." We are now reduced to the position of having to indulge in a little guess-work. If we consider the flux as being distributed uniformly we can assess the reluctance of the return field external to the winding as being one-third that of that internal to the winding, and thus it may be represented by adding to l (the length of the winding), $\frac{1}{3} l$, making a total 1.33 l . We have now to provide an addendum, as already done in the case of the coil in the open, to represent the reluctance of the external field not otherwise accounted for. This will depend upon the clearance between the end of the winding and the end of the pot. The conditions are not prescribed with sufficient exactitude to enable this addendum to be stated as a definite or precise quantity. The same factor is therefore taken as in the coil in the open, namely, 0.45 D .

If we pot the coil, given as a numerical example in the previous article, under these conditions, we have inductance

$$4200 \times 25 = 6.25 \times 10^2 = 168 \text{ microhenries.}$$

If as before 200 μh is the inductance required, the turns have to be increased from 65 to 71.

The actual inductance may be varied by increasing or diminishing the length of the pot, and thereby giving a greater or less clearance; so the constructor has two strings to his bow, if the inductance does not come out quite exact he may either lay on or cast off one or two turns or alternatively he may vary the length of the pot, in order to make the correction.

Mean Length = 12 C.M.

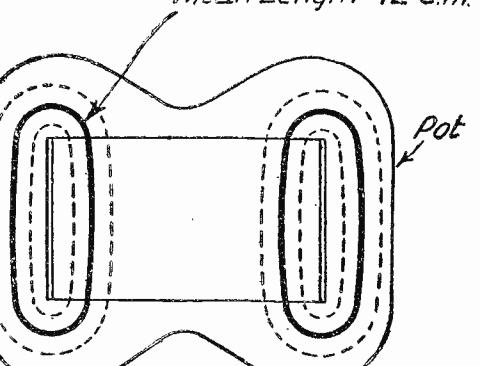


Fig. 2.—This diagram shows the arrangement of the magnetic field round a "potted" coil.

THE MANCHESTER RADIO EXHIBITION!
(Continued from page 164)

Suppressor, full-vision tuning scale, tone control and a master switch having four positions for putting the set on to either wave-range, or bringing the pick-up into circuit.

All the famous R.I. components such as transformers, chokes, etc., are shown, as well as the latest R.J. product, an iron-core coil having a unique permeability trimming device. The coil has a core of "Micron," a material which has been specially developed for Messrs. R.I.

STAND NO. 47, New Hall

RADIALADDIN, LTD., 46, Brewer Street, London, W.1

THIS firm specialises in the supply of new receivers and components, for which old ones are taken in part exchange. The system has operated very successfully in the past, and Messrs. Radialaddin's slogan "New Radios for Old" is very apt. Visitors who contemplate the purchase of a new set and who have some unwanted apparatus on hand cannot do better than consult the attendants on this stand.

**STAND No. 113, Gallery
RADIONICS, LTD., 129-131, Bridge Street, Warrington**

**STAND No. 111, Gallery
362 RADIO VALVE CO., LTD., Stoneham Road, London, E.5**

A COMPLETE range of valves is now made by this firm and all are sold at really competitive prices. Perhaps the one which appeals most strongly is an all-metal battery valve; this is the first of its type to be placed on the market. A Class B valve costing only 9s. is also an interesting line.

**STAND No. 5, Main Hall
REPRODUCERS & AMPLIFIERS, LTD., Frederick Street, Wolverhampton**

A LARGE number of loud-speakers of every type is to be seen on this stand, and the models range from the "Type 50" balanced armature unit to the latest "Victor" P.M. moving coil at 70s. An instructive feature is the display of sectionally-cut speakers of the different types; these models enable the buyer to see exactly how the speakers are built up.

**STAND No. 15, Main Hall
SIEMENS ELECTRIC LAMPS & SUPPLIES, LTD., 38, Upper Thames Street, London, E.C.4**

THE centre of this exhibit is the range of "Full o' Power" high-tension batteries. These are made in four distinct types for outputs of 7, 10, 20 and 30 millamps maximum respectively. The two larger types are especially suitable for use with Class B receivers, but there is also a more compact double-capacity battery which will be preferred where space is limited.

There is also on view a complete set of Siemens batteries of all types and sizes.

**STAND No. 100, Gallery
SOVEREIGN PRODUCTS, LTD., 52-4, Rosebery Avenue, London, E.1**

A MOST extensive range of small components of various types is shown here. Included in this are coils, eliminators, mains transformers, chokes and condensers. An entirely new line which will be of especial interest to all constructors is a permeability tuner. This is a neat component built into a small bakelite container and fitted with an operating knob and slow-motion dial; it is, of course, one of the first permeability tuners to be introduced to the British market.

**STAND No. 38, New Hall
STANDARD TELEPHONES & CABLES, LTD., 364, Grays Inn Road, London, W.C.1**

THIS firm is showing four new receivers; two of these are A.C. superheterodynes, whilst the third is an S.G.-Detector-Pentode battery set, and the fourth, a two-valve console A.C. receiver fitted with a P.M. moving-coil speaker. All these receivers are supplied with "Micromesh" valves.

**STAND No. 87, Gallery
TANNOY PRODUCTS, LTD., Dalton Street, West Norwood, London, S.E.27**

THIS firm specialises in power amplifiers for public address work and similar purposes, so it is not surprising to find that they have on show all kinds of amplifiers with output ratings from 5 to 100 watts. Some of the smaller units are suitable for use in the home when perfect quality reproduction is aimed at. All the instruments are really well designed and reflect good workmanship and sound construction.

**STAND No. 31, Main Hall
ULTRA ELECTRIC, LTD., Erskine Road, Chalk Farm, London, N.W.3**

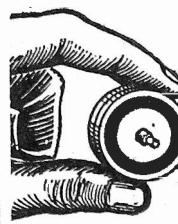
THE receivers here exhibited represent the latest in both circuit and practical design. Many of the larger models are provided with automatic volume control and other 1934 refinements. Special attention has obviously been paid to the cabinet work and this is very smart and in good taste. Ultra "Tiger," "Leopard," and other "animal" receivers are well known and will repay careful examination.

**STAND No. 77, Main Hall
VARLEY (OLIVER PELL CONTROL), LTD., 103, Kingsway, London, W.C.2**

MESSRS. VARLEY have on show a number of entirely new lines in addition to their excellent components which are being continued unaltered from

(Continued on page 169)

MICROPHONE BUTTONS 1/-



Usually sold at 3/6. Our price has always been 1/-.
We have supplied thousands to home users.

MICROPHONES FOR ALL PURPOSES. Volume Control, 6d.; Announcers' No. 11 Mikes, 7/6; Pedestal Type, 18/6; Microphone Carbon Granules.

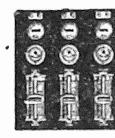
In glass capsule, enough for four buttons. Grade No. 1, 8d.; No. 2, Medium, 1/-; No. 3, Fine, 1/6; Carbon, solid back, blocks, 3d. Mouthpiece, curved or straight, 10d. Carbon diaphragm, 55 m/m, 4d. Panel brackets, pivoted, 5/-. Reed Receiver Unit for Amplifier making, 3/-. Headphones, 2, 9 pair. Veedee 10,000 Counters, 1/-.

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A.C.—D.C.

We have 25 models to offer and our prices are low for special requirements. Three popular sizes are the AC109A for 36 cells at £10 9s.; the AC106 for 108 cells at £12 10s., and the Lesdix Super Six for 200 cells at £32 7s. 6d.

Write for "Charger" Leaflet.



**ELECTRADIX RADIOS,
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**PEARL & PEARL
RADIO BARGAINS**

!! 200 ONLY !!

Famous Lamplugh Silver Ghost Speakers. Limited Number of 1933 D.C. Mains Energised Models. 2,200 ohms, suitable for A.C. Mains or 200-250 volts, using Pot. as Choke, or second model, 6,500 ohms for D.C. Mains of 200-250 volts. Original price 34/- **10/9**
Bargain price to clear

K.B. Battery "Pup" includes speaker, valves, and batteries. Attractive cabinet, automatic grid bias and sockets for extra **£2.3.6** speaker. List price £4/10/0

The well-known Lincoln Stewart dual range shielded coils 200-550 metres, 800. **2/11**
2,100 metres. List price, 6/6

Limited number Daptacon pick-ups and tone-arms, specially designed to prevent wear and eliminate scratch, reduced price **6/11**

Famous Lincoln Stewart Permanent Magnet Moving Coil Speakers, Special **16/11** purchase. List price 47/6

Limited number of Telsen Major Speaker chassis. This is a super bargain and is available **3/3** while stock lasts. Usually 10/6

K.B. A.C. or D.C. Pup. Self-contained, simple, safe, trouble-free. The K.B. 2-valve all-electric "Pup" for excellent and reliable mains-operated receiver for A.C. or D.C. mains. **£3.12.6**
List price, £7/10/0

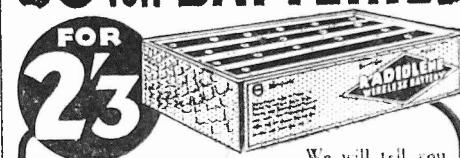
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PEARL & PEARL
190, Bishopsgate, E.C.2

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60 Volt BATTERIES



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**DIRECT FROM THE MAKERS
RADIOPHONIC CABINETS FOR 1/6 WEEKLY**



CASH PRICE 42/-

10/- DEPOSIT
and 6 monthly payments of 1/-
CARRIAGE PAID AND PACKING FREE
Specification: Soundly constructed of well-seasoned timber, beautifully polished rich walnut shade, ebonyised mouldings.
SIZE OVERALL: Height, 3 ft. 3 in. Width, 1 ft. 8 in. Depth, 1 ft. 4 in. Allowing ample room for pick-up turntables, set baseboards up to 18 in. by 14 in. and 7-in. panel, speaker and accessories. Burred motor board. SEND FOR LEAFLET.

W. S. WILKIN
NELSON NEWS - SOUTHEND - ESSEX
Phone: Southend 4330 (Gresley) Depot 7, Bondage

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ELECTRIC
CLOCK
TO YOUR SET!**
NO MAINS NEEDED!
KEEPS CORRECT TIME!
NO WINDING!

Works off small battery lasting 12 months, or can be plugged into G.B. battery without affecting reception. Uses practically no current. Fits into hole 3 in. dia. in any panel up to 3 in. thick. Easy to fix—no screw required. Only 1 in. from front of panel to back of case. Swiss movement. Hands set from front. Nickel-plated bezel. Useful addition to any set.

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Dept. 21, Crisp Road,
Hammersmith, W.E.**

Telephone: Riverside 6392.

12/6
COMPLETE WITH BATTERY
POSTAGE 6D

7 DAYS' FREE APPROVAL!

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TRICKLE CHARGERS.**

BRITISH THROUGHOUT. 2 YEARS' GUARANTEE.

A.C. models incorporate Westinghouse metal rectifier and a special power supply for illuminating tuning dials. Trickle charger 15s. Od. extra.

Catalogue free from actual manufacturers:

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154, Holmeleigh Road,
LONDON, N.18.
No Trade Discounts.

D.C.
15/-

A.C.
30/-

October 7th, 1933

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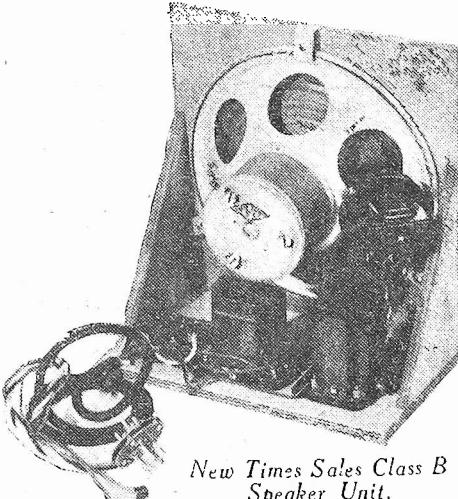


1.—A.V.C.

THESE letters stand for Automatic Volume Control, a term which is being increasingly used in connection with modern receivers. The term is not strictly correct as the arrangement only comes into effect at certain pre-arranged conditions. In general, the arrangement is carried out by utilising the signal voltages passed on by the detector to vary the bias on the H.F. valves. It is well known that a current passing through a resistance results in a voltage drop across that resistance, and, therefore, we may arrange a signal of a certain value to pass through a resistance of a certain value so as to provide a biasing voltage on a variable-mu H.F. valve. Any reduction of signal strength passed through this resistance will reduce the bias on the H.F. valve and so increase the magnification of that stage, resulting in a louder signal being passed to the detector. Conversely, an increased signal will pass more bias to the valve, and so reduce its sensitivity. Modifications of this broad principle are introduced by utilising special diode valves for biasing purposes, and also by arranging that the controlling effect of the H.F. stages does not operate until a certain signal intensity is reached. In this condition it is known as Delayed Automatic Volume Control.

New Times Sales Class B Speaker Unit

The illustration shows a neat Class B unit and loud-speaker, already mounted on a baffle for inclusion in any type of cabinet. The loud-speaker is of the permanent magnet type, with matching transformer fitted to the substantial metal chassis, and this is, in turn, coupled to an



New Times Sales Class B Speaker Unit.

efficient Class B output choke. A tone-control condenser is fitted across the primary sections, to eliminate some of the higher frequencies and so give a slightly richer effect to music. The values chosen appear very suitable and certainly avoid the rather high pitched tone which is

generally noticeable with Class B working. The three transformers are all at angles with one another to avoid interaction. A multi-way cord is fitted to the unit, and this is provided at its end with a combined valve-holder and plug which fits into the output valve of an existing receiver. The present output valve is then plugged into the top of the adaptor and so connects the unit in circuit with the batteries, etc. On test results were very good indeed, full volume being obtained, and no alterations having to be made to the set with which it is used. It is marketed by New Times Sales, 56, Ludgate Hill, E.C.4, at 59s. 6d. with valve.

A Problem Solved

DOES the A.C.-D.C. Universal receiver appeal to you? Perhaps you would like to build this receiver, or one of the other interesting designs which have been published in these pages, but are prevented from taking advantage of the improved results which are obtained from these modern receivers because you already have a receiver which is giving good results, and yet do not feel like scrapping it. There is, however, no need to go on using your present set and envy the man who can build an up-to-the-minute receiver, as your position has been considered and your requirements met by Partex Radio, Vulcan House, 56, Ludgate Hill, E.C.4. This firm specialises in the part exchange of existing apparatus in order that new receivers, or sets of parts for receivers, may be obtained. It should be unnecessary for us to point out the immense advantages which may be obtained by the scheme. No doubt many readers have already attempted to dispose of an old set to a friend, or perhaps have advertised it in a local paper, but without success. All these difficulties are removed when you can go to a firm and state that you desire the parts for such-and-such a receiver, and that you have a receiver, in good working condition, which you wish to dispose of. A really good allowance is then made for the old set, and you are able to obtain the parts for the new receiver without any further trouble.

We would urge all our readers who are desirous of taking advantage of this scheme to write without delay to Partex Radio at the above address for full details.



BATTERY DOUBLE-DIODE

USERS of battery receivers will be interested to learn that a double-diode will shortly be available for them. This is a Mazda product, and full details and reports will be given when available.

STAND-OFF INSULATOR

FROM Messrs. Ward and Goldstone comes the announcement of a neat stand-off insulator listed at 9s. This will find many uses in short-wave receivers, as well as for arranging an aerial or earth wire in the experimental workshop.

HEAVY DUTY H.F. CHOKE

A N ingenious H.F. choke, especially designed for mains use, has been received from Messrs. Ward and Goldstone. Priced at 7s. 6d., this is a most substantial component rated to carry the full mains voltage in D.C. sets, with a minimum voltage drop. Full details to be given later.

THE MANCHESTER RADIO EXHIBITION

(Continued from page 167)

last year. One of these is the latest " Nicore " iron-core tuning coil, another is the " Nicore " H.F. choke, whilst a neat and extremely compact automatic volume control unit will appeal to a great many visitors.

Besides the components there are some wonderfully up-to-date receivers, chief among which is the four-valve mains superhet. Another well-designed set is the five-valve superhet radiogram which has automatic volume control as well as many other modern features.

STAND No. 74, Main Hall
VINCE'S DRY BATTERIES, LTD., Garford Works,
Garford Street, E.14

" LION " high-tension batteries are the main features on this stand and they are shown in great variety. These are low in price and are claimed to have a longer life than most batteries. An interesting point is that the tapping sockets are arranged on the side of the batteries instead of on top, and by this means the variation of voltage is simplified.

There are also other dry batteries of various types and the visitor can see them being made by means of up-to-date machinery which has been specially installed on the stand.

STAND No. 63, Main Hall
WESTINGHOUSE BRAKE & SAXBY SIGNAL CO., LTD., 82, York Road, King's Cross, London, N.1

ALTHOUGH the full range of Westinghouse metal rectifiers are exhibited the new Westinghouse superheterodyne kit set will probably claim most of your attention here. The complete set is on view on a revolving turntable so that it can be examined with ease. It has many novel features and employs automatic volume control which is provided by means of a " Westector." Broadsheets giving full constructional details are available and are being obtained in great numbers by home-constructors.

Two entirely new metal rectifiers are being shown. One of these is the type H.T.12, which gives an output of 200 volts at 30 millamps and is to supersede the older H.T.6 and H.T.7; it costs 17s. 6d. The second is the type H.T.13, which has been specially designed for Class B and Q.P.P. use; it is the same price as the H.T.12.

STAND No. 101, Gallery
WHARFEDALE WORKS, LTD., 62, Leeds Road,
Bradford

THIS firm has only recently been formed, but they are showing some extremely good permanent-magnet moving-coil speakers. These are reasonably priced and are worthy of careful examination.

STAND No. 62, Main Hall
WHITELEY ELECTRICAL RADIO CO., LTD., Victoria Street, Mansfield

THE famous W.B. moving-coil speakers are shown here, and the new " Microlode " types are proving extremely popular. These latter are provided with a multi-ratio transformer and two selector switches. By moving the switch arms any ratio can be obtained to match either ordinary triode, pentode, Class B or Q.P.P. output stages. The largest " Microlode " is the type " P.M.1.A. " which is priced at £6; the " P.M.2A. " comes next at £3 19s. 6d.; the next is the " P.M.4A. " (of which fifty were recently given away in the PRACTICAL WIRELESS competition) and costs £2 2s., whilst the " baby " in the range is the type " P.M.6A. " at £1 12s. 6d.

Any of the W.B. speakers can be obtained fitted in beautiful cabinets of excellent acoustic design.

STAND No. 51, Main Hall
WINGROVE & ROGERS, LTD., Polar Works, Old Swan, Liverpool

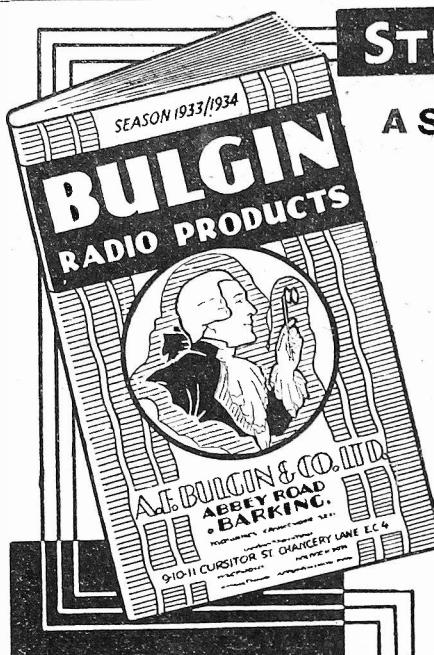
MANY new types of " Polar " condensers are to be seen here, notable among which is the " Star Minor." It is made in either " single " or multi-ganged type and may be obtained with one of three alternative drives. The latter, which may be bought separately if desired, are of the latest full-vision type, and have straight, curved and semi-circular scales respectively. All three are the same price, namely, 7s. 9d.

Other new lines include short-wave condensers of very low-loss type.

STAND No. 84a, Gallery
WRIGHT & WEIRE, LTD., 740, High Road, London, N.17

THE coils, chokes, switches, potentiometers, etc., which have been made by Messrs. Wright & Weire and sold under the trade name of " Wearite " during the past several years, require no introduction to our readers. The latest products of this progressive firm include a range of " Nucleon " tuning coils and H.F. chokes; these are, of course, iron-cored components of the latest type.

Also on this stand there are a number of really good Class B components and mains transformers. All of them are distinctly well made and of handsome appearance.



STUDY ECONOMY

A SIMPLE H.T. ELIMINATOR

The diagram shows a simple, safe and effective H.T. unit for D.C. mains 150/250v. Smoothing is adequate, and the H.T. hum-free for sets using up to three valves. The "Fuseplug" rules out accidental short-circuits. R1 and R2 resistances shown for voltage dropping are suitable for 200/250v; for lower voltage mains reduce accordingly. A cover should be provided and the earth wire of set connected to E. terminal.

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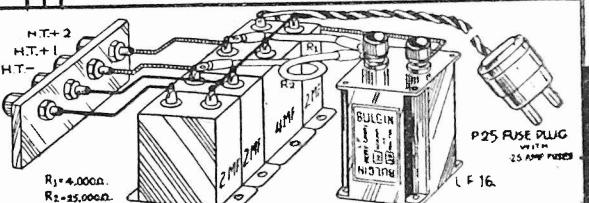
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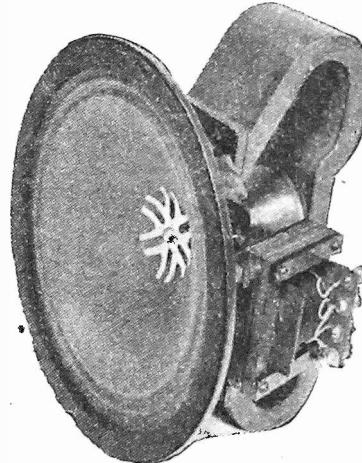
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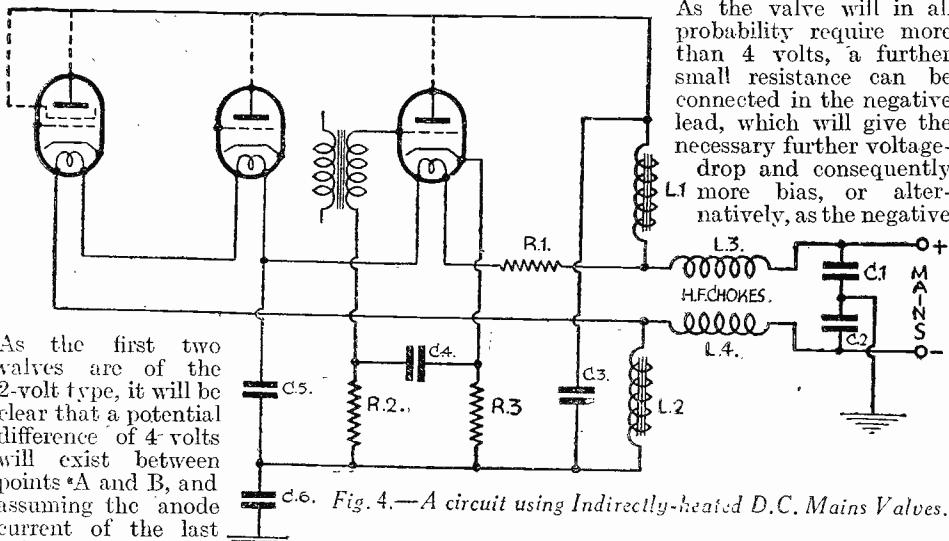
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575d, MOSELEY ROAD, BIRMINGHAM, 12.

Filament Circuit in D.C. Mains Sets

(Concluded from Page 88, September 30th Issue)

CONSEQUENTLY, the correct value in this case for the mains-resistance is 2,000 ohms. The next point requiring explanation is the necessity for the two "shunt" resistances which are shown in Fig. 3, connected directly across the filaments of the first two valves. It will be appreciated that as the anode current of the last valve passes down the filament lead it must also pass through the filaments of the other two valves, unless we provide for it an alternative path. The shunt resistances are this alternative path, allowing the anode current to pass round the circuit, but not through the two valve filaments.



As the first two valves are of the 2-volt type, it will be clear that a potential difference of 4 volts will exist between points A and B, and assuming the anode current of the last valve to be 20 milliamps, the value of the shunt resistance is arrived at by dividing the voltage difference by the current, thus:— $\frac{4}{.02} = 200$ ohms.

A further point to be borne in mind is that the filament of various valves of the same type, even though the average rating will be 20 ohms (in the case of the 2v .1 amp type) may, individually, vary quite considerably, and may be anything between 18 and 22 ohms. Consequently, if a valve has to be replaced for any reason, a voltmeter should be connected across the filament terminals to ensure that it will actually be running at two volts. Obviously, if the filament resistance of the replacement valve is less than that of the original valve, the total resistance in circuit will be somewhat less, greater current will be permitted to flow, and the valve may be over-run, causing it to lose emission much more quickly than it normally would. On the other hand, if the new valve has greater resistance, then less current will flow, and the valve will be slightly under-run, causing perhaps distortion and generally unsatisfactory results. Furthermore, it will be appreciated that any fluctuation in the mains voltage will cause a similar fluctuation in the voltages applied to the filaments, which are not, of course, designed to withstand any such fluctuations, and in order to avoid premature deterioration due to this cause a special regulator lamp can be connected in series with the mains resistance, which will take care of a considerable mains-voltage fluctuation permitting only the correct voltage to enter into the filament circuit.

Providing for Grid-bias

Grid-bias must, of course, be provided for, and fortunately this is a simple matter as the voltage-drop across any ohmic resistance in the negative side of the filament circuit can be utilized for the purpose. As has already been pointed out, the resistance of the filaments causes a potential difference of 4 volts between points A and B in Fig. 3, and, therefore, if the grid return lead is taken to point A, the grid of the output valve will automatically be 4 volts negative in respect to the filament—in other words, 4 volts bias is being applied to the last valve.

As the valve will in all probability require more than 4 volts, a further small resistance can be connected in the negative lead, which will give the necessary further voltage-drop and consequently L1 more bias, or alternatively, as the negative

choke possesses resistance, a portion of the choke winding can be tapped off and used for obtaining further bias as shown in Fig. 3.

Now indirectly-heated D.C. valves differ from the battery valve, in that whereas in the latter the filament is also the cathode, in the former the cathode is a separate element which encloses a separate heating element called the "heater." When the heater is connected to an irregular supply it becomes hot, and transmits its heat to the cathode, causing it to emit electrons in a steady stream. Obviously, if the heater—fed from an irregular supply—were itself allowed to emit, the electron stream would fluctuate in sympathy with the fluctuation of the supply current, thus causing considerable hum. As this type of valve is designed for an irregular filament heating current, there is obviously no point in smoothing this supply, and

therefore the smoothing chokes are connected in the H.T. circuit only, and not in

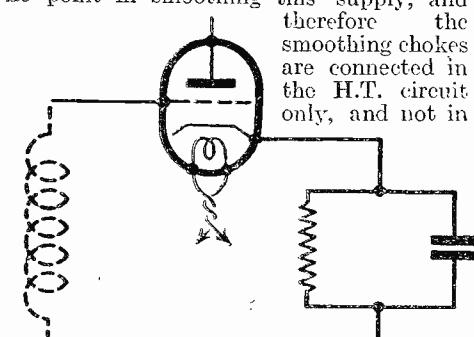


Fig. 5.—Automatic Bias is obtained by a resistance and condenser in the cathode lead.

the L.T. circuit as in the case of battery valves. This difference is apparent from Fig. 4, which shows the skeleton circuit of a three-valve set using indirectly-heated valves. The heater circuit is connected directly to the mains (through H.F. chokes perhaps, as will be explained later), but a breakdown resistance must still be used, its value depending, of course, on the characteristics of the valves used.

Screening the Detector Stage

As the current in the heater circuit is unsmoothed D.C., stray couplings are likely to be present, the results being particularly unpleasant in view of the fact that the H.F. ripple found on D.C. mains is usually at a much higher frequency than that found on A.C. mains. The detector stage is always the most troublesome in this respect, but the difficulty can be minimized either by wiring the heaters in such a manner that the detector valve is last in the negative end of the chain, or if this is not practicable, a 2 mfd. condenser can be connected, with entirely satisfactory results, between the detector heater and the negative or earth line as shown in Fig. 4. The detector stage is also particularly prone to hum pick-up, etc., and it is usually advisable to carry out the wiring of this stage in "screened" wire, or, in exceptional cases, it might even be found necessary to enclose the entire detector stage, with its associated components, in a separate screening-box, earthed, of course.

Another difficulty frequently encountered in such a set is the presence of H.F. currents superimposed on the mains which, if allowed to get into the receiver, may cause reduced selectivity, modulation hum, etc. The smoothing chokes are, of course, designed to deal with low frequencies and, consequently, they do not offer much opposition to these unwanted currents, and the only satisfactory method of keeping these out of the set is to use a special high-frequency choke in each mains lead before the L.F. smoothing chokes, as shown in Fig. 4. An earth wire connected between two 1 mfd. condensers shunted in series across the mains may be advantageous, but this depends entirely upon local conditions, and can only be determined by experiment. In fact, no definite rule can be laid down regarding earthing a D.C. set, as in some instances the earth connection tapped on to the mid-point of the two condensers may be better than the ordinary earth connection through a condenser to the negative side of the set, or in some instances, the set will operate much better with no connection to earth at all! It will be appreciated that one side of the mains is already earthed by the supply-company, but even if the negative main is not earthed, a very large capacity exists between this main and earth, which is effectively in parallel with the smoothing choke, rendering the use of a local earth unnecessary. If an earth wire to the negative side of the set is used, it must be remembered that this side of the set is in direct connection with the supply main and, consequently, it is essential to isolate the mains from earth by utilizing a fixed condenser as shown in Fig. 4. Reverting for a moment to the matter of keeping out H.F. currents, it may be mentioned that this subject assumes particular importance in the case of a superheterodyne set. H.F. currents in such a circuit may be responsible for introducing whistles throughout the tuning

(Continued on opposite page)

Established 1924

FILAMENT CIRCUIT IN D.C. MAINS SETS

(Continued from previous page)

range, these whistles being of a nature such as would render the set almost entirely useless.

As in A.C. design, automatic grid-bias can be arranged for by connecting resistances in the cathode leads as shown in Fig. 5. As the anode current of the valve must pass through any resistance in its cathode lead, voltage is developed across the resistance and a difference in potential exists between each end of it. Therefore, by taking the grid-return lead to the bottom end of the cathode resistance, the grid is automatically negative in respect to the cathode to the extent of the voltage dropped across the resistance. A small condenser—usually 1 mfd.—should in each case be shunted across the cathode resistance in order to provide a low-impedance path to earth for any unwanted H.F. or L.F. currents which may be present in the circuit. The formula for calculating cathode resistance values is:

Grid-bias voltage required $\times 1,000$. In anode current in millamps the case of a valve requiring 10 volts bias with an anode current of 15 millamps, the formula becomes:

$$\text{Resistance} = \frac{10 \times 1,000}{15} - 666 \text{ ohms.}$$

Universal Valve for A.C. or D.C. Mains

The third type of valve, namely, the "universal" Ostar Ganz valve, is a form of indirectly-heated valve, the heater of which is designed to work directly from any supply, whether A.C. or D.C., without the necessity of a mains-transformer or a voltage breakdown resistance, thus permitting the construction of a receiver which will operate from either D.C. or A.C. mains without alteration or adjustment. Such a receiver is, of course, an attractive proposition to a constructor who, although now on D.C., shortly expects to be changed over to A.C., but it is not essential to use the special universal valve—ordinary indirectly heated D.C. valves can be used. The only unconventional point is the rectification of the supply for anode current when the set is connected to A.C. mains. This is, however, quite a simple matter if it is borne in mind that a metal rectifier offers very low resistance to current passing one way, and, consequently very little voltage drop will occur through this component with direct current passing through it. Under these conditions, the rectifier is naturally only an "ornament," but in any event, it does not prevent the passage of D.C. and does not reduce, to any appreciable extent, the voltage available for the anode circuits. When the set is connected to A.C., however, the rectifier comes into its own and converts the alternating current to a pulsating unidirectional current which, after smoothing, is suitable for the anodes of the valves. It will be appreciated that in such a circuit the smoothing must be exceptionally comprehensive, partly due to the fact that only half-wave rectification is employed. It is necessary to point out that a "universal" receiver of this type does not comply with the various electrical regulations when connected to A.C. mains, as in the absence of the usual mains-transformer the set is, of course, connected directly to the mains. This can be overcome quite simply by interposing a 1:1 transformer between the set and mains, removing it, of course, when using the set on D.C.

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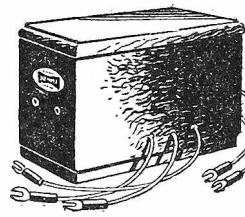
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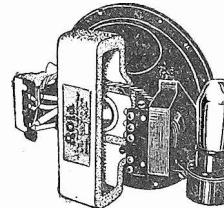
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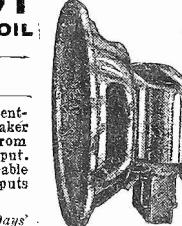


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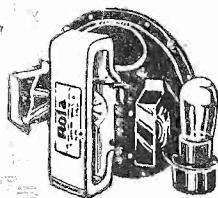
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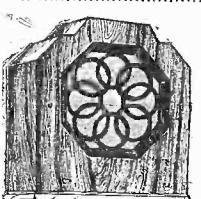


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FACTS & FIGURES

Components tested in our Laboratories

SOVEREIGN PERMEABILITY TUNER

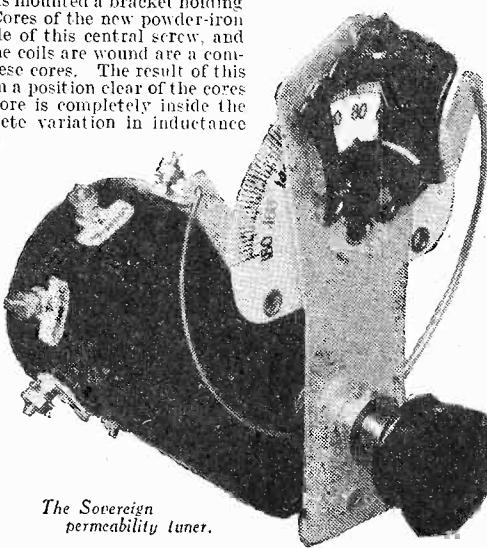
The first permeability tuner to be received for test is illustrated below. This comes from the Sovereign factory, and is no doubt the forerunner of many similar tuners. As may be seen, it consists of an ebonite casing to which is fitted a number of terminals and a slow-motion drive. The latter works with a very small reduction, approximately 9 to 1. The actual mechanism is simple but very effective, and employs a coarse thread screw running through the centre of the assembly, upon which is mounted a bracket holding two separate windings. Cores of the new powder-iron are arranged on either side of this central screw, and the formers upon which the coils are wound are a comfortable sliding fit over these cores. The result of this is that the coils travel from a position clear of the cores to a position where the core is completely inside the coil, thus giving a complete variation in inductance value. The sizes of the windings, cores, etc., have been chosen in conjunction with the pitch of the thread to produce the same effect as we have been used to experiencing when tuning a coil through the broadcast band with a .0005 mfd. tuning condenser. The spacing of the principal stations is quite effective, although on our particular coil a slight cramping was noticed in one part of the scale. For all normal purposes, however, the tuner will be found most effective, and will enable a very simple type of receiver to be built up in view of the fact that no tuning condenser is required. The price is 15/-.

*The Sovereign
permeability tuner.*



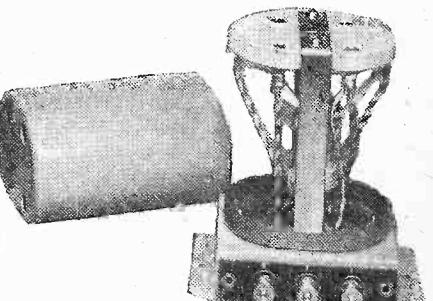
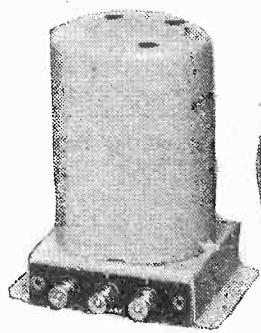
WATMEL HYWATT RESISTANCE

A NEW type of resistance has been produced by Messrs. Watmel Wireless, and a sample has been received for test. It consists of a wire winding over a tube of heat-resisting material, the completed resistance being coated with an enamel of pleasing blue-grey. The specimen received was rated at 5,000 ohms, and on test it was found to be slightly higher than this figure, the error being well under two per cent. A test was arranged to ascertain the current-carrying capacity of the complete resistance, and it was found that at 20 mA the rise in temperature was just discernible. At 80 mA the resistance was too hot to touch, but no burn-out took place nor did the enamel flake. The resistance was then run continuously for twenty minutes at 30 mA, and although a slight smell was given off the wire stood up to the strain admirably. It would appear from these tests that the resistance is admirably suited for incorporation in eliminators and mains receivers and will handle quite a considerable wattage without risk of breakdown.



NEW W/B SPEAKER

WE have already mentioned the good points of the W/B Microlode Speaker, and we have now received a smaller edition of this interesting device, in the form of a permanent-magnet moving-coil speaker with matching device fitted to the base. The cone and chassis is of the same size and material as the Microlode type P.M.4A, but the magnet system is somewhat smaller. The ordinary "U" type is employed with a central pole, and a small bracket is bolted to the magnet to accommodate the special tapped transformer. As in the case of the P.M.4A, two rotating arms are fitted with nine positions, and these may be turned to provide any one of seventeen different ratios. For this purpose two black terminals are fitted to the base, under which conditions the matching may be carried out for practically any type of output valve. When, however, push-pull or similar circuits are used, an extra connection is made to a red terminal situated between the two black ones, and the two arms are then adjusted symmetrically, providing only four ratios. The speaker was tested on a standard three-valve receiver and gave very good results. Speech was clean and crisp, with no trace of boombiness, and music was of that forward type now associated with W/B speakers. Sensitivity was quite high for a speaker of this class, and the volume from a two-valver was ample, whilst on a four-valve it was possible to push volume to the limit without any trace of distress. The matching device was found most effective. As this speaker is only 32s. 6d., it will no doubt prove immensely popular.



The new British Radiophone intermediate frequency transformer with screen removed to show construction.



PRACTICAL LETTERS FROM READERS

The Editor does not necessarily agree with opinions expressed by his correspondents.

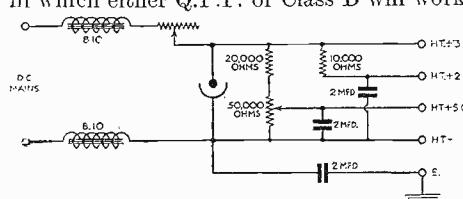
A Soldering Hint

SIR,—I read your replies to queries each week, and find them not only exhaustive and accurate, but written in an interesting manner.

But this week I noticed a reply which I think could be made a little more helpful to the reader (T. G., East Twickenham), who, like myself, two months ago could not make a soldered joint. However, I read various instructions for soldering, but *very, very* seldom could I manage to get the solder to run evenly. However, one evening I resolved to find out my difficulty. I was soldering various parts for experiment and I discovered the answer to my problem. I soon found that the solder would only melt where the iron was properly "tinned," and I noticed that a small "blob" of solder adhered on this part. If this "blob" is carefully applied to the part to be soldered, a neat job will result.—H. RATCLIFFE (Manchester).

Class B Eliminator

SIR,—I have taken your weekly book since its introduction, and I think it good value for a modest threepence. Some months ago you promised us a H.T. Eliminator using a neon tube. I am still waiting to see that, but I have been using one with the greatest of success for three months now, and find it is the only method in which either Q.P.P. or Class B will work



Circuit diagram of Mr. E. C. Hobday's eliminator.

properly, dry batteries proving unsatisfactory. The accompanying diagram shows the circuit. All materials are Ferranti, with the exception of the neon tube, which is a Cossor. There is absolutely no hum on my mains, which are very dirty and difficult.

What I should like to see in PRACTICAL WIRELESS is a battery-operated set with an Igranipak or similar unit with two variable-mu detector and Class B output with A.V.C. and tone control. I believe this could be done, and I for one would welcome any attempts made in that direction. Wishing you the best of success.—EDGAR C. HOBDAY (East Finchley).

The Fury Four

SIR,—I have built your Fury Four, and it's the best set I have yet constructed. Mr. Camm is to be congratulated as the

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New BLUE SPOT 9 PM with transformer	32/-	5/-	6 of 5/-

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New W.B. MICROLODE PM-A UNIT with transformer and special matching switch	24/-	5/-	5 of 5/-

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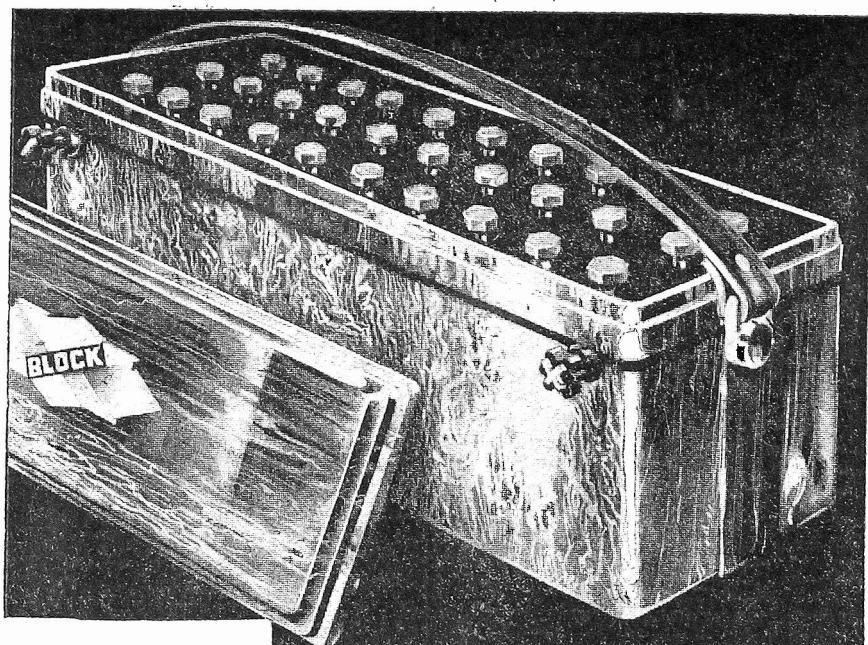
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The Editor will be pleased to consider articles of a practical nature suitable for publication in PRACTICAL WIRELESS. Such articles should be written on one side of the paper only, and should contain the name and address of the sender. Whilst the Editor does not hold himself responsible for manuscripts, every effort will be made to return them if a stamped addressed envelope is enclosed. All correspondence intended for the Editor should be addressed: The Editor, PRACTICAL WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, W.C.2.

Owing to the rapid progress in the design of wireless apparatus and to our efforts to keep our readers in touch with the latest developments, we give no warranty that apparatus described in our columns is not the subject of others patent.



October 7th, 1933



revolution!

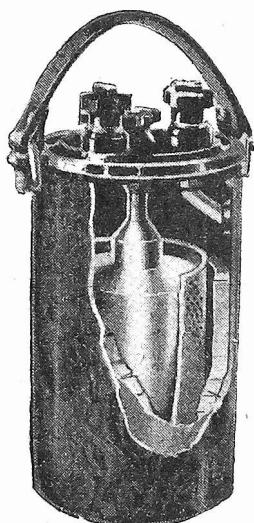
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RADIO CLUBS AND SOCIETIES

Club Reports should not exceed 200 words in length and should be received First Post each Monday morning for publication in the following week's issue.

SLADE RADIO

A talk on Cinematography was given by Mr. B. H. Gale, M.P.S., at the meeting held last week. In this he described the different sizes of films that are used and the cameras, also how the films are developed and printed. After this he dealt with the projectors and the question of magnification, etc. A number of Pathé films were shown, and also two of his own taking. The meeting proved interesting and was fully enjoyed by those present.—Hon. Sec., 110, Hillaries Road, Gravelly Hill, Birmingham.

KETTERING RADIO AND PHYSICAL SOCIETY

A very successful radio exhibition, sponsored by this Society, was held recently in the Central Hall, Kettering, at which nearly 9,000 people attended. In the main hall there was a fine show of receivers ranging from two and three-valve sets to superhets. A set which created a good deal of interest was fitted with the new iron-cored coils combined in a special circuit, giving increased selectivity, range, and amazing sensitivity. Besides wireless equipment there were many exhibits of interest to the amateur photographer, and the home-movie and television enthusiast. The trade was well represented and on these stands a comprehensive display of components and complete apparatus was to be seen. Music was relayed to the stallholders by a similar method to that used at Radio-Lympia, a powerful amplifier being installed in the balcony.—Hon. Sec., R. J. Pankhurst, 9, Shakespeare Road, Kettering.

RADIO, PHYSICAL AND TELEVISION SOCIETY

The following is a copy of a letter sent to old members of this Society:—

SIR,—It has been decided by the Committee of the late Radio and Television Society to reconvene their activities under the name of the Radio, Physical and Television Society. The annual subscription will be as before, 10s. (5s. for Junior Members). Owing to the kind offer of Dr. C. G. Lemon, F.Ph.Soc. (Lond.), A.M.I.R.E., who, you will no doubt remember, gave us several lectures in the past, it has been made possible to re-form the Society. The increased facilities and accommodation which we have now obtained from Dr. Lemon at his laboratory include permanently-installed 42-metre and 5-metre transmitters, together with all types of physical apparatus, X-rays, etc. The very latest type of Television reception will be demonstrated by our President, Major Oates. A lecture hall and workrooms are available, and facilities and assistance will be afforded for members to conduct their own research work. Lectures will be given from time to time by Dr. Lemon on physical subjects, including high frequencies and high-voltage discharges, electrochemistry, photo-electric cells, etc.

A very large percentage of the late members have decided to rejoin, and we shall be very glad if you will kindly fill in the enclosed post card to signify your personal intentions. The first meeting will be held on Friday, the 22nd inst., at 8 p.m. sharp, at Headquarters. We do hope you will rejoin as we can assure you that we have a fine programme for the coming winter months.—F. J. Bubear, Hon. Secretary, 67, Nassau Road, Barnes, S.W.13.

BEGINNER'S SUPPLEMENT

(Continued from page 154)

a loud-speaker is used for this purpose, and it is connected to the output valve in the manner shown in Fig. 26, so that all the current flowing from the high-tension battery to the anode of the valve must pass through its windings. First of all, we will assume the case of a "moving iron" loud-speaker, of which the general form of construction is shown in the sketch of Fig. 27. The armature is always attracted towards the permanent magnet, and when a steady current is passed through the windings the armature takes up a stationary position some little distance from the magnet. As the current is varied the armature is attracted more or less strongly. Imagine, now, a rapidly varying current (such as is produced by the signals) passing through the windings and you will realize that the armature will be set into vibration at the same frequency as the current fluctuations. As the armature vibrates, the cone naturally vibrates with it, and so causes the air vibrations which we know as sound.

REPLIES TO

LET OUR TECHNICAL STAFF SOLVE YOUR PROBLEMS

QUERIES and ENQUIRIES

by Our Technical Staff

The coupon on this page must be attached to every query.

If a postal reply is desired, a stamped addressed envelope must be enclosed. Every query and drawing which is sent must bear the name and address of the sender. Send your queries to the Editor, PRACTICAL WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton St., Strand, London, W.C.2.

tion of Data Sheet No. 10 will no doubt help you to choose a valve for the purpose.

ALTERING A COIL

"The reaction control on my set is much too jumpy. As soon as I turn the reaction knob the set goes plump and no signals can be heard. I know it ought to come in smoothly, but I cannot get it. I think the coil has too much reaction on it, and I should like to take some of it off. How many turns would you advise me to start with?"—(T. V. C., Salford, Lancs.)

We would not advise you to tamper with the coil at all. If you examine the circuit carefully you will probably find that the erratic reaction is not due to the reaction winding on the coil but is due to too great a voltage on the detector valve, or too large a reaction condenser. Try, first of all, reducing the H.T. voltage. If the receiver employs decoupling resistance in the anode of the detector valve you can increase the value of this. If you have a spare reaction condenser of smaller value try the effect of using that. The coil should not be touched unless everything else fails to

TESTING A RECEIVER

"My receiver has suddenly stopped working and I am rather keen on testing it out myself in order to find the fault. I do not, however, know how to set about the task, and I should like you to help me in this respect. Unfortunately I do not know sufficient about wireless to be able to tell you what is likely to be wrong, and all I can say is that the signals suddenly stopped; they did not fade away, but went suddenly in the middle of a talk. Do I need many instruments for testing?"—(W. G., Highgate).

It is a difficult task for a beginner to completely test a receiver, although by systematically going over it it is possible in many cases to locate the fault. A combined volt and milliammeter will do for the purpose, and the first job is to insert this in each anode lead in turn in order to ascertain that the valves are working correctly and that H.T., G.B., and L.T. supplies are all intact. Failure of any valve to give a correct current reading may be due to a broken anode circuit or the interruption of one of the battery supplies. These should not be difficult to trace out. If all anode currents are correct, the lack of signals must be due to a broken or otherwise interrupted grid circuit, and the various grid leads and components should be tested for continuity. The loud-speaker or 'phones should naturally be tested, and where it is not possible to employ a satisfactory instrument, the best method of testing is by means of substitution. There is no need for an exact replacement, but a resistance, condenser, or transformer approximately of the same value may be used in order to verify connections.

CHOOSING A VALVE

"I am making a one-valve set for an old person, and I am not certain as to which is the best valve to use. I intend to wind a coil of my own, using reaction and a loose-coupled aerial. Very loud signals are not desired, but the upkeep must be kept down, as I do not want her to bother with battery charging. 'Phones only will be needed. What do you advise?"—(R. H., Finchley).

In view of your locality you will have no difficulty in obtaining a really powerful signal from the local Brookmans Park transmitters. Therefore a valve taking little anode current should be used, combined with moderate amplification properties. Undoubtedly you cannot do better than use one of the so-called General Purpose types of valve, that is, one with an impedance between 10,000 and 20,000 ohms, and with an amplification factor between 15 and 30. A perusal of various valve manufacturers' lists, or an examina-

tion. First of all, a really efficient indoor aerial, when it is intended to use a crystal receiver or some other type of low-powered set, should be arranged so that every possibility of loss is removed. In other words, it is necessary to ensure that every bit of energy possible is conveyed to the receiver for detection. This is what is meant when you are advised to use good quality wire supported on good insulators at least one foot from the walls, etc. On the other hand, the majority of homes to-day employ fairly high-powered receivers, or at least, one-valve sets. In these cases, the amplification provided by the receiver offsets the slight losses entailed by using a special metallic aerial close to the wall. The crystal receivers also are generally only used when the local station is situated fairly close, and therefore there is not the necessity to rely on a very good pick-up and almost any piece of wire may be slung up in a haphazard manner to receive the transmission.

LOUD-SPEAKER DEFECT

"I am troubled by a peculiar dizzy sound from my loud-speaker. On loud passages it seems to give a noise somewhat between a buzz and a whistle, a sound which is rather difficult to describe. Whilst I was looking at the speaker in order to try and find the cause of the trouble I noticed a small spark when the noise appeared. I wonder if you can suggest the reason for this, and also the cure?"—(P. R. M., Poidhu).

You do not state what type of speaker is in use, nor the type of set, but we would imagine that the speaker is a moving coil fed direct from the D.C. mains, and that the receiver also is fed from the same source. The speech coil has become loose or out of centre and is shorting against the pole piece, with the result that a partial short of the mains is being effected. If, however, ordinary apparatus is in use we should be glad to know in order that we may offer some alternative suggestion. In giving this additional information, let us know the make of the speaker, method of connection to the receiver, type of output valve, etc.

ADDING A.V.C.

"I have a powerful commercial receiver which uses two variable-mu H.F. stages and two L.F. stages. I get practically every station in Europe and the volume on most is terrific. I find, however, that when trying for some weak stations, with the volume full on, I suddenly come to one of the English or high-powered Continentals and the speaker gives a tremendous bang and I am afraid of damaging it. I think I could fit A.V.C. to this set to avoid this trouble, but am not quite certain of the connections. Could you give me the best method of fitting up the A.V.C. to this set?"—(Y. A. L., Kilburn).

It would certainly be worth while to fit some form of automatic volume control to the set, and we do not think you could do better than purchase one of the new A.V.C. units which are now on the market. The Varley component is inserted in place of the H.F. choke at present in the anode circuit of the detector valve, and the Wearite is connected in a similar position, but the present choke is left in position. The instructions supplied with the components will enable you to connect the unit correctly.

FREE ADVICE BUREAU COUPON

This coupon is available until Oct. 11th, 1933, and must be attached to all letters containing queries.

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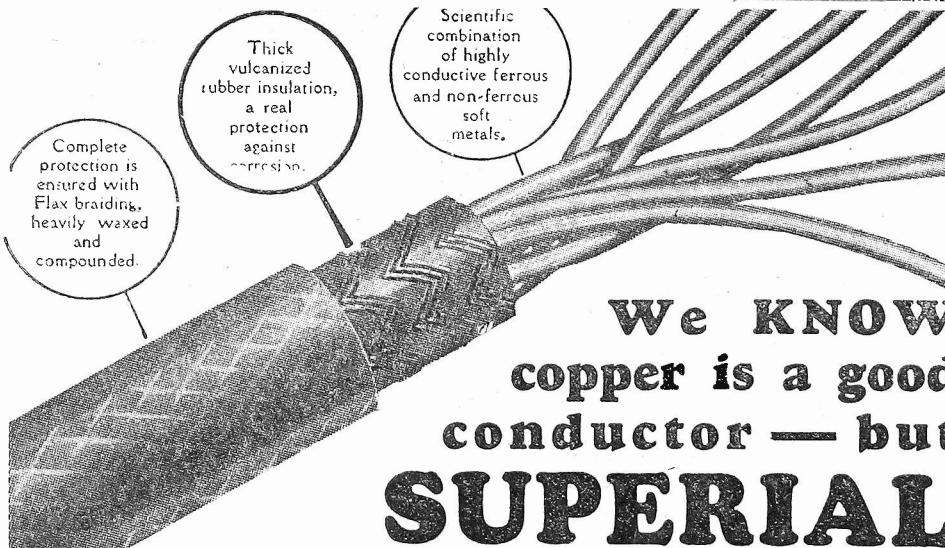
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THE MULTITONE GUIDE TO CLASS B

A USEFUL handbook dealing with Class B amplification has just been published by the Multitone Electric Co., Ltd. The book is in two parts, dealing with theory and practice respectively, and these in turn cover such subjects as Class B transmission, Economy, Driver Transformers, Ensuring Good Quality and Stability, Concerning Sources of H.T. Current, Class B Circuit Design, and L.S. matching. Readers interested in the subject are advised to write for a copy of this handy booklet. The address is 95-98, White Lion Street, London, N.1.

WESTINGHOUSE METAL RECTIFIERS

WE have received a copy of a handbook, entitled "The All-Metal Way, 1934," which deals with the construction of H.T. battery eliminators and battery chargers embodying Westinghouse Metal Rectifiers. The book, which is primarily of interest to home constructors who prefer to build their own apparatus, deals fully with rectification, battery eliminator problems, mains conversion, and battery charging. There is also a section devoted to Westectors and their uses in various circuits. The book is well illustrated with diagrams which should be very useful to the home constructor. Copies of the handbook can be obtained for 3d. each, post free, from The Westinghouse Brake and Saxby Signal Company, 82, York Road, King's Cross, N.1.

MULLARD LOOSE-LEAF CATALOGUE

FOUR new perforated leaflets have just come to hand from the Mullard people for inclusion in their loose-leaf catalogue. Leaflet No. V.R. 139, giving details of the new Mullard multi-mu screened pentode valve, type V.P.4, and Leaflet No. V.R. 138, describing a screened pentode valve, type S.P.4, should be inserted immediately before Leaflet No. V.R. 78/1A, describing valve type S.V.4.

Leaflet No. V.R. 136, giving particulars of the Mullard indirectly-heated screened-grid valve, type S.G.20, should be inserted immediately before Leaflet No. V.R. 137, describing valve type H.L.20.

The reduced price sheet should be inserted before the sheet already in the front of the catalogue, retaining the one that already appears.

TUNGSRAM BARIUM VALVES

A NEW departure in the construction of indirectly heated D.C. valves has been evolved by the Tungsram laboratories, which has resulted in a comprehensive range of these valves enabling the constructor to build almost any type of D.C. mains receiver. These valves will be found to be very economical in use, consuming a low filament current of 0.18 amps. or 40 watts on a 220-volt supply. In a folder we have received from Tungsram Electric Lamp Works (Great Britain), Ltd., 72, Oxford Street, London, W.1, full particulars and prices of the complete range of Tungsram valves are given. There is a valve for every purpose, and in the tables of characteristics for the power and output valves the output in milliwatts is given and also the anode conductance. The inclusion of these extra data will be helpful to the experimenter.

Replies to Broadcast Queries.

MAC (Muswell Hill): We can trace the following call-signs: (1) G6KA, Keith F. Hardie, 66, Ulverston Road, Walthamstow, E.17; (2) G6HG, Portable call of G2RV, S. Higson, "Heublecroft," Egremont Promenade, Wallasey, Cheshire; (4) G6KZ, W. McKenzie, 183, Great Junction Street, Leith, Edinburgh; (5) G6HB, G. M. Horn, 1, Hilton Avenue, Urmston, Manchester; (6) G6DU, J. McOmisch, "Curraheen," Perth Road, Crieff, Perthshire; (7) G6LL, J. W. Mathews, 178, Evening Road, Clapton, London, E.5; (9) G6AA-G6AB, Durham and Northumberland Collieries Fire and Rescue Brigade, 854, Scotswood Road, Newcastle-on-Tyne; (11) G6QX, R. Jardine, "Remuicourt," Ardleigh Green Road, Hornchurch, Essex; (12) G5XL, H. P. Townhill, 27, North Parade, Lincoln; (13) G5RR, Portable call of G2WJ, R. L. Royle, "Cholmeleys," Beech Hill, Hadley, Barnet, Herts; (17) PAOEC, A. S. M. Rottier, Hoofdstraat 3, St. Janssteen, Z.VI, Holland; (19) F8CA, Audureau, 29, Rue de Bretagne, Laval, Mayenne (France); (21) F8VH (P2) Caradec, 177, Rue Croix Nivert, Paris (XVe); (23) F8GG, Lerambert, 70, Rue Barrault, Paris (13e); (24) F8YQ, Le Jolif, Plabennec (Finistere), France; (25) ON4FE, I. van Hool, 23, Avenue Sécrétarie Meyer, Merksem, Antwerp (Belgium); (28) F8VH, Perrin, 13, Avenue des Templiers, Epinal (Vosges), France; (29) F8SK, Dorts, 1, Rue Delf, Bordeaux (Gironde), France.

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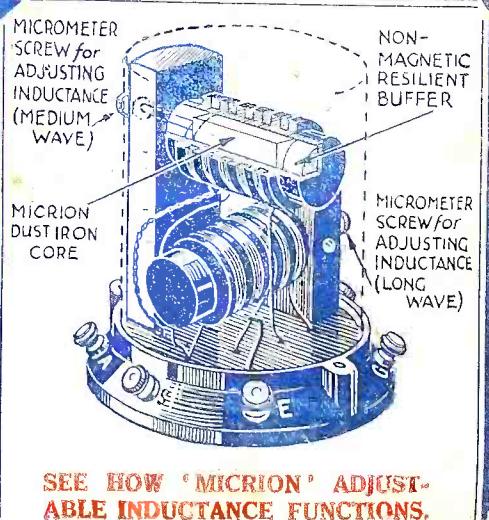
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