THE LUCERNE WAVE PLAN EXPLAINED!

Practical Wireless

3D.

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EDITED BY F. J. CAMM

Making the PORTOVISOR

The First PORTABLE TELEVISION RECEIVER

"I was amazed . . . station after station rolled in . . ."

The original of this letter may be inspected at our Head Office, Cossor House, Highbury Grove, London, N.5.

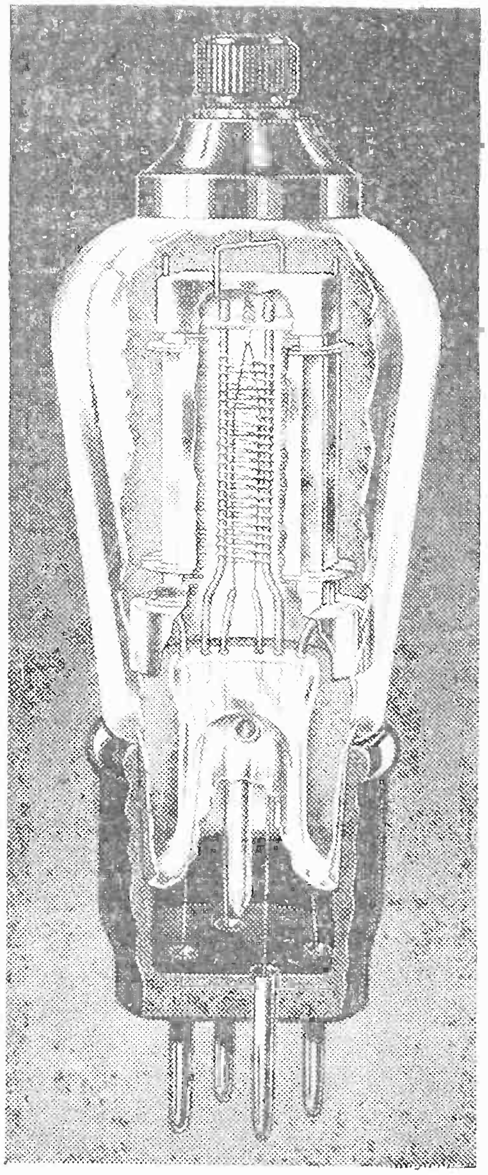
Bolton,

Dear Sirs,

*I am using a well-known Set which is noted for the way it brings in stations. I recently borrowed a Cossor Metallised Screened Grid Valve to try. I first tried three other makes of S.G. Valves and there was not much difference between them. Then I tried the Cossor. **I was amazed—station after station rolled in.** I set the dials to a certain station, took out the Cossor and tried the other S.G. Valves, result—flat nothing—only a whisper. I put back the Cossor and **without touching the dials** the Set was roaring the place down. You cannot give a better test than this.*

Yours faithfully,

Signed . . . .



THE simplest and most economical way to increase the efficiency of your Receiver is to replace your old Screened Grid Valves with Cossor. The right type of Cossor Screened Valve will make your Set like new again — restore its vigour. Thousands of Wireless Users are rejuvenating their Sets with Cossor — Britain's most efficient Screened Grid Valves. You should too.

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COSSOR SCREENED GRID VALVES

To A. C. COSSOR, LTD., Melody Department, Highbury Grove, London, N.5.

Please send me, free of charge, a copy of the Cossor 72-page Wireless Book B.V. 33.

Name

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A. C. COSSOR LTD., Highbury Grove, London, N.5. Depots at Birmingham, Bristol, Glasgow, Leeds, Liverpool, Manchester, Newcastle, Sheffield, Belfast, Cardiff and Dublin.

3300

INSIDE! BUILDING THE NUCLEON CLASS B FOUR

EDITOR:
Vol. III. No. 68 || F. J. CAMM || Jan. 6th, 1934.
Technical Staff:
W. J. Delaney,
H. J. Barton Chapple, Wh.Sch., B.Sc. (Hons.), A.M.I.E.E.,
Frank Preston, F.R.A., W. B. Richardson.

ROUND *the* WORLD *of* WIRELESS

The Lucerne Plan

IT has previously been announced in these columns that the new "Lucerne Plan" would come into operation on January 16th, and many readers have written to ask in what way this would affect them. Briefly, it can be stated that the wavelength changes will have only a very slight effect upon the listening public, and that reception will be no more difficult than before. As a matter of fact, the modified wavelengths will, in nearly every case, simplify the selectivity problem, but so that every reader may have a thorough understanding of the new position which will be created we have had prepared a special article on this subject. The article appears on page 781 of this issue, and, since it has been written at the last moment, it is right up-to-the-minute, including even those wavelength adjustments which have been called for at the very last moment. This article gives further proof of our policy of keeping all readers well abreast of the latest developments.

Television *is* Here

THERE are still a few sceptics who claim that television is not popular, and even that it cannot be so until vast changes have taken place in regard to the method of transmission and reception of light. These sceptics are generally of the "Micawber" type who are "always waiting for something to turn up" instead of helping in the development of new sciences. Whilst such people are dreaming, PRACTICAL WIRELESS is *acting*, and all readers will welcome the essentially-practical constructional article in this issue which tells you how to make a really efficient *portable* television receiver. This new piece of apparatus is easy to make, and by no means costly, so that there is no reason why every PRACTICAL WIRELESS reader should not proceed at once to enjoy to the full the many television broadcasts which are now made by the B.B.C. It is a true fact that the present television broadcasts are of distinct entertainment value, and any intelligent person who has lately "looked-in" with an efficient receiver such as the "Portovisor" will not dispute this fact.

The "Portovisor" is the *very first portable television receiver to be offered to the home constructor* and it marks a really definite forward step in modern television technique — yet another proof that "PRACTICAL WIRELESS" ALWAYS LEADS!

New KDKA Broadcast Feature

IN addition to the special transmissions made for the benefit of trappers, police, and other inhabitants of the Polar circle, the KDKA and W8XK stations of East Pittsburgh broadcast on every fourth Sunday of the month a brief sacred service and special messages to foreign missions throughout the world. This is carried out on the lines adopted by the Vatican station at Rome, except for the fact that the transmissions in this instance are destined to Baptist, Methodist, and Presbyterian denominations. The broadcasts may be picked up in the British Isles at G.M.T. 04.30 (Mondays) on 308 metres (KDKA) and 48.86 metres (W8XK).

INSIDE!
No. 2 OF
"PRACTICAL TELEVISION"

MAKING A PORTABLE TELEVISION RECEIVER

AMATEUR TELEVISION IS HERE!

France's High-Power Stations

THE seven high-power transmitters which the French State System is erecting have now been given official names in order to distinguish them from other private stations which are operating in the same districts. When reference is made to them they are to be known as follows: Toulouse-Muret, Lyon-Tramoyes, Nice-La Brague, Paris-Villejuiste, Lille-Camphin, Marseille-Realtor, and Rennes-Thouries. Their power varies between 60 and 100 kilowatts.

Germany Nearing Five Million Listeners

IN the course of November, 202,000 new registered licences were taken out in Germany, thus bringing up the total to 4,837,539. It is hoped that the five million mark may be reached by the New Year. To beat England's figures Germany still has a long way to go, as we are over one million ahead.

Wireless in Taxis

IN the United States, whence the idea originated, some two thousand taxi-cabs which were equipped with wireless sets for the entertainment of both driver and passengers were ordered by the police to remove the apparatus or to have their licences revoked. The decision was taken following an accident in which a man was knocked down and seriously injured. The New York authorities, in taking their decision, stated that in addition to distracting the attention of the drivers, radio broadcasts in such vehicles would increase street noises to the extent of making the taxicabs a public nuisance. Although they had become popular with the general public, the disadvantages of the innovation far outweighed its benefits.

More Powerful Broadcasts from U.S.A.

A RECENT decision taken by the American Radio Commission permits three of the most important U.S.A. stations to increase their power to 50 kilowatts. In these circumstances it is expected that the range of WGN, Chicago (416.7 m.), WBZ, Boston (303 m.) and WHAM, Rochester, New York (260.9 m.), will be greatly extended, and their broadcasts should be picked up more easily in the British Isles. It is anticipated that a similar licence may be given to them. They are: WMAQ, Chicago (447.8 m.); WHAS, Louisville (365.9 m.); KNX, Hollywood (285.7 m.); and WBT, Charlotte (277.8 m.).

ROUND the WORLD of WIRELESS (Continued)

Ekco Bakelite Factory

AT the bakelite plant at the Ekco works, fourteen hydraulic presses are in operation at the present time, including one 1,500-ton and two 1,100-ton machines. Each of these presses weighs over 100 tons, and stands 35ft. high from its base. This base is situated in vaults below the main floor of the plant. Nearly 2,000 tons of concrete were used in preparing the foundations, which are sunk 13½ft. into the ground. The hinged dies used for moulding cabinets weigh over 5 tons each, except on the 1,500-ton press, where the die weighs 15 tons. Two cabinets are produced simultaneously by this machine. The electricity consumed by the power plant amounts to nearly 10,000 units a day, or three and a half millions a year. Movement of an electrically worked lever plunges the upper die into the mould. A specially prepared sand-glass is used for timing, in preference to a clock or other mechanical device.

When the die is released, the cabinet is lifted out of the mould. Mortised screw sockets and metal inserts are firmly moulded in place, and the only operation needed to complete the cabinet is to break off a thin "flesh" of bakelite, and to give the edges a slight polish.

Concerts of British Music

IN addition to the seven new works to be introduced at the Six Concerts of British Music to be held in Queen's Hall, under the auspices of the B.B.C., some fifteen or so major works already well-known to the public are included in the programmes. On January 1st Delius's *A Song of the High Hills*, for chorus and orchestra, will be given, as well as Constant Lambert's *The Rio Grande*, for solo piano, chorus, and orchestra. The former is one of Delius's most beautiful works, and "is full of a sense of spacious solitudes and far horizons." Few contemporary works have won such wide popular approval as Lambert's *The Rio Grande*, which is undoubtedly one of the most successful attempts yet made to apply the rhythmic idiom of modern dance music to a serious symphonic work.

January 5th brings Arthur Bliss's *A Colour Symphony*, a work of outstanding merit deriving "its name from the fanciful attachment of a colour to each of the four movements." Another important work is Eric Fogg's Bassoon Concerto which is dedicated to Archie Camden, the renowned principal bassoon of the B.B.C. Orchestra, who is to be the soloist on this occasion.

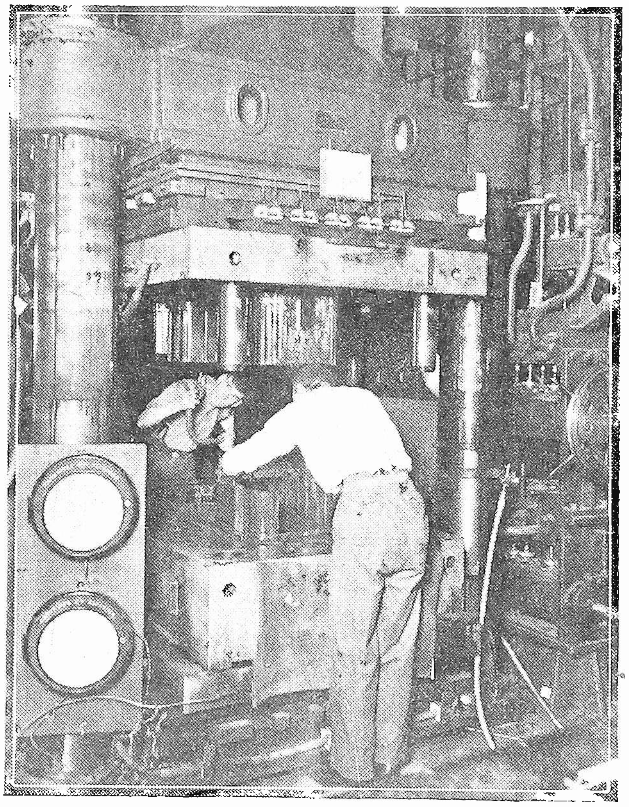
Revue Fare from Birmingham

ON January 12th, listeners will hear on the Midland wavelength both a play and a revue. The play is Philip Johnson's one-act comedy, *To-day's the Day*, and it will be given by the Birmingham Repertory Theatre Company from the specially equipped studio at this theatre. The revue, a Martyn Webster production, is entitled *Hold That*, and represents an hour in a film studio. The book and lyrics are by Michael Barringer, author of many scenarios, and the music by Reginald

INTERESTING and TOPICAL PARAGRAPHS

Bristoe, who has also written many compositions for the films. Alma Vane and Hugh Morton will be in the cast.

THE POWER OF THE PRESS!



How bakelite is moulded at the Ekco Factory. (See the paragraph on this page.) This press produces two Model 74 Cabinets at one stroke.

SOLVE THIS!

Problem No. 68

Jenkinson made up a mains receiver employing an S.G. H.F. stage, detector and L.F. stages. When tested results were very poor, and he accordingly connected a milliammeter in the anode circuit of each valve in turn. The detector and output stages were quite in order, but the H.F. valve showed no anode current at all. The H.F. choke was tested and found continuous, and an H.T. reading could be obtained between the anode and the earth line. All connections to the valve-holder were found to be soundly made and the valve was tested and found up to standard. What was wrong? Three books will be awarded for the first three correct solutions opened. Address your attempts to The Editor, PRACTICAL WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2. Envelopes should be marked Problem No. 68, and posted to reach here not later than January 8th.

SOLUTION TO PROBLEM No. 67

In joining the grid leak to the first valve, Jones overlooked the fact that a condenser was also needed in order to avoid short-circuiting the grid-bias control. It should have been joined between the grid and the top end of the coil.

The following three readers successfully solved Problem No. 66, and books have accordingly been forwarded to them:

K. Goldsmith, 47, Sycamore Grove, Southend, Essex. J. J. Keegan, 7, Hulton Street, Salford 5, Lancs. H. Jones, 67, Trehorne Road, Caerau, Bridgend, Glam.

Musical Comedy Excerpts

THE name of David Wilson (baritone) has become synonymous with the Belfast station's programmes of musical comedy excerpts. He will make another appearance before the microphone on January 8th, in a programme of this type. It includes excerpts from *The Desert Song*, *The Maid of the Mountains*, and *The Lady of the Rose*.

Aladdin

THE first relay from the Opera House, Belfast, comes into the programmes on January 9th, when an excerpt from the pantomime *Aladdin* will be heard by Belfast listeners. This is the thirty-ninth annual pantomime which has been performed in this theatre, and a long list of "stars" has been assembled for it.

Missing Links

A COMEDY in three scenes by Charles K. Ayre, *Missing Links*, will be heard by Northern Ireland listeners on January 12th. Charles K. Ayre is one of the most popular of the Ulster playwrights, and a number of his plays have been broadcast, including *Loaves and Fishes* and *The Wee Motley Cow*. *Missing Links* is a witty story of golf and science intermingled.

Military Band Concerts

THERE are two band programmes from the Midland Regional studio during the week—one by the Creswell Colliery Band, conducted by David Aspinall, on January 9th, and the other by the Birmingham Military Band, conducted by W. Arthur Clarke, on the 11th. Interludes in the two programmes are occupied respectively by Patricia Rossborough (syncopated pianisms) and Harold Pollard (entertainer).

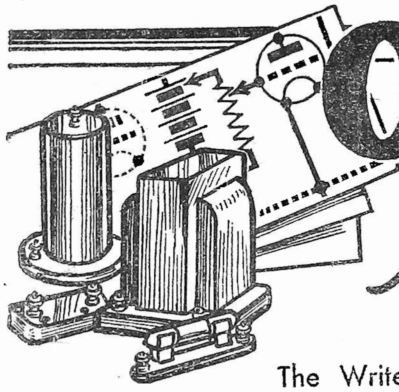
Interesting Talks from Midland Regional

TWO talks of special interest to the Midland coalfields will be given in the week's Midland Regional programmes. On January 8th, Robert Tredinnick interviews a Midland miner for the Boyhood in Industry series, and on January 10th Professor K. Neville Moss, of the University of Birmingham, gives a talk on the development of mining in the region during the past century. Professor Moss had several years of practical experience in Staffordshire coalfields before coming to Birmingham University.

Television in Italy

ENGINEERS of the E.I.A.R., the Corporation responsible for the broadcasting system, have installed the first Italian television transmitting and receiving station at the Palace of Electricity at Turin. Broadcasts will be made on short waves, namely, between 5 and 8 metres, and will consist of relays of topical events, public performances from theatres, and scenes from streets. A regular service will not be started until a similar station has been completed at Rome; it is being built for the transmission of sound films on 180 lines and 25 images.

CLAIM YOUR TOOL KIT WITHOUT FURTHER DELAY!



Old Components in New Circuits

The Writer Explains in this Article How Many of the Newer Circuit Arrangements Can Be Tested by Using Old Components in Various Ways.

By BERNARD DUNN

ANY enthusiast who does a fair amount of experimenting collects so much surplus gear that there is some difficulty in knowing how best to dispose of it. Many of the parts could be used to make up an obsolete set, but that would not interest the keen experimenter in the least. The difficulty is that most of the newer circuit arrangements entail the use of new components of special design and having characteristics in keeping with the modern circuit, and there are undoubtedly many possessors of old parts who are not prepared to go to the expense of buying new ones and scrapping those which are already on hand. In this article it is hoped to show how old parts, perhaps taken from the junk box, can be employed with fair success in the latest types of receivers. It is not going to be suggested that the old parts will give results equal to those to be obtained by using modern ones of special design, but they will, at least, enable the experimenter to try out some of the newest circuit ideas at a minimum of expense.

A Simple Band-Pass Scheme

Nearly every set built more than a couple of years ago suffers from comparatively flat tuning, so that anything which will give increased selectivity is to be appreciated. A very simple, and yet reliable, method of obtaining really sharp tuning with practically any type of set is shown in diagrammatic form at Fig. 1. In that drawing it is assumed that plug-in coils are employed in the existing set, but it should be mentioned that the very same idea is equally applicable to a receiver in which tuning is carried out by means of a more up-to-date dual-range tuner. It will be seen that the wire which previously joined the aerial terminal to the aerial tuning coil has been removed and another wire taken from the aerial terminal to one end of a second coil, across which is connected another .0005 mfd. tuning condenser. A connection is taken from the "top" end of each coil to the "fixed plate" terminals of a differential condenser, which may be of any capacity between .0001 and .0003 mfd.; the centre terminal of the condenser (moving plates) is not used. The arrangement shown and described is that of "top-capacity" band-pass tuning, the differential condenser providing the small capacity coupling. This condenser behaves like two small variable condensers connected in series, with a result that the actual capacity in circuit is only a few microfarads. Capacity is at a maximum when the moving plates are half in mesh with the two sets of fixed ones, and can be reduced almost to zero by fully meshing the moving plates with either set of fixed ones. This method of tuning not only increases selectivity, but makes the degree of selectivity easily variable. Thus the circuits tune most sharply when the capacity is at a minimum, and vice versa.

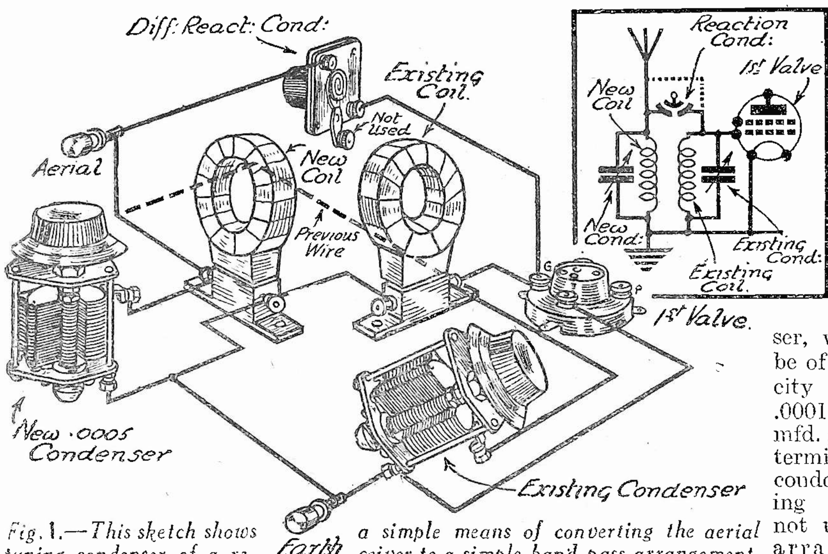
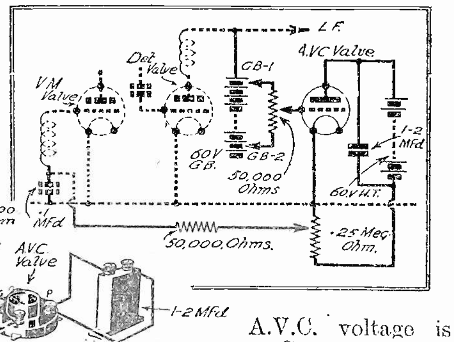


Fig. 1.—This sketch shows a simple means of converting the aerial tuning condenser of a receiver to a simple band-pass arrangement.

In trying the band-pass system described the new and old coils (or tuners, as the case may be) should be arranged with their axes at right angles, or else they should be screened from each other. If the two coils are identical the settings of the variable condensers will be practically the same for any particular wavelength, but in any case both condensers should be tuned accurately and with care. The simplest way to tune to any station is first of all to set the capacity of the differential to its maximum and find the rough tuning positions; after that the capacity can gradually be reduced and the condensers finely adjusted at the same time.

A.V.C. with a Spare Valve

Every experimenter wants to try automatic volume control, but it is not everyone who feels prepared to buy special apparatus until the efficacy of the scheme has been verified. Provided that a spare valve (of practically any type) as well as two high-tension batteries (which need not be in new condition) and a few odd resistances and condensers are on hand, an excellent form of A.V.C. can be tried out by using the connections given in Fig. 2. The drawing shows that a lead is taken from the "top" end of the detector H.F. choke to the positive socket of the 60-volt G.B. battery, whilst a 50,000 ohm potentiometer is connected between two tappings on the same battery, its slider being joined to the grid of the A.V.C. valve. Low tension for the A.V.C. valve is taken from the common source, but high tension and grid bias are obtained from the new batteries already mentioned. It will be seen that the negative lead from the H.T. battery is taken to the filament of the A.V.C. valve through a .25 megohm resistance, and it is across this that the A.V.C. voltage is set up. Consequently, a lead is taken from the negative end of this



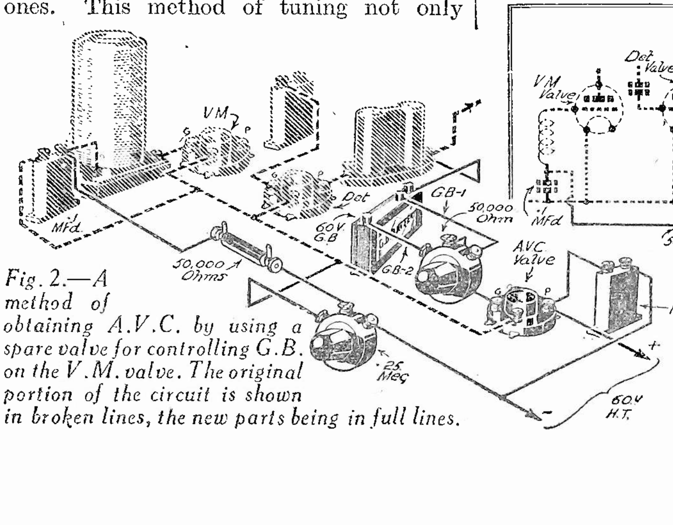
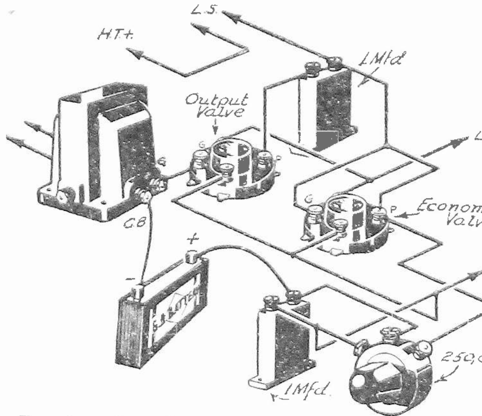


Fig. 2.—A method of obtaining A.V.C. by using a spare valve for controlling G.B. on the V.M. valve. The original portion of the circuit is shown in broken lines, the new parts being in full lines.

(Continued overleaf)



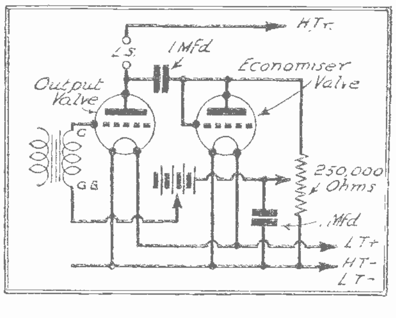


Fig. 3.—A good method of reducing the H.T. current consumption of the output valve by using an additional valve as an "economizer."

(Continued from previous page)

to the grid circuit of the V.M. valve, through a 50,000 ohm decoupling resistance. In order that the arrangement can be followed more easily, the new parts and wiring are shown in full lines, the normal portion of the receiver being represented by broken lines. The method of adjusting this A.V.C. arrangement is as follows. First remove both G.B. wander plugs and tune in a weak station in the usual way; next insert the plug marked "G.B.—1" and find a position for it at which signal strength is unaffected; finally insert the second G.B. plug into a socket giving about 9 volts less than that occupied by the first plug. If signal strength then becomes less, adjust the potentiometer until it is brought back to the previous level. Should it be decided to retain the A.V.C. as a standard fitting a switch should be included in the lead from the potentiometer to the G.B. battery to prevent the latter from being run down whilst the set is out of use.

H.T. Current Economizer

Another interesting use for a spare valve is represented by the arrangement shown in Fig. 3. In this case the valve acts as an H.T. economy device by reducing the current consumption of the output valve, which may be either a triode or a pentode. The valve now acts as a half-wave rectifier and therefore the grid and anode may be joined together. The two are then connected to the anode of the output valve through a 1 or 2 mfd. condenser, a 250,000 ohm potentiometer being joined between the anode and filament of the valve. If two L.F. valves are employed in the set it will be necessary to use a second G.B. battery, but if there is only one the original battery may be used, and the connections to it altered as shown. The principle upon which the scheme works is fairly simple and is that some of the signal currents appearing in the anode circuit of the output valve are allowed to "leak" through the fixed condenser to the anode of the "economizer" where they are rectified, so setting up a difference of potential across the ends of the potentiometer. As the positive side of the G.B. battery is connected to the potentiometer, it thus becomes more positive in respect to the filament. This is the same as making the grid bias voltage applied to the output valve less negative. It will be understood that the voltage developed across the potentiometer varies in proportion to the signal voltages being handled by the output valve, and thus the negative bias actually applied becomes less as the signal voltages increase. Because of this it is possible to apply a nominal G.B. voltage much greater than that required by the valve when it is fully loaded, without running the risk of introducing distortion. The connections are self-explanatory, and it need only be added that the negative grid-bias wander plug should be inserted in a socket providing about twice the voltage previously employed, after which the potentiometer should be adjusted to a position at which there is no distortion on either weak or loud signals. A certain amount of initial experiment might be called for in order to find the most suitable voltage, but once that has been done the "economy" device is perfectly self-compensating. Try it!

Q.P.P. with Old Transformers

Quiescent push-pull amplification is not used very widely now, due to the fact that Class B is cheaper and equally effective, but it gives a much greater output than can be obtained from an ordinary power or pentode valve. This system of amplification can be tried fairly easily and in a form that will prove reasonably effective by following the connections shown in Fig. 4. Two ordinary L.F. transformers are used, the primary windings of these being connected in parallel and the secondaries in series in order to obtain a high step-up ratio. "Stopper" resistances of 50,000 ohms each are included in the grid leads to the push-pull valves, but these will not be essential if the valves have similar characteristics and if the transformers are alike. In any case, however, it is desirable that the valves should be of the same types and that both transformers should have the same ratio. The valves represented are pentodes, although triodes can be used instead, merely by omitting the two leads marked "H.T. 2" and "H.T. 3." For preference, the output choke should be a special Q.P.P. one, but it is sometimes possible to obtain good results by using an ordinary centre-tapped choke, provided that it has a low D.C. resistance and a high inductance. As an alternative, a pair of plain chokes may be joined in series, the H.T. positive lead being taken from their junction. Of course any form of output choke would be unnecessary if a loud-speaker of the special Q.P.P. type were to be used with the set.

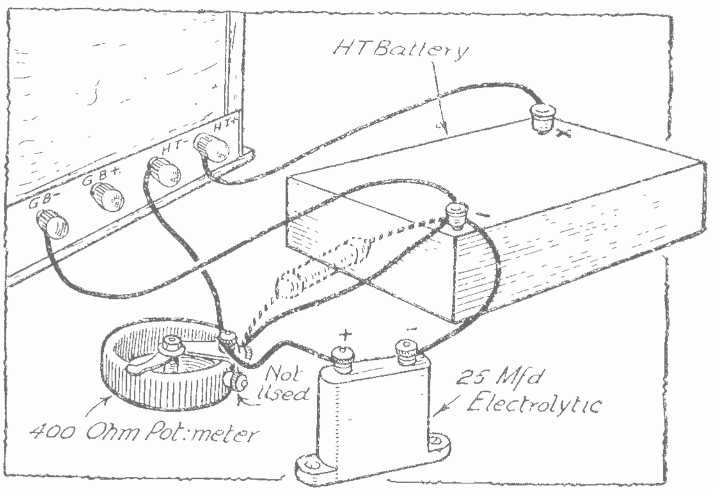


Fig. 5—Automatic grid bias can be provided in the manner shown above by making use of an old potentiometer.

In using the improvised Q.P.P. amplifier the G.B. voltage to the last two valves should be increased to about twice the value normally required by the valves. It is also desirable that the preceding (detector) valve should be of comparatively low impedance; one of the "detector" or "L.F." type will fill the bill.

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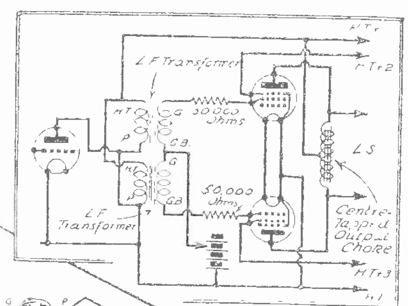


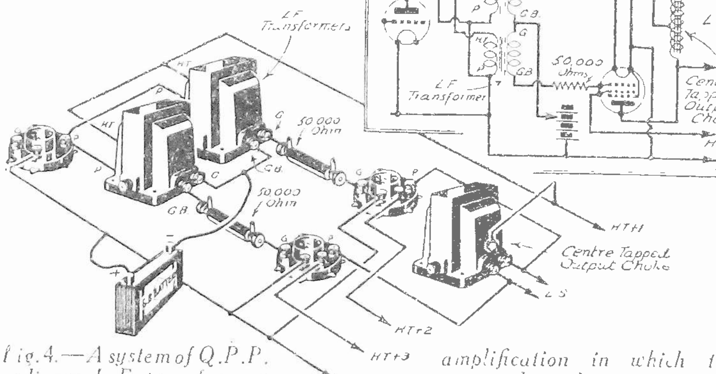


Fig. 4.—A system of Q.P.P. amplification in which two ordinary L.F. transformers are used in the input circuit.

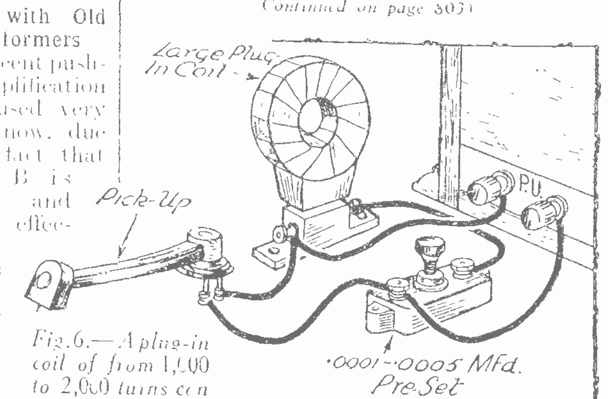
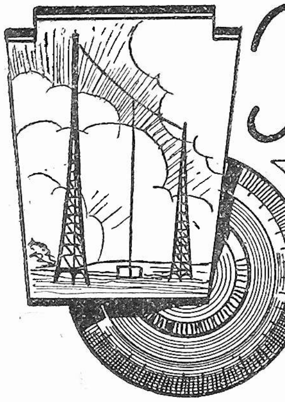


Fig. 6.—A plug-in coil of from 1,000 to 2,000 turns can often be used in series with a pre-set condenser as a pick-up scratch filter.



The LUCERNE WAVE PLAN and its CONSEQUENCES

In this Article, Mr. J. Godchaux Abrahams Discusses the New Wavelengths and Their Effect Upon Your Particular Receiver.

THE alleged revolutionary upheaval of the broadcasting world due to the coming into force of the new Lucerne Wave Plan on January 15th appears to have aroused some anxiety in the minds of many listeners. From the letters we have received on the subject it would seem that many readers are labouring under the impression that the game of "general post," played by the European transmitters on that date, is likely to cause considerable inconvenience, inasmuch as such a change in channels will necessitate a complete re-dialling and will render the present condenser scales obsolete.

Let it here be said that however drastic the re-allocation of wavelengths appears at first sight, the practical result of the allotment of new channels to the individual stations will not affect listeners to any appreciable degree. As will be explained later, the actual adoption of the new wave plan will only restrict the number of broadcasts available to the energetic knob-twiddler; it means that such advertised features as "logs of eighty and one hundred stations" may become a thing of the past. The number of transmissions receivable may be curtailed, it is true, but on the other hand the placing of the transmitters in the wave-band having been carried out in a more judicious manner, the relatively fewer programmes tuned in will be less marred by interference and thus a greater proportion of worth-while broadcasts should be available to the ordinary listener.

How the Stations are Divided Up

To understand the reason for which a lesser number of stations will be captureable, it is necessary that some explanation should be given of the new Lucerne Plan. It must be borne in mind that at present wavelengths have had to be found for over two hundred and thirty different European stations, and this number is still likely to grow. Do not forget that in addition to providing a "place in the sun" for the broadcasting studios, clear channels must exist for wireless transmitters connected with such vital services as shipping, commerce, meteorology (weather forecasts, storm warnings, etc.), fog beacons, and for the police, military and naval authorities of the various States. For this reason the band which can be allocated for the use of wireless education and entertainment is strictly limited, and its boundaries are well defined. To place, therefore, over two hundred and thirty stations, it has been necessary to create one hundred and thirty separate channels comprised in three different bands, namely, (*a*) 1,000–2,000 metres (300–150 kilocycles), (*b*) 600–1,000 metres (500–300 kilocycles), and (*c*) 200–600 metres (1,500–500 kilocycles). Of these (*a*) and (*c*) may be said to be mainly reserved to broadcasting stations, but (*b*) is merely "lent" for the purpose on the understanding that the use of it may be withdrawn if it is found that any interference is caused to other services.

The reason for which exclusive channels for all stations has not been found possible is attributable to the fact that if mutual interference between two neighbouring stations is to be avoided, a definite separation of at least nine kilocycles must exist between their respective transmissions. It is, consequently, this necessary separation which has restricted the number of available wavelengths throughout the three wave-bands and which, for the same reason, has compelled the authorities to create four different classes of channels. These are (1) exclusive, (2) shared, (3) national common and (4) international common. Let me make this clear. In the first case we have, without doubt, a channel coveted by all, namely, an exclusive one to the station to which it has been allocated: in the second we find a wavelength which must be shared with some other transmitter. In this instance the geographical position plays an important part; where such a split channel has been allocated the choice has fallen on two stations at the greatest distance possible from each other. The disadvantage of this arrangement as against the exclusive wavelength will be seen later. The national and international common waves are self explanatory; the former are channels reserved to one country for a number of stations, and on which a programme may be simultaneously broadcast—it will be mainly used for relays —the latter represents a channel allotted to a number of different countries and, as may be realised, can only be used for low power stations in view of the fact that they may be operating at the same time, and will be broadcasting individual entertainments.

How the Listener is Affected

Now, before going into the question of power, let us see in what way this new plan can affect the listener. If we consider the exclusive channels nothing much has happened as, whether we tune in Rome on 420.8 metres as against its present position on 441 metres, we are not affected in any way. We may change the exclusive channels all round with the sole result that in the case where dial readings are in degrees we shall have to make a fresh list of the stations. Where the dials of manufacturers' receivers have been made out in station sequence, most of them have taken steps to provide their clients with new readings to conform with the wave plan.

If your neighbour, Mr. Brown, moves from No. 78 in your street to No. 20 in the next, there is nothing to prevent your telephoning to him; all that has happened is that his calling number has changed and you will require a new telephone list by your instrument.

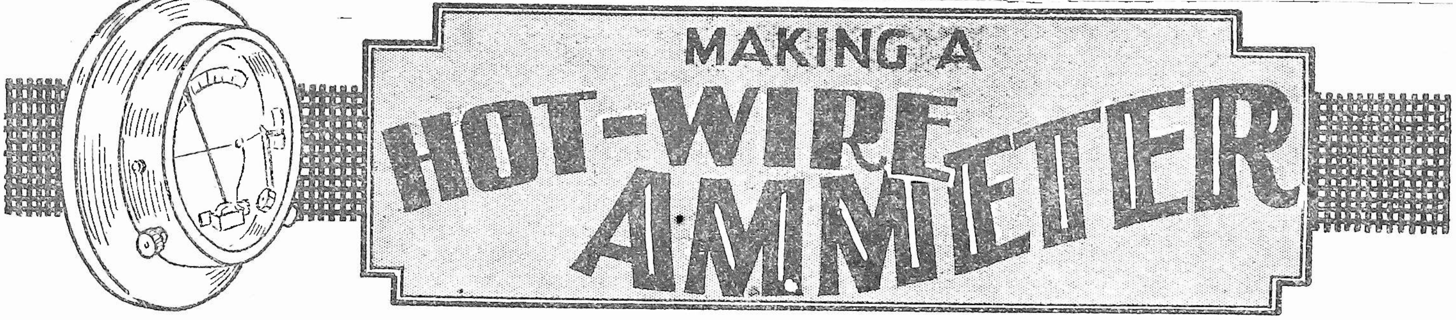
But what about shared waves? Well, here we are not so well off because, to use the same illustration, Mr. Brown and Mr. Smith may be living in the same house and now possess the same telephone number. In reality, in the case of shared channels, although a clean transmission may be secured locally, it is unlikely that a listener at a distance will be able to receive the transmission without interference.

If you happen to be living at a point situated half-way between the two stations and your receiver is capable of capturing signals from both, it is evident that the jumble of sounds originating from different programmes will be an unpleasant one. Such a contingency, however, so far as is possible, is warded off, as already stated, by allocating the channel to two transmitters at a great distance from each other. As an example let me cite Limoges (France) and Dniepropetrovsk (U.S.S.R.), both ordered to work on 328.6 metres. As there is little chance of your hearing the latter in the British Isles, there is a good possibility that the French concerts through the former will still be picked up fairly free from interference. Most of the trouble which might have arisen through the sharing of channels has also been obviated by limiting, in either or both cases, the power of the transmissions.

Allocating the Power

The new wave plan, however, had many snags to contend with, one of the most troublesome lying in the power to be used by transmitters already under construction. The limitation of energy permissible in the different wave-bands in respect of the various classes of waves could not be enforced without exceptions, a matter which increased the difficulty of compiling the plan. Roughly speaking, the power allowed to the stations is as follows: For those working on wavelengths between 1,000 and 1,980 metres, up to 150 kilowatts, with a special dispensation granted to Moscow, already in operation, to use 500 kilowatts; transmitters located on channels between 272.7 and 545 metres, 100 kilowatts (Budapest, Vienna, Prague, Leipzig, Paris PTT, Toulouse PTT and Rennes-Thouries were exempt from this restriction); 60 kilowatts maximum if working between 240 and 272.7 metres and 30 kilowatts for waves between 200 and 240 metres. For the common waves allotted to stations in one specified country, not more than 5 and 2 kilowatts, and for international waves in the last class 200 watts is not to be exceeded.

(*Continued on page 784*)



MAKING A HOT-WIRE AMMETER

An Ammeter has Many Applications in Wireless, and This Article Describes How a Simple and Efficient Instrument can be Made at Home.

THE construction of a meter for measuring current is not a task that is generally undertaken by the amateur, principally because it is considered to be outside his scope. This might be true so far as instruments of the moving-coil or moving-iron type are concerned, but a hot-wire instrument can easily be made by anyone who is accustomed to using simple tools, especially if he has some knowledge of electricity. A hot-wire ammeter of the kind to be described is illustrated in Fig. 1, and it can be seen from this that there are very few parts required, whilst none of these are of an intricate or complicated nature.

How It Works

Before dealing with the actual constructional work it will be better to describe briefly the principle upon which the type of meter under discussion operates, so that later remarks will more easily be understood. As the name implies, a hot-wire ammeter reads the intensity of a current due to the heating of a length of wire. The wire used has a (comparatively) high resistance, being made of german silver, nichrome or some similar alloy, and thus as current is passed through it the wire becomes hot, just in the same way as does the element of an electric fire or the filament of an electric lamp. It is well known that when a metal is heated it expands, and it is this property which is made use of in the hot-wire type of meter. The length of resistance wire in the meter is so arranged that when it expands it is caused to sag, due to the tension exerted upon it by a thread attached to a spring. In passing from the wire to the tension spring the thread passes over a small pulley or roller to which is attached a pointer. Thus, as the resistance wire expands (and sags), the thread moves, rotates the pulley, and so drives the pointer over a scale, which may be calibrated in amps or volts as required.

Parts Required

Rather than give a specific design entailing the use of exact parts, which might in some case make it necessary to employ a lathe in their construction, more general information will be given so that it may be applied in utilizing small parts, as well as odds and ends, that might be on hand. The principal parts are shown in Fig. 2, and in that illustration it is assumed that the reader will have facilities for turning up in a lathe the wooden case. Failing such facilities, it will be found quite possible to employ a rigid cardboard or paxolin tube mounted on a wooden baseboard. Yet another alternative is to use a short length of metal cylinder attached to a baseboard, but in that case insulating washers must be provided for all the terminals and screws. The casework is dimensioned, although the figures given are really arbitrary ones, which may be modified in accordance with the actual component parts which are made use of. Assuming the use of a wooden case, the first thing to make is the "bridge" that serves as a mounting for a steel spindle, on which are mounted the pulley and pointer. All dimensions are given, and the most convenient metal is mild steel hoop, but those who prefer to make a rather better-looking job will prefer to use a stout gauge of brass sheet. First make the piece marked "A" by cutting off the metal to length and bending it in a vice. Next drill the necessary holes; three of these are about ⅛in. diameter, the third being drilled 5/32in. and tapped out with a 3/16in. Whitworth tap. After that the piece marked "B" can be cut to length and suitably drilled, using a ⅛in. bit. It is essential that the holes in "A" should register exactly with those of "B," and this can be ensured by using the former part as a template. The final task in connection with the spindle-mounting "bridge" consists of making a small indentation with a centre punch in the centre of the piece marked "B" and also in the centre of the 3/16in. grub screw marked "C." Here again accuracy is an important feature, so great care should be taken that the two punch marks are directly opposite to each other. This can be ensured by first making a pointed screw to fit in place of "C," mounting "A" and "B" on a flat piece of wood and tightening down the screw until its point makes a mark on "B"; this mark will then indicate exactly where the point of the centre punch should be placed. Another way is to use the ordinary screw, turn this down until its end touches plate "B," and then carefully scribe round it, afterwards finding the centre of the small circle.

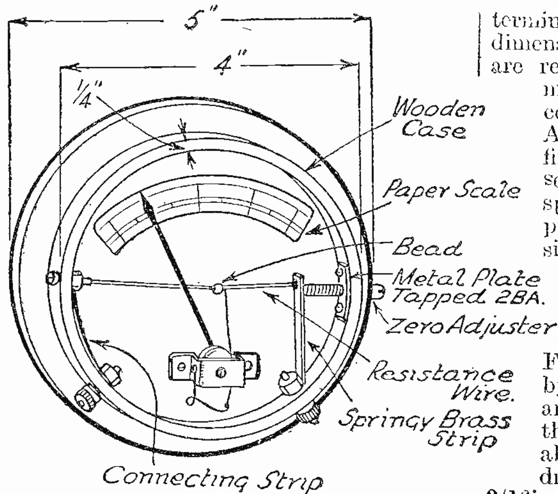


Fig. 1.—Sketch of the finished hot-wire meter described: dimensions are only approximate.

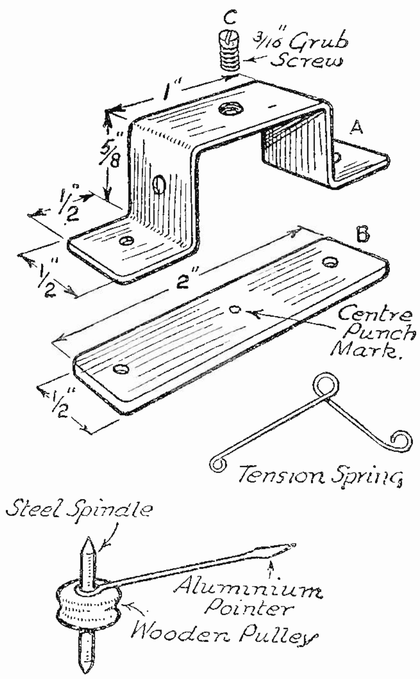


Fig. 2.—The above sketches give all constructional details for the more important parts of the meter described.

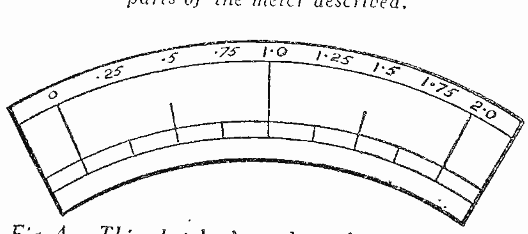


Fig. 4.—This sketch shows how the paper scale is calibrated in fractions of an ampere.

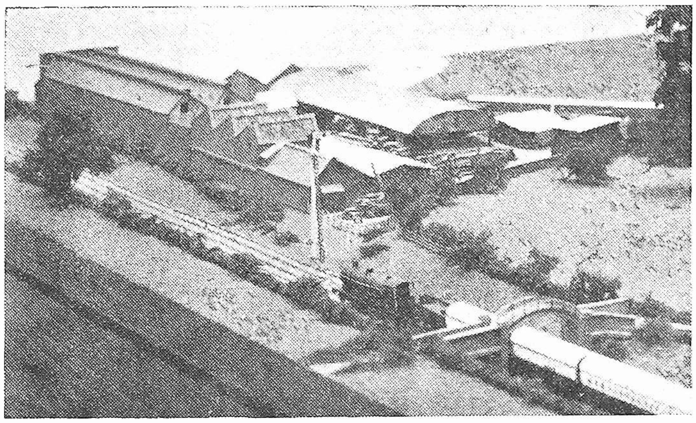
The Spindle and Pointer

The small spindle can next be made from a short length of steel wire. Both ends are pointed, and the points can be formed most satisfactorily in a lathe, but failing that, they can be made with a file, or on a small grindstone or emery wheel. The points should be really hard, and, therefore, if the wire has been filed or ground, it will be best to harden them by heating the wire to redness, allowing it to cool to the point at which it is just changing from yellow to blue and then plunging it in water. A small pulley must next be made to fit tightly on to the spindle, and this can be done most easily in a lathe. On the other hand, a suitable pulley might be found in the junk box, whilst failing that, it can be

(Continued on page 784)

TABLE-TOP CINEMATOGRAPHY

How interesting Movies can be Taken with Models.



This model looks like "the real thing" in a home cine film.

Studio pictures, whether "stills" or "movies," go on through winter, undeterred by the short days and poor natural light. But you do not need to be a professional to take good indoor shots. It is quite sufficient to use the ordinary lights of the room, together with an inexpensive lamp in a good reflector. One of the simplest forms of indoor photography is the "table-top" picture. Model railway engines and accessories in these days are built with careful regard to detail, therefore a good imitation of the real thing can quite easily be made up and an interesting movie table-top film can then be taken. Amateur photographers are given still more scope for ingenuity in movie table-top pictures which have an increasingly popular future.

Other Features

A HOME-MADE TALKIE APPARATUS FOR TWELVE SHILLINGS AND EIGHTPENCE

How a reader solved the cost problem.

SECRETS OF TITLING

By the Editor.

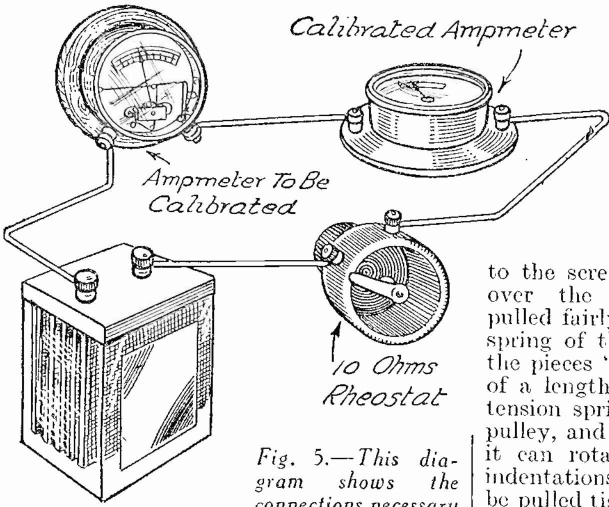


Fig. 5.—This diagram shows the connections necessary when calibrating the hot-wire ammeter.

(*Continued from page 782.*)

built up by winding a narrow strip of thin paper round and round the spindle, applying thin glue while winding.

The tension spring is called for next. A suitable shape is indicated in Fig 2, although the exact form is by no means important provided that it maintains a (rather weak) steady tension on the thread. A short length of 24-gauge spring-steel wire is most suitable, and if this is not on hand it can be obtained from practically any ironmonger. At first it will be quite hard and springy, so that it is impossible to bend it to shape without first annealing it by holding it in a gas flame until it becomes red hot. Allow the wire to cool slowly, and then bend to shape with a pair of small round-nose pliers. The wire must then be tempered again by heating it and plunging in water when it cools to the temperature indicated by a blue coloration. The spring is attached to the piece we have called "A" by means of a short 4 B.A. bolt and nut.

When that has been done the spindle can be fitted with a pointer made from a length of 22-gauge wire. Copper wire of this gauge can be used, and it should first be straightened and then looped round the spindle and secured with a spot of solder. Later it can be cut to the correct length, after which the end should be flattened out to enable more accurate readings to be taken.

The Zero Adjustment

The final step in regard to the constructional work is to fit the terminals (either 4 B.A. or 2 B.A. can be used) to the case, mount the length of resistance wire, and fit the "zero adjuster." The latter name might not be quite understood, so it should be explained that after prolonged use the resistance wire will become permanently elongated, and therefore some provision must be made for tightening it and setting the needle to read zero when no current is being passed through the meter. The method of complying with these requirements is straightforward enough, since it is only necessary to attach one end of the resistance wire to a strip of springy brass, which is held under the head of one terminal and arranged so that it can be moved by means of an adjusting screw. The latter is merely a 2 B.A. brass bolt passed through a strip of brass or steel tapped out and screwed to the inside of the case. If the latter were made of metal, the tapped plate would, of course, be sweated on instead of being held by screws.

Assembling the Parts

In assembling the meter the terminals and zero adjuster should first be fitted. After that, a screw should be attached to the inside of the case diametrically opposite to the adjusting screw. One end of a length of resistance wire should then be soldered to the screw, a small glass bead slipped over the end, and the wire then pulled fairly tight and soldered to the flat spring of the zero adjuster. Now mount the pieces "A" and "B," attach the end of a length of thin thread or silk to the tension spring, wind this once round the pulley, and fit the spindle in place so that it can rotate easily in the centre-punch indentations. Finally, the thread should be pulled tight and tied to the bead. Now set the pointer to a zero (left-hand) position, when the meter will be ready for calibration. Before this can be carried out a scale, consisting of a strip of paper glued on to a thin strip of wood, must be made as shown in Fig. 3. This should be fitted inside the case by means of two screws which can easily be removed again later on.

Calibration

For calibration purposes the meter should be connected up in series with an ammeter (any type) of known accuracy, a filament rheostat of between 10 and 20 ohms, and an accumulator (see Fig. 4). By turning the knob of the rheostat into various positions a number of current readings can be taken, and the positions of the pointer corresponding to, say, .25, .5, 1, 1.5, and 2 amps. can be marked off in pencil on the blank scale. After that the scale can be removed and neatly divided up into suitable parts as shown at Fig. 4. It will be found that the divisions are not proportional to the current passing, but that they are more "crowded" toward the bottom of the scale; this is due to the fact that the sag of the wire is not proportional to the expansion, nor is the expansion proportional to the current.

So far no mention has been made of the gauge of resistance wire needed. As a matter of fact, this depends upon the maximum current reading required, the particular kind of wire employed, and the size of the meter (more correctly, the length of the wire). When using Eureka wire and making the case to the approximate dimensions shown, the wire should be about 32 s.w.g., when a maximum reading of 1 amp is required, or 26 s.w.g. when the instrument is to read up to 2 amps. If a still lower maximum reading is called for, such as when measuring the aerial input current from a transmitter, 36 or 38 s.w.g. wire will prove more suitable. It might be mentioned that it is always best to make the meter so that the full-scale deflection is only slightly greater than the value of current to be measured most frequently. By following this rule the most accurate results will be obtained, since it is obvious that more correct readings are to be obtained on the "open" part of the scale.

The instrument described can be used as a voltmeter for reading up to 10 volts or so, if the resistance wire is of about 32 gauge. In that case it can be calibrated with fair accuracy by connecting it in *parallel* with a *high-resistance* voltmeter which is known to give true readings.

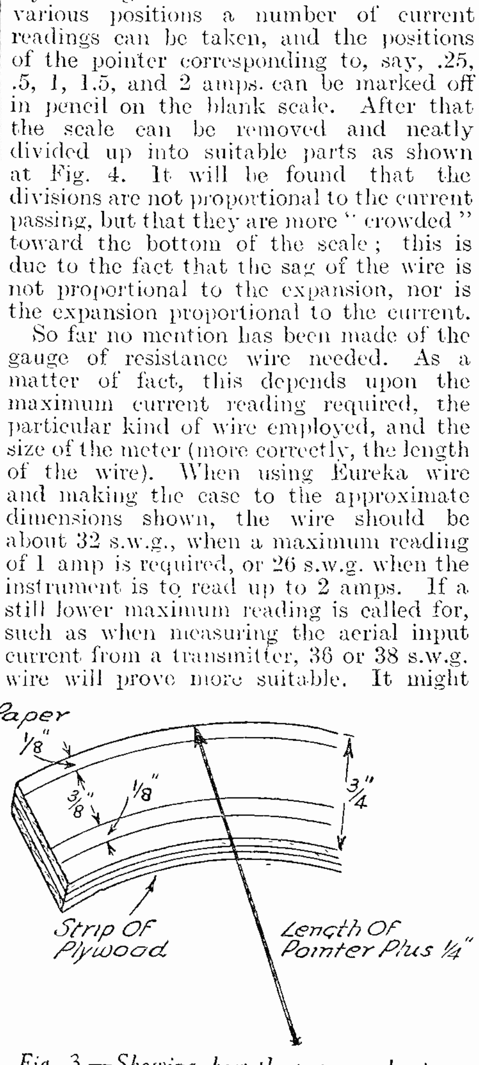


Fig. 3.—Showing how the paper scale is drawn and mounted on a strip of wood.

THE LUCERNE WAVE PLAN

(*Continued from page 781*)

In addition, stipulations were made as regards direction of aerials and also in some instances transmitters must reduce their power after sunset. As you will see, many points have been considered and much has been done with a view to making the plan the best possible in the circumstances; it would be a great pity if in practice its results fell far short of its theoretical possibilities.

The British listener who is content to limit his wireless entertainments to those provided by the B.B.C. stations has no cause for complaint; the B.B.C. authorities have successfully fought out his case and, as will be seen by the channels secured, the majority of wavelengths are exceedingly favourable. There is, in general, very little change from those used to date.

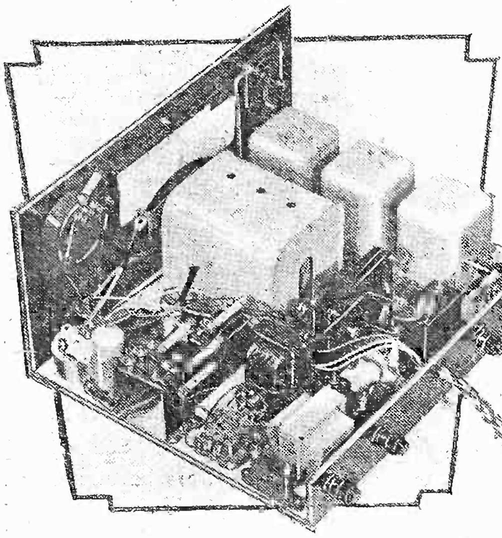
When, however, the 150-kilowatt station at Droitwich is ready to take over its duties as a National transmitter in lieu of Daventry, some further alterations will be made. The power of the London, North, West and Scottish Regionals will be raised to 70 kilowatts and the London, North and West National on the medium-waves will close down. This will permit a slight change over in channels which will prove to our advantage.

Re-shuffling May Be Necessary

It is to be remembered that of the thirty-six European States interested in the Lucerne discussions, delegates of only twenty-seven countries agreed to the decisions on the day the Convention was signed. As Finland, Luxembourg, Sweden, Poland, Lithuania, Hungary, Holland and Greece refused to recognise the wave plan—at least in some of its findings—a certain amount of re-shuffling may still take place.

As far as can be foreseen the failure of the dissenting States will not affect the medium broadcasting band, but there is every likelihood that much alteration must be made in the allotment of channels between 1,000 and 2,000 metres before these countries will declare themselves satisfied. In these circumstances, it would appear that stations working on the "high" waves may not change over on January 15, but until further notice will continue in their present positions.

It is evident that the Lucerne Plan was only compiled as a *modus vivendi*, and that if it is to satisfy all interested parties, some concessions may be needed. As it is, it is supposed to stand good for two years, but revisions are not barred, and it forms an excellent basis for negotiations. It will be given a thorough trial when stations take up their allotted channels in January, and as may be seen from the list published, it should go far to alleviate the present congested state of the ether.



Building the NUCLEON 4

A Simply-Constructed and Highly-Efficient Four-Valve Receiver Which Employs Iron-Core Tuning Coils and a Class B Output Stage

A LARGE number of readers have asked for a receiver which embodies the two most recent improvements in battery-receiver design, and also has a wavelength calibrated dial. The great difficulty with this type of tuning device is that it is not always possible to obtain an accurate indication of the exact wavelength to which the receiver is tuned owing to the use of coils and condensers of different makes, or which are not adapted to one another. The condensers which are supplied by Messrs. Wingrove and Rogers are designed to be fitted with full-vision scales having an accurately calibrated wavelength scale, and these are designed for coils having a certain inductance value which must agree on both wave-bands. Thus, in this particular case we find that the scale is suitable for coils which on the medium wave-band have an inductance of 157μH and on the long wave-band an inductance of 2000μH. The Nucleon coils manufactured by Messrs. Wright and Weaire are found to have these precise figures, and thus it should be possible to combine the two components to provide an accurately tuned receiver. Our experiments have confirmed this point, and we are thus able to introduce to the reader an easily constructed receiver which does not employ an expensive combined tuning pack, but which does, at the same time, enable him to obtain one of the great advantages of the commercial receiver, namely, a calibrated receiver. Station searching is greatly facilitated when this type of receiver is employed, as all that is necessary is to look up the wavelength of the desired station and to set the pointer to that portion of the dial. If the station is within range it will be heard, and there will be no loss of time due to searching for a station which is probably out of range of the receiver.

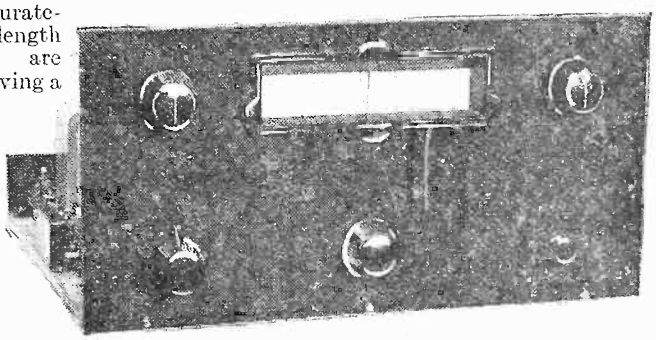


Fig 1.—Neat panel layout of the Nucleon Class B Four.

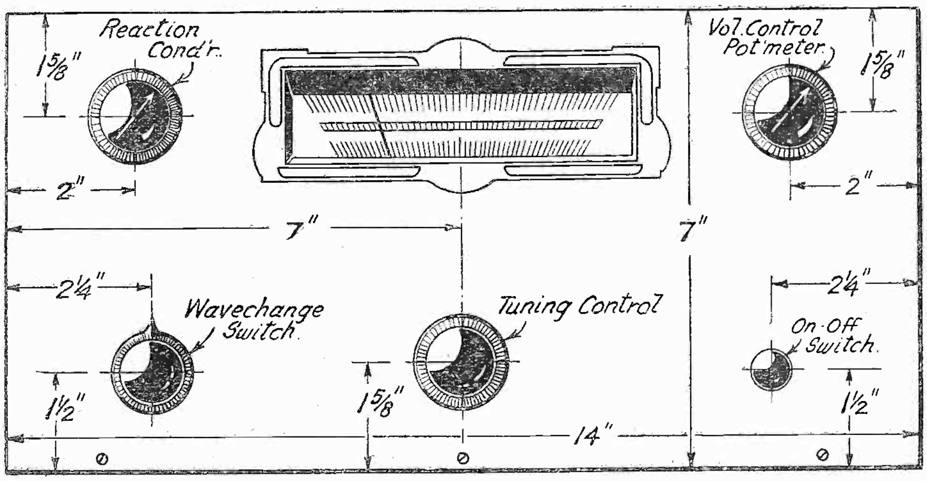


Fig. 2.—Front of panel layout.

The Circuit

Having described the principal feature of this circuit, and the reason for its adoption, we may examine the remainder of the receiver, and see in what manner it differs from other sets which we have described in the past. Firstly, it will be seen from the theoretical circuit, Fig. 5, that the tuning of the aerial circuit is carried out by means of one coil, and this is coupled to a second coil in the grid circuit of the variable-mu H.F. valve,

(Continued overleaf)

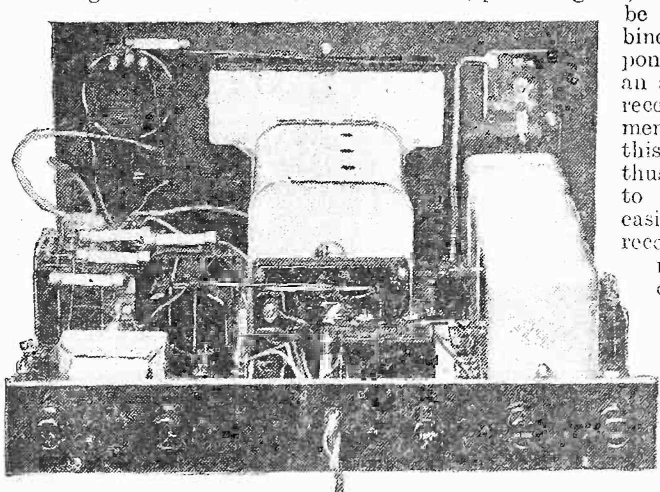


Fig. 3.—Rear view of the Nucleon Class B Four.

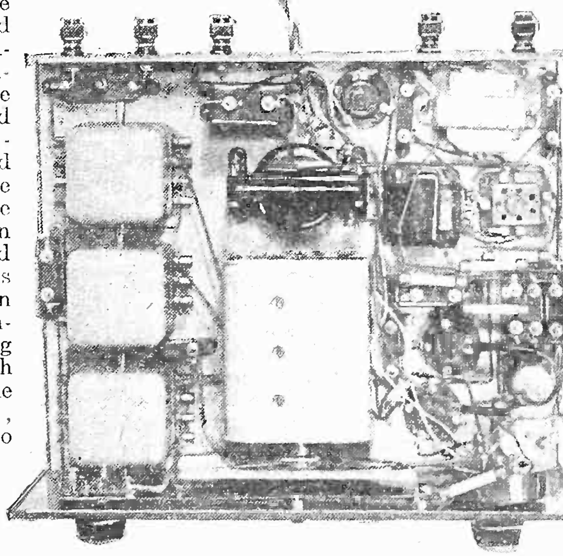


Fig. 4.—Top view of the Nucleon Class B Four.

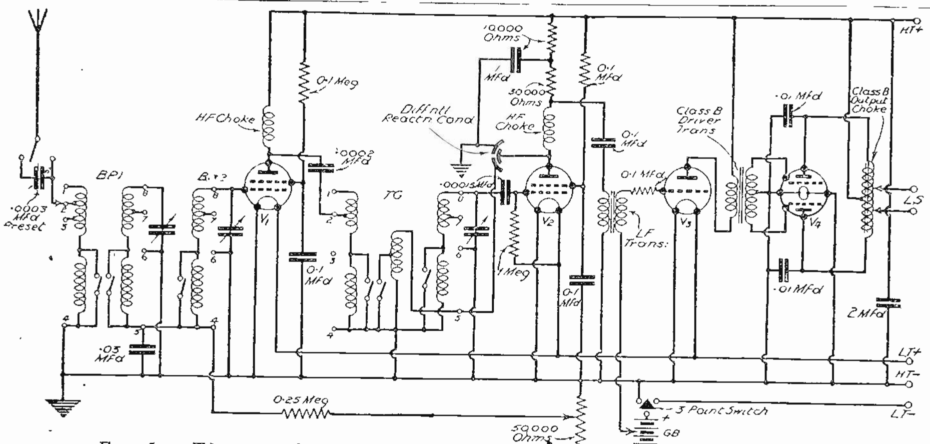


Fig. 5.—Theoretical circuit of the Nucleon Class B Four.

(*Continued from previous page*)

the complete arrangement forming a highly-efficient band-pass tuner, giving a high degree of selectivity with good signal strength. The combination of this type of tuner with a variable-mu valve thus gives one of the most efficient types of H.F. amplifier which can be built for battery operation at the present day. The H.F. valve is coupled to the detector valve by means of a similar coil, which is provided with a winding for reaction purposes. This may be used to augment signal strength and also to assist in selectivity where this is found necessary. The three tuned circuits are tuned by the separate sections of a ganged condenser as already mentioned, and trimmers are provided on this condenser in order to balance out stray capacities when the receiver is first put into commission. The detector valve is transformer-coupled to a valve of the small L.F. type, and this in turn is transformer-coupled to an output valve of the Class B type. A tone modifier is fitted in the output circuit, and this supplies a moving-coil loud-speaker. It will be seen, therefore, that the circuit is perfectly straightforward and possesses no "frills" or other stunts which might render it freakish in operation. It may thus be built up in the certain knowledge that it will function straight away, and no time will have to be spent in carrying out intricate circuit balancing.

The Layout

From the photographs it will be seen that in this instance we have departed from the usual chassis construction. Quite a number of readers have asked for a receiver of this design, as they apparently object to the wiring of a receiver on two sides of a baseboard. They find that they get confused when passing wires from one side to another, and, although we do not think that the majority of readers experience this difficulty, we have arranged this receiver on the older method of construction in order to cater for everyone. It will be seen that this unfortunately results in a rather crowded layout, many

(*Continued on page 804*)

LIST OF COMPONENTS FOR THE NUCLEON CLASS B FOUR

- One set Wearite Iron-Core Coils (Types BP. 1, BP. 2 and T.G.). (Wright and Weaire.)
- One Polar Star Minor Three Gang Condenser with Horizontal Drive. (Wingrove and Rogers.)
- One Polar Pre-Set Condenser (.0003 mfd.) (Wingrove and Rogers.)
- One 50,000 ohm Megite Potentiometer. (Graham Farish.)
- One .00015 Differential Reaction condenser. (Graham Farish.)
- Three 4-pin valveholders and one 7-pin. (Graham Farish.)
- One .03 mfd. Non-inductive condenser, Three .1 mfd. Type 81 ditto, One .0002 mfd. Type 34 ditto, One .00015 mfd. Type 34 ditto, One 1 mfd. Type 50 ditto, Two .01 mfd. Type 34 ditto, One 2 mfd. Type 50 ditto — T.C.C.
- One 250,000 ohm 1 watt resistance, Three 100,000 ohm. ditto, One 30,000 ohm. ditto, One 10,000 ohm. ditto, One 1 megohm ditto — Dubilier
- One 3-point On/Off Switch Type S.39. (Bulgin.)
- One Type H.F.P.A. Screened H.F. Choke. (Wearite.)
- One Midget Screened H.F. Choke. (Bulgin.)
- One A.F.3 L.F. Transformer. (Ferranti.)
- One Hypernik Class B Driver Transformer. (Lissen.)
- One Metaplex Baseboard (14in. by 11 in.). (Peto-Scott.)
- One Panel (14in. by 7in.). (Peto-Scott.)
- One Terminal Strip (14in. by 1½in.). (Peto-Scott.)
- One 7-way Battery Cord. (Belling and Lee.)
- Five Type B Terminals (Aerial, Aerial, Earth, L.S.— and L.S.+). (Belling and Lee.)
- Two Coils Connecting Wire, Length of Screening Braid, Screws, etc. (Peto-Scott.)
- One 220 VSG valve, One 210 DET valve, One P.215 valve, One 240B valve — Cossor
- One 120-volt Lion Battery, One 16-volt Lion Grid Bias Battery — Vinces
- One 2-volt 40 amp. Accumulator. (Lissen.)
- One Rola P.M.F4 Loud-speaker. (Rola.)

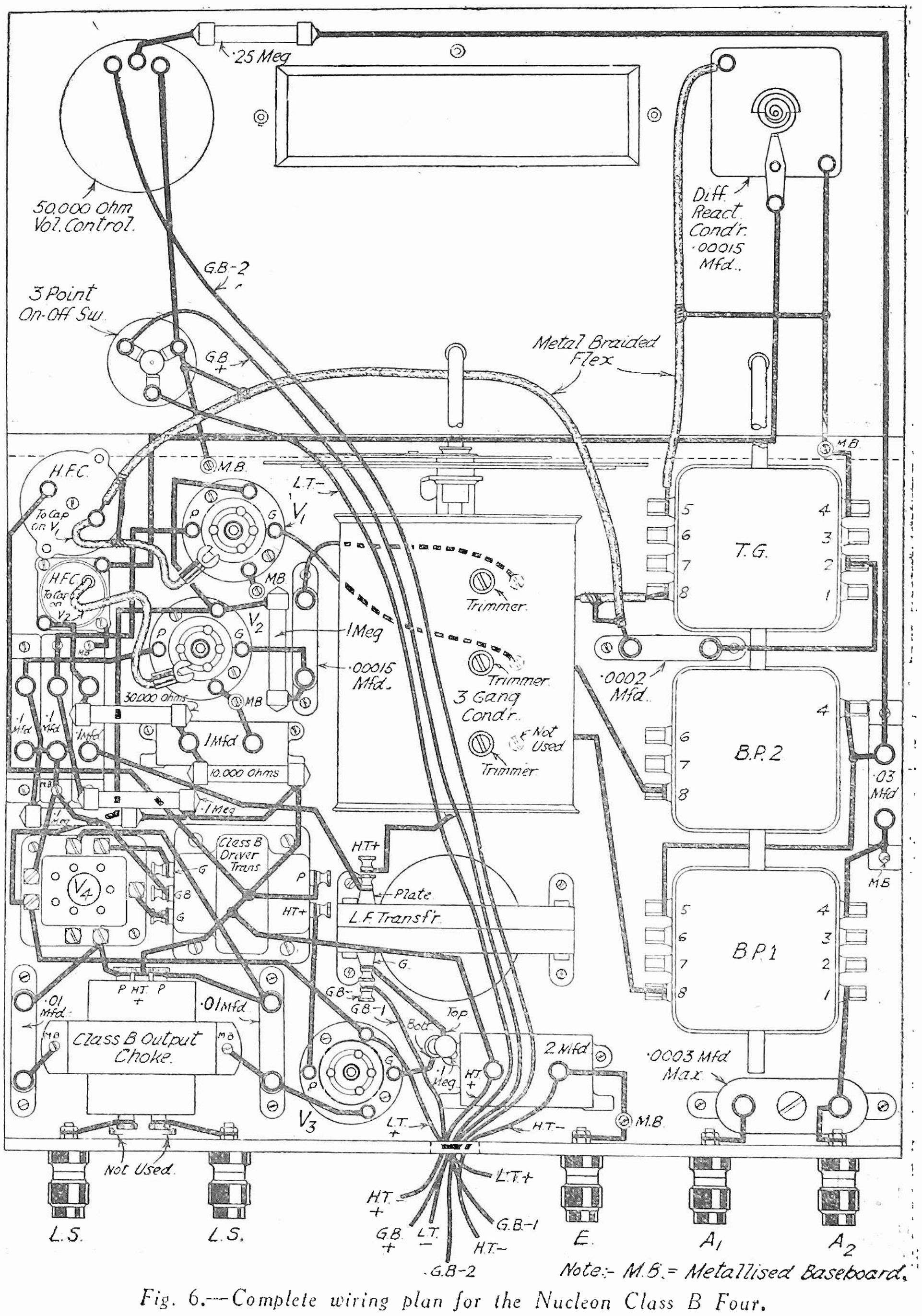
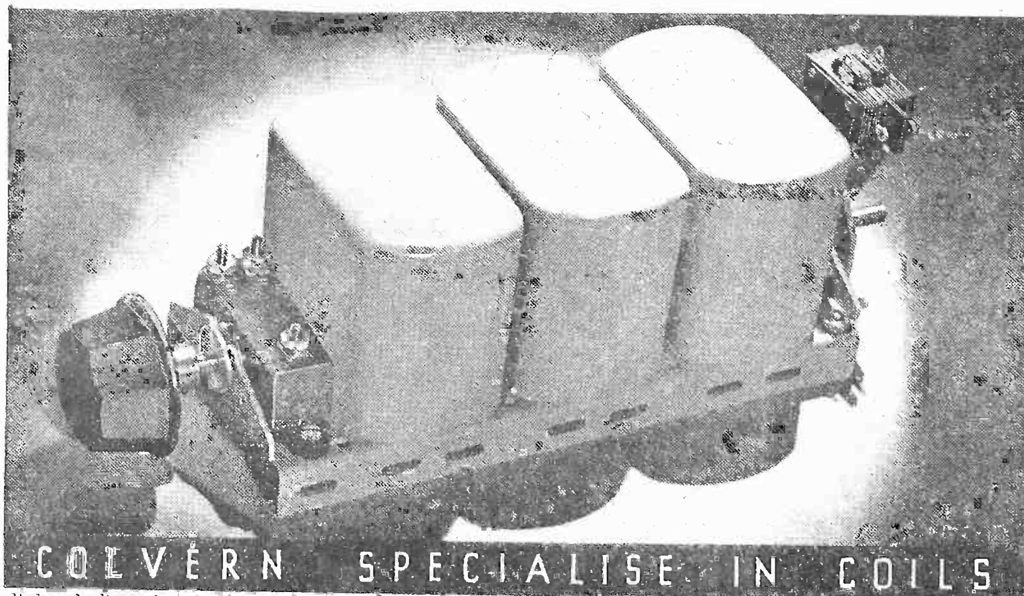


Fig. 6.—Complete wiring plan for the Nucleon Class B Four.



Made under licence from the patentee, Hans Vogt.

selectivity

accuracy

IF you could see the consummate care with which Colvern Coils are made, if you knew the amount of scientific research that has gone—and is going—into the making of them, you would realise why Colvern are the most accurate coils ever made . . . why practically every expert chooses them. Every coil is thoroughly tested and guaranteed. Write to-day for Radio List No. 12, telling you all about Ferrocart.

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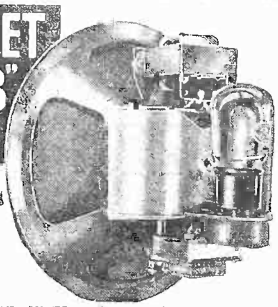

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READERS' WRINKLES

THE HALF-GUINEA PAGE

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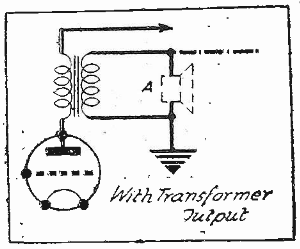
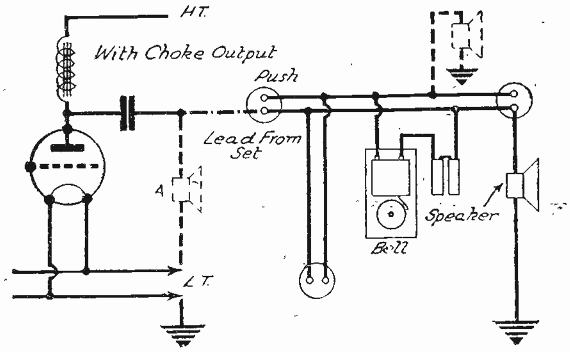
Using Bell System for Speaker Connections

IN these days of "a Speaker in Every Room" the following is an easy way of leading the set's output through the house for those who possess the usual house bell system. The latter is usually fairly well insulated, has a low resistance, and is not earthed. Transformer or choke output is necessary in the set, the usual speaker connection being shown at "A." The positive lead is taken to any convenient point on the bell system. If connected at a "push" it is worth trying the effect of connecting to alternative sides of the contacts. If one lead from the speaker is now connected to any other point in the system, and the other lead connected to earth (usually a convenient gas pipe) reproduction will be obtained with very little loss of signal strength. Alternative connections should also be tried when tapping off at a "push." This latter point is more important when using a bell system run from a mains transformer, as in some cases slight "mains hum" is picked up on one side of the wiring. For convenience two pin plugs can be arranged alongside the bell pushes, one wire connected to wiring, the other being earthed. A fine wire led down the wall and covered by a narrow strip of paper to match has been used in my case, and is almost invisible. Connection may also be taken from the door bells for outside use if required. A useful point is found in the fact that when the bell rings a loud buzz is heard on the speaker.—S. R. RUSHBROOK (Glasgow).



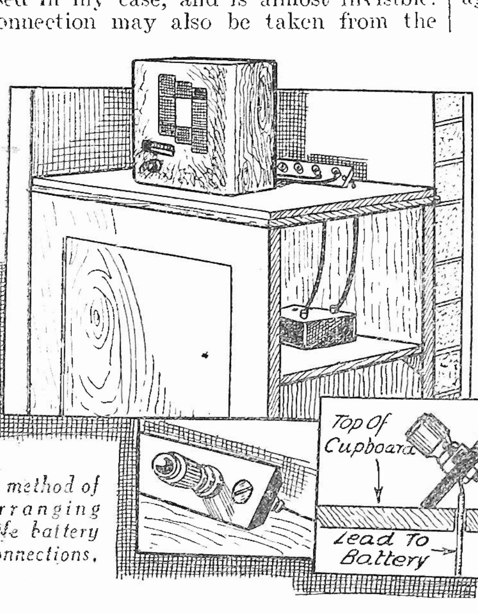


Wiring diagrams showing how a bell system may be used for speaker extensions.

Safe H.T. Connections

THOSE amateurs who use accumulators for H.T. (and some battery users) usually keep them in a cupboard, bringing the wires through a hole in the top, and taking them either direct to the set, or to a terminal board. Both methods have objections, the former owing to the fact that the leads may short when disconnected, and the latter that in the event of any metallic object falling on the terminals, either the front or the back, the results will again not be advantageous to the battery.

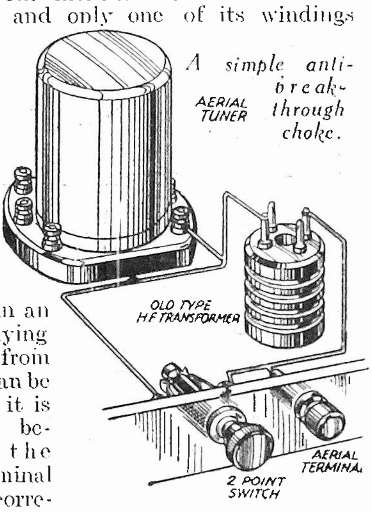
The terminal board illustrated will be found to be absolutely fool-proof in spite of its simplicity. The terminals should be of the completely insulated type, and they are mounted on a strip of ebonite or wood, the edges of which are chamfered at 45 degs. This fits into the corner formed between the top of the cupboard and the wall, and is held in place by two screws driven diagonally into the corner. The leads are taken through a hole drilled as near as possible to the corner, thus the connections at the back of the terminals are totally enclosed, and the lettering on the terminal tops is easily read. For quick connections insulated plugs and sockets could be used, but whichever method is adopted the result is a neat and fool-proof terminal board.—E. L. PARKER (London, S.E.15).



A method of arranging safe battery connections.

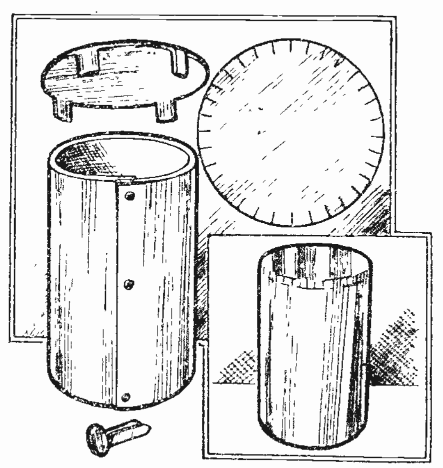
A Cheap Anti-Breakthrough Choke

AN excellent anti-breakthrough choke, which will effectively prevent medium-wave interference when listening on long waves, can be made from an H.F. transformer of the old-fashioned plug-in type. The transformer must be one intended for medium-wave reception and only one of its windings (either the primary or secondary) is actually made use of. The method of connecting the "choke" is shown in an accompanying sketch, from which it can be seen that it is inserted between the aerial terminal and the corresponding terminal on the first tuning coil. In order to put the "choke" out of circuit when reception is being carried out on the lower waveband, an ordinary two-point on-off switch is connected in parallel with it. For those who do not happen to have a suitable transformer on hand it might be mentioned that these components can often be picked up for a penny or so from "junk" stores dealing in obsolete wireless apparatus. The pins on the base are arranged in the same order as those on a valve, the "filament" pins being connected to the primary winding, and the "grid" and "anode" pins taking the secondary connections. In using the transformer for the purpose mentioned above wires may be soldered to the pins or a neater job can be made by fitting the component into an ordinary valve holder. There should be no necessity to screen the choke, although it may be found worth while to vary its position in relation to other unscreened coils, etc.

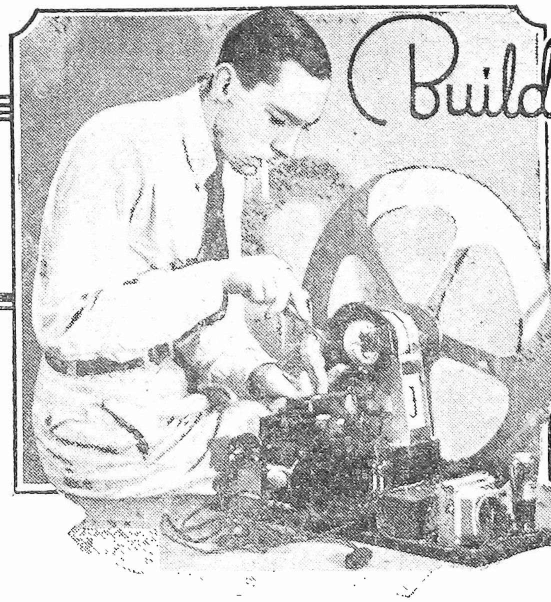


A simple anti-break-through choke.

(Continued overleaf)



Details for making emergency coil screens



AN EFFICIE[NT] TELEVISI[ON]

Building the PORTOV[ISOR]

(Continued from previous page)

positive main and A so as to regulate the current passing to the neon lamp.

Finally, if the reader does not want to feed the points A and B from mains at all, he can connect a 200-volt battery across, using batteries of the super-capacity type. This last-named course must also be followed by those who have no mains available at all, while the motor instead of being a mains-driven type is replaced by a six-volt machine and fed from accumulators.

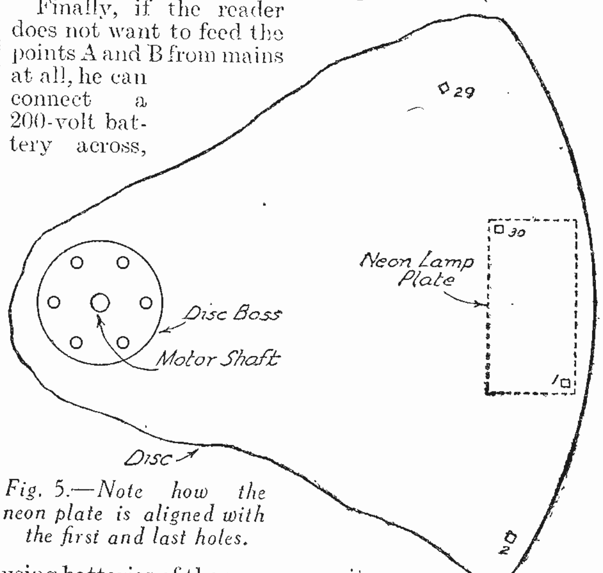


Fig. 5.—Note how the neon plate is aligned with the first and last holes.

The First Step

We can now turn to the practical side and see how easy it is to duplicate the design featured in the illustrations. A complete list of the components is included elsewhere, every one of the items being quite standard, and hence readily obtainable from the makers mentioned.

If the combined wooden baseboard with motor platform is not obtained complete, then it must be built up to conform exactly to the dimensions given in Fig. 9. First of all there is the main baseboard 20½in. by 8in. by ½in. A piece 5in. by 1in. must be cut out from the front edge in the centre as shown to enable the disc to run freely. Then make up the motor platform which, of course, has to be built very solidly. A piece of wood 4½in. square and ¾in. thick has two side pieces 4in. by 4½in. by ¾in. screwed to it, with three long screws on each side as indicated. Before adding the top platform screw the base to the baseboard after having accurately marked off its position from the dimensions given in Fig. 9. Finally, add the top platform 6ins. by 4½in. by ½in. and it will be found that the structure is very rigid.

Now comes the wooden block on which stands the neon lamp and its holder. This is 4½in. by 3in. by 2⅝in. Before screwing on the block by three countersunk wood screws passing right through from the underside of the baseboard, drill three holes. Two of these are ¼in. holes centrally displaced and 3in. and 3⅞in. from the bottom and drilled right through. Now drill another ¼in. hole in the top so that it meets the top hole. This will then allow the pair of leads from the neon lamp holder to make connection, while the lower hole is for the extension rod to the variable motor resistance to pass through. The block can now be screwed in place, measuring up its position accurately according to the dimensions furnished in Fig. 9.

Changing the Motor Direction

In nearly every disc television receiver described so far, the synchronizing

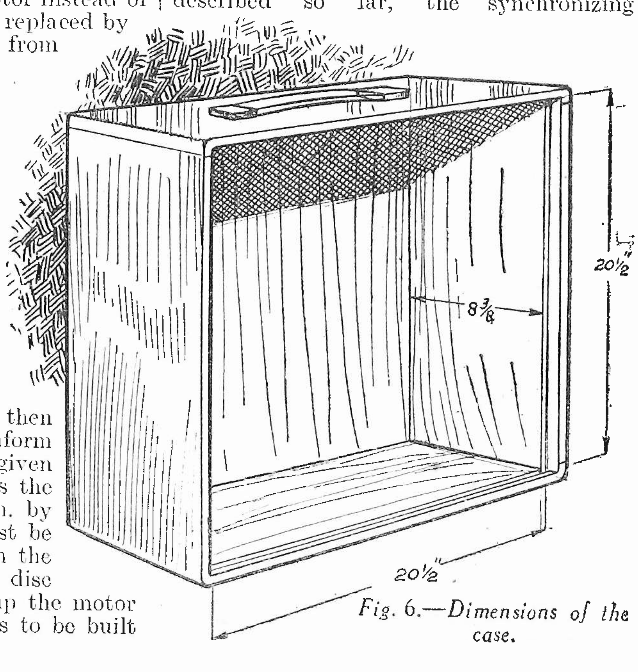


Fig. 6.—Dimensions of the case.

AND SIMPLE RECEIVER

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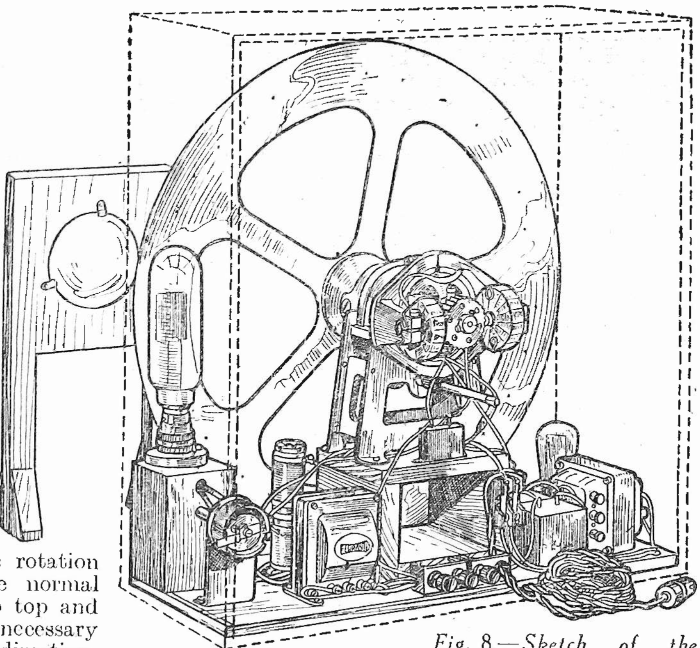


mechanism is at the front of the motor, the disc at the back and, of course, the neon lamp on the right. With the "Portovisor," however, I decided to have the disc at the front, and in order to maintain the disc rotation correct, and give the normal scanning of bottom to top and right to left, it became necessary to reverse the motor direction. This is a very simple process and is carried out in the following way:

Remove the synchronizing gear complete by withdrawing the two screws holding the springs against the movable framework. Take off the cogwheel, and then pull out the brushes, after unscrewing the two caps. The aluminium end casing of the motor at the synchronizing gear end may then be pulled off gently, and the motor armature withdrawn at the same time. To reverse the motor direction we must reverse the field winding. At the brush end of the motor casing will be noticed two leads, one at each brush point, which are just sprung into place. Ease off each lead and interchange their positions, then replace the armature, brushes and end plate, screw back the synchronizing mechanism in place and fit the cogwheel once more to the motor shaft. The motor now runs counter-clockwise when viewed from the end remote from the synchronizing equipment.

A Question of Space

Being anxious to reduce the cabinet width as much as possible, and to allow the disc to be as close as possible to the front aperture, the following steps have to be taken. First of all, saw off a piece of the motor shaft at the disc end so that only ⅜in. remains. Then take the disc which is supplied with a fairly long boss, and has cheese-headed screws holding the disc between the two flanges, and cut off a piece of the cylindrical boss so that the length remaining is 11/32in. This will necessitate drilling and tapping a new grub screw hole, but that is quite an easy matter. Now remove the cheese-headed screws one at a time and replace with countersunk head screws, and quite a substantial saving in depth will be effected, as indicated by the sketch Fig. 2.

Complete Assembly

The constructor can now make a start on the assembly of the apparatus. The pictorial diagram, Fig. 8, the wiring plan, Fig. 11, and the accompanying photographic illustrations will assist in this connection, and should be studied carefully for there is little room to spare. First of all, the motor and its stand must be screwed to the platform. The motor must be quite square with the baseboard edge so that the disc when mounted revolves in a plane parallel to the baseboard edge. Fixing dimensions for the feet are given in Fig. 12, and these must be adhered to. Next comes the neon lamp holder, and

(Continued on page IV)

Fig. 8.—Sketch of the finished apparatus.

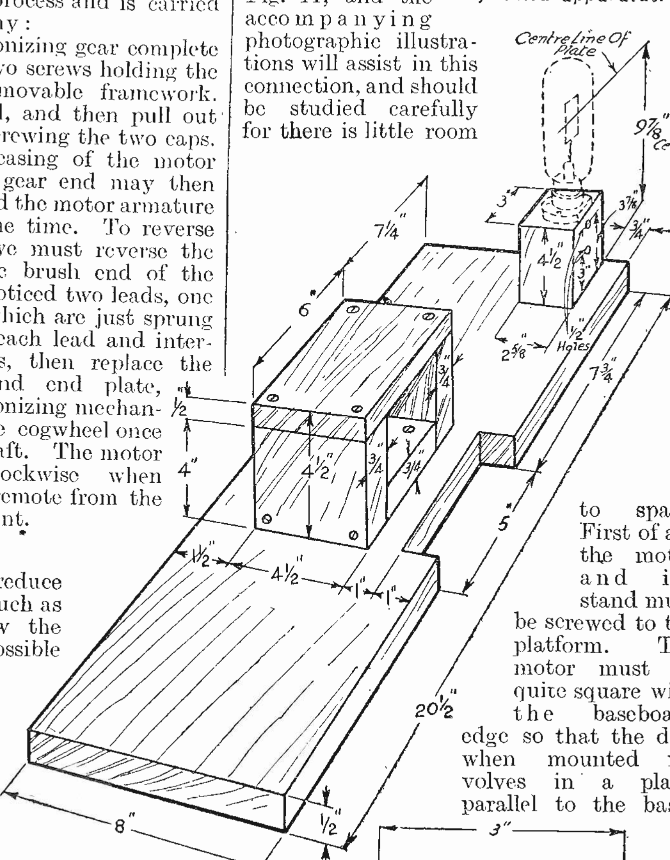


Fig. 9.—The wooden base and motor support.

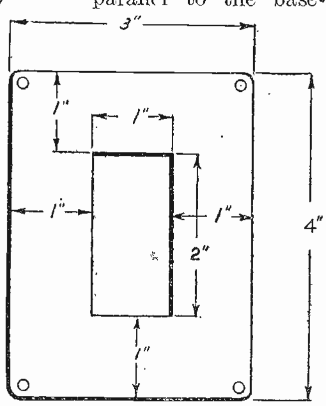


Fig. 7.—The aluminium mask should be cut to these dimensions.

here again we must remove superfluous material. With a hacksaw cut off a segment of the lamp-holder base, so that the flat edge is flush with the circular holder portion. This is shown very clearly on the left of Fig. 12. See that the centre of the holder, and hence the centre of the flat plate of the neon lamp, is 8$\frac{3}{8}$in. from the centre of the motor shaft. Another important point to note is that when cutting off the segment of the bakelite neon lamp-holder, position the cut so that the neon lamp when in its holder has its flat plate parallel with the baseboard edge. Two new screw holes must be drilled before the holder can be held down on its wooden mount.

Next make up a small right-angled bracket to hold the 150-ohm variable resistance R_1. The position of this bracket on the baseboard is fixed automatically if the extension shaft is added, and the bracket moved forward until the shaft flange is $\frac{1}{8}$in. away from the front of the wooden neon lamp-holder mount.

Next screw down in position both the vertical tapped tubular resistance R_2 and the 0.1 mfd. fixed condenser C_3.

I have detailed the work up to this point, for this completes the task of assembly for those who desire the simple television receiver alone without the eliminator and transformer feed. In addition, these constructors using a six-volt motor to be driven from accumulators will omit the vertical tubular resistance, and replace the 150-ohm variable resistance with a 6-ohm one. Only one or two leads need be added now by these constructors, and the apparatus is complete.

Completing the Work

Naturally, the best course for those with A.C. mains is to carry out the complete design, and then the remainder of the components can be screwed to the baseboard as indicated in the wiring diagram, Fig. 12. When this is done complete the wiring. For convenience this has all been carried out in single rubber-covered flex. The runs of each wire are shown in Fig. 12, and care should be taken to trace out each lead so as not to go wrong. As far as the output transformer is concerned, although this is a push-pull type, the centre tap points of each winding are ignored. The lead connecting one terminal of the variable resistance R_1 to the tapped resistance R_2 terminates in a crocodile clip to enable the correct tapping to be ascertained. Also be sure that the mains transformer primary winding is joined to the proper voltage tapping to correspond with the house mains electricity rating.

A Preliminary Trial

At this juncture it is as well to give the "Portovisor" a preliminary trial to ensure that both the wiring and assembly are free from errors. Place the neon lamp in its holder and the disc on the motor shaft, holding the latter in place by its grub screw. Turn the disc gently by hand to see that it does not foul any of the components. Owing to its flimsy nature it tends to flap somewhat, but this is not harmful and when you run up to its isochronous speed it will whip out flat.

Clip in the pair of one amp. fuses and the single 150 milliamp. one, and insert the rectifying valve in its holder. Tap off the maximum resistance on R_2, insert the A.C. mains plug into a convenient socket and switch on. The first thing to notice is whether the neon lamp lights up correctly. The flat plate should glow uniformly with a fairly bright orange red colour, but if the short horizontal bar behind the plate glows instead, switch off the mains, reverse the two connections in the bakelite lamp holder, and matters will be rectified.

Next note that the motor is rotating the disc in an anti-clockwise direction when facing the disc, and, of course, see that the blackened side of the disc faces the observer.

It now becomes necessary to see that the motor, disc and neon lamp are in the correct relative positions, so as to scan the whole of the glowing neon lamp plate. Disconnect the mains and temporarily remove the crocodile clip from the tubular resistance. This will break the motor circuit and prevent it from running. Switch on the mains once more, so that the neon lamp glows, and turn round the disc by hand until the first and last of the scanning holes are positioned as in Fig. 5. The dotted rectangle represents the glowing plate, and the first and last holes (Nos. 1 and 30) of the disc should be just accommodated within the bottom right-hand and top left-hand corners respectively. If this is so, then every hole will scan a strip of the neon plate. If the lamp is a trifle too far to the left or the right, then ease the screws gripping the lamp holder to its wooden base, and adjust the lamp position until the condition shown in Fig. 5 is obtained. Switch off the mains, replace the crocodile clip and prepare to accommodate the apparatus in its cabinet.

Cabinet Details

The appearance of the cabinet can be gathered from the accompanying photographic illustrations. It has *internal* dimensions of 20½in. by 20½in. by 8$\frac{3}{8}$in., being made of ½in. wood and having a detachable back. Fig. 6 gives all the details, and if the constructor prefers he can have it made up in any wood desired by Messrs. Peto-Scott, Ltd., who regularly advertise in this journal. The back is detachable, having one hole drilled to allow the synchronizing framing shaft to pass through, and also a rectangular section cut away at the bottom to allow access to the three terminals and give the mains lead free passage.

At the front, on the right, an aperture (midway between top and bottom) is cut out 2¼in. wide by 3in. deep, so that its centre coincides with the centre of the neon lamp plate. Below this is a hole to take the bush of the extension rod, and to enable an easy control of the variable resistance to be effected from outside. When the aperture and hole have been made, slide the whole apparatus into the cabinet from the back. See that the disc boss does not touch the back of the cabinet front, and then once more connect the plug to the mains socket and switch on. The disc as it gathers speed will flap a little and knock against the cabinet frame slightly, but this is quite normal and as soon as it is revolving fast it will run quite flat, and not in any way foul anything. The strips of light area of the neon lamp will now be observed through the disc holes, and it becomes necessary to mask off the cabinet aperture with a *blackened* aluminium plate $\frac{1}{16}$in. thick cut to the dimensions shown in Fig. 7. Position this over the aperture while the apparatus is running, so that the hole in the mask just exposes the glowing light area, and then attach it to the cabinet front by four small wood screws.

(Continued on page VI)

(Continued from page 11)

Enlarging the Image

The television image observed through the rectangular hole in this model will be the true size as traced out by the disc holes, that is approximately 2in. by 1in. For certain experimental purposes this is sufficient, but on many other occasions when it is desired to sit down and watch the programme provided by the B.B.C. transmissions, lens magnification must be resorted to.

Details of a simple outfit for this purpose are shown in Fig. 10. First of all obtain two lenses, one a 4in.-diameter double convex of 11.5in. focal length, and a second of 6in. diameter, single convex, having a 17in. focal length. Now make up the wooden structure indicated in Fig. 10. When the hole centre has been marked off scribe off with dividers or compasses two holes on one side of 3¼in. and 4in. diameter respectively. On the other side two similar concentric circles of 5½in. and 6in. diameters respectively. Cut out the inner circle of 3¼in. with a fretsaw, and then with a spokeshave chamfer off sufficient wood so that there is a bevel between the 3¼in. diameter hole at the back and the 5½in. diameter circle at the front.

Place the large lens central with the 6in. diameter circle so that its flat face touches the wood, and hold it firmly in position with three small brass clips as shown in Fig. 10. Turn the structure over and mount the smaller lens in place, that is central with the hole, and fix it securely with three small clips. This can now be painted black, and in use just stands in front of the cabinet mask, and in this way magnifies the image considerably. As the cabinet has rubber feet at the bottom, the height of the lens centres just corresponds with that of the aperture centre.

To house the assembly when not in use make two U-shaped clips and fix these to the inside of one cabinet side, on the right facing back preferably, to accommodate the feet of the lens stand. Then screw a short length of ½in. thick wood to the inside top of the cabinet, nearly flush with the top end of the lens frame, and add two clips to hold it in place with the feet resting in the U clips.

The "Portovisor" is joined to the receiver through the pair of input terminals and earth terminal. Join the former direct to the normal loud-speaker terminals if there is not a step-down output transformer already included in the set. If there is, join the pair of terminals to the plate of the output valve and H.T. + after having first disconnected the set's output transformer primary.

Having connected the earth terminal to an earth point on the set, switch on the "Portovisor" five or ten minutes before the television transmission is due to start to allow the motor to warm up and run steadily. Assuming the London National station which broadcasts the television programme has been previously tuned in on the set, then as soon as the transmission begins, some form of image, very probably distorted to start with, will be seen in the right-hand cabinet aperture.

A series of black lines will be noticed sweeping upwards or downwards, depending on whether the motor is running too fast or too slow, the correct speed being 750 revolutions per minute. The variable motor resistance must be adjusted carefully until the lines lie horizontal, it being noted that if this does not happen then another tap on the tubular fixed resistance must be tried.

When this state of affairs is reached the synchronising equipment will come into action, and maintain the image steady. If, however, the condition of synchronism is brought about with two sections of the image lying side by side, then increase the motor speed slightly until the images move slowly upwards and drift to the left. Let this go on until the double picture resolves itself into a single one, and then quickly bring back the speed of the motor to normal again. This is called phasing the image.

Again, it may happen that two portions of an image appear one vertically above the other. To rectify this, turn slightly the knob at the back and so frame the image centrally.

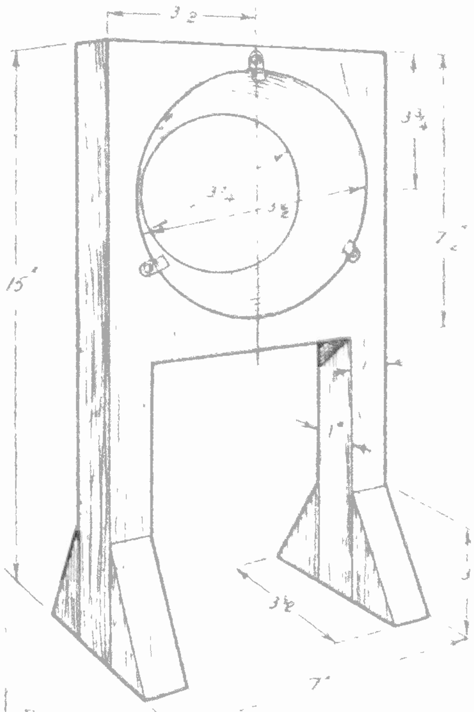
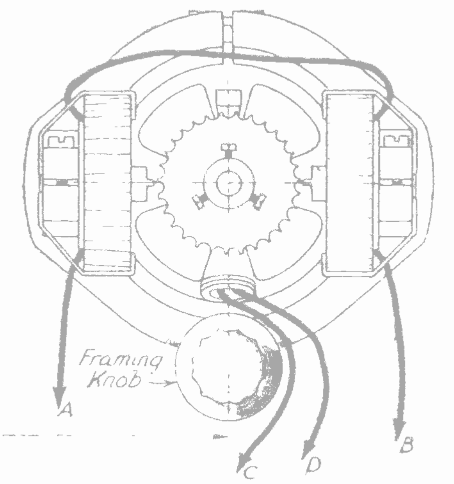


Fig. 10.—The lens mount. Note the bevelled hole.



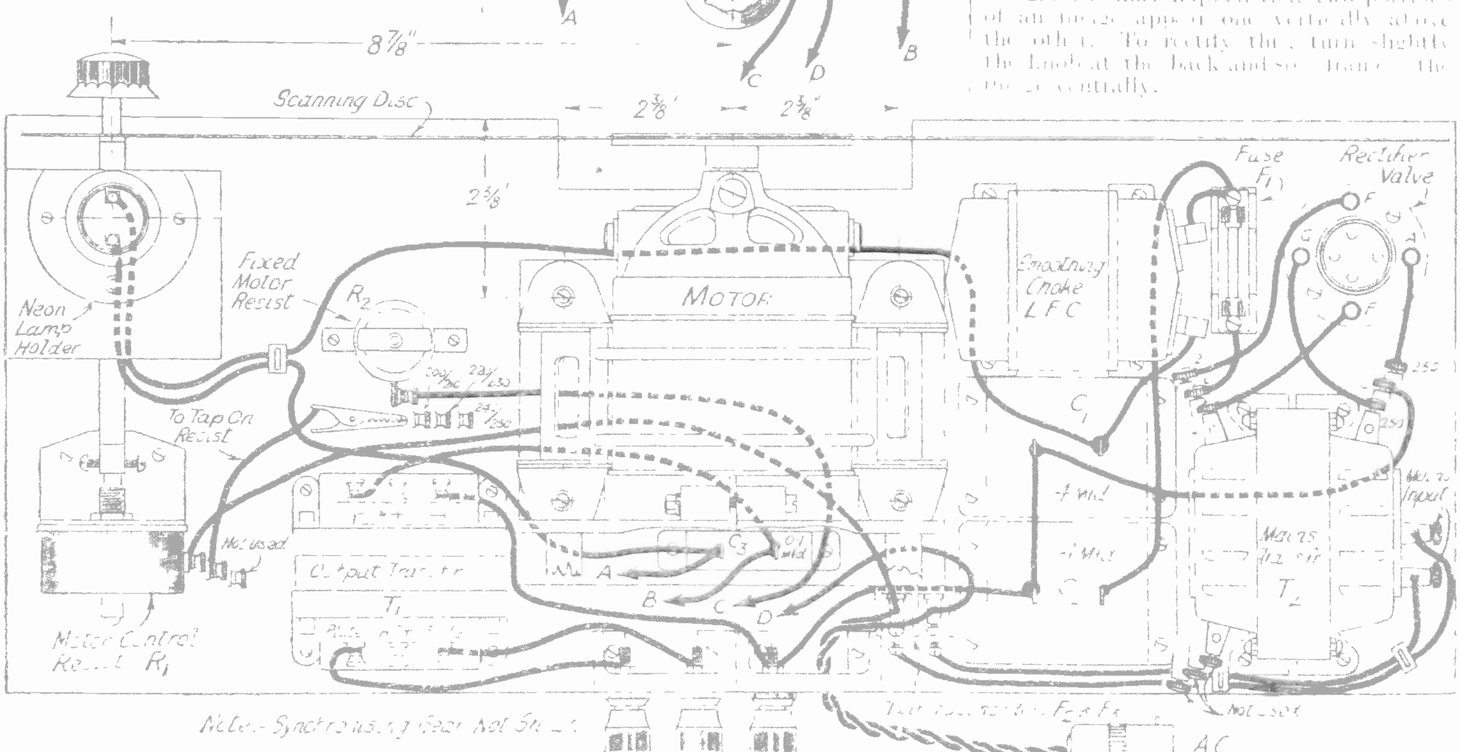
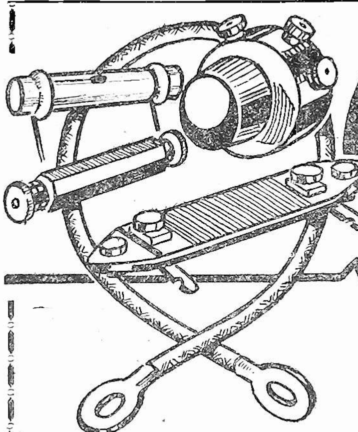


Fig. 11.—Wiring diagram of the "Portovisor."

The Beginner's Supplement



Choosing and Using RESISTANCES

In this Article the Author Simply Explains How the Correct Type and Value of a Resistance for any Purpose can be Decided Upon.

WITH the evolution of new and up-to-date circuits it appears that resistances (or more correctly resistors) are being required in rapidly increasing numbers. A few years ago the only resistance that one was likely to find in a standard type of receiver was the grid leak, but nowadays quite an ordinary three-valve battery set might have as many as a dozen, whilst more complicated circuits (especially those for mains working) frequently contain a score of resistances of various patterns. There is no doubt that, although many of the resistances are not absolutely essential, they do improve the performance of the set, in addition to simplifying the operation to a considerable extent. That is all very well for the advanced experimenter who understands the function of each component, but the beginner is very apt to find himself quite "at sea" in trying to decide upon the correct type and pattern for any particular purpose. It is hoped to remove any such difficulty by explaining the applications of each pattern, and showing how the resistance value can most easily be determined.

Types of Resistances

In the first place let us consider the principal varieties of resistances. First, there is the wire-wound one which is generally employed in positions where a good deal of current has to be carried, and where a certain amount of self-inductance is of no consequence. Then there is the so-called metallized resistance, which usually consists of a thin "lead" of metallized material running through the centre of a porcelain rod which has metal connecting caps or wires at each end. Another type of resistance is the "composition" one in which the resistance element consists of a composition made principally of finely-divided carbon, this being enclosed in a bakelite, glass or porcelain tube. Lastly there is the so-called spaghetti resistance in which the element is very thin wire wound in helical fashion on a core of asbestos string. This kind of component is very convenient, since it can generally be connected directly to the terminals of other components; but it is somewhat fragile, due to the very thin resistance wire which must be used in making it. Consequently, it cannot carry heavy currents, and it is liable to be fractured if it is "kinked" or bent to a sharp angle.

Neglecting the spaghetti resistance for a moment, it can be broadly stated that the wire-wound component is most suitable for carrying heavy currents, partly because the wire has a higher current-carrying capacity than have carbon compositions, and partly because the heat developed can more readily be dissipated. Moreover, this kind of resistance is "permanent" and cannot cause crackling sounds due to its resistance value fluctuating frequently. The carbon composition type, on the other hand, is more liable to introduce crackling sounds, due to the variable contact between the particles of conducting material. In making this statement it should be pointed out that there *are* a few composition resistances on the market which are practically as reliable as wire-wound ones, especially when they have to deal with comparatively low currents. Metallized resistances are rather similar in their properties to composition ones, but on the whole they are probably more reliable. The last kind of resistances, those in which a conductive film is deposited on a porcelain or similar rod, can be classed along with metallized ones, since their properties are found to be very similar indeed. It would appear that they would better be able to dissipate any heat developed, but this does not seem to be the case in practice.

Variable Resistances

All the above remarks have actually been applied to fixed resistances, but most of them are equally applicable to variable resistances and potentiometers, the only difference being that there are but two general types of variable resistances. One type is wire-wound, and should be used when there is any appreciable current (more than 1 milliamp. or so) to be carried, and the other is the carbon composition type, where a layer or film of carbon is traversed by a rotating arm. For illustrations of the various types of resistances mentioned see Fig. 2.

Finding the Correct Value

The first thing that the beginner requires to know about resistances is how the correct value for any particular requirement can easily be determined. This brings us to the old favourite, Ohm's Law, which states that the current flowing in a circuit is equal to the applied voltage divided by the circuit's resistance; the three factors must be in amperes, volts, and ohms. As however, it is generally milliamps. which are dealt with in a wireless set, it is better to modify the law by saying that the current (in milliamps.) is equal to the applied voltage multiplied by a thousand, and divided by the resistance in ohms. By re-arranging the expressions in the formula we can get the equation that the voltage dropped by a resistance is equal to the current (in milliamps.) multiplied by the resistance in ohms and divided by a thousand. Similarly we

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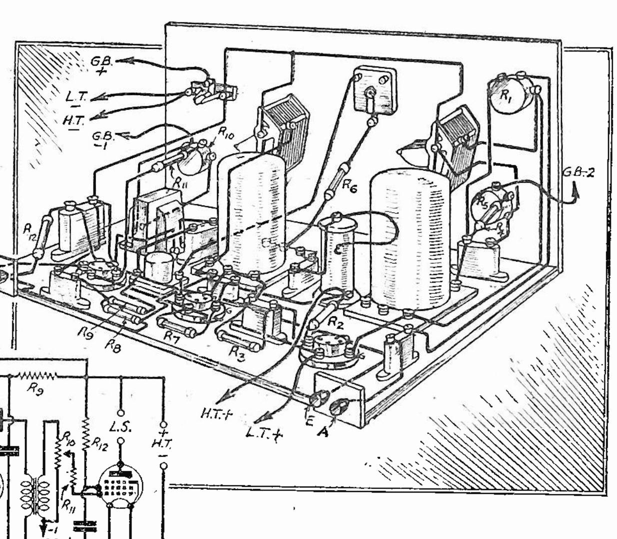

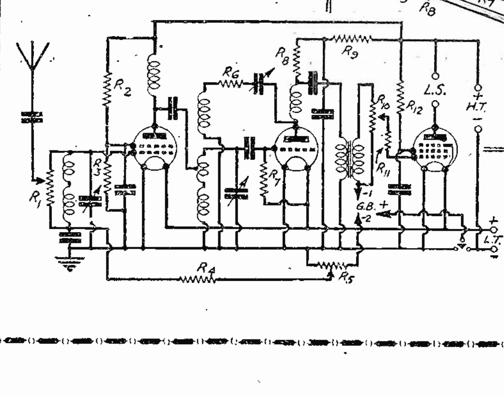

Fig. 1.—The above sketch and circuit show the various resistances referred to in the text.

(*Continued from page 797*)

can obtain the equation that the resistance required for any circuit (in thousands of ohms) is equal to the voltage to be dropped divided by the current in milliamps.

The Wattage Rating

Another factor which must be decided before a resistance is bought is its required wattage rating. Every reader will have noticed that resistances are stated as being of 1, 2, 3, 4 watts, etc., and will perhaps have wondered what is the meaning of this. Power, in watts, is determined by multiplying voltage by current (in amps.): thus a valve filament which takes .1 amp. at 2 volts consumes .1 multiplied by 2, or .2 watt. On the other hand, a resistance which, when passing 20 milliamps., "drops" 100 volts will consume .02 (20 milliamps. expressed in amps.) multiplied by 100, or 2 watts. Another way of finding the power consumption of a resistance is by squaring the current which it passes (in milliamps.),

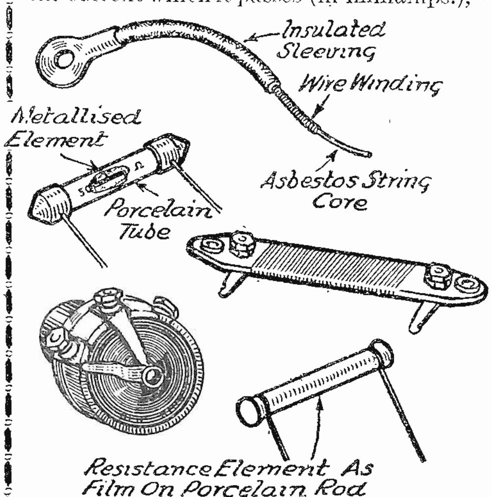

Fig. 2.—Various types of resistances are shown in the above sketch; some of these are sectionalized to indicate the form of construction.

and multiplying that by the ohmic value of the resistance. For example, a resistance of 5,000 ohms which carries a current of 20 milliamps. must have a power rating of .02-squared multiplied by 5,000, or .0004 times 5,000 which is just 2 watts.

Resistances in H.T. Circuits

The simple calculations which have been explained are applicable to most resistances required in the high and low-tension supply circuits of a wireless set, but are of little value when deciding upon the resistances called for in high-frequency circuits. These latter require rather special consideration, and their functions will best be understood by making reference to the more or less standard circuit arrangement for a three-valve variable-mu H.F. detector-pentode receiver such as that shown at Fig. 1. All the resistances, both fixed and variable, have been numbered for easy reference. The purpose of R.1 is to act as a volume control by varying the amount of signal energy passed on to the first tuned circuit from the aerial. Its total resistance must be much higher than the (high-frequency) impedance of the tuning coil, and a value of from 100,000 to 250,000 ohms is generally correct. The resistance element must be entirely non-inductive or else it will create various "resonance peaks" which will affect tuning; it has not to carry any D.C. current, and therefore a component of the composition type is to be preferred on every count.

R.2 and R.3 act together as a fixed potentiometer, their purpose being to apply the correct potential to the screening grid of the first valve. Assuming that they had to carry no D.C. current at all their resistances would be in the same ratio as that of the S.G. potential to the total voltage of the H.T. battery. For example, if the screening grid required 50 volts and the battery gave 100 volts, the two components should be of equal value; if the screening grid required 40 volts, and the battery gave 120 volts, R.2 should be half the resistance of R.3, or one-third of the sum of the resistances of R.2 and R.3. Actually, R.2 does carry a small D.C. current, and this fact modifies the calculation slightly, although for most purposes this can safely be ignored. It is generally best to choose R.2 and R.3 so that their combined resistance is approximately 100,000 ohms.

R.4 and R.11 are for the purpose of preventing the passage of H.F. currents, although they must offer little impedance to L.F.; values from 25,000 ohms upwards would serve the purpose. Both resistances should be non-inductive, but, as they have to deal with alternating current only, this is not any disadvantage.

R.6 is to prevent the passage of L.F. into the reaction circuit, and may have a value of between 100 and 500 ohms.

R.5 is a potentiometer, the purpose of which is to apply a variable potential to the grid of the first valve. Theoretically it could have any value from about 5 to 100,000 ohms, but if the value were so low as the first figure the G.B. battery would rapidly be exhausted, whilst if it were so high as the latter it would not provide the "nicety" of control that is desirable. Thus the value generally chosen is either 25,000 or 50,000 ohms, and it does not matter very much whether the component is wire-wound or of the composition type, although the former is likely to be somewhat more reliable. It is also desirable that R.5 should be "graded" in order that its resistance value should change by a lesser amount for any given movement of the knob when the latter approaches the "positive" position.

R.8 is used to couple the detector valve to the L.F. transformer, and it should have a resistance equal to from two to two-and-a-half times the impedance of the valve. In most cases it will have to carry but a small D.C. current, and therefore any type of half or 1-watt component will serve. Where the valve operates on the power-grid principle, the current will be considerably higher, so that in some cases a 2-watt resistance will be called for; that can be decided by making the calculation previously described.

R.9 decouples the anode circuit of the detector, and at the same time reduces the total H.T. voltage to a figure suitable for the anode of the detector. Generally its value will require to be between 10,000 and 50,000 ohms, but this can be determined by calculation, as also can the necessary voltage rating.

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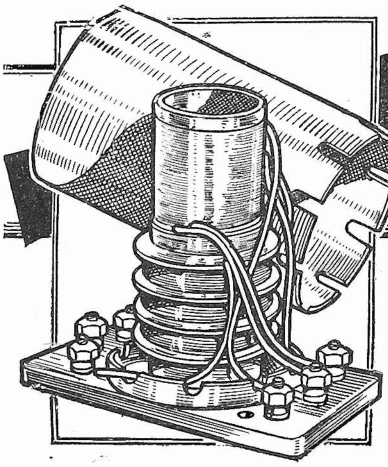

MAKING YOUR OWN Screened Coils

This is the Fifth and Concluding Article of the Series, and in it the Author Describes Some Simple Methods of Ganging Sets of the Coils Previously Described, Besides Giving Some Useful Circuits and Other Information.

By FRANK PRESTON.

IN previous articles of this series I have described in fair detail the construction of practically every type of screened tuning coil normally required, so that some further information in regard to the use of the coils described will prove useful. Different types of single coils have been dealt with and circuits have been given to show how two or more of these could be employed together. The principal difficulty in using a number of the coils, however, has been that a separate wave-change switch has been required for each, thus complicating matters to a certain extent. Fortunately, a new switch has lately been placed on the market by Messrs. Wilkins and Wright (of "Utility" fame) which is an excellent adjunct to the coils under discussion. The switch is a flat one, occupying a minimum of space and having an entirely negligible self-capacity, and it can thus be mounted alongside the coils without adding greatly to the space they occupy. This flat switch can be obtained in two or three different types, but the one which will be most useful in connection with our home-made coils is the three-pole shorting switch. The latter can be used for wavechanging on three ganged coils of the type normally requiring a push-pull switch for each, but when one of the coils is of the kind requiring a three-point switch for wavechanging, a four-pole switch can be used to operate on three coils. A photograph of a switch of the kind referred to is given at Fig. 1, whilst various methods of connection for different coil combinations are clearly shown in Fig. 2.

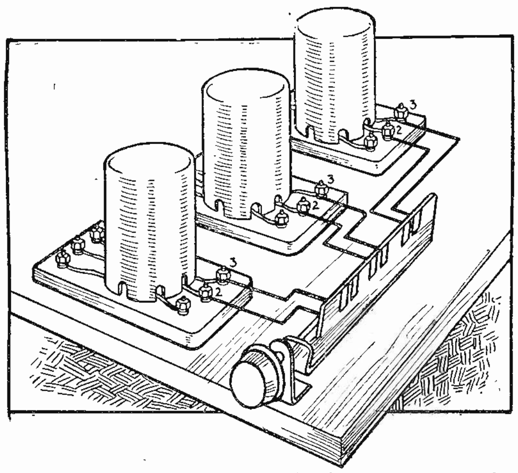

Fig. 3.—A convenient method of mounting the flat wave-change switch beside a set of coils.

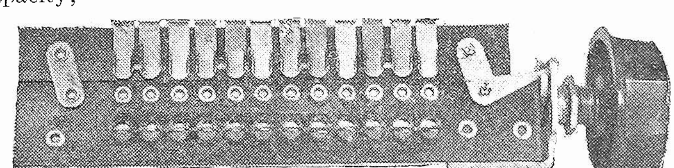

Fig. 1.—A flat switch of the type referred to. The particular component illustrated is a 3-pole change-over switch.

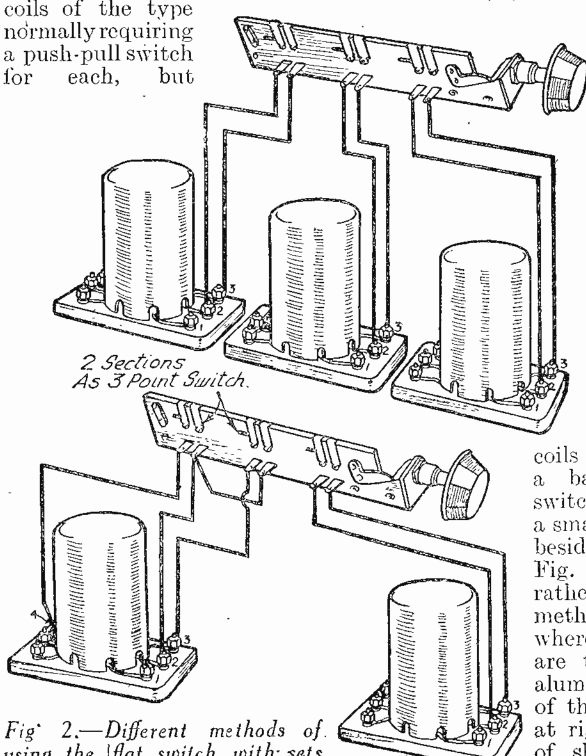

Fig. 2.—Different methods of using the flat switch with sets of the coils described in this series.

Ganged Coils and Switching

A practical detail we have not yet considered is in connection with the method of mounting the flat switch. If all the coils are screwed directly on to a baseboard or chassis, the switch can easily be attached to a small component bracket fixed beside the coils, as shown in Fig. 3. Another and perhaps rather more "professional" method is illustrated in Fig. 4, where the coils and the switch are together mounted on an aluminium baseplate; the edges of the baseplate are bent over at right-angles to form a kind of shallow chassis on the underside of which the switch can be mounted very neatly by means of a small aluminium bracket. The sketch will be self-explanatory, and it need only be added that the switch should always be mounted so that the connections to it from terminals on the coils are as short and direct as possible.

All-Wave Tuning

Coils for short waves, as well as for the broadcast bands, have been fully dealt with, but no information has yet been given in regard to employing a combination of broadcast and short-wave coils in an all-wave receiver. This is certainly a combination that is rapidly becoming more popular, and which has been proved (by the "All-Wave Two" and the "All-Wave Unipen," both described in PRACTICAL WIRELESS) to be thoroughly satisfactory and efficient. The circuit of a two-valve detector and low-frequency receiver is given in Fig. 5, where the two coils employed are the second to be described (illustrated on page 684, in Fig. 3) and the short-wave coil described on page 731. A flat switch of the type above referred to is used for shorting out a section of each coil, a separate three-point push-pull switch being employed for cutting out the broadcast coil entirely. This is a very convenient system of wavechanging, since the lower and higher band on either the short or broadcast ranges can be obtained by means of the ganged flat switch, whilst to change from broadcasting to short waves it is only necessary to pull out the knob of the three-point switch.

The circuit is so arranged that the

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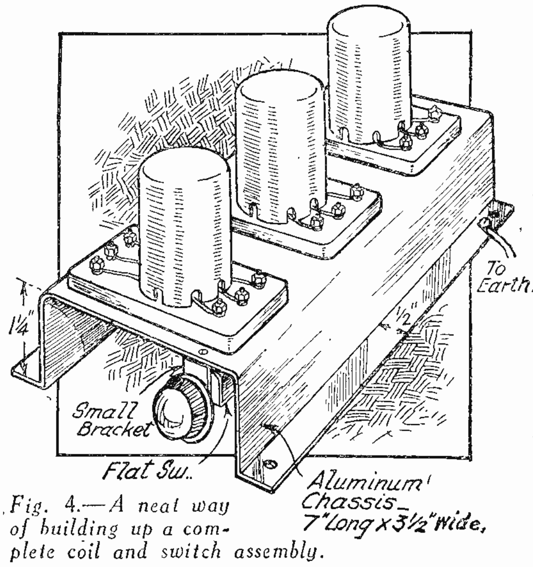

Fig. 4.—A neat way of building up a complete coil and switch assembly.

MAKING YOUR OWN SCREENED COILS

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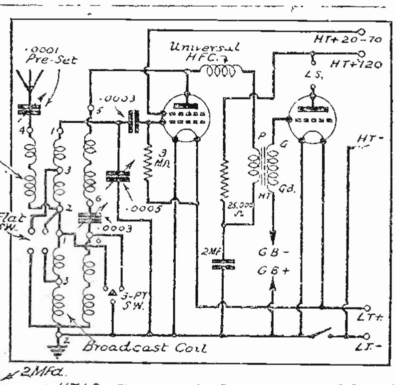


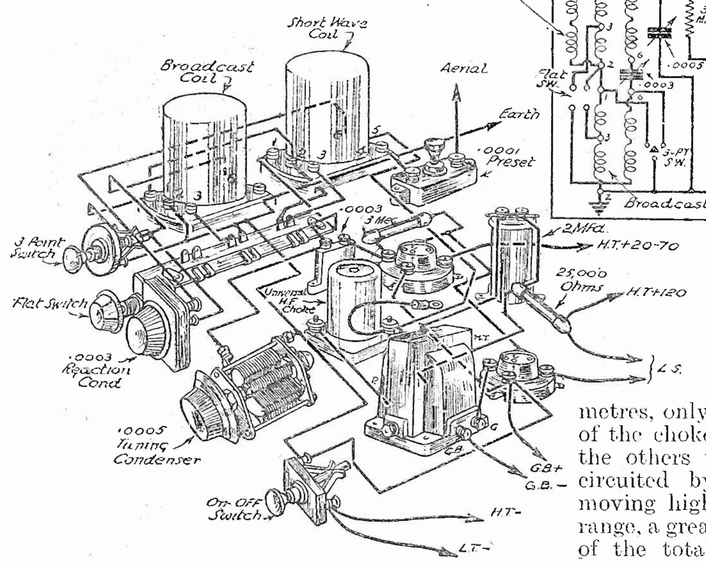


Fig. 5.—A useful all-wave two-valve circuit using two of the coils described.

winding should be connected to the anode of the detector-valve, as shown. It will be understood that when receiving on the short waves below some 30 metres, only the side-by-side turns of the choke will be in use, since the others will be virtually short-circuited by their capacity. On moving higher up the wavelength range, a greater and greater portion of the total windings will come into use until, on long waves, the whole choke will be in action.

reaction condenser comes between the two reaction windings, and because of this the moving vanes (which are connected to the spindle, of course) are at earth potential; in consequence, hand-capacity effects are not likely to be troublesome. A .0005 mfd. variable condenser is shown for tuning purposes, and this capacity is admittedly rather high for short-wave reception, although it is essential for covering the full band of wavelengths on the broadcasting ranges. So that tuning shall not be too critical a process, it is practically essential that the condenser should be provided with a reliable slow-motion drive. The reaction condenser is .0003 mfd., and although this is on the high side it is not likely that any great difficulty will be experienced in operating it; if it should seem rather "fierce," a smaller capacity can be tried. As a matter of fact, even a .0002 mfd. condenser will give reaction over the full range of wavelengths when a screen-grid valve is used for detection, as shown, but with medium-impedance triodes, such a capacity will be found rather too low to produce oscillation at the higher condenser readings.

A "Universal" Choke

A "universal," or all-wave high-frequency choke is shown, and most of the components sold under one or other of these names can successfully be used in this position. As an alternative, a short-wave and broadcast choke can be wired in series, connecting the short-wave component to the anode of the detector valve. Yet another method, and one which will be favoured by keen constructors, is to make the choke from similar materials to those employed for the coils. Constructional details of such a choke are given at Fig. 6, and it will be seen from this sketch that a small portion of the windings are arranged as side-by-side turns (for short-waves), the other portion being placed in slots formed by means of the dividing washers supplied with the coil former. There are 900 turns in all of 34-gauge d.c.c. or enamelled wire, and of these 25 are wound side by side, 50 are placed in the first slot, 105 in the second, and 180 in each of the remaining four. The "top" end of the

Points of Interest.

There are a few other practical points which should be dealt with before concluding this series. A reader wrote some days ago from Aberystwyth asking if it would not be better to use silk-covered wire in place of the d.c.c. specified in the previous articles. As reason for this question the reader said that he had been informed that cotton

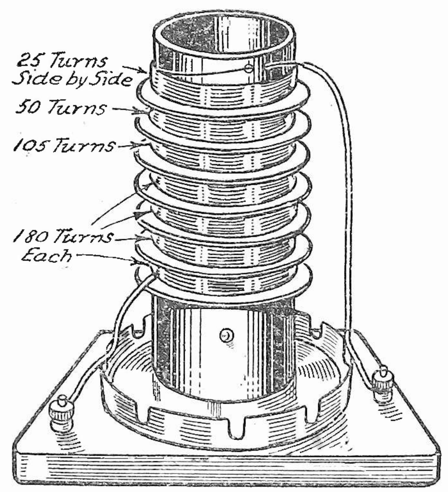


Fig. 6.—Details of an excellent all-wave or universal H.F. choke.

possesses some property which makes it unsuitable for coil winding. This is not quite true, although the reader had probably seen it stated at some time that cotton absorbs moisture rather easily, and when it becomes damp it is liable to act as a kind of high resistance short between adjacent turns. In practice, however, it is scarcely likely that the finished coil will be situated in a damp place where the moisture could produce an effect such as that mentioned. Should there be any danger of the coil being attacked by damp, it would be best to apply a thin coat of shellac varnish or melted paraffin wax to the windings. Here again we come up against a question that is often disputed—whether or not shellac and cotton produce a compound which attacks and corrodes the copper wire. There might be something in the suggestion that copper is attacked in this way, but I have never found any proof of it. In any case, whether using shellac or wax, make quite sure that only the thinnest possible layer is applied, because it will increase the self-capacity of the finished coil and thereby reduce its efficiency to some extent.

The difficulty just referred to would, of course, be non-existent if enamelled or silk-covered wire were used for the windings. Enamelled wire was given as an alternative in the specifications in respect to all the coils described, and this is eminently suitable provided that care is taken in winding it to prevent adjacent turns rubbing each other and scraping away the enamel. If enamelled wire is used, the number of turns should, theoretically, be modified slightly, due to the fact that the inductance and self-capacity are changed. In practice, however, the difference is generally so slight that the correction factor need not be taken into consideration. The only point that should be considered is that the distance between the ends of windings should be the same as those mentioned and shown in the various drawings. And as enamelled and silk-covered wires are thinner than those with cotton covering, the medium-wave turns occupy a shorter space on the former. The same remarks apply to silk-covered wire as to enamelled, except that in this case there is no danger of the insulation being scratched.

There is a little point in regard to soldered connections that ought to be dealt with. Under no circumstances should acid or chloride be used as a flux in soldering fine wires, since if it is, the joints are almost sure to corrode sooner or later, when trouble will naturally be experienced. Perhaps the best flux of all is resin, because this is not only non-corrosive, but it leaves a protective layer over the joint and is not "messy" in use. Additionally, it is an insulator, so that if any should "splutter" when the hot soldering iron is applied, no harm can be done.

CHOOSING & USING RESISTANCES

(*Continued from page 798*)

R.10 is an L.F. volume control, and varies the amount of L.F. signal current passed from the transformer secondary to the grid of the output pentode. Its function is comparable to that of R.1, although low-frequency, instead of high-frequency, current is being handled. The maximum resistance should be considerably higher than the impedance of the transformer, or else there will be some loss in the way of high-note response. A good value for general use is 250,000 ohms, and the component may be either wire-wound or otherwise; the former type is liable to be a bit "noisy" when the control is in use, but the latter might —if not of very sound construction—be productive of crackling noises. As in the case of R.5, it is an advantage to have this resistance of the "graded" type so that the resistance variation near the "full-volume" (grid) end of the element is less than at the other end.

R.12 is for decoupling the priming grid of the pentode, and it also cuts down the voltage to a suitable figure: the method of deciding upon its value is similar to that employed for R.9. It should be added, however, that an average value is about 2,000 ohms, which serves to prevent the passage of low-frequency alternating currents without "dropping" the voltage.

"MICRO-MICRO-FARADS"

By "Photon"

THE capacity of a conducting sphere in infinite space is, in electrostatic units, defined as equal to its radius in centimetres. To avoid the use of the term "infinite" it is easy to interpret this by saying that *well in the open* the capacity of a conducting sphere is somewhat greater than its radius expressed in cm. This enables us in many cases to assess the capacity of a component or part of a component by mere inspection with sufficient accuracy to decide whether it is important, and to compute what its effect will be on the

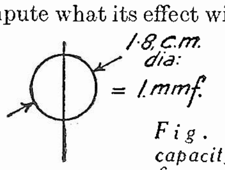


Fig. 1.—A sphere whose capacity is 1 micro-micro-farad.

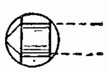


Fig. 2.—The capacity of a metal fitting can be estimated from the size of a sphere which will contain it.

circuit of which it forms a part, but the result being in *centimetres* means nothing to the ordinary man used to dealing with microfarads. The conversion factor fortunately is simple and easy to remember thus:—

One micro-micro-farad = 0.9 of an electrostatic unit, that is to say 0.9 of a centimetre. For ordinary purposes, especially if the equivalent sphere has to be guessed, it is sufficient to say that a capacity

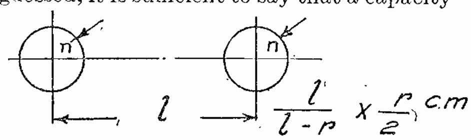


Fig. 3.—Two equal spheres at a distance l apart.

of 1 cm. is equal to 1 m.m.f. As an amusing example of this it may be remarked that the radius of the earth is a matter of 640 by 10^6 centimetres, and therefore on this approximate basis its electrostatic capacity is 640 microfarads only! What a paltry thing is our earth! More accurately the figure is 700 microfarads. As a practical application of this rule, the following examples are interesting. We can always make an *outside estimate* of the capacity of any metal fitting such as a grid-leak clip, or cap, or a terminal by describing around it the smallest sphere that will contain it, then the radius of that sphere in centimetres gives the capacity in m.m.f. Again, if we have to deal with an H.F. choke, we can approximate the end portions by imaginary spheres, and so assess the capacity. There is, however, one thing to guard against, capacities assessed in this manner are capacities between the part, or its equivalent sphere, and the surrounding earthed metal work, as for example, the screening or other metal panel. This means that the capacity may be greater than given by the estimate, but unless the space is exceptionally cramped the error will not be substantial. The method is capable of refinement without much complication. For example, if there are two equal spheres at opposite potential widely separated the capacity between them (one + and the other —) is half that of a single sphere, or if separated by a distance l (centres) the capacity of one to the other is:—$\frac{l}{l-r} \times \frac{r}{2}$ cm.

Some Examples

In conclusion a few examples are given in Figs. 1, 2, 3, 4 and 5. Fig. 1 represents a sphere whose capacity in the open = 1 mmf. Fig. 2 is the simple case of a metal fitting supposed to be far removed from earthed surroundings, a limiting figure being given by the radius of the containing sphere, as drawn. Fig. 3 is the case of two equal spheres distance l apart, Fig. 4 is the case of a single sphere at a distance = $l/2$ from an earthed boundary wall. Fig. 5 shows the manner in which it is possible to estimate the capacity of a choke coil; here, however, if the dielectric is in part solid, such as ebonite, the capacity will be greater than for a naked winding. This may be assessed knowing the value of the specific inductive capacity K. For ebonite K=2.8 to 2.9; there appears to be no suitable material available with a lower value.

It often happens that in putting up or remodelling a set one or more condensers of small capacity are found to be required, it is far easier to make such condensers than to buy them, and it costs less. If C_{11} stand for the capacity in mmf.

$$C_{11} = \frac{KA}{11.3\,b} \text{ mmf. or } A = \frac{C \times 11.3\,b}{K} \text{ cm.}^2$$

where A is area in cm.^{2}; b is thickness of dielectric in cm. and K is the specific inductive capacity. In air K= unity.

Two examples will suffice. If the dielectric is *air*, and the thickness $b = \frac{1}{2}$ mm.=.05 cm. Then *one mmf.* will require an area:—

$A = 11.3 \times .05 = .565$ cm.^{2}

It should be noted that $\frac{1}{2}$ mm. is about the usual air gap in a variable tuning condenser, hence for a condenser of .0005 m.f. (=500 mmf.) about 280 cm.^{2} is required. A sample measured was found to have vanes of 14 cm.^{2} area and 20 dielectric spaces which is in perfect agreement.

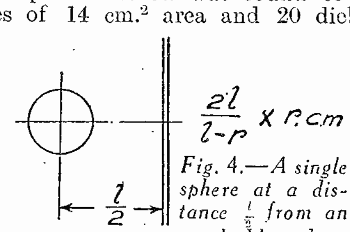


Fig. 4.—A single sphere at a distance l/2 from an earthed boundary wall.

If the dielectric be mica the value of K may be taken = 5. A usual thickness of mica is $2\frac{3}{4}$/1000 inch or .008 cm. Hence area required for one mmf.

$$A = \frac{11.3 \times .008}{5}$$

=0.18 cm.^{2}

In building up small mica condensers it is convenient to use copper foil rather than tin foil. The copper foil should be as thin as procurable.

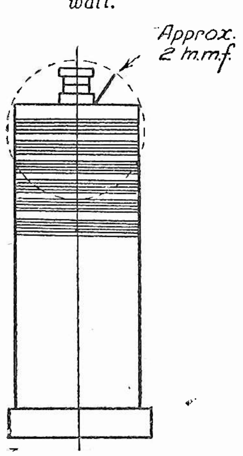
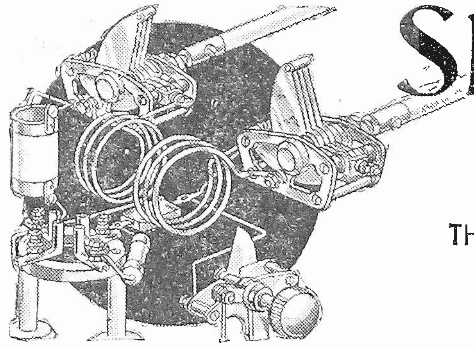


Fig. 5.—Illustrating the method of estimating the capacity of a choke.



Short Wave Section

THE LESSER LOGGED SHORT WAVERS

By E. THURWAY

CONDITIONS are now proving very favourable for the capture of distant transmissions on short waves, and daily reports are being received of the logging of stations of which signals had not been tuned-in for several months. Generally speaking, most of the short-wave transmitters can be classed under two separate headings in our lists, namely, those we can pick up at almost any period of the year, and those for which only a useful search can be made during certain months. As a rule, amongst the former may be found most Europeans, a number of North Americans and, to a certain extent, Australians, such as Sydney VK2ME; in addition, we can also look forward to hearing such stations at Nairobi, Bandoeng, and a few others from the East. In January especially the following guide will be found useful, as it gives the various times at which we may expect to hear broadcasts from the different quarters of the globe.

From midnight onwards to roughly 6 a.m. is the favourable period for East Coast and mid-west North Americans, and for stations situated in the Argentine, Brazil, Mexico, and so on, in the 30–50 metre band; from 6 to 9 a.m. you may expect to log Australian calls, as well as broadcasts from the American Pacific coast. Starting again towards midday, the 16 to 25-metre band should be searched, such broadcasters as W3XAL, Bound Brook, and the Dutch stations at Bandoeng usually coming in at that time; also Europeans working on channels between 19 and 32 metres. Again, from 5 to 8 p.m. we can try for India, South Africa, Kenya Colony (all included in 30–50 metres), or in the immediate lower band for North America, then until midnight in the wave-lengths ranging from, say, 35–70 metres and above.

If, as I assume, this is not your first attempt at listening to short-wave transmissions, you will have already secured the dial readings of some of the more better known or more powerful broadcasters, possibly in different sections of the wave band; if such is the case, it will help you greatly to narrow down your search for other wanted transmitters, as the loggings will give you a landmark for the various dial degrees at which to start. Casual twirling of the condensers is usually very disappointing, as tuning on the short waves must be very accurate, and consequently it is an easy matter to pass over a number of signals which very careful and slow moving of the dial would have caught.

European Wavelength Alterations

Before giving you details of a number of new stations, now being heard, let me mention a few alterations in some of the regular Europeans. Poznan (Poland), which had closed down temporarily when my last notes were published, is again on the air on Tuesdays and Thursdays at G.M.T. 17.30. The wavelength at present is slightly higher than hitherto, namely, 31.63 metres (9,485 kc/s). Jelöy, which relays the Oslo broadcasts, is now working on 42.92 metres (6,990 kc/s), on which channel it is providing both excellent quality and exceedingly loud signals. You will hear on this wavelength the usual musical-box signal usually associated with the Oslo entertainments in the higher broadcasting wave-band. Vienna (UOR2) on 49.41 metres (6,075 kc/s) has also resumed its tests on Tuesdays and Thursdays, and may be picked up at odd hours between G.M.T. 13.30 and 21.00. There is no change to report in the time schedules or frequencies of the British, French, and German transmitters.

The station used by the Technical College of the University of Bucarest, which had not been logged for some months, has been overhauled and now operates on 45.5 metres (6,593 kc/s) at slightly increased power. The best time to make the search is on Sundays from G.M.T. 15.00. It may be identified by the fact that the studio possesses a woman announcer and that the call frequently given out is *Radio Romania*.

OXY, Skamlebaek, after trying out a few channels around 49 metres, seems to have settled down again on 49.4 metres (6,075 kc/s); through this station you may get an excellent reception of the Copenhagen programmes.

In the 49-metre Band

Now for the lesser logged foreigners. In the 49-metre band we find several, but it will repay you to devote some time to the capture of La Paz (CP5), Bolivia, on 49.3 metres (6,085 kc/s), which is a daily transmitter between G.M.T. 00.30 and 04.30; the station also uses an alternative channel for its daylight broadcasts, namely, 19.61 metres (15,295 kc/s), which should be picked up between G.M.T. 16.30 and 17.30.

Barely two or three kilocycles above the former wavelength between midnight and 01.30, you may come across a Canadian call: VE9BJ, St. John, New Brunswick, a privately owned station which does not fail to mention its owners (C. and A. Munro); gramophone records are broadcast as well as a news bulletin.

Working up higher, if you hear Spanish and English announcements, you should stand by to secure identification, as CMCI, Marianao (Cuba) is on the ether daily from about 22.00; it is a powerful station on 49.5 metres (6,060 kc/s), of which the signals have already been logged in the British Isles. W4XB, on 49.67 metres (6,040 kc/s), the short-wave relay of WIOD, Miami Beach (Fla.) is also a possible and equally deserves a careful search.

Exploration of the 50-75 metre band, beginning with the powerful Moscow station, on most nights will bring good results; it is a mistake to believe that all the broadcasters work on the lower channels. A few evenings spent in this direction will amply repay your trouble. HJ4ABE, Medellin (Colombia) on 52.17 metres (5,750 kc/s) works from 00.30–04.00 on Tuesdays, and from 23.30–01.00 on Thursdays and Saturdays; also on other days from 16.00–05.00. Another South American, HCJB, Quito (Ecuador), I am informed, has changed his wavelength to 73 metres (4,110 kc/s) and operates every night from 01.15–02.45; the calls are in Spanish and English and the interval signal a two-tone chime.

Transatlantic and Other Distant Stations

A few metres above this channel you will find a welter of Dutch, French, and other amateur transmitters (75–85.7 metres), which at times provide items of interest. Working down, you will pass through the channels used by the International Service of Criminal Police, *e.g.*, HAP2, Budapest, on 72.09 metres, and by the transatlantic and other liners (71.82 metres). There are many degrees of the condenser dials on which you will wish to spend a little time, as most of them represent busy commercial or other channels.

Landmarks, as already stated, in the form of detailed logged condenser readings, are indispensable to the short-wave enthusiast. In every instance they will provide a quick jumping-off point and save considerable delay and worry. They also permit, by comparison, if a wavelength is not available, a fairly good estimate of the wavelength on which a transmission has been tuned in. Should you have found W8XK, East Pittsburgh, one of the KDKA pioneers, on 48.86 metres—it is on the air nightly—work up very slowly, degree by degree—when you will probably capture YV3BC, Caracas, on 48.92 metres (6,132 kc/s), the relay of the medium-wave broadcasting station in that city. From G.M.T. 21.00–02.00 on week-days is the most favourable period; on Sundays at that time the transmissions are carried out on 31.56 metres (9,510 kc/s). In the call you will hear a reference made to the *Radio-difusora Venezolana*. A further Venezuelan station, namely, YV11BMO, situated at Maracay, operates on 48.95 metres (6,127 kc/s). You may distinguish it from the previous one by the fact that it announces itself as the *Broadcasting Company of Caracas*; a man presides at the microphone.

Finally, reports have been received respecting two new Russian 500-watt transmitters, RNZ and RTL, respectively, on 62 metres (4,839 kc/s) and 54.74 metres (5,480 kc/s). They are situated in Kamschatka.

Exploring the ether with a good short-wave receiver to-day provides a fresh interest in radio; moreover, it permits its owner to hear transmissions which are not vouchsafed to him in the ordinary broadcast band.

RADIO RAMBLINGS

By JACE

Jottings from my Notebook

Loosely-Fitting Coil Covers

THERE is a point regarding tuning coils which is worth mentioning. I refer to the fitting of the covers of the "canned" type. Sometimes these do not fit at all tightly. This may not at first appear to be a very serious fault until we remember that the position of the cover affects the tuning range. This means that, in the case of ganged circuits, any movement of one of the coil covers is liable to upset the ganging. Of course, some coils have the covers held firmly in place by means of a nut on top. A simple safeguard of this nature is really all that is necessary.

Sometimes the covers fit fairly well, but tend to move when operating the wave-change switch incorporated in the base of the coils. I came across an example of this in a set of three coils mounted on one base with the switches linked by a rod in the popular manner. Every time the switch knob was turned the three covers wobbled from side to side!

"Intermittent" Rating of Accumulators

I SHOULD also like to give two suggestions concerning accessories. The first concerns the rating of accumulators. Could not the out-of-date and misleading "intermittent" rating be discontinued? It was based on the purely arbitrary assumption that an accumulator used to work a trembler coil, as for motor ignition or similar purposes, would last twice as long as when on continuous discharge. Under this system an accumulator capable of delivering 10 ampère-hours of electricity would be marked "20 amp.hrs.int." or "20 a.h.i." Often, however, the "int." is omitted and the purchaser is led to believe that he has a 20 amp.hrs. battery whereas, in reality, it is only of 10 amp.hrs. capacity. Of course, if it is stamped "20 amp.hrs. actual" there can be no mistake, but, as it is, a rating of 20 ampère-hours without any other qualification may mean either of two figures. If the intermittent system were abolished there would be no possibility of ambiguity.

Battery Cords

THE other suggestion I should like to make is that portable and such like receivers could be considerably cleaned up and at the same time made more fool-proof by eliminating most of the battery cords. Instead of using wander plugs, the H.T. and G.B. batteries would be fitted with brass contacts or clips somewhat similar to pocket-lamp batteries. All that would be needed when renewing a battery would be to slide the old one out and slip a new one in. The brass contacts would automatically connect with corresponding ones inside the case. This arrangement would make battery changing easier besides eliminating the possibility of plugging-in to the wrong sockets.

The batteries would have to be standardized as regards shape and size and would be fitted with a number of brass clips in place of the sockets used at present. The contacts inside the set would be in the form of spring-loaded plungers and placed so as to register with the clips on the battery which gave the appropriate voltages. Of course, each battery clip would be provided with a socket as well so that the battery could still be used in the orthodox manner with sets employing wander plugs.

Whistling in the Dark

I WAS privileged recently to witness a performance of *Whistling in the Dark*, a gangster play on American lines produced at the Comedy Theatre. The plot in brief is this: A dope and bootlegger gang are anxious to "bump off" an undesirable official who is in their way. An unsuspecting novelist, looking out for quiet retreat, happens upon them and asks to be allowed to look over the house. Amusing incidents result in his being held prisoner by the gang until he has produced a plan, on thriller lines, of the perfect crime which said gangsters can apply to aforesaid official. As a writer of crime stories the novelist here applies his imagination and produces a workable scheme. The play continues through amusing efforts on his part to warn the victims of his plot. Eventually he converts the radio set into a two-way system of communication with the telephone exchange, the gang having disconnected and removed the telephone. This part of the play was well done, and it is the first time, so far as I am aware, that radio has been used as a theatrical property in this way. The play is well acted, and I particularly liked Miss Billie Riccardo's acting as the eloping bride-to-be of the novelist. I had seen this actress only once before in the revival of *The Belle of New York*, in which she daintily played the part of Fifi with grace and distinction.

Siemen's Full o' Power Batteries

IT is always interesting to learn something about the construction of the apparatus or accessories which we use in conjunction with our radio sets and generally accept as a matter of course.

I have just been given some very interesting information concerning the Full o' Power Radio Battery which is claimed to be entirely distinct in construction to other types of dry batteries. Most of us visualize a dry battery as consisting of the type with a "dolly" wrapped with fabric surrounded with a moist paste or jelly electrolyte in an outer zinc container with soldered seams. In the Full o' Power Battery, however, the made-up "dolly" is dispensed with, a special manganese mix being compressed directly into the zinc container which, in this case, consists of a one-piece seamless cup pressed out from zinc sheet of heavy gauge. The zinc cup is thus perfectly leak-proof. It is most important to observe, however, that the manganese mix is not permitted to come into direct contact with the zinc, an insulated lining of very thin but tough paper being inserted into the zinc cup before the manganese mix is compressed into it. By this method it is possible to compress approximately 20 per cent. more active materials into the Full o' Power cell with a consequent increase in its life.

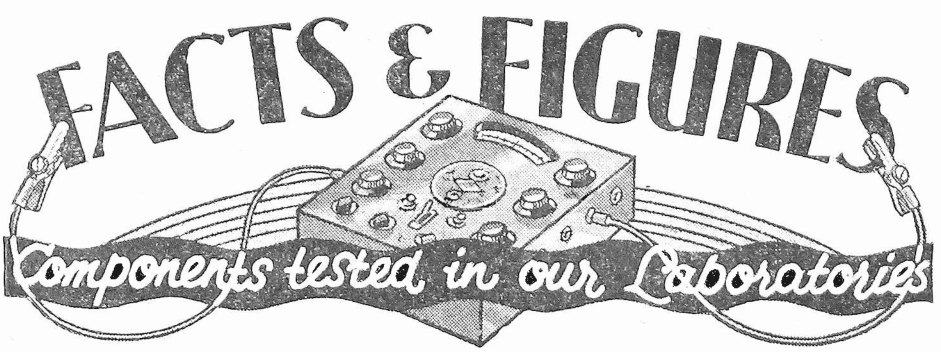
OLD COMPONENTS IN NEW CIRCUITS

(*Continued from page 780*)

Many amateurs whose experiments were commenced several years ago will have a 400-ohm potentiometer lying about. This was probably used to vary the potential applied to the detector grid through the grid-leak, but it can now be employed as an automatic grid-bias resistance in the L.F. circuit. The method of connection is perfectly simple, as can be seen from the sketch given at Fig. 5. The lead which was previously connected to the negative H.T. wander plug is now joined to one side of the potentiometer, whilst the other side is taken to the G.B. negative terminal and to the negative wander plug on the high-tension battery. In order to prevent instability a fixed condenser is connected in parallel with the potentiometer. The condenser shown is a 25 mfd. electrolytic one, this being most suitable, but if such a condenser is not readily available, an ordinary 1 or 2 mfd. one will make a good substitute. A correct value of bias for some types of valves can be obtained by varying the slider of the potentiometer, but the maximum resistance available will be too low for valves of other types, and in such cases it will be necessary to include a fixed resistance in the lead between the potentiometer and H.T. negative; this is shown by broken lines in Fig. 5. In any case the actual resistance value required can be found by dividing the grid-bias voltage required by the valve at maximum anode voltage by the anode current taken under the same conditions, and multiplying by a thousand. All the figures required for the calculation can be obtained from the makers' instruction sheet. An example will remove any difficulty in following the above statement; for the moment consider the Cossor 220 P.T. which requires 9 volts G.B. and takes 23 milliamps high-tension current. The bias resistance required is 9 divided by 23 and multiplied by 1,000, or 391 ohms. Suppose the valve in use had been a Cossor 215P, which requires a G.B. voltage of 7.5 and consumes 10 milliamps anode current, the bias resistance necessary would be 750 ohms, and therefore a fixed resistance of about 500 ohms could be wired in series with the potentiometer and the optimum setting of the potentiometer slider found under working conditions.

Scratch Filters

It frequently happens when using a pick-up that needle scratch is troublesome and some kind of filter is desirable in order to eliminate it. Scratch filters can be bought, but those who are still in possession of a set of plug-in coils will be pleased to know that one of these—having between 1,000 and 2,000 turns—may be used in conjunction with a small pre-set condenser as an excellent filter. The connections are shown in Fig. 6, and these are self-explanatory. It need only be pointed out that the pre-set condenser should be adjusted until needle scratch becomes inaudible or is reduced to its lowest volume level.



BY THE PRACTICAL WIRELESS TECHNICAL STAFF.

BRITISH RADIOPHONE PERFECTION SEVEN

BRITISH RADIOPHONE, LIMITED, announce that they are shortly releasing a free blue print of an ingenious seven valve superhet receiver in which their well-known Radiopak is employed. The circuit arrangement employed is of the single H.F. separate, oscillator type, and a metal rectifier (or cold valve) is employed for second detection and a separate similar rectifier for delayed automatic volume control purposes An output stage of the pentode type is used to deliver an output of slightly over 1 watt. The blue print gives full constructional details and a list of recommended accessories, and we hope to have an opportunity of testing a complete receiver built to the specification in the near future. A point of interest for the more technical-minded reader is the choice of a frequency of 117.5 kc/s as an intermediate frequency in place of the more orthodox 110 or 126 kc/s. The chart may be obtained free from British Radiophone. Ltd., Aldwych House, Aldwych, London, W.C.2, or from your local dealer.

TESTING MULTI-PIN VALVES

USERS of the Six-Sixty valve and set testers will have probably found that it is a rather difficult matter to test the new multi-pin valves in these testers. The same point applies to all users of testers in which the standard type of holder for a valve is fitted. The Six-Sixty Valve Company have now issued an interesting pamphlet which gives the following useful information for using the testers with the latest type of valve. They advocate the mounting of a 7-pin valveholder of standard type on a suitable small baseboard and suggest that a flexible lead should be joined to each of the terminals. A plug should terminate the leads, and this should be of a type suitable for plugging into the existing valve sockets on the tester. The valve to be tested is then inserted in the 7-pin holder and the appropriate leads are plugged into the socket of the valveholders on the test panel as indicated below.

Battery H.F. pentodes are tested as normal S.G. valves.

Battery Class B (each half tested separately): B to 7; C to 9; D to 8; and E to 10.

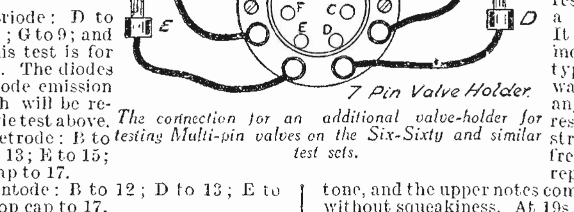
Mains H.F. pentodes: B to 12; C to 11; D to 13; E to 15; F to 16; G to 15; and top cap to 17.

Mains duo diode triode: D to 8; E to 10; F to 11; G to 9; and top cap to 7. This test is for triode section only. The diodes will fail when cathode emission fails, a fact which will be revealed by the triode test above.

Mains single diode tetrode: B to 12; C to 14; D to 13; E to 15; F to 16; and top cap to 17.

Mains duo diode pentode: B to 12; D to 13; E to 15; F to 16; and top cap to 17.

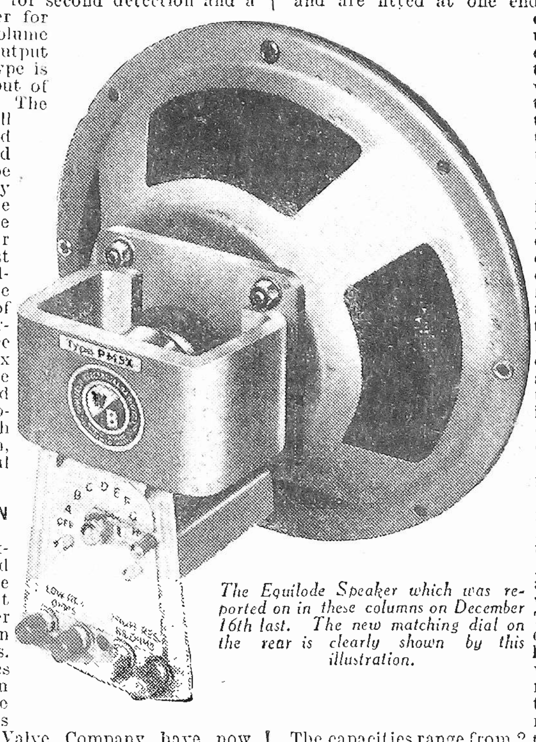
Mains output pentode: B to 2; C to 1; D to 3; E to 5; F to 6; and G to 4.



The connection for an additional valve-holder for testing Multi-pin valves on the Six-Sixty and similar test sets.

DUBILIER SMALL ELECTROLYTIC CONDENSERS

A FURTHER consignment of the new small electrolytic condensers manufactured by the Dubilier Condenser Company has been received. These are of the type primarily designed for grid bias smoothing, and vary from a 10 volt working rating to 250 volt. The condensers are extremely compact, and are fitted at one end with a nut which, in contradistinction to the usual large electrolytic condenser, is connected to the negative pole. It will be recalled, of course, that in the ordinary type the case is negative, and this makes contact with the metal chassis. The positive pole is then found below the chassis, projecting in the centre of the hole through an insulated disc. In these small condensers, however, the case is provided with the fixing bolt, and the positive lead is provided in the form of a long flexible projecting from the upper end of the case. It is sufficiently long to enable the condenser to be wired into practically any circuit, and it will be found exceedingly useful for biasing purposes in mains receivers, with a consequent reduction in the risk of hum troubles. We have thoroughly tested these condensers, subjecting some to as much as 50 per cent. overload with no apparent trouble. They are roughly 1in. in diameter by about 2½in. long, and thus may conveniently be fixed into most receivers in place of the standard type which may at present be fitted. The capacities range from 2 mfds. to 50 mfds., and the price from 2s. 6d.



The Equilode Speaker which was reported on in these columns on December 16th last. The new matching dial on the rear is clearly shown by this illustration.

NEW PETO-SCOTT LOUD-SPEAKER

A NEW moving-coil loud-speaker of sound design is now offered by Messrs. Peto-Scott. It will be recalled that this firm previously had a remarkable model which sold at 15s., and the demand has resulted in the stock of this speaker being completely disposed of. The new model is slightly dearer, and is of more robust design. The magnet system is of the orthodox claw type, and is larger than the previous model, whilst the cone itself is of a prepared paper material. The chassis is also continued so that the back of the diaphragm is practically enclosed, with the result that the complete unit is slightly heavier than the previous model. The sensitivity of this speaker is quite as good as the original model, satisfactory results being obtained with a good two-valve receiver. It appears to handle slightly more volume than the old type, and a 5-watt amplifier was coupled to it without any undue chatter. The response curve is sensibly straight over the normal frequency band, bass being reproduced with a clean tone, and the upper notes coming out in a crisp manner without squeakiness. At 19s. 6d., complete with dust-bag, this is a line which no reader should pass by. A Class B model is available at 22s. 6d.

MAGNUM COMPONENTS

AMONG recent new Magnum components are the H.F. choke and the two-gang condenser. The former is wound with high-grade copper wire on a slotted ebonite former. A high inductance with a low self-capacity is obtained, and the choke is suitable for use in the anode circuit of a S.G. valve, or for simple reaction purposes. The component is designed for one-hole fixing, and terminals are provided for ease of connection. The price is 2s. 6d. The two-gang condenser incorporates two of the .0005 mfd. magnadensers, together with a Magnum slow-motion drive, and an independent drive is provided for trimming purposes. Both drives are positive and non-slipping, and the dial is calibrated 0 to 100, or, if desired, in wavelengths for use with Magnum coils. The price of this unit is 10s. 6d., and, if desired, a grey cellulose cover may be obtained for an additional 1s.

BUILDING THE NUCLEON 4

(Continued from page 786)

of the small fixed condensers having to be accommodated near to their respective associated components instead of being disposed below the surface. However, it is not possible to have things both ways, and, therefore, the difficulty of wiring and other drawbacks of the "one-side layout" must be contended with.

Construction

Before commencing construction the various components should be placed on the baseboard exactly as shown in the Wiring Diagram, Fig. 6, and not until every part has been found to be exactly in place should the fixing screws be driven home. It will be found most convenient to leave the tuning condenser until last, and to fit only the valveholders and the fixed condensers at the outset, the various interconnecting wires being put in as the assembly progresses. If the whole of the components are mounted first, it may be found by some constructors that the wires to the filament terminals of the valveholders, for instance, are impossible to connect. When the valveholders have been wired the transformers may be mounted and then the terminal strip at the rear. The leads to the terminals should be fitted, and then the three coils mounted in the space provided. Care must be exercised to get these in the correct positions, as it will be noticed that two of these are for the band-pass tuner and the third has entirely different connections. If they are reversed on the baseboard the receiver will not function. Coil TG is nearest the panel, and coil BP2 is the centre one.

The Panel

Now drill the panel, using the dimensions in Fig. 2 as a guide, and marking out the window from the template supplied with the drive. To cut this out a fretsaw may be used, or a number of small holes may be drilled all round the edge of the opening and the central piece of ebonite then broken out. It will not be necessary to file the opening smooth if the hole is made slightly larger than that recommended on the template. Mount the escutcheon and the other panel components, and then attach the leads to the reaction condenser, potentiometer, and switch. Place the panel in position and fix the retaining screws, after which the remaining wires may be fitted into position. It will be seen that in many cases soldering has been resorted to in order to make quite certain of good connection, but there is no reason why the task of building should be shirked on this account, as soldering is a really simple job, and, as has already been mentioned many times in these pages, the principal point to bear in mind is cleanliness. If the iron is used when it is really hot and the work is clean the solder will run quite freely, and a really sound connection will result.

PRACTICAL LETTERS FROM READERS

The Editor does not necessarily agree with opinions expressed by his correspondents. All letters must be accompanied by the name and address of the sender (not necessarily for publication).

A Very Useful Little Set

SIR,—I received the PRACTICAL WIRELESS Kit of Tools safely, with which I am delighted. They are a very useful little set, and are well worth the money. I am a regular reader of your valuable paper, so I also have the set of spanners and drill gauge. Every success to PRACTICAL WIRELESS.—F. HANDS (Burton-on-Trent).

"Time Constant"

SIR,—In the December 2nd issue the term "time factor" is mentioned in Photon's article, "The Subdivision of Copper." I would be grateful if you would tell me in plain words:

1. Where the question of time comes in?
2. The importance of the "time factor."
3. And physical explanation of the term.

In reading an article on electric instruments I came across "Maximum time factor." What does this mean?—M. NEIDLE (London, S.E.).

[*Firstly it would appear that when you mention "time factor" you are misquoting from the article in which the term used is "time constant." The time constant is a term used in electrical engineering to denote the relation between L the inductance, and R the ohmic resistance of a circuit, but it is also applied to circuits having a capacity and resistance in which the time constant is:* $C \times R$

More generally it applies to any physical change, whether electrical or otherwise, which follows the logarithmic law. For example, when an E.M.F. is applied to a circuit that comprises a resistance only the current rises immediately to a value $= V/R$. *If there is an inductance also in circuit the current rises logarithmically, ultimately reaching thes ame value* V/R, *but the initial rate of rise is determined by the inductance only and the time constant is the time which would elapse if this initial rate of rise were to continue till the value* V/R *is reached. The actual current flowing after that period of time is approximately two-thirds of the full value* V/R.—ED.]

A Wonderful Kit.

SIR,—I wish to take this opportunity of thanking you for your wonderful Pocket Tool Kit. One look at these tools is enough to convince anyone that they are made to stand the test of time.. PRACTICAL WIRELESS will also stand this test, because it is always kept up to a high standard.—G. BAILEY (London, N.).

"Proud To Own Such a Set"

SIR,—Thanks very much for the Tool Kit just received. Such a kit was, you may be sure, scrutinized severely, and as a practical man I have not the slightest hesitation in stating it is (in my opinion) a kit of the essential tools every amateur constructor should possess. I am proud to own such a kit, and urgently urge others to write you for one.—F. O'C. COOPER (Dover).

"Remarkable Value for the Money"

SIR,—I beg to acknowledge receipt of my Tool Kit, and I must say that it exceeded all of my expectations. The gift is like PRACTICAL WIRELESS, remarkable value for the money.—R. TAYLOR (Churt).

"A Wonderful Volume"

SIR,—I have been a regular reader of PRACTICAL WIRELESS since the first edition, and I think it is a very good wireless magazine for beginners and experts alike. I also wish to thank you for your "Popular Mechanics Encyclopædia," which I have just received. It is a wonderful volume, and will be most useful to me.—G. ALLAN (Forest Gate).

"Exactly What Is Required"

SIR,—I should like to take this opportunity in wishing your paper every success. I consider that it is about the best weekly wireless periodical that I have read since about 1922. No, I have not been a reader since No. 1 issue, but that I regret. However, I consider that your gift Tool Kit is exactly what is required by a person who spends nearly all his time at the experimental bench.—G. BARTHOLOMEW (Bulford).

"The Ideal Tool Kit"

SIR,—I must write and thank you for the really first-class Tool Kit which arrived O.K. It is the ideal kit for the wireless enthusiast.—J. E. BISHOP (London, W.C.).

CUT THIS OUT EACH WEEK

DO YOU KNOW?

—THAT whilst indirectly-heated valves are warming up, the primary of an L.F. transformer is unloaded.
—THAT the above point explains the cause of hum when first switching on a mains receiver.
—THAT it is not possible to convert an inductive condenser into a non-inductive condenser by external means.
—THAT, generally speaking, it is not possible to use A.V.C. in a D.C. mains receiver unless a simple inefficient circuit is employed.
—THAT a whistle which accompanies loudspeaker reproduction, and which stops when the grid of the output valve is touched, denotes L.F. instability.
—THAT the simplest cure for the above is to reverse the connections to one of the L.F transformer windings.
—THAT instability can be caused by the vibration of the vanes of a tuning condenser.
—THAT an H.F. choke may be wound on a tapered former to improve its characteristics.
—THAT a sectional-wound choke, with small sections at either end, acts in a similar manner to the above type.

NOTICE.

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 and 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 letters patent.

CATALOGUES RECEIVED

To save readers trouble, we undertake to send on catalogues of any of our advertisers. Merely state, on a postcard, the names of the firms from whom you require catalogues, and address it to "Catalogue," PRACTICAL WIRELESS, *Geo. Newnes, Ltd., 8/11, Southampton St., Strand, London, W.C.2. Where advertisers make a charge, or require postage, this should be enclosed with applications for catalogues. No other correspondence whatsoever should be enclosed.*

MULLARD H.F. PENTODES

CONSTRUCTORS contemplating the use of screened (H.F.) pentodes in their next receiver should obtain a copy of a new Mullard leaflet on these valves which has just been issued. The special properties of the screened pentode are fully described, and are followed by full operating data and characteristics, with curves of the two Mullard types—V.P.4 and S.P.4—and practical operating hints for using these valves in modern circuits.

EELEX SHORT-WAVE CONVERTERS

THE problem of getting a short-wave superhet type converter to work with superhet receivers has been effectively solved by J. J. Eastick and Sons, who have produced a range of compact converters of single and two-valve types, the two-valve models having an extra stage of amplification. The converters are suitable for all types of broadcast receivers which are designed for reception above 1,000 metres. The wavelength range of the converter with the standard coil supplied is 15-60 metres, although this range can be increased to 120 metres by means of an additional coil. Booklets containing full particulars can be obtained from the above-mentioned firm at 118, Bunhill Row, London, E.C.1.

"THE ALL-METAL WAY, 1934."

THIS is the title of an attractive handbook dealing 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.

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.

THE CROYDON RADIO SOCIETY

A popular comparison of members' gramophone pick-ups took place on December 12th at St. Peter's Hall, S. Croydon. A motor was fixed to a special test board, around which was screwed each pick-up on arrival. Switching enabled any two to be compared at a time, and all of them fed into a high-class receiver, using an A.C. H.L. and an L.S.6a at 350 volts for output. A discussion revealing some inherent difficulties in records and their reproduction first took place. Correct tracking was vital, and the needle must remain at right angles to the radius. There was also the difficulty of side pull on the groove, methods of minimizing this being indicated. In any case needle scratch limited top response at 3,500 cycles, while impracticability of a wide groove limited the bass. Tests were performed on a special musical frequency test record, and various needles were tried in turn. The Society is preparing for its New Year campaign for members, and PRACTICAL WIRELESS readers can gain ready admittance on application to the hon. secretary, E. L. Cumbers, Maycourt, Campden Road, S. Croydon.

SLADE RADIO

It was a "Members' Night" at a meeting held recently, and the opportunity was taken to deal with the following:—

1. Questions on subjects relating to lectures during the past quarter.
2. General questions.
3. Interference, mains, etc.

A large number of questions were raised and dealt with in a very satisfactory manner by Messrs. A. Freeman and G. T. Peck, the joint technical advisers. During the evening an oscillator of the latest type was exhibited and inspected by the members with great interest.—Hon. Sec., 110, Hillaries Road, Gravelly Hill, Birmingham.

BATTERSEA AND DISTRICT RADIO SOCIETY

On Friday evening, December 15th, the Battersea and District Radio Society held its last meeting for 1933, when Mr. D. Ashby, of the Westinghouse Brake and Saxby Signal Co., Ltd., gave a lantern lecture on the "Westector and its Associated Circuits." Various circuits for detection, automatic volume control, and H.T. current economizing by means of the Westector were shown by means of slides, and ably explained by the lecturer. The next meeting will be on January 9th, when it is hoped that the finishing touches will be given to the new D.C. mains receiver which the members have been building.—L. W. Smith, Hon. Sec., 8, Emu Road, Battersea, S.W.8.

INTERNATIONAL SHORT-WAVE CLUB (LONDON CHAPTER)

At the meeting of the London Chapter held at R.A.C.S. Hall, Wandsworth Road, S.W.8, on Friday, December 15th, Mr. P. J. L. Macfarlane, (G5MK), gave an illustrated talk on the layout and construction of short-wave receivers. He also gave some details of a new method he has discovered of obtaining reaction. A discussion then followed, dealing with the propagation of ultra-short waves. Various theories being put forward by the members, who showed great interest in this subject. Our new series of meetings commenced on January 5th at 8.0 p.m.—A. E. Bear, Sec., 10, St. Mary's Place, Rotherhithe, London, S.E.16.

INTERNATIONAL SHORT-WAVE CLUB (MANCHESTER CHAPTER)

A large number of short-wave listeners attended the inauguration of the Manchester Chapter of the International Short Wave Club, held on Tuesday, December 12th, at 75, Long Street, Middleton, nr. Manchester. Mr. F. Fielding, of Allied Newspapers, Ltd., and Mr. F. Sharpe were present. Mr. H. Wild, chairman, in opening the meeting spoke of the many advantages of being a member of this world-wide organization. Mr. Fielding then gave a talk on short-wave receivers, and mentioned the thrills to be obtained by hearing Australia for the first time. Mr. H. B. Shields, technical adviser, then described and demonstrated several short-wave receivers. All present agreed that they had enjoyed a most interesting evening. Many exclusive features have been arranged for future meetings, and all PRACTICAL WIRELESS readers in the district who are interested in short-wave work are invited to attend. The next meeting will be held at 75, Long Street, Middleton, nr. Manchester, at 8.0 p.m. on Tuesday, January 9.—R. Lawton, Secretary, 10, Dalton Avenue, Thatch Leach Lane, Whitefield, Nr. Manchester.

REPLIES TO BROADCAST QUERIES

MAC (London, N.10): We can trace the following call signs: (2) G6VK, A. R. Dellbridge, "Normanhurst," High Road, Laindon, Essex; (4) G2WS, W. A. Scarr, B.A., 4, Ridge Mount, Cliff Road, Hyde Park, Leeds, Yorks; (5) G5VT, A. E. J. Cooper, "Half-acres," Bishops Stortford, Hertfordshire; (6) G5VL, R. W. Leader and H. J. Powditch, Porth House, Porth, St. Colomb Minor, Cornwall; (9) G5CV, P. D. Walters, 45, Fairfax Road, Bedford Park, W.4; (11) G2SK, K. G. Styles, 19, Southampton Buildings, Chancery Lane, W.C.2; (12) G5UK, M. B. Buckwell, 114, Tankerville Drive, Leigh-on-Sea, Southend, Essex; (13) G6VI, W. MacCallum, 21, Park Place, Stirling, Scotland; (16) G5VB, A. F. Elton Bott, "Francisca," Barlow Road, Hampton, Middlesex; (17) G5SB, S. Berry, 143, Cheltenham Road, Bristol, 6; (18) G5RB, A. R. V. Garrett, Swinley House, South Ascot, Berkshire; (20) HAF4A, Denes Bibo, 50, Marvany Utca, Budapest 1, Hungary; (21) PAOAG, R. H. Brouwer, 14, Grootestrasse, Rijssen, Holland; (23) PAOHB, W. M. F. J. Otten, Havermarkt, Breda, Holland; (25) PAORO, J. R. Letitre, 111, Scheveningenschelaan, The Hague, Holland; (27) PAORP, M. E. A. Bemelmans, 24, Bezuidenhout, The Hague, Holland; (28) PAOMF, J. H. Van Dijk, 381, Hoofdweg, Amsterdam, Holland; (30) F8VG, Georget, Rue de l'Eglise, St.-Laurent près Epinal (Vosges), France; (31) F3BI, Marc Tonna, 134, Boulevard Dauphinot, Rheims, France; (33) F3CP, Louis Regnier, 9, Rue de Mazenay, Le Creuzot, France; (34) F8PU, Bassus, 2, Rue Saint Vincent-de-Paul, Bordeaux (Gironde), France; (36) F8QS, Eugène Dartevelle, 21, Rue de Douzies, Sous-le-Bois, Maubeuge, (Nord), France; (37) F3AM, P. Munch, 1, Rue du Hugstein, Guebwiller (Haut Rhin), France; (38) F8KI (K ?), M. Yvonnet, 8, Rue Desnouettes, Paris (15), France; (39) F8VV, Marcel Dudouet, Chalet D.9, Colombelles (Calvados), France; (40) F8AC, Lagien, 12, Rue Edmond Rostond, Marseilles, Bouches-du-Rhône, France; (41) F8CL, De Commines de Marsilly, Villa Saint Georges, Saint-Lô (Manche), France; (42) F8JE, Leon Cozic, 8, Rue Victor Hugo, Brest (Finistère), France; (43) F3BN, Marcel Mathias, 36, Rue Marchais, Orleans (Loiret), France; (44) F8ZB, Bouchard, Les Erables, Route de Corcelles, Dijon (Côte d'Or), France; (45) F8VL, Caradec, 177, Rue Croix-Nivert, Paris (15), France; (46) F8YR, Beaujeau, 85, Rue Sadi-Carnot, Armentières (Nord), France; (47) EAR155, Ignacio Guitian, 44, General Lacy, Madrid, Spain; (49) HB9K, Philip Recordon, Grand Champ, Lausanne, Switzerland; (50) HB9AA, Hans Buechler, 77, Scheuchzer-strasse, Zurich 6, Switzerland; (51) ON4BL (A ?), H. de Thier, 115, Avenue du Chêne, Heusy, Verviers, Belgium; (52) F8MI (L ?), Lieutenant Paqueron, Chef de Transmissions du Territoire, 22, Rue du Commandant Mellier, Fez (Morocco); (53) CT1FU, Mario de Vasconcelos, 161, Rua das Valas, Oporto, Portugal. AUSSI (Kent): SILVANUS HAYWOOD (Tipton): VK2ME, Sydney (Australia) received direct on 31.28 m. The interval signal is the call of the Kookaburra (Laughing Jackass). The address is: Amalgamated Wireless, Ltd., 17, York Street, Sydney, N.S.W., Australia.

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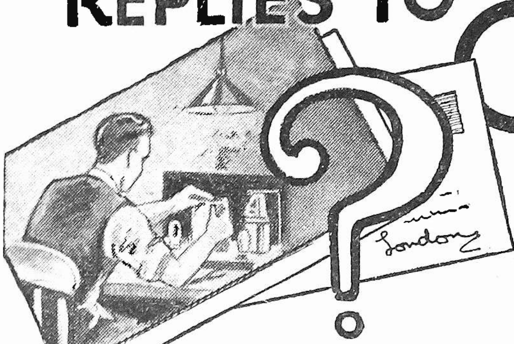
REPLIES TO QUERIES and ENQUIRIES by Our Technical Staff



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.

SPECIAL NOTE.

We wish to draw the reader's attention to the fact that the Queries Service in intended only for the solution of problems or difficulties arising from the construction of receivers described in our pages, from articles appearing in our pages, or on general wireless matters. We regret that we cannot, for obvious reasons—

(1) Supply circuit diagrams of complete multi-valve receivers.
(2) Suggest alterations or modifications of receivers described in our contemporaries.
(3) Suggest alterations or modifications to commercial receivers.
(4) Answer queries over the telephone.

Please note also that all sketches and drawings which are sent to us should bear the name and address of the sender.

THERMAL DELAY SWITCH

"As a new reader of your interesting periodical I have just seen reference to what is called a thermal delay switch. I realize from the name that this operates on a temperature basis, but regret that I cannot see its application in a normal receiver. Please could you let me know just what it is, and its general application ?"—G. H. (Kettering).

The switch is employed on the mains side of a receiver, which uses a rectifying valve of the indirectly-heated type. The heater of such a valve is fed from a secondary winding on the mains transformer, and the centre tap of this winding is employed as the H.T. positive lead. Obviously, therefore, when the mans are switched on the H.T. positive connection is completed to the receiver, but the heater takes thirty seconds or so to obtain maximum emission, and thus there is a risk of condensers and other components breaking down due to the excessive load caused by the fact that no anode current can flow until the valve is giving emission. Where the valves in the receiver are of similar type the danger is increased. The delay switch is wired in series in the H.T. lead, and it is fed from the same heater winding. Thus, whilst the heater is attaining maximum temperature the switch is also warming up and only closes when a certain temperature is obtained. This is designed to take approximately the same time as the normal I.H. valve. The switch may, of course, be employed in a D.C. mains receiver for the same reason.

WAVE-CHANGE SWITCH FAULTY

"My receiver has been working for quite a long time without any trouble, but find I cannot now get Daventry or other long-wave stations. When I switch over to the long waves there is a sort of rustling noise, but there are no signals and reaction also seems dead. Can you give me any idea what is wrong ?"—R. B., (Pimlico).

It is most probable that the wave-change switch has become faulty, due either to corrosion or a bad contact caused by a weakened spring. There is, however, the remote possibility that one of the long-wave windings (if more than one coil is used) has broken, although with the majority of commercial coils this should not happen. Examine the switch carefully and we think you will find that this is the real cause of the trouble. Whenever a set works well on one wave-band and fails on another it may be taken that the fault can only arise in the part of the circuit which is changed, and with the majority of broadcast receivers one part of the coil is simply shorted out for medium waves, thus localising the fault as being in the switch or that portion of the coil which is brought into circuit.

FUSE SHORTING TO CHASSIS

"I have finished the Orbit but am rather puzzled by a peculiar fault which is occurring on it. When I finished and screwed the fuse bulb in it glowed fairly brightly. The switch was 'off,' and so I pulled it into the 'on' position, and was surprised to see the fuse go out and the valves then lit up and the set worked. Results are really splendid, and I could not wish for a better set, but I cannot understand whether I have made a mistake in the wiring, or whether the fuse should work as it does. It is definitely alight when the switch is off and goes out when the set is on. Is this normal ?"—W. D. C. (Bromsgrove).

The fault is due to the fact that you have screwed the fuse bulb too hard into its holder, and this has forced the lower contact down on to the metallized chassis. If you give the bulb one or two turns upward you will find that it will go out and will then function in the ordinary way. A number of readers seem to have experienced this peculiarity, and it would, therefore, appear to be a good plan to fit a disc of paper or thin card below the fuse holder when mounting this in order to avoid the risk.

DATA SHEET No. 68.

Cut this out each week and paste it in a notebook.

SHUNT RESISTANCES FOR CONVERTING A 100-OHM METER.

Required Shunt (Ohms)	Multiplying factor	Required Shunt (Ohms)	Multiplying Factor
0.100	1,000	2.04	50
0.125	800	2.56	40
0.200	500	3.45	30
0.251	400	5.26	20
0.334	300	11.11	10
0.503	200	14.29	8
1.010	100	20	6
1.266	80	25	5
1.695	60	33.33	4
		50	3
		100	2

From the above table it will be seen that if a meter having a resistance of 100 ohms and reading 5 milliamps is required to read 50 milliamps (that is 10 times) a shunt of 11.11 ohms will be required. Knowing the resistance of the meter, any resistance can be ascertained from the above table.

FURY FOUR PROBLEM

"I have finished the Fury Four and can only get very weak signals. I have tried everything to bring up the strength but without avail. I finally borrowed a meter and find that the total H.T. across the terminals are only 30 volts I have checked all the resistances by replacing them with others and can still get no results. Can you give any clue to the trouble ?"—T. Y. D. (Gloucester).

There is undoubtedly a short-circuit across your H.T. supply in some part of the receiver, and the only way to find it is to connect a meter across H.T. positive and negative and then to go right through the circuit disconnecting various components one at a time until you find that the voltage rises to normal. This may seem tedious, but it is infallible, and it will most likely be found that there is a short-circuit on to the chassis.

MEASURING OUTPUT VOLUME

"I am getting really interested in the performance of my set since I have taken up "Practical Wireless," and I have a problem to put to you. I know nothing of mathematics, or the technical side of wireless, but I am immensely keen to be able to measure the actual volume given off by my set as I wish to carry out experiments with various ideas and to compare them with what I get now. I can, of course, judge the quality by my ear, but I cannot judge actual power and I should like to measure this, as I read that an increase of 50 per cent. is not detectable by the ear alone."—F. L. P. A. (Holloway).

If a circuit is made up by you and you cannot detect an increase in volume, there is hardly any necessity to measure it. However, from an interest point of view, you probably wish to carry out some experiments, and therefore the easiest arrangement is to fix up the following apparatus. Obtain a small disc of polished aluminium, say, about as large as a penny. Have a really high polish on one side, similar to a mirror. Stick this, mirror side outwards, on a length of very thin silk, and stretch the silk between two firmly fixed arms. The entire structure should be really rigid, and the length of silk should be adjusted so that the mirror can rotate, or at least vibrate freely. This piece of apparatus should be stood directly in front of your loudspeaker (the actual optimum distance being found by experiment), and a small lamp focused on the mirror with no signals coming through. When the set is switched on it will be found that the sound waves will cause the mirror to move about, and you can then arrange the lamp and mirror so that the spot light cast by the latter is directed on to the wall. The maximum movement will be obtained by the loudest signal, and you should be able to arrange matters so that you get only a small movement with the present set and thus be able easily to see the circuit which produces maximum volume. Of course, the lamp and mirror must always be placed exactly in the same position.

ADDITIONAL LOUD-SPEAKER

"I was very interested in the recent article on connecting an extra loud-speaker, but I find that all through that article the author did not deal with the push-pull circuit. As I am at present using this arrangement, and should like to use an extra speaker, I should be glad of directions for connecting it to my circuit."—H. A. S. (Gainsborough).

The conditions of a push-pull circuit are generally similar to a triode employing an output choke. That is, the two anodes of the push-pull valves are joined together through a choke or the primary of an output transformer. The centre tap of this winding is joined to H.T. positive. Therefore, an extra speaker may be joined to the two anodes, either direct, or through a fixed condenser of 2 mfds. There is no D.C. flowing in the normal push-pull stage so that the condensers are not essential, and they need only be used when the extra speaker is supplied at some distance from the apparatus. If the present speaker is joined to the anodes, then it will be preferable (as in the other cases mentioned in the article) to obtain a speaker with an output transformer, or a separate transformer, and to use this for supplying one speaker and the primary to be used as a choke.

STATICS

"I am rather puzzled by the phenomenon which I receive regularly on my set. If I set the tuning dials to a spot slightly below London there is practically dead quiet. As I turn the dials towards London, however, there comes in a lot of cracklings and noises which are strongest when I am tuned to London, and if there is no music on there is a most horrible noise. —G. T. (Edgware).

The fault is quite beyond your control, and is due to the high efficiency of your H.F. stage, or stages. The carrier-wave of the local station acts as a conveyor for all kinds of static and other noises and these are in themselves untuned but accompany the carrier wave. Thus, when tuned to a point where there is no broadcast station the noises are not so clearly audible as when you tune in a powerful carrier with its accompanying "mush." Obviously the noises (as well as the general signal) will be reduced if you lower the amount of H.F. amplification.

FREE ADVICE BUREAU
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This coupon is available until January 13, 1934, and must be attached to all letters containing queries.
PRACTICAL WIRELESS, 6/1/34.

PRACTICAL WIRELESS MISCELLANEOUS ADVERTISEMENTS

Advertisements are accepted for these columns at the rate of 3d. per word. Minimum charge 3/-. All advertisements must be prepaid.

PREMIER Supply Stores, 20, High Street, Clapham, S.W.4. See our advt. on Page 748 of December 23rd issue.

SOUTHERN RADIO's Wireless Bargains.—Se manufacturers' guaranteed surplus.

VARIABLE Condensers.—Lotus 2-gang 0.0005 complete with dial, knob, escutcheon, 8/6; Lotus Dyblock Single Variable 0.0005 Condensers with dial knob escutcheon, 4/9, (list 9/56; Hydra block condensers, new, 16 mfd., 2+2+8+2+1+1 1,000 volt test. 7/- each 4 mfd., 2/6; 2 mfd., 1/9; 1 mfd., 1/-. Block condensers 1.500 volt, with terminals 20 mfd (2+2+2+2+2+2+2+2+1+1) 12/9; 10 mfd (2+2+2+2+1+1) 8/3.

RADIOPHONE Volume Controls and Switch 50,000 and 10,000 ohms, 3/3 each (list 10/6).

HELLESENS 8 mfd., Electrolytic Condensers. 3/6 each, 4 mfd., 3/- each.

SPEAKERS.—Permanent magnet, 28/- (listed 49/6); D.C. mains energised, 2,500 to 6,500 ohms. complete with humbucking coils and transformers. 16/6 (list 39/6): Magnavox D.C. speakers, M.C. latest type "154" all voltages, 17/6 each. G.E.C. Stork speakers, complete in magnificent cabinet, 19/6 (listed £3/15); Ormond speakers, complete in cabinets, 10/- (listed 25/-); Blue Spot, 100 U, 13/6 (list 37/6).

READY Radio "303" A Kits, complete with cabinet, M.C. speaker, less valves, £2/5; with 3 Mullard valves (P.M.1L.F. P.M.2D.X., P.M.2) £3/5 (list £6/17/6).

READY Radio Meteor "A" 3-Valve Screen Grid Kit, complete with cabinet, M.C. speaker, less valves, £3/7/6; with 3 Mullard valves (P.M.12A. P.M.2.D.X. P.M.2.A.), £4/10 (list £8/7/6).

READY RADIO ST.400 Kits, as specified by Scott Taggart, £2/19/6 each (list £4/17/6), all kits brand new in original sealed cartons.

B.T.H. Senior Pick-ups 1934, complete with volume control, 28/6 each (list 37/6). Blue Spot Pick-ups, with volume control, Model "88," 26/- each (listed 63/-). Ferranti Chokes, C.T., 20 Hys., 50 m.a., 6/- each (list 35/-): H.M.V. volume controls, 1/6 each (list 12/6) Dubilier 4 mfd. condensers (2+1+1), 1,000 volt, 2/9 each. 4.5 mfd. (2.25+2.25), 1,000 volt., 3/- each. Lumophon D.C. Moving Coil Speakers with terminals, 11/6 each (list 39/6). Mains Switches, 3 amp., 250 volt, 8d. each, 7/6 doz. Edison Bell Centre Tapped Inductance Coils. all values from 20 upwards, 9d. each, 7/6 doz. assorted. Amplion Loudspeaker Units 2/3 each (list 12/6) Every article perfectly new.

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SEND FOR IT ON 7 DAYS' TRIAL.

Frequency response 80-5,000 cycles. Bakelite head, Florentine bronze finish. Complete with lead and arm support.

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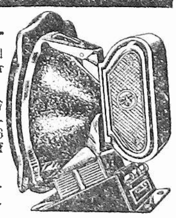
Send only 2/6 for 7 days' trial. If approved, balance in 4 monthly payments of 4/3. Cash or C.O.D. Carriage Paid, 17/6.

BLUE SPOT 29 P.M. MOVING-COIL SPEAKER

SEND FOR IT ON 7 DAYS' TRIAL



A very popular P.M. Moving-coil Speaker for operation from Power or Pentode.

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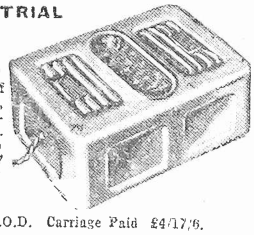

Model W.346. 150 volts at 28 m.a. S.G, and Detector tappings.
Send only 2/6 for 7 days' trial. If approved, send further 2/6. Balance in 17 monthly payments of 6/-.

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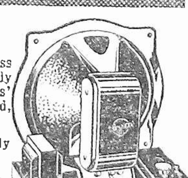

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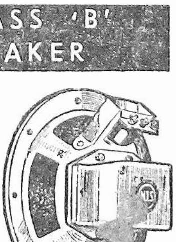

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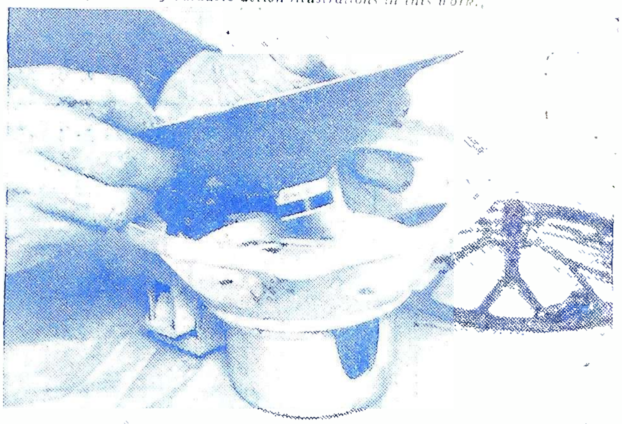

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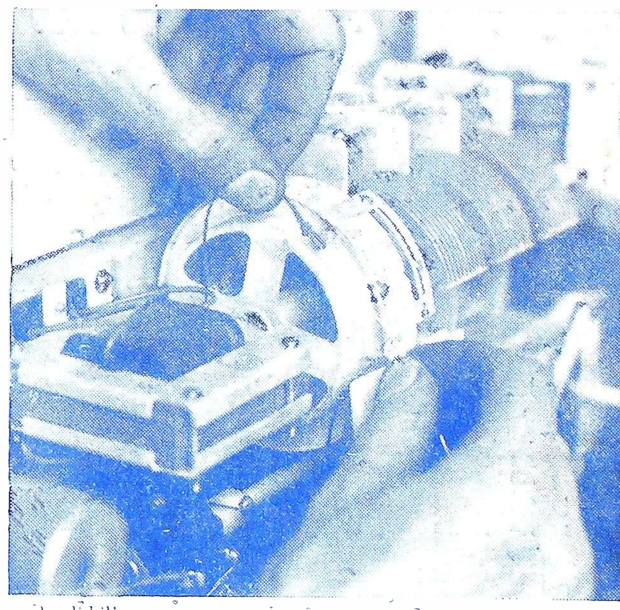

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