Practical Wireless

3D.

AND PRACTICAL TELEVISION

EDITED BY F.J.CAMM

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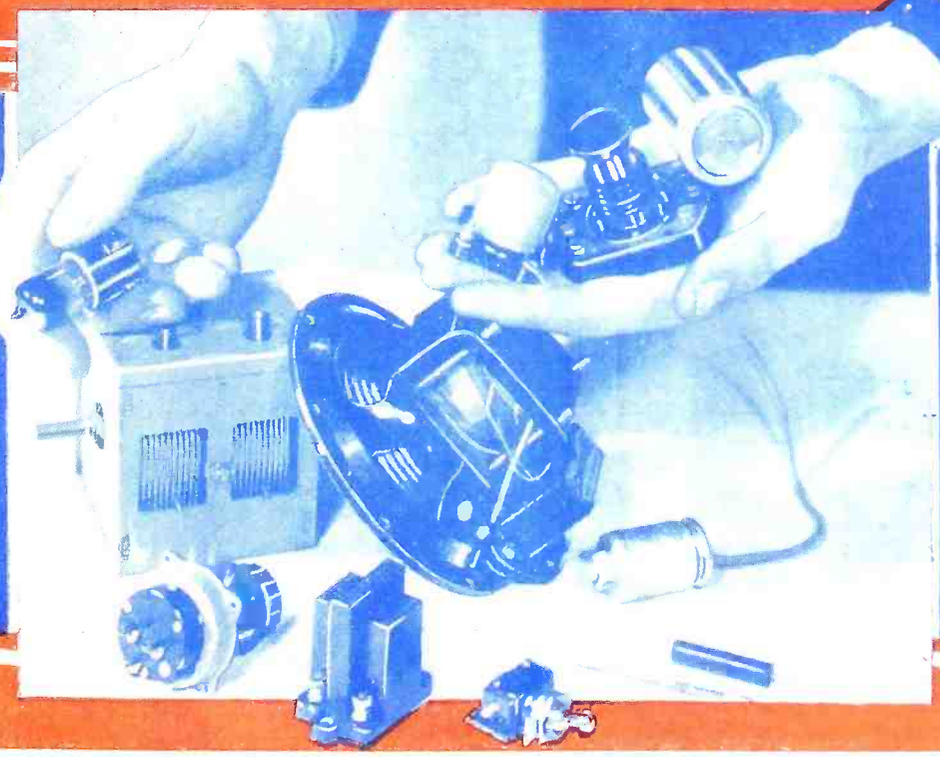

IF YOU ARE QUALIFYING FOR OUR POCKET TOOL KIT, TURN TO PAGE 1156

EDITOR:
Vol. III. No. 78 || F. J. CAMM || March 17th, 1934
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ROUND *the* WORLD *of* WIRELESS

Reorganization of Spanish Broadcasting Net

ONCE again a scheme has been put forward in Spain for placing the broadcasting system on a sound basis. It is reported that the matter is being taken up by the Ministry of Posts and Telegraphs and that the network will be State controlled. The new plan calls for the construction of seven transmitters, of which one situated near Madrid would be of more than 100 kilowatts, and six regional stations in the provinces ranging from 20 to 30 kilowatts.

Lithuania's Proposed 120 Kilowatter

IT is reported that Lithuania proposes to erect a 120-kilowatt broadcasting station at Klaipeda, on the borders of the Baltic Sea. It would operate on the channel at present occupied by Kaunas, namely, 1,935 metres. The latter 7-kilowatt transmitter would act as a relay on 222.6 metres (1,348 kilocycles). Klaipeda is the native name of the Baltic port Memel, lying about ninety-one miles to the north-north-east of Koenigsberg (East Prussia).

The Empire Within the Sound of Bow Bells

AS an experiment the B.B.C. is using as a new interval signal a gramophone record which peals out the chiming of the famous Bow Bells. Although only recently introduced in the medium-wave broadcast, it has been used for some little time in the Daventry Empire transmissions. The B.B.C. does not promise that this signal will definitely replace the one-second metronome tock-tocks.

World Broadcast of Passion Play

LISTENERS the world over will be given an opportunity this year of hearing a unique transmission, as the German authorities propose to relay at some date in May an excerpt of the Passion Play presented at Oberammergau (Bavaria). The broadcast will be relayed to all German stations and will also be sent out through the Zeesen short-wave transmitters. It is expected that most countries in Europe will take this exceptionally interesting performance, inasmuch as 1934 will mark the tercentenary of the first performance. The Passion Play is given every ten years.

Small Portuguese Transmitters

IN addition to Radio Parede (near Lisbon), now testing on 401 metres, there exist four other private broadcasting transmitters on low power putting out daily programmes in the later evening hours. Three are situated at or near the capital—namely, CT1DR (216.6 m.), CT1DH (212.6 m.) and CT1AA (291 m.). In addition, a transmitter has also been opened at Porto under the call sign CT1HP which has been heard working on 245.9 metres.

Prague on Short Waves

THE Czech Ministry of Posts and Telegraphs plans to build at Podebrady a short-wave station with directional aerials for transmission to North America. The station will be used not only for ordinary wireless telephony, but also for the relay of broadcast programmes to the United States.

Altered German Programmes

IN future more relays will be carried out by the German stations of musical or other plays performed at theatres. The National Hour—a programme simultaneously broadcast by transmitters throughout the country—is now given every Monday, Tuesday, Thursday and Friday between G.M.T. 7.30–8.30 p.m.

Special Broadcast from Vatican

AT the conclusion of the Holy Year, His Holiness the Pope will broadcast an address, on April 1st, which is to be transmitted to the entire world through the Vatican short-wave station. It is expected that the Papal blessing and other portions of the ceremony will be also relayed to a number of European high-power stations on medium and long channels.

Startling Radio Cabinets at the B.I.F.

WHAT will the radio sets of the future look like? Startling developments were suggested by exhibits shown at the British Industries Fair by E. K. Cole, Ltd., the radio manufacturers. The Ekco Stand in the Plastic Section showed, among other exhibits, specimen radio cabinets moulded in red, green, walnut, blue, cream, ebony black, marble, amber, and in mosaics of brilliant colours. A new Ekco superhet which has just been introduced is supplied in alternative finishes of grained walnut or ebony with chromium plated inserts. Many of the novel and extremely pleasing effects which can be obtained by combining metals and bakelite were well demonstrated by the Ekco exhibits.

ROUND *the* WORLD *of* WIRELESS *(Continued)*

Light Music by Midland Studio Orchestra

FOUR Midland composers are represented in a programme of light music which will be given by the Midland Studio Orchestra, conducted by Frank Cantell, on March 23rd. They are Sir Edward German (a native of Whitchurch, Shropshire), Leslie Bridgewater (who was born at Halesowen), Joseph Engleman (Birmingham), and Barrs Partridge (Stourbridge).

Wellesley Colliery Band Concert

ON March 24th the Wellesley Colliery Band, conducted by William Pegg, will give a concert for the Scottish Region. Wellesley Colliery, belonging to the Wemyss Coal Co., Ltd., is one of the most modern in Scotland, and is situated near Methil Docks, in Fife. In June, 1919, a meeting of the workmen was held at the colliery, and they decided to form a brass band and to allow contributions from their wages towards its support. In one year's time they gained honours at all contests in which they took part.

Broadcast by Band of R.A.F. College

THE Band of the Royal Air Force College, Cranwell, travel from Lincolnshire to Birmingham on March 18th for their first Midland Regional broadcast. They broadcast from Cardiff in 1923, three years after the College was founded by Lord Trenchard. Mr. A. E. Sims will conduct them in a programme which includes selections from Gounod's *Romeo and Juliet*, and from Wagner's *Lohengrin*. Louise Atherton, of Derby, plays four violin solos.

"Serenade" from the Midland Regional

MOZART'S eleventh Divertimento is not often heard. It is one of the features of a programme entitled "Serenade," which Birmingham Philharmonic String Orchestra, conducted by Johann Hock, are to give on March 20th. Haydn's Partita in F is another orchestral work to be given. Percy Underwood (baritone) will sing two groups of songs of the serenade type.

Massed Choirs Concert

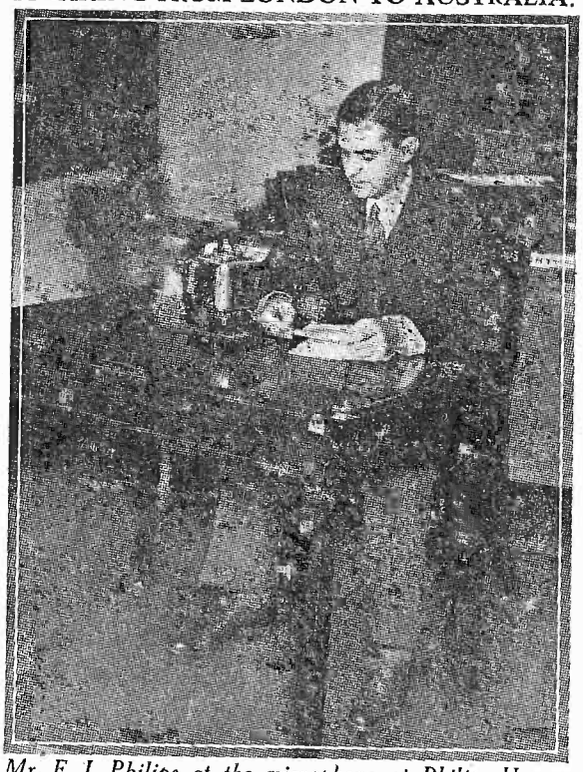
OVER a hundred school choirs take part in the non-competitive musical festival at Dudley. Cyril Winn, the composer, will adjudicate, and then on March 21st he will conduct a concert (which will be relayed) in the new Town Hall at Dudley by a massed choir of three hundred and fifty voices from senior and junior schools with percussion bands from infants' schools. The Schools Festival movement was inaugurated by U. C. Brunner, of Bridgnorth, and Dudley has had a Schools Festival since 1930.

Round the World in Thirty Minutes

SNAPSHOTS of a world cruise in dialogue and song are part of the lure employed by a travel agency in the amusing Midland Regional comedy, "Round the World in Thirty Minutes," which Martyn C. Webster is producing on March 22nd. A lady customer, portrayed by Alma Vane, is the chief beneficiary, although not in the way the young men of the bureau (played by Hugh Morton and Harold Clemence) have imagined. Laurie Devine and T. W. Rees are the authors. On March 24th Martyn Webster continues his "Don't Listen to This" series with two weird one-act plays abounding in grim atmosphere. These are *Hanged*, by Douglas Allen, and *The Last Survivor*, by W. Cumming Tait. Three experienced actors—John Lang, of Leicester; Stuart Vinden, the old Birmingham Repertory player; and Arthur Freeman, one of the founders of the Crescent Theatre, Birmingham, form the casts.

INTERESTING and TOPICAL PARAGRAPHS

SPEAKING FROM LONDON TO AUSTRALIA.



Mr. F. J. Philips at the microphone at Philips House, Charing Cross Road, London, from whence he addressed an audience at Sydney.

London to Australia

A SUCCESSFUL short-wave transmission marked the opening of the Australian Radio and Electrical Exhibition on Wednesday (Feb. 28th), when Mr. F. J. Philips, son of Dr. A. F. Philips, founder of Philips Lamps, Ltd., speaking from Philips House, London, W.C.2, addressed an audience gathered at Sydney. Mr. Philips's address, delivered at noon, was sent from the Rugby transmitter on 28 metres. Mr. A. den Hertog, chairman of the Australian Radio and Electrical Exhibition, and managing director of Philips, Australasia, replied from Sydney *viâ* the Baldock receiving station; his message was clearly heard at Philips House, Charing Cross Road, on the loud-speaker as well as through the headphones.

Blue Spot Speakers

IN the Blue Spot advertisement which appeared in our issue of March 3rd, the price for the Blue Spot Chassis was given incorrectly as 29/6. Actually there are Blue Spot Moving Coil Speaker Chassis available at prices from 27/- to 59/6, as well as Cabinet Speakers at prices from 45/- to 87/6.

New Scales for Ekco Receivers

WE are informed that replacement scales for the following Ekco receivers are now ready: SH25, C25, RG25. These models are, of course, from the popular range of 1933. New scales will be supplied in pairs of two sections at 9d. per pair, and will be available from all Ekco dealers, to whom application should be made as soon as possible.

Spanish Amateur Broadcasters

IN view of the number of low-power stations installed by amateurs in Spain for the purpose of broadcasting radio programmes and news bulletins, steps have been taken by the authorities to prevent mutual interference. There are already fifty-six stations working on various channels between 200 and 206 metres. In future, licences to transmit will no longer be granted unless the stations are at least twenty miles from one another! Power, for the majority, does not exceed 100–150 watts.

All Gipsy Orchestras Under One Control

AS complaints have been made in Hungary to the effect that the Gipsy Orchestras are gradually losing the true Magyar character of the compositions played, the bands are now being placed under a single control. In future, therefore, listeners to the Budapest broadcasts may have the assurance that they are hearing correct interpretations of old Hungarian melodies.

SOLVE THIS!

PROBLEM No. 78.

After building up a three-valver employing a capacity-coupled band-pass aerial tuner, Rogerson found that there was a lot of electrical interference received by his aerial. He, therefore, obtained an anti-interference aerial device, consisting of impedance-matching transformers for aerial and receiver, and connected these to the top of the lead-in and to the receiver. He found, however, that although interference was removed he got very few stations and could not tune in a number which he previously got at good strength. He found that many of these stations could be obtained by re-setting the trimmers on the ganged condenser, but this had to be done at nearly every setting of the dial. Why? Three books will be awarded for the first three correct solutions opened. Address your envelopes to The Editor, PRACTICAL WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2. Envelopes must be marked Problem No. 78 and must be posted to reach this office not later than the first post Monday, March 19th, 1934.

Solution to Problem No. 77.

Smith overlooked the fact that the field of the moving-coil loud-speaker had a very high resistance, and consequently when the total anode current of the receiver was passed through this it gave a very appreciable voltage drop and prevented the application of the correct voltage to the receiver.

The following three readers successfully solved Problem No. 76 and books have accordingly been forwarded to them:—A. Edwards, Maybury Inn, Maybury Hill, Woking, Surrey. H. A. Bayley, 1, Hill Street, Hill Top, West Bromwich, Staffs. R. Harvey, 31, Boswall Drive, Edinburgh 5.

Problems *of the* Midget Set.—1

In This Article the Writer Outlines the Principal Points which come up for Consideration when Designing a Compact and Miniature Receiver. Next Week We Shall Deal with the Midget Components Now Available for Midget Receivers.

By FRANK PRESTON

THERE is always a fascination about a wireless set which is much smaller than has become conventional, and whether or not there are any real advantages to be gained by building a "midget" receiver the design of such an instrument offers many interesting and novel problems.

In the first place it seems necessary to define the word "midget," as applied to a receiver, because it is entirely a matter of comparison. Receivers which were considered to be small a few years ago are quite bulky affairs as judged by present-day standards, and it does not appear unlikely that in the very near future it will be possible to construct receivers of even smaller dimensions than those which at present are thought to be diminutive. The smallest commercial receiver known to the writer measures approximately 10in. long by 7in. high by 7in. deep, and this is a four-valve superheterodyne of American origin. This set, despite its Lilliputian size, is entirely complete and self contained, having its own loud-speaker and aerial built in. As a matter of fact, the "aerial"—if such it can be called—consists of a short length of insulated flex which can simply be thrown along the floor or hung from a picture rail. The speaker has a maximum diameter of about 5in., and although this cannot be expected to give really first-class reproduction, its performance is considerably better than one would expect from theoretical considerations alone.

These midget receivers were very much "in vogue" in America a short time ago and their containers were cleverly designed to represent trinket boxes, jewel cases, clocks, and all kinds of small ornaments. It would appear, however, that they have not found very much favour in this country. The reasons are indefinite, but, for one thing, the British public is accustomed to having the very best possible reproduction, whilst the Americans do not appear to be quite so critical on the whole, judging by the reproduction afforded by the average American receiver. Then again, the average Englishman is not ashamed to own a wireless set, especially when it is housed in a cabinet which is in harmony with the household furnishings. Perhaps another reason for the comparative unpopularity of the midget receiver in this country is that English people generally are not so interested in "novel gadgets" as are the natives of U.S.A.

Advantages of the "Midget" Set

But quite apart from the novelty aspect of the case, there are a number of things to recommend the miniature receiver, especially if it can be designed in such a form that it will give good reproduction. A set of this kind can be placed in any odd corner, it can be moved from room to room with the greatest of ease and may, if necessary, be used as a normal portable set for use in any house wired for electricity.

The Power Supply

When the question of designing a midget receiver is first considered it becomes obvious that the set cannot be battery operated since, no matter how compact it is made the batteries cannot be reduced in size to any appreciable extent. At the same time the set cannot be an A.C. operated one of the normal kind, because the essential mains transformer would occupy nearly the whole of the available space, besides adding considerably to the weight. A D.C. set is quite feasible, but has such a limited application that it is immediately ruled out, especially when it is considered that D.C. mains in every part of the country are being changed over to A.C. One might thus well ask: "How can the set be operated, then?" The answer is that it can be a "universal" instrument, employing "mains voltage" universal valves, which can be operated equally well, and without modification, from either A.C. or D.C., and without the use of a mains transformer.

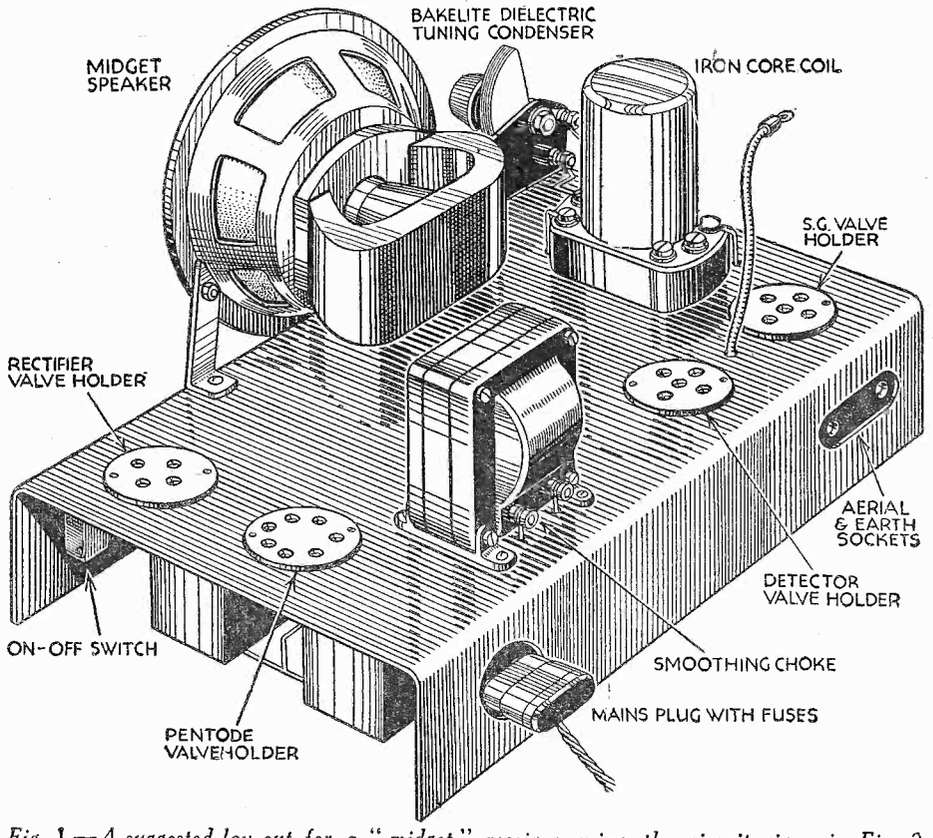


Fig. 1.—A suggested lay-out for a "midget" receiver using the circuit given in Fig. 2. The chassis would be about 11in. long by 7in. deep by 1½in. high.

A complete circuit for a three-valve universal "midget" set is given in Fig. 2, from which the simplicity of the whole scheme can easily be seen. The circuit arrangement is perfectly straightforward and comprises an S.G. H.F. stage, followed by a leaky-grid detector and a power pentode. The most important feature, however, is the valve rectifier which operates at mains voltage, carrying out its normal function when the set is connected to A.C. mains, and merely acting as a low resistance in the H.T. circuit when D.C. mains are being employed. All the valves are indirectly heated, and it is worth mentioning that they are quite as efficient as their "4 volt, 1 amp." A.C. counterparts. This point will be appreciated when it is pointed out that the mutual conductance of the screen-grid valve is 3.8, and of the detector, 3.5, these figures applying to two typical valves of well-known make. Added to this is the fact that the pentode has a maximum undistorted output of more than 2.000 milliwatts, and such an output can actually be obtained when using the valve combination shown in conjunction with a short improvised aerial situated within 20 miles or so of a main B.B.C. station.

Not only are the valves efficient from the point of view of the amplification they give, but also in regard to their current consumption. For example, the three receiving valves each require a heater wattage of only 6 (250 volts (max.) at .024 amp), whilst their H.T. requirements are similar to those of normal A.C. valves of the same types.

A Suitable Circuit

It has been said that the circuit arrangement is very straightforward, and it should be mentioned that the constructional details for a really compact receiver using the circuit are equally simple. By reducing the components to the least possible number compatible with efficiency, and by choosing modern parts of small dimensions, the whole set can be accommodated in less space than that required by a single-valver of the battery-operated type.

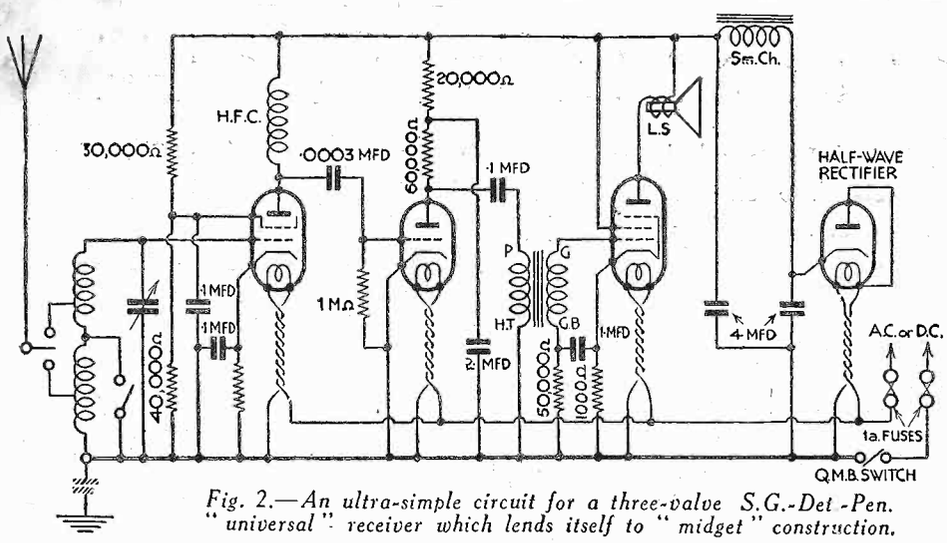


Fig. 2.—An ultra-simple circuit for a three-valve S.G.-Det.-Pen. "universal" receiver which lends itself to "midget" construction.

Grid bias is obtained in the usual manner by inserting suitable resistances in the cathode leads; the values of resistances shown are average ones which may require to be modified according to the particular valves employed. The tuning arrangements are not of the most efficient type, and the absence of reaction is not conducive to very good reception of comparatively distant stations, but this particular instrument is intended more as an example of what can be done in the way of simplifying things and making a really small set, than as an "ideal" receiver. The adoption of a single tuned circuit (in which one of the small iron-core coils would be used) serves to simplify the design and to economize in space by employing a single variable condenser of the bakelite dielectric pattern. Moreover, by using a good iron-core coil the degree of selectivity is ample for the purpose, especially when the set is "fed" from a short aerial. Provided that a really efficient screened H.F. choke is connected in the anode circuit of the S.G. valve a very useful amount of high-frequency amplification can be secured.

Resistance-fed transformer coupling is employed between the detector and pentode valves to ensure a high stage gain and the detector anode is adequately decoupled by means of the 20,000-ohm resistance. The cathode circuit of the pentode is decoupled by means of a 50,000-ohm resistance and, although this might not always be essential, it does eliminate the possibility of L.F. instability.

Another point in regard to the circuit is that, if the set is to be used in conjunction with an earth lead (which is frequently quite unnecessary due to the fact that the "earth line" is in direct contact with one mains supply lead) a fixed condenser must be inserted between the earth lead and the set as shown by broken lines.

Choosing the Components

It is obvious that the components for use in a "midget" receiver must be chosen with extreme care; not only must they be really small but they must be capable of withstanding the full voltage of the mains. As a matter of fact, however, there is a wide market from which to choose, especially since nearly all components are now made in more compact form than ever before. One should make a start by considering the loud-speaker. This component should preferably be a high-resistance moving-coil, in order to obviate the need for an output transformer, and should not have a greater diameter than 5 or 6ins. In most instances it will be necessary to employ a speaker of the permanent-magnet type, even though a field-energized one would be very helpful, due to the fact that it would remove the necessity for a smoothing choke. Unfortunately, however, so far as the writer is aware, there is no speaker on the market having a sufficiently-low field resistance that the magnets could suitably be energized without producing too great a voltage drop when the field is connected in the main H.T. lead. This difficulty would not exist if the constructor were prepared to accept a certain loss in efficiency by feeding only about 150 volts to the anode of the output valve. In such a case a standard field energized "midget" speaker with a field resistance of 2,500 ohms could be made use of, and this would produce a voltage-drop of 75 volts when the valves were consuming 30 milliamps high-tension current. The loss in this case would not be so very serious excepting when the set was operated from 200-volt D.C. mains.

When a permanent-magnet speaker is to be employed the smoothing choke presents a rather difficult problem, since it must have an inductance of not less than about 15 henrys when handling the full H.T. current, which might amount to nearly 40 milliamps. On the score of compactness it is best to choose a "stripped" component of the "manufacturers'" type; this is devoid of the usual casing, but is quite as efficient as one of the more usual kind.

There is not much difficulty in choosing a minute iron-core coil, and the same thing applies to the bakelite-dielectric condenser used for tuning it. All the fixed condensers with values of less than 1 mfd. might well be of the tubular type, while the two 4 mfd. and two 2 mfd. condensers might be obtained in the form of a compact "block" which could be of very small dimensions, since the condensers need have a working voltage of no more than 300. Fixed resistances are easy, for there are any number of small tubular ones with wire ends, some of these actually measuring no more than 1¼in. long by 3-16in. diameter. The L.F. transformer would be of the parallel-feed type.

A suggested arrangement of a "midget" set employing a circuit similar to that given in Fig. 1 is illustrated in Fig. 2. The valves must necessarily be placed near together, and the cabinet should have an open back.

The DETECTOR STAGE

HOW TO OBTAIN THE BEST RESULTS

The Detector Stage is the Most Important in the Whole Receiver, and This Article Deals with a Number of the Problems which Beset the Amateur when Designing This Section of the Set.

PREVIOUS and recent articles have dealt with the design of the high-frequency and low-frequency portions of receivers, and as those articles have proved very popular with readers it is felt that the detector section should now be dealt with in order to complete the series. It is not proposed to consider every form of detection, but simply to deal with the chief practical aspects of the grid-leak detector; the power-grid system is really a form of leaky-grid detection, so this will be referred to at the same time.

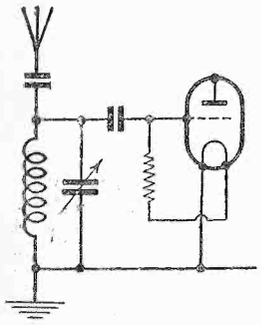


Fig. 1.—The usual form of aerial-grid circuit employed in simple receivers.

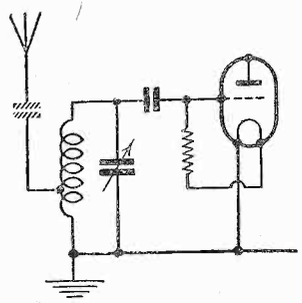


Fig. 2.—A better detector input circuit connected to a tapping about one-eighth of the distance from the bottom of the coil. A condenser may also be included in the aerial lead where a long aerial is employed.

Grid-circuit Coupling

The first point which the designer must consider in regard to the detector stage is the type of coupling which shall be used in the grid circuit. When the valve is not preceded by an H.F. stage the input circuit will generally consist of a single tuned coil to which the aerial is connected, either through a small condenser or to a tapping; the two arrangements are shown in theoretical form in Figs. 1 and 2. Both are standard tuning systems, although the first one is probably most widely employed. As a matter of fact, however, the latter is nearly always better, provided that the tapping points on the medium- and long-wave windings are chosen with care. Experiment nearly always proves that the optimum tapping positions for maximum selectivity, with the smallest loss in signal strength, is to be obtained by tapping the two windings about one-eighth of the distance from the "bottom" of the windings. The aerial is, of course, connected to the appropriate tapping for long- or medium-wave reception by means of a single-pole change-over switch. This should preferably be ganged with the main wave-change switch that serves to short-circuit the long-wave winding for medium-wave reception. Consequently, it is most convenient to use a two-pole change-over switch (of either the Q.M.B. or rotary type) wired up as shown in Fig. 3. The arrangement shown in Fig. 3 is, incidentally, readily applicable to nearly every type of tuner, home-made or ready-made, and the numbers of turns and diameter of former shown will be useful to those constructors who propose to make their own tuners. It should be stated that the dimensions apply to coils suitable for the "Lucerne" wavelengths, and covering the bands from approximately 190 to 500 metres and 800 to 1,800 metres when tuned by a .0005 mfd. condenser of good design.

Another form of aerial-grid coupling coil is that which makes use of inductive coupling only, and which has the connections shown in Fig. 4. This is very good from the point of view of selectivity on medium waves, but is not generally so satisfactory on long waves. In any case, the tapped coil previously described is nearly always to be preferred, especially if the constructor is prepared to experiment a little in regard to the most suitable tapping points.

When the detector valve follows an H.F. amplifier conditions are somewhat different, and there are three alternative methods of grid-input coupling. These are: tuned anode, tuned transformer, and tuned grid. Readers are frequently in doubt in regard to which of these is to be preferred, and the solution to the problem is not always very obvious. The question can best be tackled by pointing out the advantages and disadvantages of the three systems, and by quoting examples of different PRACTICAL WIRELESS receivers in which each was employed.

Tuned Anode

Tuned-anode coupling (see Fig. 5) is one of the oldest systems, and is probably the most efficient, provided that the anode tuning coil is a really good one. This form of coupling was used in the recent "Boom" set, where a maximum amount of high-frequency amplification was required from a single variable-mu stage, in order to derive the greatest benefit from the A.V.C. device connected in the anode circuit of the detector. The objection to tuned-anode coupling is that, due to its extreme efficiency, it tends to produce H.F. instability unless the set is carefully designed and the components chosen with care. It is, generally, a difficult matter to combine two stages of tuned-anode coupling without introducing some form of "artificial" damping to maintain stable operation.

Tuned H.F. Transformer Coupling

Tuned-transformer coupling (illustrated in Fig. 6) is actually very similar to the system just described, the only difference being that two windings are used, one of which is in the anode circuit of the preceding H.F. valve and the other in the grid circuit of the detector. By varying the number of turns on the primary (anode) winding, and modifying its position in respect to the secondary, it is possible to

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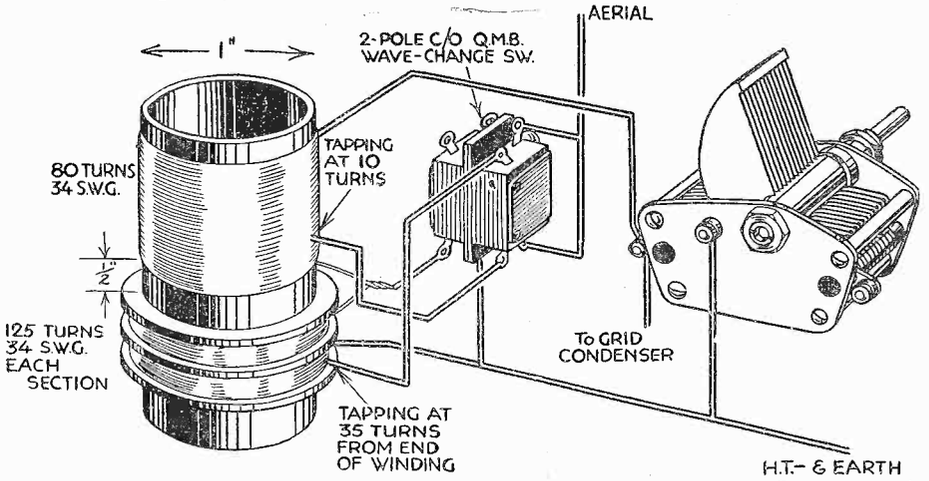

Fig. 3.—Details of an excellent aerial coil with aerial transfer tapping. Constructional details can be obtained from the article "Making Your Own Screened Coils," on page 633 of "Practical Wireless" dated December 9th, 1933.

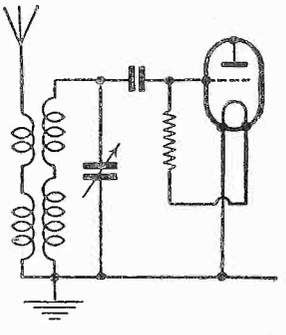

Fig. 4.—An inductively-coupled aerial input arrangement. This usually works well on medium waves, but is not quite so good on the long-wave band.

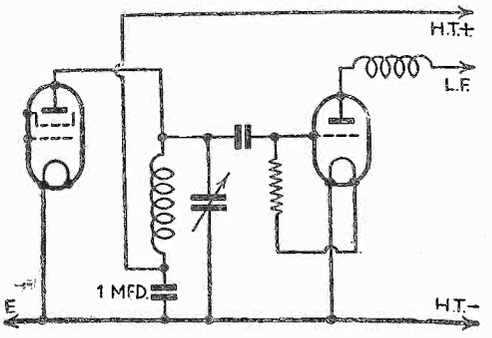

Fig. 5.—Tuned-anode coupling in its simplest form.

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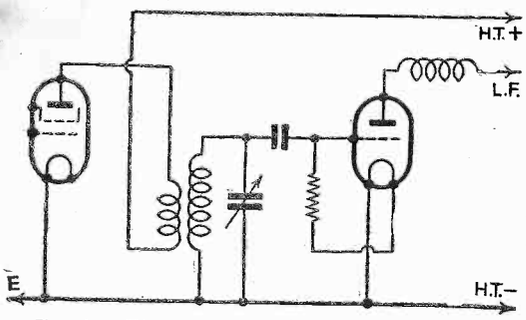


Fig. 6.—The connections for tuned-transformer coupling are similar to those for tuned anode, but an extra winding is used.

obtain a wide variation in the degree of selectivity. Thus, the tuned transformer, if made in selective form, is not quite so efficient as the tuned-anode coil, but is more stable and generally more selective. This kind of coupling was used in the "Quad-pak" (described in PRACTICAL WIRELESS dated November 25th and December 2nd, 1933), where two highly-efficient variable-mu pentodes were used in the H.F. amplifier stage. These valves themselves give an enormous amount of amplification so that if too efficient coupling devices had been employed instability would have resulted. Tuned-transformer coupling was also used in the "Leader" (described in PRACTICAL WIRELESS dated March 3rd, 1934), but in this case the transformers chosen gave fairly close coupling between primary and secondary, so that the overall amplification was not reduced. At the same time, the transformers obviated the need for an S.G. H.F. choke, such as would have been required in the case of tuned-grid coupling, or decoupling condenser and resistance which would have been called for in the case of tuned-anode coupling. As a result, high efficiency, selectivity and cheapness were all secured at the same time.

Tuned-grid Coupling

Tuned-grid coupling is very similar to tuned anode, but calls for the use of an H.F. choke in the anode circuit of the valve preceding the detector, a condenser being joined between the anode and the tuning coil in the grid circuit of the detector valve. Tuned-grid coupling can generally be considered to be just about as efficient as tuned anode, but it is less prone to instability. When using a very high-impedance H.F. valve (for example, an H.F. pentode) tuned-grid coupling is often preferable, owing to its greater freedom from instability. Tuned-grid coupling was used between the second V.M. valve and the detector in the "1934 Fury Four Super," and the circuit of that set will serve as an example for those readers who are not quite sure of the connections. The circuit appeared on page 904 of PRACTICAL WIRELESS dated 27th January last.

The Detector Valve

After having decided upon the form of input circuit to be employed we must make a choice of the detector valve. There are two general types of valve available; one of these has a comparatively low impedance and correspondingly low amplification factor (or mutual conductance, which is more descriptive of the "gain" provided by the valve), and the other is of high-impedance and higher mutual conductance. It depends very largely upon the general circuit arrangement as to which type shall be employed. If the detector is preceded by more than one H.F. stage and is followed by a pentode L.F. amplifier the former type of detector is to be preferred, since it will handle greater input signal voltages without overloading, and, because of its own comparatively low amplification, there will be less risk of overloading the pentode. On the other hand, if only a single H.F. stage is in use, and especially if the detector is followed by a low-amplification triode, it is better to use a detector of the high-amplification type. In order to differentiate between the different patterns of detector valve it might be stated that the average high-amplification detector is of the "H" or "H.L." type and has an impedance between about 20,000 and 35,000 ohms. The low-amplification detector, type "L" or its equivalent, generally has an impedance between 10,000 and 20,000 ohms.

Grid Condenser and Leak

When the valve has been chosen attention can be turned to the values of its associated components. The grid condenser and leak must first be considered, and the values of these depend partly upon the characteristics of the valve, and partly upon the voltage applied to its anode. In the case of the average high-amplification detector used under average conditions the somewhat stereotyped .0002 mfd. and 2 megohms can rarely be improved upon. At the same time it is frequently worth while to experiment with different values, bearing in mind that a reduction in capacity, or an increase in grid-leak resistance, tends to improve selectivity, whilst the opposite usually increases the power-handling capacity of the valve.

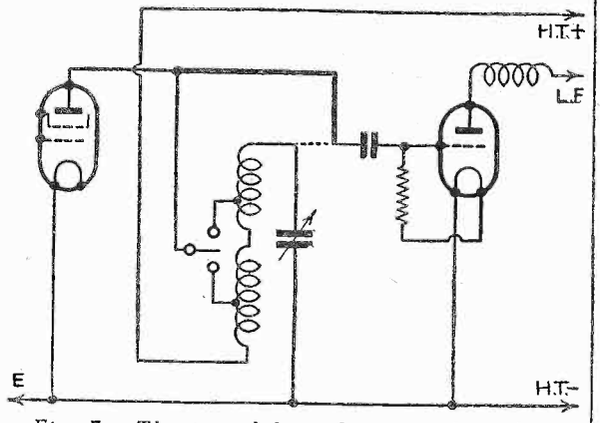
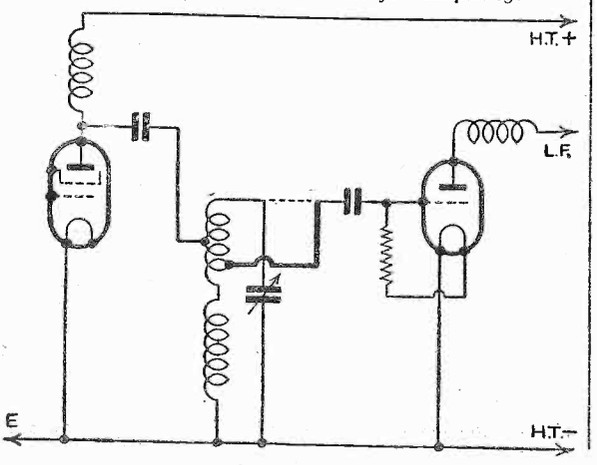


Fig. 7.—The two skeleton diagrams alone show simple methods of improving selectivity by connecting the detector grid condenser to a tapping on the preceding tuning coil. The usual connection is shown as a broken line. Wave-change switching is omitted from both circuits for simplicity.

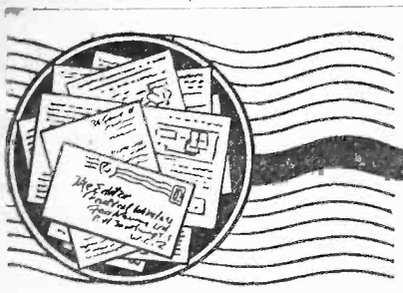


Power-Grid Detection

This introduces the question of power-grid detection. Although the variation in values just mentioned *does* increase the power-handling capacity, the mere alteration in capacity and resistance *does not* effect the change from leaky-grid to power-grid, as many amateurs seem to imagine. For power-grid detection it is necessary to employ a low-impedance detector and to supply its anode with at least 120 volts and 170 volts, for the battery- and mains-operated types respectively. Another "power-grid" fallacy is that this form of rectification produces an increase in volume; this is far from the truth. All that power-grid does is to increase the *power-handling* capacity of the valve. This entails the use of a low-amplification valve under the appropriate conditions, so that the volume would be less after changing over in a receiver giving a small amount of high-frequency amplification. Another disadvantage of power-grid is that it reduces selectivity, due to the fact that the lower-impedance valve imposes a greater load on the preceding tuned circuit. This can often be overcome, however, by connecting the grid to a tapping on the coil by one of the methods shown diagrammatically in Fig. 7. Incidentally, this idea can be used successfully to improve selectivity with any kind of detector, and is always worth trying.

The Detector Anode Circuit

The detector anode circuit may be considered last of all. The first requirement is an H.F. choke having an inductance of not less than about 200,000 microhenrys and a self-capacity of no more than 4 m.mfd. The choke prevents the leakage of H.F. currents into the L.F. amplifier, but in order to allow the choke to function to the best advantage a by-pass condenser (capacity between .0001 mfd. and .0003 mfd.) should be connected between the anode of the detector and earth; this provides an easy leakage path for H.F. currents which are "choked back." The anode coupling component (transformer, resistance, choke, etc.) has formed the subject of many previous articles.

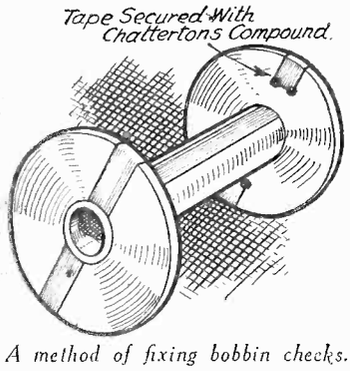


READERS' WRINKLES

THE HALF-GUINEA PAGE

Fixing Bobbin Cheeks

THE accompanying sketch shows a simple and sure method of fixing end cheeks to bobbins, used in the construction of transformers, etc. A piece of tape is fixed along the tube and brought



A method of fixing bobbin cheeks.

out round the flange and fixed with a dab of Chatterton's compound, two or more pieces of tape being used as found necessary. —H. DAINTON (Stanmore).

Trammel for Marking and Punching Television Discs

THE accompanying sketches show a trammel and gauge which I have found very useful in marking out a television disc. The trammel is made from 3/16in. square mild steel or brass, the end which fits the centre leg being filed round and a hole drilled in the leg to suit. Both are bored to take a tapered pin or grub screw when held parallel. The outer leg is bored up to take a gramophone needle. This should be ground square to size and is used to punch out the spiral of holes. The centre leg is made a good fit in the boss of the disc, the collar shown being used to adjust the height so that the punch just rests on the disc before punching. The gauge is made from light brass, copper, or tin, the hole being also the exact size as the one in the boss. To use the trammel and gauge the centre leg is passed through the gauge, then into the boss of the disc.

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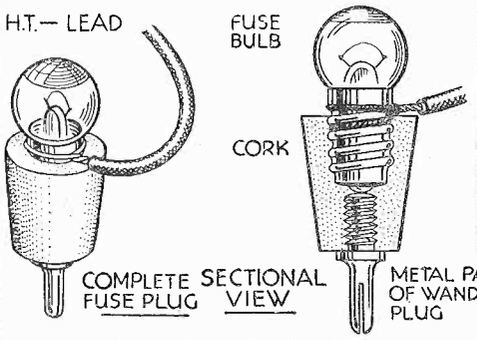
Then adjust the collar for height, and punch hole No. 1. Set the punch until its outer edge is exactly over the inner edge of hole No. 1. Now the gauge comes into use. Place the edge till it just covers hole No. 1, then take the punch up until it touches the gauge and punch hole No. 2 and so on until all the holes are made.—W. HALL (Greenock).

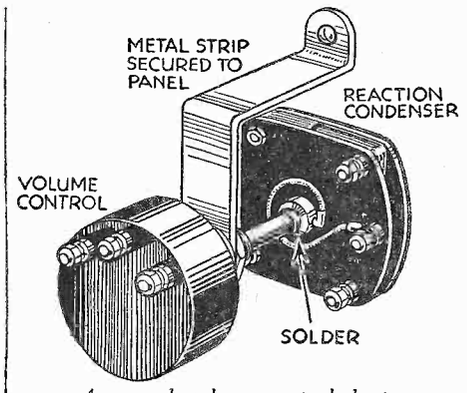
A Simple Wander-plug Fuse

AN easily-made "plug fuse" can be constructed in a few seconds with the following:—a cork bored at each end



An easily made plug-fuse.

to take one end of an ordinary wander plug and also the end of a fuse bulb. The fuse bulb is then connected to the H.T.—lead by twisting the wire round the fuse bulb as shown.—G. M. SHEWAN (Aberdeen).



A ganged volume control device.

A Ganged Volume Control

BY ganging the pick-up volume control to the reaction condenser, it will obviate the necessity of another control. The volume control potentiometer is held by a metal strip, bent to the shape shown in diagram.

The method of fixing is self-explanatory. The volume control spindle is then soldered to the condenser spindle.

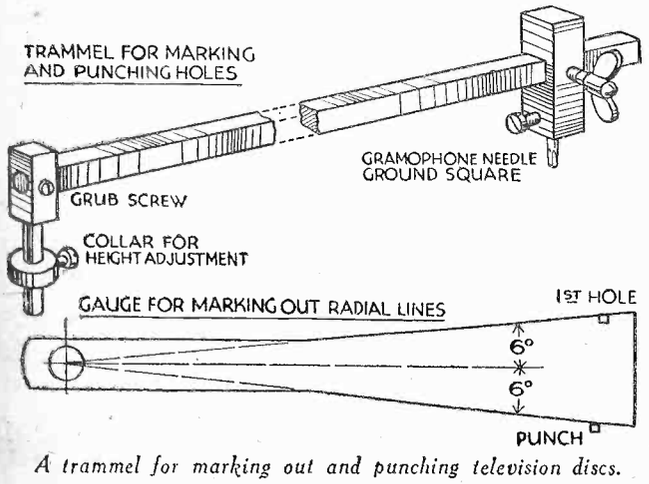
In some cases a more satisfactory job will result if the ends of the two spindles are tapped, and a short length of screwed rod fitted. Solder should be applied to the screw-thread as the rod is being fitted.—C. GANTZER (Billericay).

Eliminating Long Mains Leads

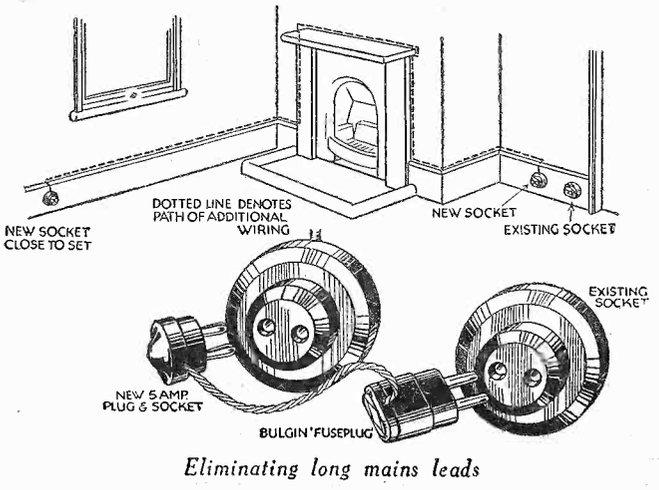
I RECENTLY encountered a problem which has doubtless troubled many fellow readers, viz., how to operate a mains-driven set from a wall plug situated on the opposite side of the room. In my case, as in many others, there was just one logical position for the receiver, which resulted in the use of a long flex lead. It was very soon discovered that this method was not only unsightly, but that it was dangerous. At a small expense the difficulty was overcome as follows.

Two extra 5-amp. wall sockets (with bases), one 5-amp. plug and a Bulgin

(*Continued overleaf*)



A trammel for marking out and punching television discs.



Eliminating long mains leads

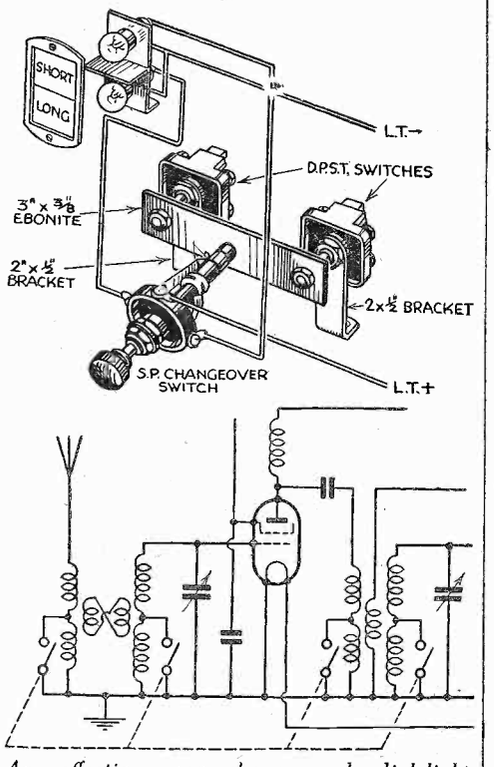
READERS' WRINKLES

(Continued from previous page)

fuseplug (for safety) were obtained. One socket was placed near the existing point, and the other on the skirting close to the set. Wiring was carried out with heavy workshop cable, secured by insulated staples. This was carried round the skirting of the room, and toned down to match the paintwork, and was inconspicuous. The "fuseplug" was, of course, used at the end adjacent to the mains point. A short connector, as shown in sketch, joined the two sockets.—J. S. SHELLEY (East Sheen, S.W.14).

A Convenient Wave-change and Dial-Light Switch

ONE movement of the switch illustrated changes the waveband and also lights up the glass panel fitted on the set



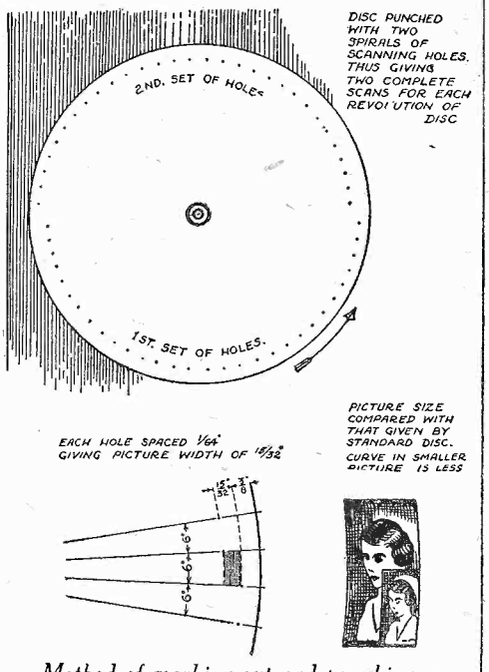
An effective wave-change and dial-light switching arrangement.

to show which wave-band is in use. Material required for the combination switch is as follows: One Lissen push-pull switch with ⅛in. of the insulation cut off the end, leaving the thread for screwing in the ebonite strip. The ebonite strip, of 3in. by ⅜in. by ⅛in. thick, has a 3BA hole tapped ⅛in. from each end. For the brackets, two brass strips bent at right angles at one end, giving a ½in. foot for screwing to base board, are required. The height of the brackets is 2in. Drill a 5/16in. hole ½in. from top of each for fixing the four point switches together by removing knobs and fitting ebonite strip with nuts. The light indicator comprises two low-consumption 2-volt bulbs, a small bracket with dividing piece and a small piece of thin opal glass with the words "long" and "short" printed backwards on the inside of the glass.—F. W. MARLOW (W.2).

Making a Television Scanning Disc

I FOUND the motor in my home-constructed television receiver was incapable of driving the scanning disc at the requisite 750 r.p.m. I, therefore, marked out another disc having two sets of scanning holes (60 in all), and was able to receive the picture at half speed, *i.e.*, 375 r.p.m. It is necessary to mark off the disc into 6 degrees sections, in place of the 12 degrees of the standard disc, and for accuracy I have found it best to mark off at 12 degrees and then bisect each section. If the first holes of each spiral are started ⅜in. from the outside edge of the disc, and each hole is spaced 1/64in., the resulting picture will measure approximately 15/32in. by 1-1/32in. which is about right for the 7/3 ratio. A needle of medium thickness can be used for making the holes. The resulting picture is, of course, smaller, but has an advantage of being almost straight sided, more so, in fact, than that of the standard disc. Amateurs who have motors incapable of reaching 750 r.p.m. may like to try out the idea, and will find *thin ivory board* both cheap and satisfactory for experimental purposes.—R. L. GRAPER (St. Albans, Herts).

[Whilst Mr. Graper is correct theoretically in his suggestion for a double spiral or holes in the disc rotating at half speed, the workmanship involved for accurate



Method of marking out and punching a television scanning disc.

results is beyond the average amateur. Similar quarter-size images are given by rotating a 30-hole disc at half speed, it being necessary to mask out the three redundant images also obtained. Each individual image under these circumstances has a scan of only fifteen lines, and is, therefore, coarser, but this will be preferable to an inaccurate double spiral disc for, unless each spiral is absolutely identical, image weaving will result. Another very important point omitted by Mr. Graper concerns the disc sizes, for it is on this factor and the image ratio that the exact hole size is calculated. Using the hole size given, the radius of the outside edge of the first hole is 10.464in., and unless this diameter is used, the image will be of the wrong ratio and give distorted results.—ED.]

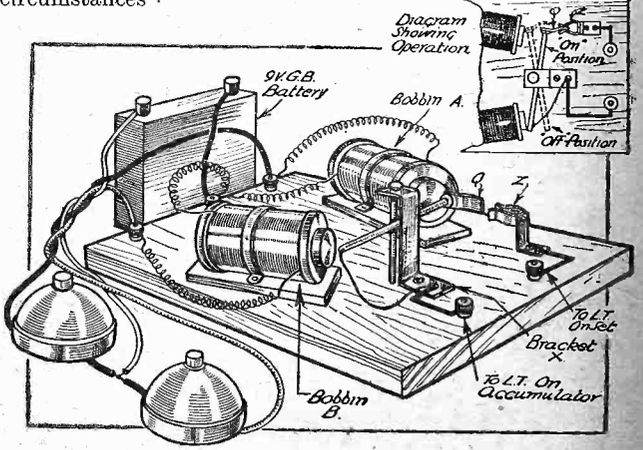
An Effective Remote-Control Relay

THE remote-controlled relay illustrated can be constructed for less than 2s. 6d., including battery, and is ideal for switching the set on and off from another room. Any number of control points can be used.

A piece of baseboard ply about 5in. by 3in. is first required, and on this are mounted two ordinary bell bobbins raised slightly on little blocks of wood and secured by brass strips in the position shown. Next, two nails about 1¼in. long are required. Take a piece of fairly stout brass ½in. wide and 2½in. long. Bend to shape as shown at X. Each of the bends should be ¾in. long, therefore the centre portion should be 1in. in length. Drill a hole the same diameter as that of the nail ¼in. from the edge of the top bend and insert one nail point first. Now solder the other nail horizontally to the first so that when the whole is mounted the head of the horizontal nail is toward the bobbin A. (See below.) A small piece of *thin*, springy brass or phosphor bronze (the latter for preference) about ¾in. long, and, say, ¼in. wide, and bent to the shape shown is then soldered to the nail head. To the other end of the horizontal nail solder a *single strand* from a piece of flex about 2in. long. Now mount the whole on the board in the position shown, the point of the nail being recessed into the wood to form a pivot, making sure that it swings easily. Now proceed to make the clip-shaped piece Z; this is made from a piece of the same brass as used for the first bracket. Now make the clip from a similar piece of brass 1¼in. long and bend as shown in the diagram, each side being ½in. long. Solder this to the top of the other as illustrated, and mount in position. The strand of wire soldered to the pointed end of the horizontal nail should be connected to one of the screws holding the base of the bracket X, and should be looped slightly to form a weak spring, thus holding the contacts Q and Z securely apart when the device is *off*; this also establishes a definite contact between the bracket and the nail. The actual construction is concluded by connecting the bobbin wires as shown in the diagram to three screws or terminals and the contacts (Q and Z) are connected to two more terminals at the other end of the base.

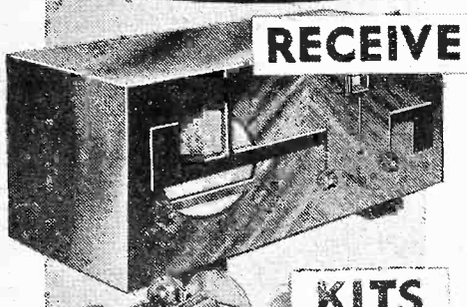
A 9-volt G.B. is needed to operate the device, and as the current used is only momentary this should last a long time. Triple wire is needed for the extensions, connected up as illustrated.—W. J. L. (Epping).

See page 1156 for instructions for securing the POCKET TOOL KIT.



A cheap but effective remote-controlled relay.

LISSEN



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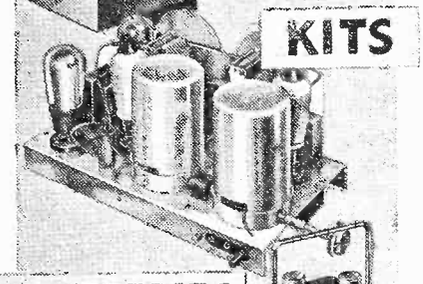

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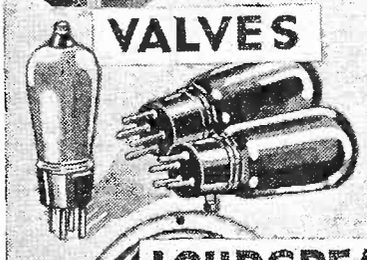

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SOLDERED CONNECTIONS

Our Readers Recently Voted Overwhelmingly in Favour of Soldered Connections. Some Very Useful Information in Regard to Correct Soldering is Given in this Practical Article which Explains the Process from the Amateur's Point of View.

IT is an unfortunate fact that the terminals fitted on some components are not all that they should be. The smaller sizes are almost invariably fitted with miniature nuts which have had their diameters reduced on the under side. These prove sometimes too small to hold even a closely-formed loop of 18-gauge wire, and attempts at tightening usually result in the nut forcing the loop open. Another snag frequently encountered is the terminal that is unable to accommodate more than one wire without making it difficult properly to screw on the nut.

Advantages of Soldering

After having spent an evening in wiring up to terminals of this description, how many readers have wished that they were masters of the soldering iron? Besides providing a definite solution to these troubles the wires, when soldered to tags, make much better electrical contacts. Soldering also permits the use of many small components fitted only with soldering tags. These may be connected and suspended in the wiring. Parts such as these are equally as efficient as those fitted with terminals, but, naturally, they are considerably cheaper. There is one other point in favour of soldering, and that is that where two or more wires run to one terminal in the ordinary way it is only necessary to take one wire direct to that point and join the other wires more conveniently to it.

Many people who have never yet attempted soldering are under the impression that it is a tricky job. This is not so! Let anyone who is doubtful have a try and see, if by following the instructions given below a perfect soldered joint is not made at the first attempt.

The Equipment Required

The most important tool required is a soldering iron. An electrically-heated one is eminently suitable for wireless work, but as there is no difference in the actual use excepting the method of heating we will confine our remarks to the flame-heated variety. The most serviceable type to buy is that illustrated, the copper bit being riveted between the forked shank. The actual copper portion should be about 8ozs. in weight. A 6in. or 8in. flat "second-cut" file, together with a stick of tinman's solder, a small bottle of non-corrosive soldering fluid, a tin of "Fluxite," and two small tin lids complete the outfit.

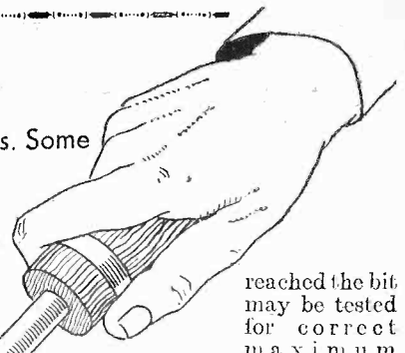


Fig. 1.—The most useful type of soldering iron for wireless work.

No doubt the gas ring will provide the heating agent, in which case it will be well worth while to make up a cowl as follows: Bend a piece of sheet iron to form a tunnel about 3in. high by 6in. long, wide enough to span the small burner, and at the same time rest on convenient grid bars. In the centre and 1in. up from the bottom on either side drill a hole to pass a 6in. wire rail. The object of this is to concentrate the heat and save wastage of gas.

Now examine the point of the copper bit and you will in all probability discover that it is shaped in the form of a pyramid. Should this be so, re-file it to a chisel point with a width of about 3-16in. See that the angle formed is less than 90 degrees, as shown in Fig. 4.

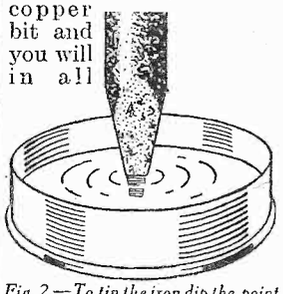


Fig. 2.—To tin the iron dip the point in non-corrosive soldering fluid after heating.

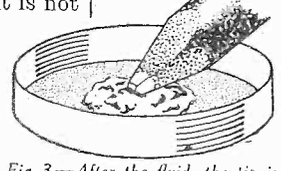


Fig. 3.—After the fluid, the tip is pressed into some solder, until the point is bright all round.

Tinning the Iron

Half fill one of the tin lids with the fluid. Lay the copper bit on the bar in the sheet-iron hood so that it is directly over the flame. Now watch the flame, and when the colour changes from blue to bright green, remove the iron and dip the point into the tin containing the fluid. Hold the iron against the stick of solder and melt a small heap into the other lid. Place the end of the copper bit into this heap and, upon removal, it will be coated with solder; in other words, it will be tinned. It must always be kept in this condition. For successful soldering the two important points are tinning and correct temperature of the iron. Anyone with experience can tell the correct temperature by holding the iron close to the cheek. But until this state of affairs is reached the bit may be tested for correct maximum temperature by holding it against a piece of newspaper held in the hand. The iron should char the paper, not merely scorch it, without burning a hole.

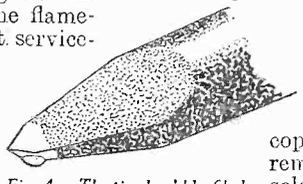


Fig. 4.—The tip should be filed as shown in this illustration.

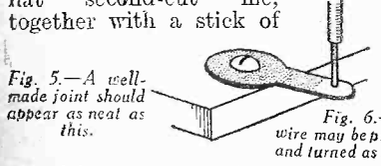


Fig. 5.—A well-made joint should appear as neat as this.

Fig. 6.—For strength, the wire may be passed through a hole and turned as shown here.

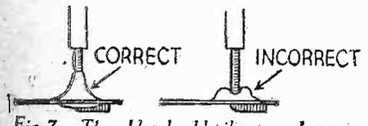


Fig. 7.—The solder should pile up as shown on the left. If it appears as shown on the right the joint is dry-soldered and therefore unsound.

Soldering Wire Connections

Prepare the end of the soldering tag and wire by smearing on a small quantity of "Fluxite." Dip the point of the heated iron into the solder. This will cause a little "blob" of melted solder to hang on the under side of the iron when withdrawn. Place the point of the iron on the tag where prepared, leaving it there for a second or so, and treat the wire in the same way. Touch the end of the wire with "Fluxite" and place in position. Pick up a little more solder and apply to the junction of wire and tag, again leaving the iron in contact for a few moments. A perfect joint should be the result. Figs. 1 to 7 show the various stages of preparation and soldering in the sequence named.

Actually the joints take no longer than thirty seconds each to complete. Failure of the solder to form a proper junction, as in the view marked "incorrect" in Fig. 7, is proof either that the tinning was not properly done or that the temperature of the iron was wrong.

Where wires have to be attached, as shown in Fig. 8, a small crook formed on the end of the wire will provide a greater area of contact for the solder, thus producing a much stronger joint.

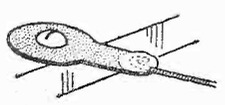


Fig. 8.—An alternative method of connecting a wire to a soldering tag.

Sweating

Sweating is another form of soldering, a typical example of which is illustrated in Fig. 9, which shows two spindles joined together by a sleeve. The parts are first tinned and then heated until the solder melts, assembled and allowed to cool.

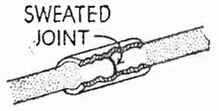


Fig. 9.—A neat method of joining two wires or rods end to end.

Hints On Wiring

When wiring up a set the following hints will be helpful:—

Tin all tags before fixing the components.

Place a piece of paper over exposed portions of components where a stray bead of solder is likely to cause trouble.

Use the "Fluxite" sparingly, and don't use the soldering fluid as a flux for electrical connections.

When joining one wire to another make a right-angle bend about ⅛in. in length on the end of the wire to be joined, and solder this alongside the other wire.

When tinning the end of a flexible wire press the bared and fluxed end into the solder with the heated iron.

In conclusion, do not let the iron remain on tags or parts adjacent to ebonite or moulded casings, since, apart from softening this material, there is the liability of the heat to travel down the screw to other soldered connections inside the component, with obvious consequences.

W. H. D.

FINISHING TOUCHES

Some Novel Suggestions are Made in This Article for Improving the Appearance of the Receiver.

By H. BEAT HEAVYCHURCH

MOST amateur listeners construct at least one receiver in a lifetime, and thousands build a considerable number; but how often is a set really finished off in a neat and workmanlike manner? A set is built, it is almost

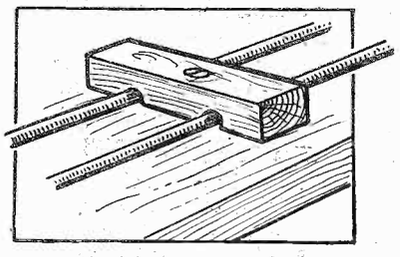


Fig. 1.—Small wooden cleats keep the base-board wiring neat.

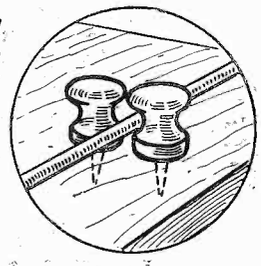


Fig. 2.—Glass-headed photographic pins are useful for anchoring wiring.

completely wired up and ready for service—and the builder, in his impatience to give it a practical test, cannot wait to give it the finishing touches but must make a hasty and sketchy job of the last few wires and start reception trials immediately.

Then, when the trials are completed and satisfactory, the set often remains for the whole of its existence really uncompleted. Or even if the wiring is made permanent, it will often occur that the receiver is never fitted into a respectable cabinet. So I am going to suggest ways and means for making a workmanlike job of your present receiver or the next one you build.

A Coat of Paint

If the baseboard is of the unmetallized type and is given a coat of absolutely matt black paint, what a difference is made in the appearance! (*All baseboards should be metallized or metal covered.*—ED.) The metallic parts and the different components stand out, and the whole construction takes on a professional appearance.

It has always seemed to me a pity that radio components are supplied in such a variety of colours. The low-frequency transformer may be dark brown, the fixed-condensers green, the cans of the coils battleship grey, and other components black, brown, or mottled.

Neat Wiring

It must be admitted that nothing looks better, especially against the black background, than bare tinned copper. This type of wiring, however, is a little risky for modern receivers with fairly high anode voltages, and has therefore gone out of fashion. One of the many excellent brands of insulated wire, or bare wire covered in systoflex is, therefore, suggested.

Some constructors consider it unfashionable at the moment to use the straight wires with neat right-angled bends which have been so popular.

There are always a certain number of wires that can best be run on the surface of the baseboard (when non-metallized), and they present something of a problem because they are apt to rise in the air, or sag and

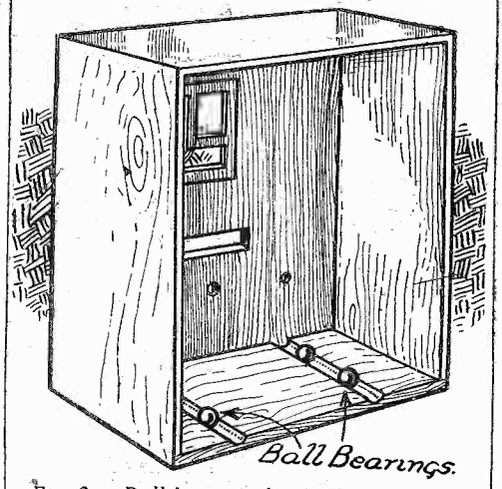


Fig. 3.—Ball bearings for facilitating entry of receiver into cabinet.

bend just sufficiently to spoil an otherwise neat job. They can be made permanently neat by clipping them down to the base with little wooden saddles which can be easily contrived by the handy constructor,

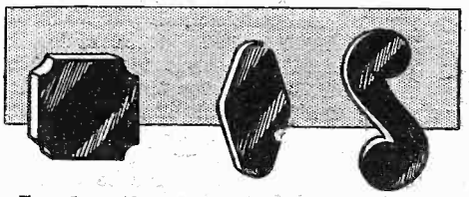


Fig. 5.—Alternative shapes for "knobs."

as illustrated in Fig. 1. Another plan is to use those glass-headed drawing-pins which are sold to photographers for hanging up prints to dry. A few of these, arranged in pairs at places where the wires make a change of direction act as guides and anchors and are quite inconspicuous, the scheme being shown in Fig. 2.

The Cabinet

Now we come to the question of cabinets. Have you noticed how difficult it usually is to slide a heavy set, complete with mains unit, into the average cabinet? Here is a little refinement which will make it easy. Cut a couple of shallow grooves across the base of the cabinet from back to front about an inch or so from the ends. Place one or two small steel balls such as those used in ball bearings in each groove (Fig. 3) and they will serve as rollers on which the baseboard of the set will slide easily as you insert it into the cabinet.

It is, of course, hopeless to expect that radio manufacturers will ever standardize the designs of knobs, and although it is not really a very difficult matter for the average amateur to purchase a complete set of knobs all of a type in view of the different diameters of spindles which have to be accommodated, there is an alternative. I recently saw a receiver which had only one round knob, and that was the knob of the tuning condenser. All the others were straight handles composed of round rod similar to that illustrated in Fig. 4. These could be made easily by anyone who possessed a drill brace, a few bits, and a small tap for forming the thread in the hole for the grub screw. They could be made from ebonite rod of half to three-quarter inch diameter, and then enamelled to match or tone with the cabinet if plain black was not acceptable. Alternatively, knobs of square, diamond, or fancy shape could be cut or filed up from a thick sheet of ebonite and decorated to taste. A few suggestions are indicated in Fig. 5.

Another finishing touch is some provision for moving the set. During the process of the daily dusting or the weekly "turn-out" it is usually necessary to lift the set from its normal position but this is frequently a difficult task. Fit four castors of some kind. For a cabinet set it is a more difficult matter to provide easy means of lifting, but in the case of a home-made cabinet such provision may be combined with ornament something after the style of the device shown in Fig. 6.

It will be best to fit your set with plugs and sockets for both aerial and earth connection so that these can be removed when it is desired to move the set.

This brings me to the final finishing touch—the flexible connections to aerial, earth, batteries, and speaker. Many an otherwise excellent installation is marred by long, untidy twisted flexes. The total amount of flex required for any set is only a matter of a few yards, so invest in new and good flex, fit it neatly to the terminals or spades, binding the insulation at the ends to prevent it from fraying, and cutting each length exactly to the right size to prevent it from drooping about in an untidy way.

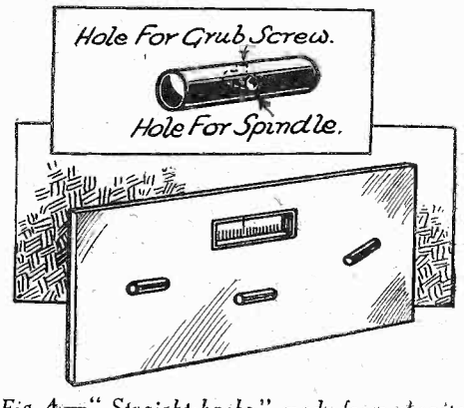


Fig. 4.—"Straight knobs" made from ebonite rod.

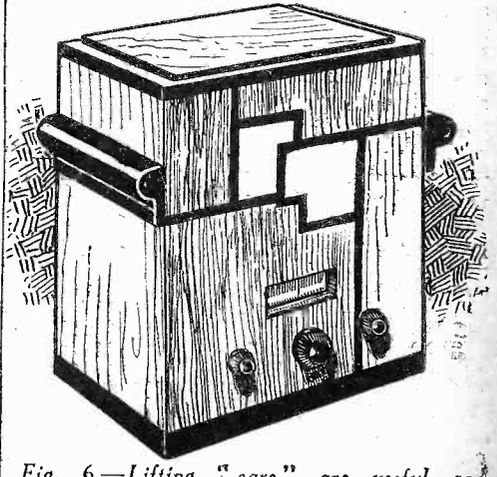


Fig. 6.—Lifting "ears" are useful and ornamental.

A.V.C. on SHORT WAVES

The Problems Involved in Obtaining Automatic Volume Control in a Short-Wave Receiver are Discussed in This Article

SINCE, generally speaking, fading is more pronounced on short waves than upon the broadcasting bands, it would seem that the use of some form of automatic volume control would be particularly desirable in any short-wave receiver. And yet, if a census were taken of the number of short-wavers fitted with A.V.C., it would probably be found that the number of such sets was very small indeed. There are many reasons for this, one of which is that none of the A.V.C. systems in use appears to be effective in coping with the "high-speed" fading which is peculiar to short-wave reception. I have tried various ways of overcoming this difficulty, but without success; the simple and usually excellent control unit which makes use of an H.F. metal-oxide rectifier is apparently quite useless at the higher frequencies, whilst the diode and double-diode valves prove little better in this respect. The reason for the ineffectiveness of these arrangements is probably that the essential decoupling condensers introduce too much "lag." This explanation would account for the fact that in some cases the normal A.V.C. schemes seem to make "high-speed" fading worse, rather than better.

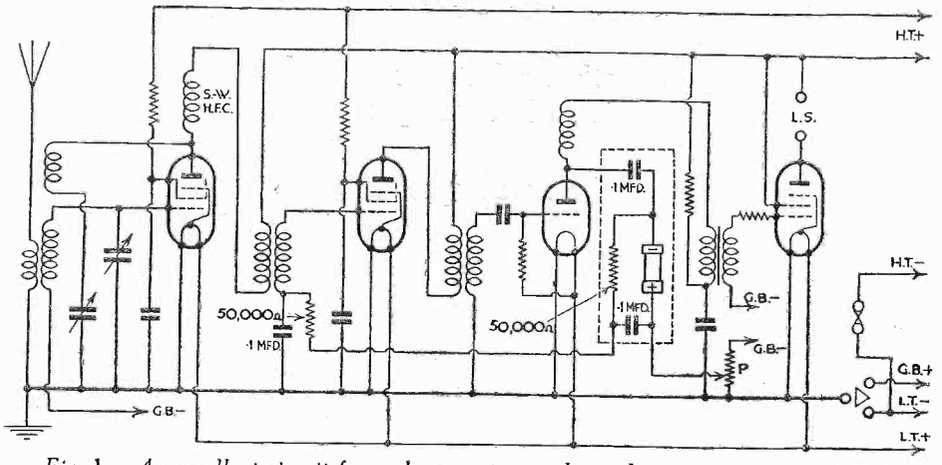


Fig. 1.—An excellent circuit for a short-wave superheterodyne incorporating A.V.C.

Very Little H.F. Amplification

Even if it is taken for granted that rapid fading cannot be overcome—at least by any method yet known—there seems to be no reason why the normal "slow" fading should not be cured by the use of an A.V.C. device. But there are a number of snags here, particularly when the popular type of S.W. receiver is being considered. For any A.V.C. system to operate it is essential to employ a variable-mu valve, the amplification of which can be varied by applying to its grid a changing bias voltage obtained by rectifying the H.F. signal voltages applied to the detector valve. On short waves, however, the S.G. or V.-M. valve gives very little amplification indeed, with a result that even if a varying grid-bias voltage were fed back to it the effect would be comparatively slight. A greater controlling effect would be obtained by using two variable-mu H.F. amplifiers, but a short-waver with two tuned H.F. stages is a most difficult piece of apparatus to control, so that the idea is by no means a good one.

Rectifier Efficiency Proportional to Wavelength

Another difficulty immediately presents itself in a set of this kind. The percentage efficiency of the type of automatic volume control unit (which makes use of the metal-oxide rectifier) is proportional to the wavelength of the signal voltages applied to it. In other words, the efficiency is inversely proportional to the frequency. Thus, although the unit might be a model of perfection at, say, 1,500 metres, its efficiency at, say, 20 metres would probably be just about nil. Besides, a unit of this kind, which is connected in the anode circuit of the detector, has a certain "damping" effect, which increases with the frequency of the signal voltages. Consequently on short waves there would be considerable difficulty in getting the detector to oscillate, and even then the efficiency would probably be quite low.

Diode Difficulties

It might be suggested that the latter difficulties would be avoided by using a double-diode triode, or similar valve, as detector and automatic volume control. Here again, though, there are many snags. One of these concerns the difficulty in providing a useful reaction control with the diode type of valve, and another occurs due to the fact that a diode has an appreciable "damping" effect at the shorter wavelengths. Both these are serious disadvantages, particularly the first one, since reaction is one of the greatest assets to good short-wave reception, and can almost be considered as an essential feature. Moreover, a circuit to include a diode detector would require to have several stages of H.F. amplification, and would be the very opposite of the simple arrangement which is preferred by nearly all short-wave experimenters.

The Solution

From the above remarks it might appear that automatic volume control in useful form is entirely out of the question in a short-wave receiver. The position is, however, not quite so serious as that, since a useful measure of A.V.C. *can* be obtained by the use of a super-heterodyne circuit, which may be a comparatively simple affair having no more than four valves. A good circuit of this kind is given in Fig. 1, and it can be seen that the first valve (an H.F. pentode) acts as a combined anode-bend first detector and oscillator, operating upon the autodyne principle. This is followed by a variable-mu pentode intermediate frequency stage, which is followed in turn by a leaky-grid second detector and a power pentode. Two normal 150-kilocycle I.F. transformers are used for coupling the first detector-oscillator to the L.F. amplifier and the latter to the second detector, whilst the tuning system follows standard practice.

The chief point of interest in regard to the subject under discussion is the insertion of an A.V.C. unit in the anode circuit of the second detector. This feeds a varying bias voltage back to the grid circuit of the L.F. amplifier, this voltage providing the required A.V.C. action. Additionally, there is a potentiometer, marked P, which serves as a manual volume control acting upon the variable-mu pentode.

A circuit of this kind really does give a reasonable and useful measure of automatic control over fading, and this effect can still further be increased where necessary by adding a second intermediate-frequency amplifying stage. The reason for the A.V.C. control working in a short-wave superheterodyne—although it will not do so in a "straight" short-wave circuit—is that the second detector operates as a constant (intermediate) frequency of 150 or 110 kilocycles, at which frequency the metal-oxide rectifier in the A.V.C. device is very efficient. It need scarcely be mentioned that a superheterodyne employing a diode or double-diode second detector would be equally good, although the arrangement illustrated is the simplest one and is to be preferred on that score.

Those who use a short-wave converter in conjunction with a normal broadcast receiver having one or more variable-mu stages can enjoy the same benefits by adding an A.V.C. unit to the set in the ordinary way. The unit will, of course, prove effective on both broadcasting and short waves. A skeleton circuit which shows how the A.V.C. unit should be connected is given in Fig. 2.

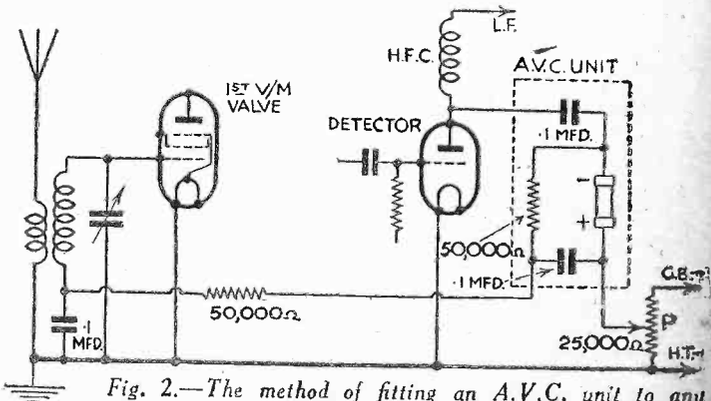


Fig. 2.—The method of fitting an A.V.C. unit to any type of variable-mu receiver.

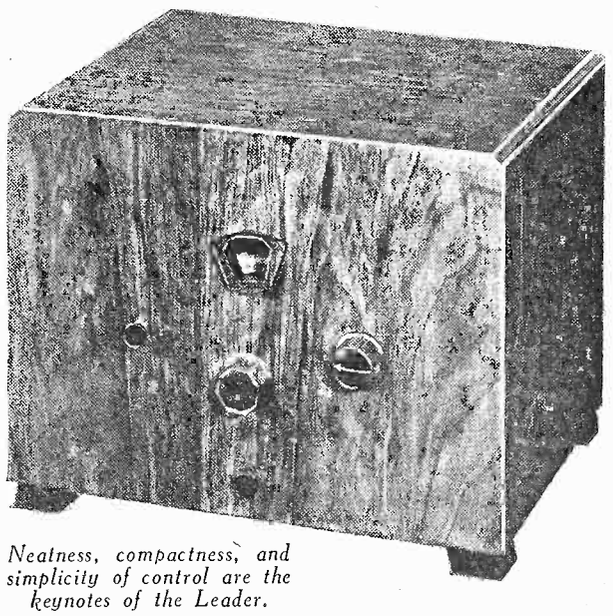
THE LEADER THREE

How to Use The Leader for Gramophone Record Reproduction

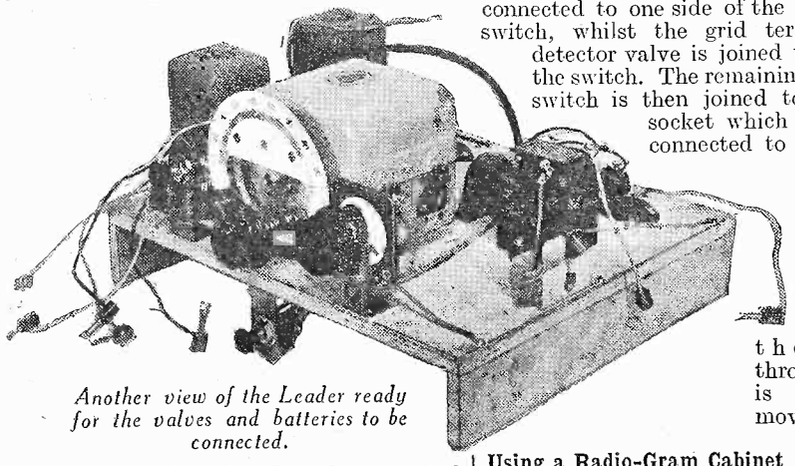
BEFORE dealing with the method of using the gramophone pick-up with The Leader, we wish to thank the hundreds of readers who have written and given us their appreciation of the new policy which we have adopted in the interests of the home-constructor. Whilst we knew that the policy would meet with approval with the majority of home-constructors, we had no idea that it would be productive of such enthusiasm, and we hope that the receivers which we shall describe in the future will be made in their thousands and will do much towards paving the way to better radio.

Connecting the Pick-up

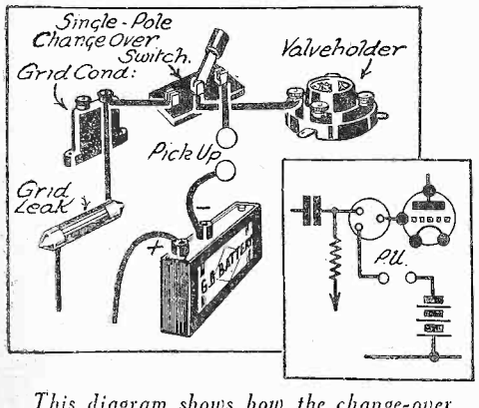
It will be seen that the terminal strip on the left-hand (rear) of the chassis is provided with sockets marked P.U. and that these two sockets are connected to the grid of the detector valve and to a grid-bias lead. No switching has been incorporated for this purpose, partly on account of the desire to reduce the cost, and partly because it is not entirely necessary to use such a switch. If a pick-up is plugged into these two sockets, and the pick-up bias lead is inserted in the grid-bias battery at about 3 volts, good record reproduction will be obtained, even although the grid-leak, grid condenser, and tuning-coil are all connected in parallel with the pick-up. If The Leader is being used within a few miles of a powerful broadcasting station it may be found, when the tuning dials are adjusted to the wavelength of that station, that the broadcast signals break through when the pick-up is being used. All that is necessary to overcome this difficulty is to turn the tuning dial to zero, or to some position on the scale where this interference is not experienced. If, however, it is thought worth while, a single-pole change-over switch may be attached to the rear chassis strip. It may be necessary to fit an insulating bush for the switch, but that will depend upon the type of switch which is employed. The lead from C4 and the grid-leak is then connected to one side of the switch, whilst the grid terminal of the detector valve is joined to the arm of the switch. The remaining point on the switch is then joined to the pick-up socket which is at present connected to the grid. If this is done, then when the switch is put over to gramophone, the tuning circuits are isolated and the break-through difficulty is entirely removed.



Neatness, compactness, and simplicity of control are the keynotes of the Leader.



Another view of the Leader ready for the valves and batteries to be connected.



This diagram shows how the change-over switch may be fitted.

Using a Radio-Gram Cabinet

It may be desired by some readers to mount the complete receiver in a radio-gram cabinet fitted with motor, etc. This will be quite in order, provided the receiver can be mounted fairly close to the pick-up. In some radio-gram cabinets the shelf for the receiver is rather low down, and this necessitates rather long leads from pick-up to receiver, with consequent risk of instability or induced hum. If, therefore, this difficulty is experienced when the apparatus is in use as a radio-gram, it will be necessary to enclose the pick-up leads in metal screening, with an earth connection joined to the screen. Any type of gramophone motor may be employed, and as the receiver is battery-operated, the listener who has no access to the electric mains may fit a good clockwork motor in order to complete the equipment.

Increasing the Output

Among the many letters which we have received there are quite a number from readers who, whilst they wish to build The Leader, desire to have a greater output than the 150 milliwatts which is provided by the present output valve. It is not possible to deal with every type of query individually, but it may be stated that the receiver in its present form is admirably suited to the addition of a Class B amplifier. The unit which was described in our issue dated April 8th last may be added to The Leader, under which conditions the present output valve becomes the Class B driver. No other alteration of any sort will be required. The input terminals on the unit are connected to the L.S. terminals on The Leader, which means that the primary of the driver transformer is connected direct in the anode circuit of the P.215 valve.

An alternative to the Class B output, for those who wish to have a little more volume, is the fitting of a pentode valve in place of the P215. To do this it is only necessary to purchase a pentode of the four-pin type. This is provided with a small terminal on the side of the valve base, whilst the four pins are connected in the normal manner. Thus, the pentode is plugged into the valve-holder and a length of ordinary flex is joined to the side terminal, and a wander-plug fitted to the end of the flex is then inserted in the H.T. battery at some point near maximum voltage. The exact position is not critical, but the total current consumption will be increased as this plug is moved towards the highest voltage. It was not thought desirable to fit Class B or a pentode output stage to the original model of The Leader, as the cost of upkeep was borne in mind, together with the initial outlay. These modifications are, therefore, only given for the benefit of those readers who desire to have a little more volume.

NOTABLE "LEADER" FEATURES

THE LATEST COILS FOR THE NEW "LUCERNE" WAVELENGTHS

AN EFFICIENT SCREEN-GRID STAGE FOR DISTANT RECEPTION

TUNED-TRANSFORMER H.F. COUPLING FOR MAXIMUM SELECTIVITY

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REVIEW OF LATEST RECEIVERS

Tests of Standard Receivers On Our Aerial.

THE EKCO MODEL 74 A.C. CONSOLETTE.

IN this receiver we have a design which is based on the latest fashion in colouring and manufacture. Anyone who has seen the black and chromium finished cabinet must have been immediately struck by the beauty displayed by the severe simplicity of the scheme, and its arrangement is such that it will tone with any furnishings, although obviously looking at its best in a glass and chromium setting. The electrical side of the receiver is also absolutely up to date, and before describing this it would perhaps be worth while to describe the cabinet work. This is of bakelite, the pressing enabling a most clean appearance to be obtained. The corners are rounded, and the two rolls at the side, apart from relieving the plainness of the cabinet, enable the cabinet easily to be lifted when moving it from one place to another. The back of the cabinet is closed in by a sheet which is screwed into place, a further evidence of the care and thought which has been expended on the design being evident here. The screw-heads are provided with slots of such a width that they easily accommodate a coin such as a penny, so that no tools are required when adjusting the mains transformer tapping, or otherwise obtaining access to the interior. The speaker fret is removable, by the simple expedient of giving it half a turn to the left. It then comes free, and it is possible to remove the silk backing in order to replace it for cleaning or to insert some material which matches the normal room furnishings.

The Circuit

It would be obvious that where such care has been expended on the outward design of a receiver the interior should have received equal care and thought, and this is made apparent when the arrangement of the components and the actual circuit are examined. There are four valves (excluding the rectifier) and these consist of three pentodes and a duo-diode-triode. Two pentodes are of the latest type high-frequency valves, whilst the remaining one is an output valve, capable of delivering its full output of 3 watts. The first pentode valve acts as a combined detector-oscillator, whilst the second performs the function of intermediate frequency amplifier. This valve is of the variable-mu type and is controlled by one of the diodes of the duo-diode-triode which acts as second detector, automatic volume control, and first L.F. Fully delayed automatic control is employed, and this enables the manual volume control to be set to the best position and the main tuning control rotated throughout its complete movement without the inconvenience of a sudden blare as powerful stations are passed. It also renders all worth-while stations to be received at approximately the same volume, whilst removing many of the troubles which accompany fading. The screening is most comprehensive, the H.F. valve, for instance, being completely enclosed in a metal screen. Pick-up terminals are provided, and the gramophone circuit is brought into action by rotating the main selector switch. The loud-speaker is of the energized type, and is fully capable of handling maximum volume without distress and without the usual cabinet boom on loud bass notes.

The Controls

It will be noticed from the illustration that there are only three controls, and that there is no pointer or other indicator on the tuning scale. The right-hand control is for the manual setting of the volume and also brings the receiver into operation. When it is rotated a mains on/off switch comes into operation and immediately a dial light is illuminated behind the scale. Two such lights are provided, one behind the upper, or medium wave scale, and one for the lower, or long-wave scale. The lights are fitted to a travelling arrangement which throws on to the back of the scale a V-shaped lighted patch, with a small vertical shadow at the point behind the dial markings. As the main tuning control (centre) is turned the lighted section travels along, with the central line accurately showing the tuning setting. This is a very novel arrangement and proves most effective in use. When the left-hand control is turned the light travels from the upper to the lower section, or gives half illumination to both sections, denoting that the receiver is then adjusted for gramophone reproduction. Beneath the central control is a small tumbler switch which reduces the sensitivity of the receiver when tuned to a local station.

The Ekco Model 74 A.C. Consolette costs only 14 guineas in a black and chromium finished cabinet.

Test Report

The utility of this switch was experienced when the receiver was tested in North London. Here, in its most sensitive position the amplification afforded by the circuit was such that the output valve was easily overloaded and background noises were naturally very troublesome. A touch on the switch, however, and the noises disappeared as if by magic, and the local stations were received loud and clear. It was, in fact, not found necessary to use this switch on the aerial which is generally employed, unless very distant stations were required, and all of the B.B.C. main stations were heard without the necessity for operating the switch. Tuning was delightful, possessing that square-peak effect which is so often strived for but so often not obtained. A station could be tuned-in and as soon as the usual separation space was passed the station suddenly disappeared—there was no spread over five or six degrees. If the volume control was set to a suitable position, the main tuning control could be rotated and stations were heard at every point on the scale, all clear from interference (except where actually heterodyned) and all at sufficient volume for normal home-entertainment purposes.

On a small indoor aerial, and with the switch in the sensitive or "distant" position, dozens of stations were obtainable. The tone was full and clear, with no boom and no undue shrillness. Second channel whistles may be shifted so that they occur at a point on the dial where they do not interfere with the reception of a station.

Separate plugs are fitted to the rear of the chassis for the use of an external speaker. Hum was negligible, even with the earth lead removed, and when accurately tuned to a station was inaudible even in the silent parts of the programme.

For those who prefer walnut, a model is available at one guinea less. The console cabinet costs 18 guineas.

Practical Television
Conducted by H. J. Barton Chapple, Wh.Sch., B.Sc., Etc.
MARCH 17th, 1934. Vol. 1. No. 11

MAKING SCANNING DISCS

Details of a Simple Device Which Will Enable an Accurate Disc to be Quickly Made.

By W. H. DELLER

THE simplest form of television receiving apparatus is that which employs a scanning disc to reproduce the "light lines," into which the object being portrayed is broken up for purposes of transmission.

There is nothing complicated in any of the parts necessary to construct a receiver of this type, the main essential being a disc driven at 750 r.p.m. Near the edge of this disc are a series of holes, 30 in all. Each hole is spaced radially 12 degrees from its neighbour, and each successive hole is closer, by an amount equal to the width of the hole, to the centre of the disc. A line drawn through all the holes would thus form an involute curve.

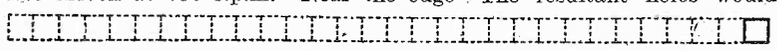

Fig. 1—This diagram shows how each hole in the scanning disc should line up with its neighbour to produce a clean strip of light.

Figs. 2 and 3.—These sketches illustrate the light patches which will be obtained by any overlap caused by inaccurate aligning of adjacent holes.

Fig. 4.—The irregular hole which is obtained if the hole is punched against a yielding substance.

If the completed disc was mounted on a pin, representing the spindle of the driving motor, over a piece of paper situated near the edge of the disc, and each of the radial lines brought up to a given point in succession, the result obtained by following the shape of the holes on to the paper, with a very sharp pencil, should be as shown in Fig. 1. the solid square representing the first hole and the dotted lines those which follow.

Accuracy Essential

From this it is apparent that each square should be exactly adjoining and accurately disposed in relation to the radial line, and in consequence it is impossible to produce a series of 30 holes so disposed by "rough and ready" means with anything like an approach to the desired and necessary accuracy. Consider for a moment the likely result from an attempt at punching with a square punch and a hammer, bearing in mind that the holes required are comparatively minute, and the fact that there are 30 of them, that the punch each time has to be exactly located against a previously made accurate marking on a radial line and struck with a hammer. The resultant holes would probably be, owing to an involuntary movement or movements of the punch by the operator while the hammer blows were struck, either as shown in Figs. 2 and 3 or both, in relation to each other. Fig. 2 represents three holes in the relative positions that they will occupy at a given point, the shaded portion showing how a staggered hole will cut into the track of the previous or next scanning line, thus producing an unwanted band of light. Fig. 3 shows the holes irregularly spaced, A leaving an unwanted band of metal in the light track, and the shaded portion B where two holes overlap. The holes must also be cleanly cut. Punching the holes in metal against a yielding substance would burst the metal, as illustrated in Fig. 4.

Constructing the Gauge

Doubtless many of these discs have been "hand made," as it were, with a more or less degree of success. To those, however, who intend to make this part of the apparatus, emphasis is again directed to the fact that it is an impossibility to punch the holes within the close limits of predetermined accuracy unless some mechanical means is employed for spacing and locating the punch in relation to the intended position of the holes. A simple device for this purpose is illustrated in Fig. 5. Briefly the method for using is as follows: The prepared disc, complete with boss, is placed in the position shown, the hole in the boss fitting on to a pin of the same diameter as the motor spindle. A close fitting steel pin pointed to an included angle of about 60 degrees, hardened for preference, is pushed into the 1/16in. diameter hole situated at the front of the guide plate, and held in contact with the disc with one hand and the disc rotated with the other hand. This will make a well-defined pitch line for the indexing holes on the face of the disc. The rim of the disc, by the way, should be made slightly wider for this purpose. Remove the disc, and with a pair of sharp-pointed dividers, space the pitch circle thus obtained into 30 equal parts. Providing that the dimensions given in the following text are adhered to the pitch circle should be 15½in. diameter. The exact chord distance between the marks on a circle of this diameter should be 1.6202in. Set the dividers at a shade (.005in.) under 1⅝in. and lightly plot off the circumference. The space left after making the thirtieth mark hould be exactly equal to the distance at which the points of the dividers are set.

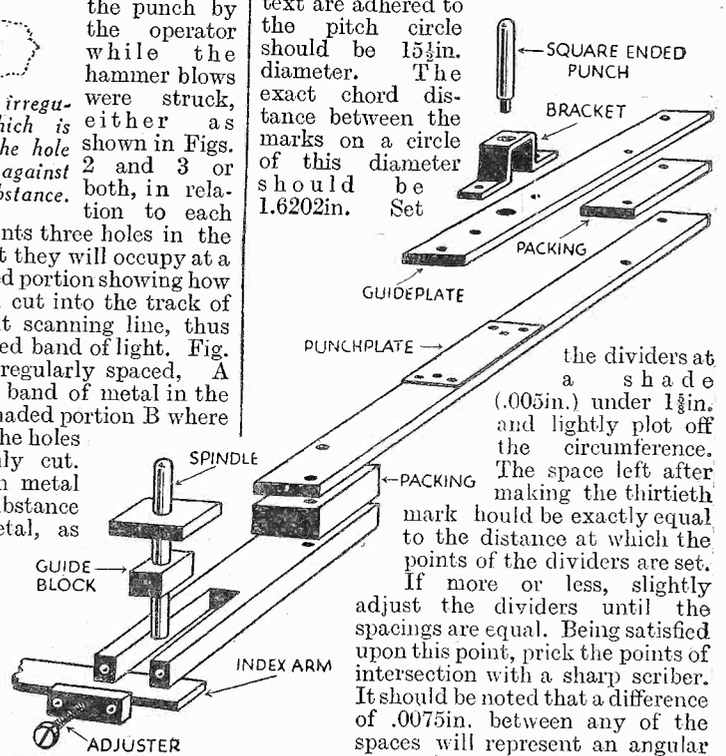

Fig. 7.—Assembly details of the complete apparatus.

If more or less, slightly adjust the dividers until the spacings are equal. Being satisfied upon this point, prick the points of intersection with a sharp scriber. It should be noted that a difference of .0075in. between any of the spaces will represent an angular error of approximately 3 minutes of a degree which will be reasonably accurate.

The following details relate to a 20in. diameter disc with the outside edge of the first hole 9½in. from the disc centre.

Replace the disc and punch the 30 indexing holes. To do this each of the markings are brought up to the small pointer, and the holes pierced with a 1/16in. diameter flat-ended punch, the punch passing into the

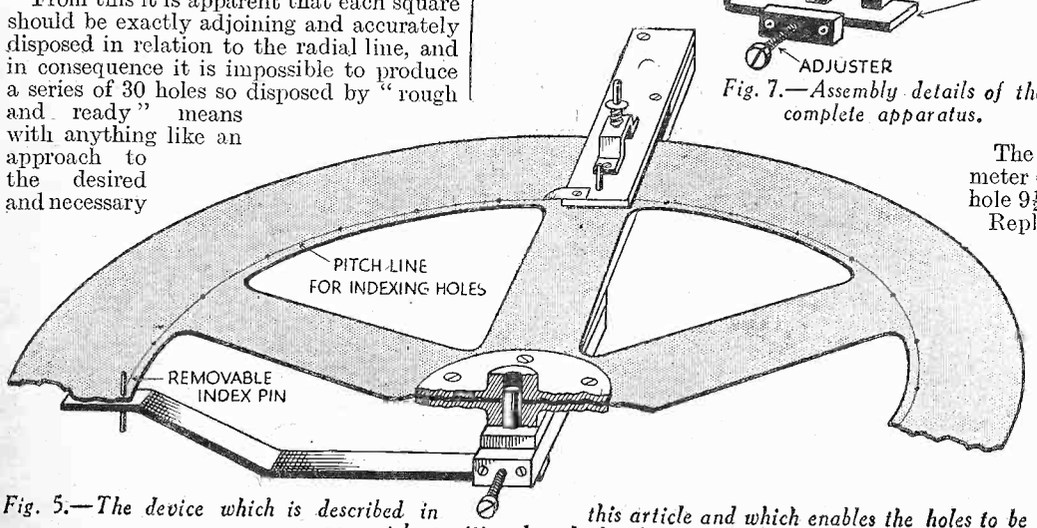

Fig. 5.—The device which is described in this article and which enables the holes to be accurately positioned and cleanly cut.

Fig. 6.—The alternative method of adjusting the punching device.

same hole that was used to scribe the pitch circle. Now locate the disc by means of a pin which fits both the holes made and that in the arm shown at the left-hand side of the illustration. The first square hole is then punched. Release the adjusting screw and remove one packing piece from the number that are clamped between the guide block and end of the slot, index to the next position and punch the second hole. Proceed in this order, removing a packing piece each time until the 30 holes are punched. Thus it will be noticed that the disc moves up to the punch each time by a predetermined amount, *i.e.*, the thickness of one packing piece. The index arm is attached to the spindle, and therefore also moves forward.

Fig. 6 shows an alternative method employing a 40-thread screw upon which is fixed a small gear wheel (¾in. diameter by 25 teeth). This is used in place of the adjuster, and a suitable locating pin is provided to fit the gear teeth. Where this is used the guide block would be backed up by a stiff coil spring, and the screw turned once completely plus the amount of three teeth each time to give a forward movement of .028in.

Constructional details are made clear in Fig. 7, and bright mild steel is the material mainly used. This is 1½in. in width except for the index arm, which is 1in. The guide plate, and that on which the punch plate is fitted, is ¼in. thick. The slotted plate is ⅜in. thick. The bar fitted with screws to this part is tapped for the adjusting screw. File the slot clean and parallel, with the block a good sliding fit in it.

Assembling the Parts

Fasten the index arm, block, and small top plate together with counter-sunk bolts nutted on the under side. This assembly should slide freely in the slot without shake. There should be sufficient space between this and the end of the slot to accommodate twenty-nine packings. These packings are made from bright rolled No. 22 S.W.G. metal. This should be checked by micrometer to ensure that it is up to gauge .028in. Cut the pieces tee shape, the heads of which overlap the edges of the slot. On the end of a piece of ¼in. silver steel file a short .028in. square projection to form the punch. The strip metal guide fits the body of the punch. This is mounted on the guide plate and the guide hole continued in the plate for a depth of 3/16in., the remaining 1/16in. being squared out to take the end of the punch. Make the punch plate or die from 1/16in. steel that is afterwards case-hardened, or if cast steel, hardened and tempered. Drill and countersink four fixing screw holes in this plate, also a 1/16in. diameter hole for punching the index holes, and a .028in. hole (No. 70 wire gauge drill). Both holes are counter-bored from the back, about 1/32in. diameter larger, half-way through for clearance and the smaller hole drifted out square with the hardened and tempered punch. The punch, by the way, should have previously been drilled for two 1/16in. diameter split pins. One of these is arranged to restrict the rise of the punch against the under side of the strip metal guide, so that the squared end does not leave the square hole in the guide plate. The other pin retains the return spring and washer. Clearance holes must be drilled in the plate to which the die is fixed to allow the punchings to fall clear. The parts are then firmly screwed and nutted together in the positions indicated on the drawing. It should be made clear that the distance from the centre pin to the die opening with the packings in position should equal the radius of the hole nearest the edge of the disc. Further, sufficient clearance must be left to allow the boss and the edge of the disc to travel a distance of approximately ⅞in. without fouling the packing pieces.

TELE-TALKIE TOPICS

By H. J. BARTON CHAPPLE, Wh.Sch., B.Sc., A.M.I.E.E.,

Continental Television Transmissions

EVIDENCE of the growing interest in television is furnished by the increasing number of television transmissions which emanate from countries on the Continent. Many of these are designed purely for experimental purposes or local reception, but that in no way disguises the fact that progress is being made. As far back as 1929 I participated in a number of television experiments between Witzleben and London, and during part of that period visited Berlin to install and operate some of the television transmitting apparatus used in that city for broadcast purposes.

It is therefore always interesting to pick up transmissions from Berlin, and to enable readers to do the same the particulars which follow will prove useful. No guarantee can be given as to the accuracy of the programme times, but from the latest information I have been able to secure, it is as follows :—

First of all, the station transmitting these low-definition signals is the high-powered long-wave one at Berlin (Königswusterhausen), working on a wavelength of 1.571 metres (191 kilocycles) and a power of 60 kilowatts. The times it is on the air are :—

Tuesdays, 8.5 a.m. to 9 a.m.
Thursdays, 12.45 p.m. to 1.45 p.m.
Saturdays, 8.5 a.m. to 9.45 a.m.

Although these periods are somewhat inconvenient for the average reader, I strongly advise all those who can at least to test the strength of the signal and compare it with that received from the London National Station.

Scanning Differences

If the transmissions are watched with a standard television receiver built for the B.B.C. transmissions, they will at first be almost unintelligible. This arises from two main reasons. First of all, although the same number of scanning lines—that is, thirty—are used, and the speed of rotation of the scanning mechanism is identical namely, 12½ pictures per second—the Germans scan horizontally and in a clockwise direction, whereas in England it is vertical and in an anti-clockwise direction. Any image received in this country is in consequence not only turned through an angle of ninety degrees, but it is reversed as well. The differences do not stop at that, however, for whereas the B.B.C. picture ratio is 7 vertically to 3 horizontally, the German ratio for broadcast band transmissions is 4 horizontally to 3 vertically.

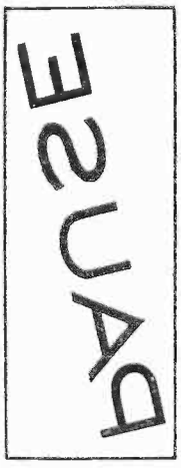

Fig. 1.—Indicating how a word transmitted by television from Germany would appear on a standard English Television receiver.

The resultant images therefore are also distorted when viewed on an English disc. This is shown by referring to Fig. 1. It indicates the German word PAUSE, representing an interval which is sent out while any changes are being effected during the course of a transmission, and instead of being a horizontal printed word it has the appearance denoted in the sketch.

German Disc Details

It is quite a straightforward matter to make an allowance for this, provided that certain important details are studied, and this can be done best by giving the reader dimensions and picture-shape data for German discs. The first point to note is that, although the rotation of the scanning disc is in the reverse direction to that used in this country, the scanning takes place from the outside and proceeds towards the centre. Referring to Fig. 2, the individual square apertures punched in the

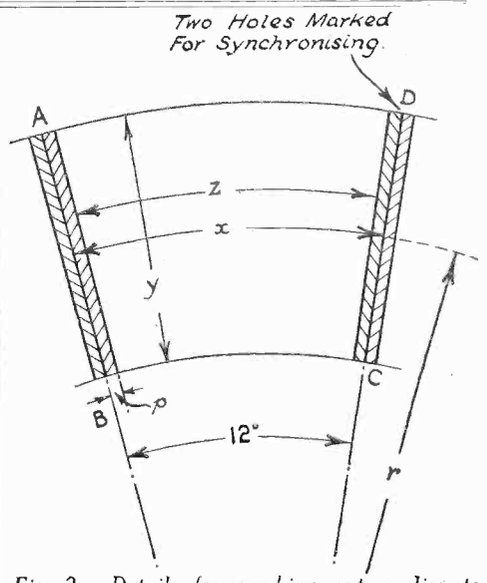

Fig. 2.—Details for marking out a disc to receive the German transmission.

disc in the form of a single-turn spiral traverse the field of light provided by the flat plate of a neon lamp mounted behind the disc so that they start at the top on the left—that is, at A—and finish at the bottom on the right—denoted by point C. This reasoning, of course, is based on the assumption that the " looker " is facing the front of the disc.

To provide the synchronizing signal of 375 frequency, the Germans definitely mask off one hole at each side of the true picture area, and this is shown by the double shaded lines at AB and CD. The picture depth is given by the radial distance y, which is the difference between the radius of the outside edge of the first hole and the inside edge of the last hole. The picture length, according to German reckoning, is the circumferential distance z measured on the *mean* radius circle (midway between arcs AD and BC).

On this reckoning we have $\frac{z}{y}=\frac{4}{3}$ Now as the picture is divided into thirty strips, and if we call p the size of each square

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1 Varley Electronic 1 watt type resistance 25,000 ohms		9
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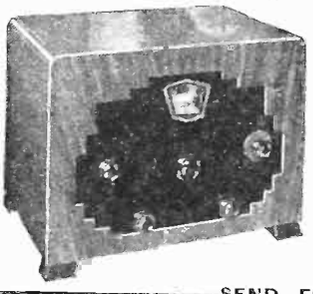

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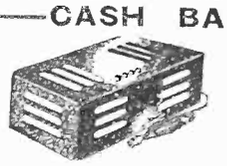

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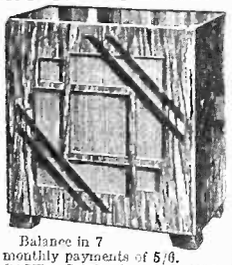

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hole, we have y=30p. But the *total* width of the picture area, allowing for the two holes masked off, is really z+2p, and for reference purposes we can call this x. Also x in one-thirtieth of the circumference of a circle having the mean radius r, and so

$$2\pi r = 30x$$
$$= 30\,(z+2p)$$

But $z=\frac{4}{3}y$ and $y=30p$

Therefore $z=40p$

and $2\pi r = 30\,(42p)$

Hence $p=\frac{2\pi r}{1260}$

From these simple equations it is, of course, a very easy matter to calculate all the data we require. As a general rule, the dimension which is decided upon owing to considerations of space available is the mean radius, that is r, and this gives all the other dimensions.

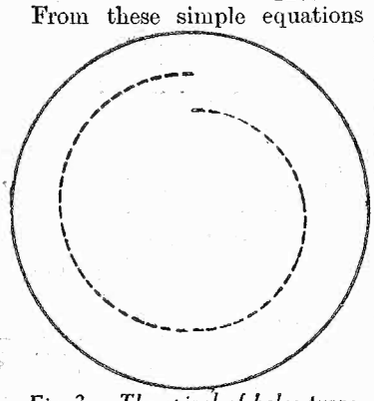


Fig. 3.—The spiral of holes turns in an anti-clockwise direction.

It will, no doubt, be a guide to readers if a typical example is worked out. First suppose we take the generally-accepted standard-size disc having an external diameter of 20ins. With this we can comfortably take a mean radius of 9ins. The size of each square hole then becomes

$p=\frac{2\pi\times 9}{1260}=.04488$ inches. Readers will at once see that the hole size is relatively large, for it is about 50 per cent. greater than that for an English disc of about the same mean radius.

The total picture height is now

$y=30p=1.3464$ inches,

while the circumferential width taken on the arc of mean radius r=9ins., that is, z in Fig. 2 becomes

$z=\frac{4}{3}y=40p=1.7952$ inches.

In marking out a disc for the German television transmissions do not forget that the spiral of holes turns in the manner shown in Fig. 3—that is, anti-clockwise—while the disc rotates in a clockwise direction. Furthermore, after having marked out the thirty radii each subtending an angle of 12 degrees at the centre, the outside edge of the first hole is distant from the centre by an amount $(r+\frac{y}{2})$, since the calculations are based on a mean radius dimension.

For example, in the case just worked out this distance is $\frac{9+1.7952}{2}=9.8976$ inches. Having marked off this hole, the others come automatically.

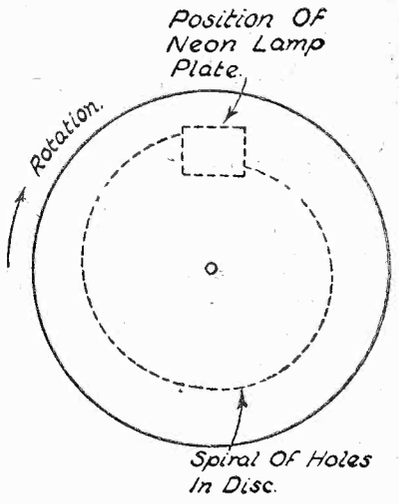


Fig. 4.—Mount the neon lamp centrally at the top back of the disc for reception.

Finally, remember to change the direction of rotation of the disc when compared with the English scanning direction. In the case of small universal type motors this is done very simply by reversing the leads which actually pass to the brush contacts. In addition, the neon lamp must be mounted at the back of the disc at the top with the plate in a horizontal direction (Fig. 4).

A Q.P.-P. CONVERSION

By E. J. R. MAY.

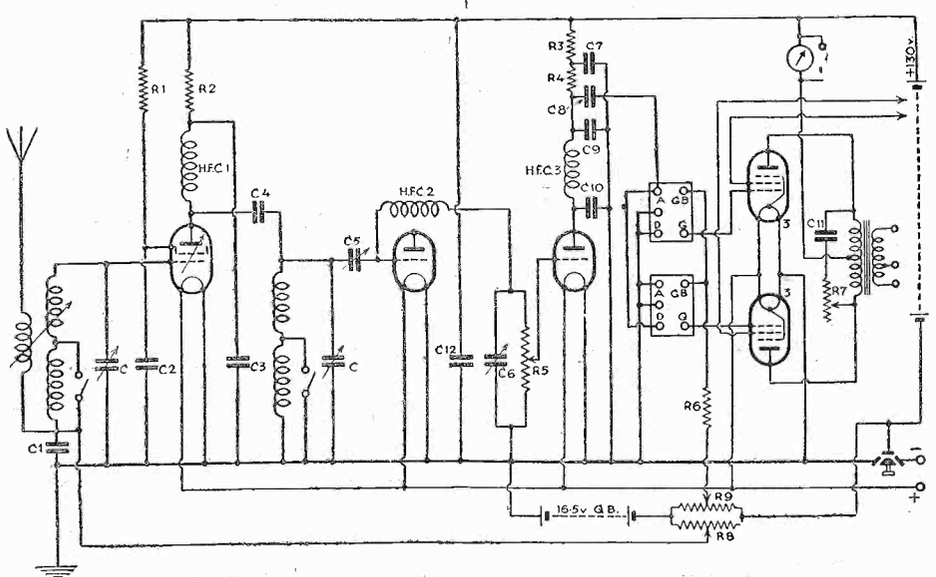
THE chief disadvantage—if one can call it so—of Q.P.-P. is the necessity of using a transformer having a step-up ratio of 8 or 9 to 1, in order to feed a suitable grid swing to the push-pull output stage. Transformers of this type on the market have a low primary-inductance value—of the order of 30 henrys with no D.C. flowing, with the result that reproduction of the bass notes especially is somewhat curtailed.

In the writer's receiver the L.F. stage was coupled by a parallel-feed transformer having an inductance value of 80 henrys. Another parallel-feed transformer was obtained and connected in parallel with the first, but with one primary reversed to effect a change of phase. The detector valve was replaced by a diode feeding an L.F. stage, resistance-coupled in its turn to the two transformers. All this can be seen in the circuit diagram.

In order that the grid-bias battery shall discharge at a rate comparable with that of the H.T. battery, and to obviate constant re-balancing of the circuit, it is fed through two 50,000-ohm potentiometers connected in parallel, one supplying the bias for the pentodes and the other forming a pre-detector volume control by varying the bias on the variable-mu H.F. valve.

An H.F. filter circuit, consisting of an H.F. choke and two .0002 mfd. condensers, is placed in the anode circuit of the L.F. valve in order, finally, to dispose of any stray H.F.

The two .0001 mfd. condensers C5 and C6 are of the pre-set type; and the .25 megohm potentiometer forms a post-detector volume control, as it is desirable that a fairly strong signal should be fed to the diode in order that it should work under the best possible conditions. The 50,000-ohm resistance forming part of the tone-correction circuit is made variable, so that it may be used as a tone control. The Drydex 130½-volt H.T. battery is used as it is tapped at 1½-volt intervals between 120 and 130 volts, and, therefore, provides considerable help in balancing the circuit. Care should be taken to see that the pins marked 3 on the pentodes are wired to the L.T. negative.



The circuit arrangement referred to in the above notes.

In setting up the circuit, the following procedure should be adopted:—

1. Plug in the anodes at 130½ v. and the grid-bias at 15 v. 2. Open the switch, thereby connecting the 0-10 m/a meter in circuit. 3. Insert *one* pentode in its valve socket and plug its priming-grid lead into, say, 129 v. 4. Adjust the meter reading to 2¼ m/a by adjustment of the bias potentiometer. 5. Remove pentode No. 1 and insert pentode No. 2, switching off the set before so doing, and, *without touching the grid-bias potentiometer*, vary the priming-grid lead in different tappings until it also reads 2¼ m/a. If it should not read 2¼ m/a, alter pentode No. 1 tapping and start all over again. 6. Having balanced the circuit, close the switch shunting the meter, since this will cause distortion if left in circuit, by providing a common impedance in the anode lead. 7. Adjust the pre-set condensers C5 and C6 to about half capacity and the L.F. potentiometer to nearly all in.

The total current consumption averages out at about 10 m/a at comfortable strength in a room 20ft. by 15ft. In the writer's case the old power valve—a Mazda P.240—is used in the L.F. stage, because this takes a larger grid-swing than the more usual P.M. 2DX. type.

The output is, approximately, 1.3 watts, but with 150 v. H.T., 21 v. grid bias, and the consumption of the pentodes adjusted to 2½ m/a *each*, an output of 2 watts can be obtained.

The Easy Road To Radio

BEGINNER'S SUPPLEMENT

EASY SWITCHING WITH PLUGS AND JACKS

WHERE there are two or more low-frequency stages of amplification in a receiver, sufficient volume will be obtained on the pick-up if it is plugged-in to the grid circuit of the first L.F. valve. Plugging it in to the detector would most likely cause overloading so that no advantage would result. Incidentally, when connecting to one of the L.F. stages the circuit is somewhat simplified since grid bias is already provided. All that is required then to enable a pick-up to be used is a single closed circuit jack and a plug.

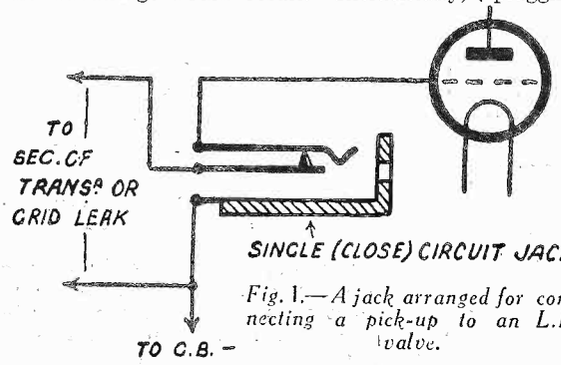


Fig. 1.—A jack arranged for connecting a pick-up to an L.F. valve.

Fig. 1 gives the circuit when using battery operated valves. Two of the lugs of the jack are connected to the secondary of the transformer (or across the grid leak if the coupling from the previous stage is by R.C.C.) and the third lug to the grid of the valve. For mains valves the circuit in Fig. 2 would apply. If desired, a receiver can be fitted up with a jack in the grid circuit of each of the L.F. valves as well as that of the detector. In this way one or more valves may be used at will by plugging-in the pick-up to the requisite socket.

Combining a Change-over Switch

Some constructors prefer to use an ordinary switch with which to change over from radio to gramophone, but at the same time like to be able to quickly disconnect the pick-up whenever necessary. To arrange this a single pole change-over switch of the rotary, or other type, is mounted on the panel of the set while the pick-up itself is connected to the set by means of a plug and jack arranged somewhere at the back or side of the cabinet. Ordinarily the pick-up is left plugged-in and the change over effected by means of the panel switch. If, however, it is desired to move either the set or the gramophone to another part of the house all that is necessary to separate the two is to pull out the plug. The circuit for such an arrangement when plugging-in to the detector valve is given in Fig. 3. Fig. 4 shows the circuit when plugging-in to one of the L.F. valves.

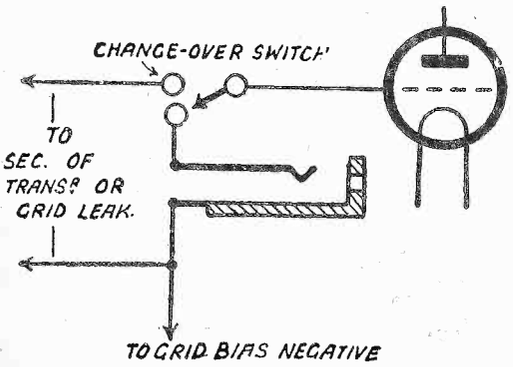


Fig. 4.—A similar arrangement to that shown in Fig. 3, in this case for an L.F. valve.

Ingenious Interstage Switching

In dealing with methods for cutting out one or more of the L.F. stages of a receiver, mention was made previously of a circuit for use with parallel-feed and resistance-capacity coupled stages, in which the anode resistance was cut out of circuit when plugging-in to the detector or first L.F. valve. At first sight this appears to be the obvious thing to do, since, when the speaker is plugged-in to one of the earlier L.F. stages the valve concerned will then become the output valve and as such would not be fully exploited if the coupling resistance were left in its anode circuit. However, to remove it would naturally increase the voltage on the plate. So far, then, all is well, but an increase in plate voltage would call for increase in grid bias voltage and here lies the difficulty. Clearly a compromise could be struck by using a value of bias which was rather on the high side when the valve was working as an intermediate amplifier, but would not be too low when it was functioning as an output valve. However, in the case of valves which are rather critical as regards bias values, a more satisfactory arrangement is to employ the circuit given in Fig. 5.

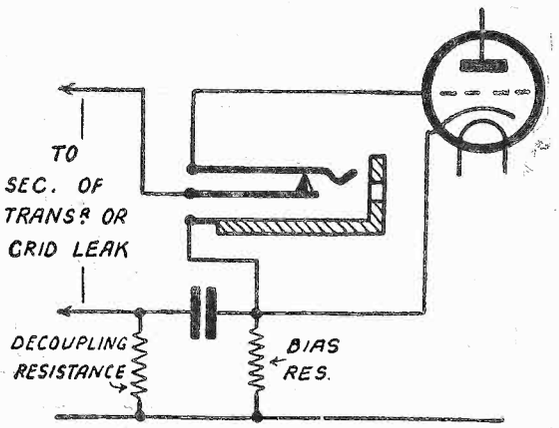


Fig. 2.—A modification of Fig. 1 for use with indirectly-heated valve.

Automatic Bias Adjustment

Here the difficulty is overcome by automatically adjusting bias directly the speaker is plugged-in. A five-spring automatic jack is used. It will be seen that the insertion of the plug joins the speaker directly between the anode and H.T.+ while disconnecting both the anode resistance and also the decoupling resistance

(Continued on next page)

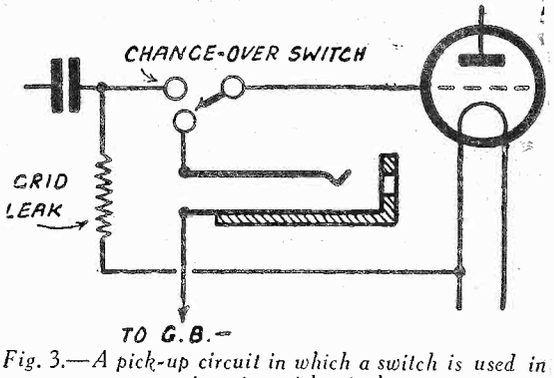


Fig. 3.—A pick-up circuit in which a switch is used in conjunction with a jack.

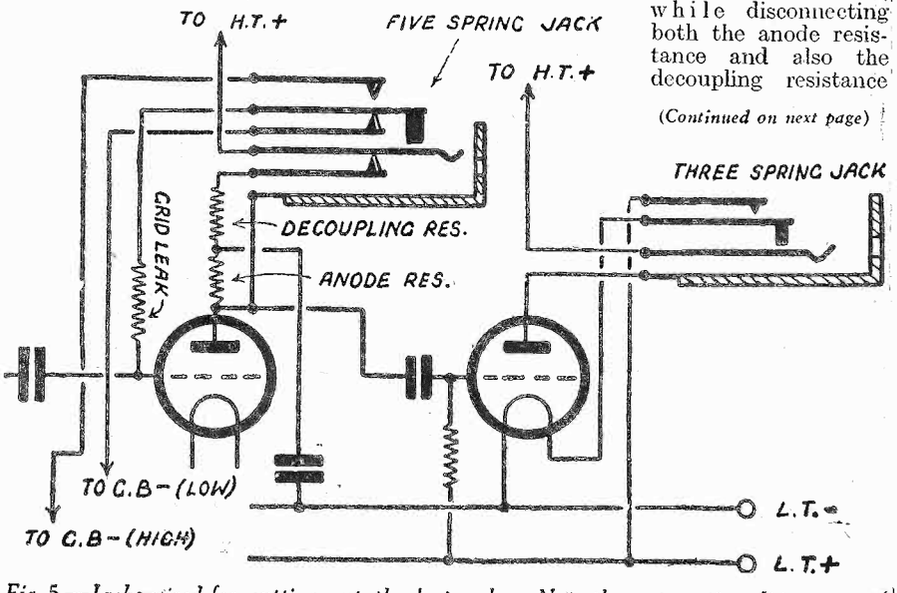


Fig. 5.—Jacks wired for cutting out the last valve. Note the automatic adjustments of H.T. and G.B.

(Continued from previous page)

(if one is fitted). At the same time the grid leak return is transferred to a higher negative bias value. With a battery set this will simply mean an extra tapping on the grid bias battery, but in the case of a mains set two bias resistances are used. Normally, only one is connected in the cathode lead, but on plugging the speaker in to the five-spring jack the second one is brought into operation in series with the first. Of course, a tapped resistance could be used in place of the two resistances if desired.

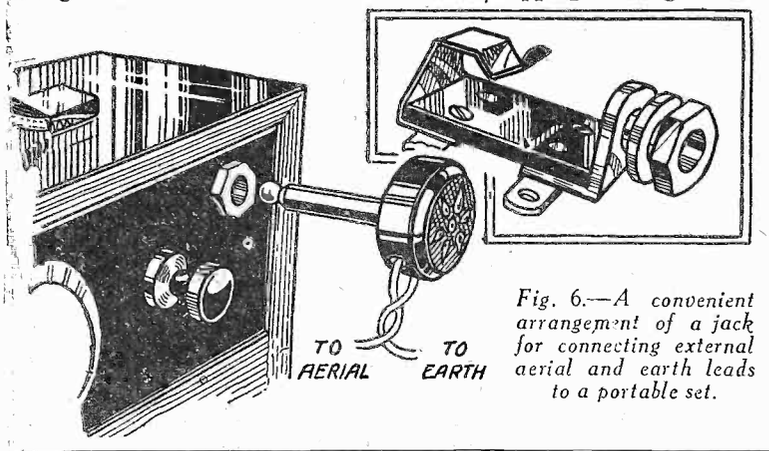


Fig. 6.—A convenient arrangement of a jack for connecting external aerial and earth leads to a portable set.

H.F. Circuits

Although generally speaking plugs and jacks are not suitable in H.F. circuits, there are nevertheless one or two low-capacity jacks such as the Bulgin illustrated in the inset (Fig. 6) which enables the use of jack switching to be extended to the H.F. stages of the receiver. One of the first uses for such a jack that suggests itself is in connecting a frame aerial to a receiver. By using two jacks so that one is connected to each of the frame windings the receiver could be plugged-in to either the long or medium wave winding, and so obviate the use of a separate switch.

In the case of a portable set, which is occasionally used on an outside aerial, the fitting of a low-loss jack to the set, and a plug to the aerial and earth wires, as in Fig. 6, enables it to be connected or disconnected with the least possible effort.

A SIMPLE ONE-VALVE TRANSMITTER FOR BEGINNERS

THE diagram, Fig. 1, illustrates a simple one-valve set employing two coils for aerial tuning and reaction. When the two coils are brought close together oscillation occurs, due to the feeding-back of the energy from the anode circuit to the grid circuit. To employ this energy for transmitting purposes it is necessary to ensure that it shall be passed into the aerial, and therefore the aerial and earth connections are changed round.

Fig. 2 shows practically the same circuit arrangements, with the exception that the aerial is now joined to the anode, instead of to the grid, and the earth connection is taken from the other end of the reaction coil. (The 'phones are naturally removed.) This method of connection ensures that the maximum current which the valve is capable of generating is fed into the aerial circuit, and if a milliammeter is inserted in series with the anode coil, a reading of the anode current is obtained. If this current (expressed as a decimal fraction of an amp.) is multiplied by the voltage of the high-tension battery, the figure obtained will express the power of the transmitter in watts.

A Simple Transmitting Circuit

This circuit is the basic arrangement of all transmitters, and it is only necessary now to insert a key for the transmission of morse signals, or a microphone for the transmission of speech or music. The most efficient way of breaking the circuit is to disconnect the wire linking the batteries, and therefore a tapping key should be inserted at the point marked X. When the key is depressed the circuit is completed and oscillations will be present in the aerial circuit. As soon as the key is released the oscillations will cease. The signals of the morse code may therefore easily be transmitted. For speech, the oscillations must be continuous in the aerial circuit, and the speech currents superimposed upon these oscillations. A microphone and a microphone transformer are the essentials required, and the secondary of the transformer (which should have a step-up ratio) is joined in the grid circuit at the point marked Y. The microphone is joined in series with the primary of the transformer, and to complete this part of the circuit a battery is necessary.

Fig. 3 shows how this microphone circuit may be completed by using the accumulator which supplies the filament of the valve, and also the method of including the secondary in the grid circuit. The value of the condenser across the secondary must be fairly carefully chosen in conjunction with the secondary winding and the frequencies which it is desired to transmit. It is also desirable to shunt the H.T. supply with a large condenser. This method of employing a microphone is not efficient, although it is the simplest method, and in actual modern practice a separate valve is used for the microphone. It is arranged so that part of the aerial energy is absorbed according to the speech currents in the grid circuit of the modulator valve. The first valve generates the oscillations (known as the "carrier wave"), and the second valve modulates these.

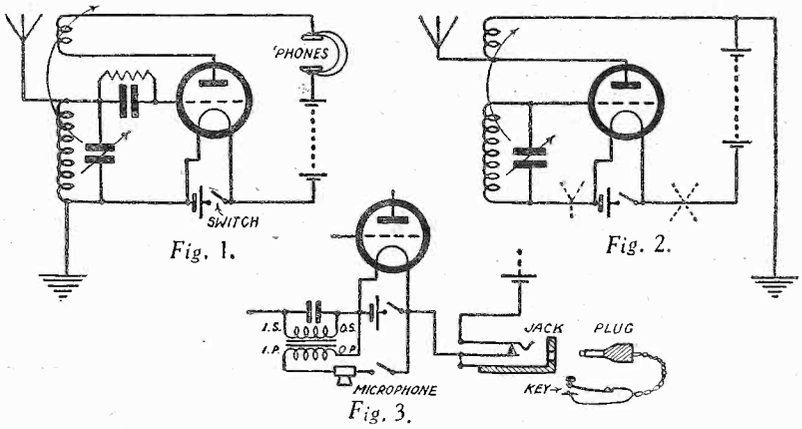


Fig. 1.

Fig. 2.

Fig. 3.

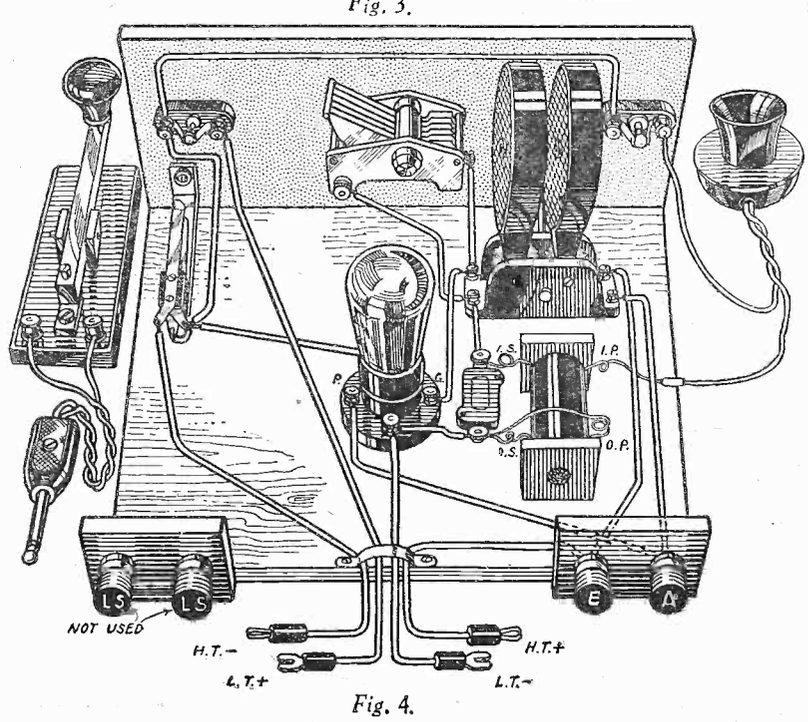


Fig. 4.

Circuit diagram and layout for a simple one-valve transmitter.

Fig. 4 shows the complete layout with the microphone connected and with the key complete with jack.

It should be pointed out here that on no account must any experiments in transmission be carried out without the sanction of the Postmaster-General, and a transmitting licence must be obtained before any attempts at transmission are undertaken.

A HETERODYNE WAVEMETER

In This Article Instructions are Given for Making a Cheap but Efficient Instrument.

By W. B. RICHARDSON

THIS useful instrument, for measuring the wavelength of a received signal, or setting a receiver to a predetermined wavelength in order to receive a particular station, consists of a coil tuned by a variable condenser, the latter having a calibrated dial. Across this tuned circuit is arranged a battery and small buzzer. If desired a switch may be included in order to avoid disconnecting the battery. When the buzzer is operated oscillatory currents are set up in the tuned circuit, and these can be picked up by a receiver over quite a considerable distance. If the dial of the wavemeter is set to a given wavelength and the buzzer put in action, upon rotating the tuning dial of your receiver you will find a spot where the oscillations from the buzzer are at a maximum. At this spot the receiver is tuned to the wavelength shown by the dial of the wavemeter. In order to enable sharp tuning to be carried out it is advisable to remove the wavemeter as far away as possible from the receiver. Furthermore, once the wavemeter has been calibrated, the coils and condenser should be enclosed in boxes so that they may not be damaged and the values altered. The accompanying illustration shows the circuit arrangement.

There are three types of wavemeter in general use. First, there is the "buzzer" meter, which is in reality a miniature "spark" transmitting station which can be tuned to known wavelengths. It consists of an oscillating circuit similar to the aerial circuit of a receiver. This is excited by a buzzer like that used in an electric bell. Secondly, there is the absorption wavemeter, which works by virtue of absorbing energy from the circuit of the set it is desired to calibrate. It consists essentially of a tuned circuit, comprising an inductance and a variable condenser. It is brought into close proximity to the circuit to be calibrated. This latter has to be oscillating, but when the wavemeter is brought near it ceases to oscillate on the particular wavelength to which the wavemeter is tuned. This kind of wavemeter is very simple and requires no batteries, but it has one drawback, that as it has to be brought very close to the circuit undergoing calibration it is sometimes difficult to use.

The heterodyne wavemeter is similar to the other two, in that it has a tuned circuit controlled by a variable condenser. This circuit, however, is made to oscillate by means of an ordinary valve. It might be compared to a one-valve receiver, in which the reaction is "turned on full" all the time. It is placed some little way from the set to be calibrated. The latter is then made to oscillate by advancing the reaction, and on tuning-in to the wavelength which the wavemeter is radiating, the familiar squeal one gets when passing a station with the reaction too far advanced is heard in the loud-speaker or 'phones. When this squeal is heard the wavelength of the meter is noted, and the same figure marked on the dial of the receiver opposite where the pointer is.

A glance at the illustration will be sufficient to show you that the little meter described here has just about the simplest circuit possible. It consists of two oscillating circuits—one for the medium, and one for the long waves. Each consists of a grid coil and a reaction coil. The long-wave windings are in the form of loading coils which are brought into use by a three-point wave-change switch. An ordinary on-off switch is used to switch on the valve.

If a wavemeter is to be reasonably accurate and, what is most important, remain accurate, it must be carefully constructed, and must include only good-class components which will not vary their characteristics in the course of time. It will be realized that any change in the value of the components will upset the readings and necessitate the recalibration of the meter. It is for this reason that one valve must always be kept for the meter. A different valve would most likely throw the readings right out. In fact, it is best not to remove the valve at all unless you are certain of pushing it right home in its holder each time. It is the same with the other components—once they are fixed leave them alone, and try by all means to avoid the accumulation of dust, especially when accompanied with moisture.

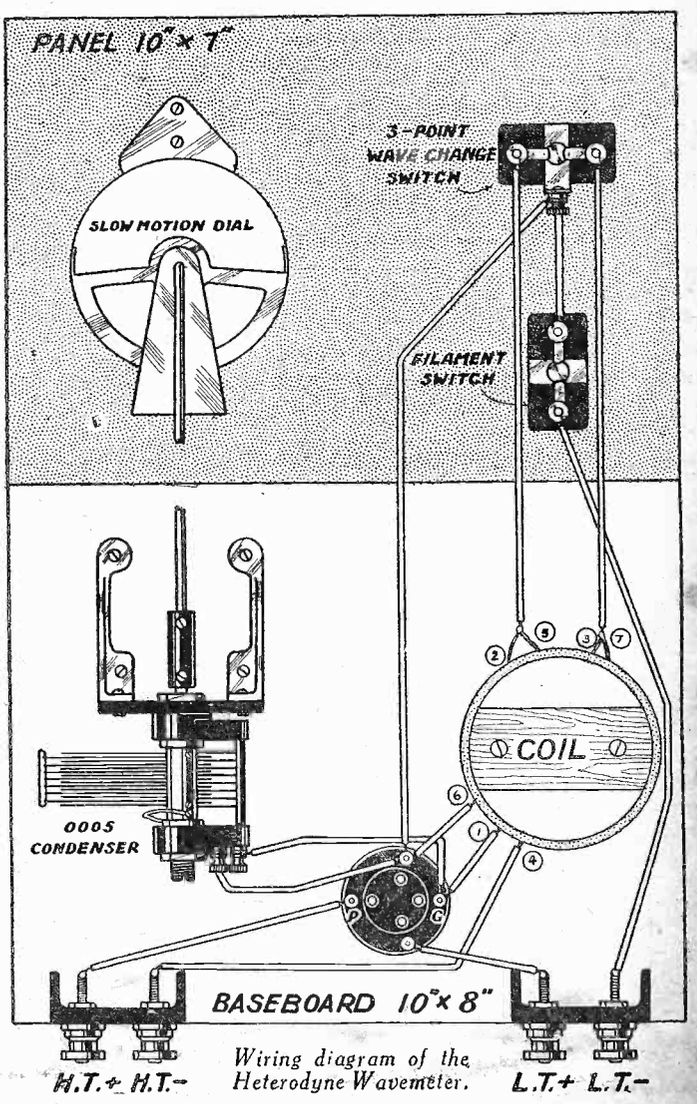
Winding the Coil

The only part to be actually "constructed" is the coil. This is wound on a 3in. diameter paxolin former 6in. long. Wind the wire as evenly and tightly as possible, so that it will not shift later on and alter the wavelength. Pierce two small holes about ¼in. from one end of the tube and leaving a short length for the connection, secure the wire through the holes. Then commence winding. Put on fifty-five turns, which by the way should consist of 24-gauge d.s.c. wire, and then make two more holes and finish off by threading the wire through the holes as before, leaving the short length for connections. This is the medium-wave grid coil. The reaction coil follows, and consists of twenty-five turns in the same direction composed of the same gauge wire. Leave a space of about ¼in. before starting the long-wave coils. These consist of 170 and 50 turns for the grid and reaction windings, respectively. Full details of the coil and its connections will be given next week.

Mounting the Components

The illustration gives a bird's-eye view of the layout, with the panel represented as lying flat. Probably the first thing that will strike you as being somewhat unusual is the mounting of the variable condenser. It is supported on a little ebonite panel of its own some way back from the panel. This is to reduce hand-capacity effects. If you are not familiar with heterodyne wavemeters you may not at once see the reason for this, but it is because there is no aerial or earth used with the meter. In a receiving set the moving vanes of the tuning condenser are connected to earth, so that bringing one's hand, which is also at earth potential, into proximity with them when tuning has no effect. The fixed vanes, which are at high potential, are screened by the moving vanes. Here, however, both the fixed and moving vanes are at high potential, hence the need for placing the condenser some way back.

(To be concluded next week—Ed.)



Wiring diagram of the Heterodyne Wavemeter.

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MULLARD VALVE GUIDE

OPERATING data and characteristics of the complete range of Mullard valves is given in the new season's Mullard Master Valve Guide, a useful book of pocket size. The application of each valve is simply explained and useful hints concerning such matters as grid-bias voltage, operating notes, and so forth are included for each type. The technical appendix, which occupies thirty-four pages, includes a useful article with many diagrams on automatic grid bias, an authoritative article on the operation of rectifier valves, a handy method of calculating the correct ratios for output transformers, a guide to the standard connections to the new seven-pin base, and many other informative articles. Copies of the handy book can be obtained from the Publicity Dept., Mullard Wireless Service Company, 111, Charing Cross Road, London, W.C.2.

LISSEN RECEIVERS

A FINE range of the popular Lissen receivers, including the "Skyscraper" series, is displayed in an attractive folder recently issued by Lissen Limited. There are models to suit varying tastes and purses, and from which the most discriminating listener should have no difficulty in choosing a receiver to suit his requirements. There is model 8005, a two-valve battery set with a "pentode" performance, and its price is only £3 19s. 6d., complete with batteries and valves. At the other end of the range there is model 8060, a fine six-valve all-mains superhet. Equipped with A.V.C., band-pass tuning, and an electro-dynamic loud-speaker, this high-class instrument is priced at £14 14s. Other models include A.C. and D.C. models with moving-coil speakers, and battery-operated portable and table sets, all housed in handsome cabinets of modern design, and at prices ranging from £4 4s. to £12 12s. Full particulars of all the receivers are given in the folder, copies of which can be obtained on application to Lissen Limited, Lissenium Works, Worple Road, Isleworth, Middlesex.

HIVAC DRIVER+B VALVE

THIS valve is the latest addition to the Hivac series of high-efficiency low-priced valves for battery sets. It combines in one bulb two separate systems operating respectively as Driver and Class B output. This latest development in design, which gives added efficiency, reduction in cost, and simplifies wiring, is the result of extensive experimental work in the Hivac laboratories. The new valve is of particularly robust construction, and embodies mica spacers and filament suspension springs, the anodes, grids, and filaments being housed between a side supporting framework. Interested constructors should write for a copy of the Driver+B leaflet, giving full particulars, prices, and characteristic curves, to The High Vacuum Valve Co., Ltd., 113-117, Farringdon Road, London, E.C.1.

REPLIES TO BROADCAST QUERIES.

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RADIO RAMBLINGS

Jottings from my Notebook

By JACE

New Finnish High-power Station

LAHTI, which up to the present has been relaying the Helsinki broadcast programmes on 1,796 metres, with a power of 40 kilowatts, has been reconstructed and will shortly increase its power to 150 kilowatts. As, contrary to the Lucerne allocation of 1,145 metres, it has continued to work on 1,796 metres, the channel now occupied by Radio Paris, there is a possibility that an alteration in wavelength may be made when the new station comes into operation. France's contention that her second long-wave channel used by Eiffel Tower cannot be given up as long as the Radio Paris transmissions are not clear of interference would be strengthened if no change is made in Lahti's wavelength.

An "Ekco" of a Christmas Drama

DURING the last days of 1933, the two keepers of the Dutch Heartach lighthouse—one of whom had an injured leg—were marooned by gales. Their only means of communication was by wireless telephone, and by this link their wives kept in touch with them over the Christmas period. The men were eventually rescued by the lighthouse steamer *Hesperus*. The "skipper" of the *Hesperus* has now been presented with an Ekco Model 74 suitably embellished by an engraved plate.

Exide Cells in China and Australia

CHINA is not always associated with the immediate adoption of the most modern Western developments, and from what we read of conditions there it hardly seems credible that battery emergency lighting systems are in use. Yet a "Keepalite" emergency lighting equipment has recently been installed in the fine new Paramount Dance Hall in Shanghai. The installation consists of a "Keepalite" equipment of 17 cells having a capacity of 120 ampere hours, supplying current at 32 volts for the emergency lighting circuit.

Australia also has had its first "Keepalite" equipment, this being installed in the large new department store of Messrs. G. W. Coles & Co., Ltd., in Sydney. The actual "Keepalite" panel was shipped from this country, the 50 Chloride cells, having a capacity of 120 hours, being made in Sydney.

Two New Marconi Contracts

THE Rumanian Broadcasting Company have placed an important order with the Marconi Company for the supply of two broadcasting stations, one of the "super-power" variety with an aerial energy of 150 kilowatts, and the other of 20 kilowatts aerial power. This new success for the British wireless industry closely follows an order given by the Swedish Government to the Marconi Company for a 150-kilowatt station for Motala, and these contracts will supply work for many months for a large number of skilled craftsmen at the Marconi Works at Chelmsford. The 20-kilowatt transmitter is now temporarily operating at Bod until the 150-kilowatt station is completed, when it will be transferred to another site. The super-power station will operate on a wavelength of 1875 metres.

Service Department's Passports

IN order to ensure that no false representation is made when carrying out "His Master's Voice" service calls the Company is making arrangements for each engineer to be equipped with an identification card which will bear the photograph of the individual. "His Master's Voice" engineers will present these when making service calls. The identification cards will be about the size of driving licences, and it is hoped that they will remove difficulties that have arisen in the past when engineers have called to service or instal instruments at customers' houses and have been refused admittance owing to the maids only being in.

The Modern Call of the Muezzin

THE Egyptian authorities have intimated that when the new Cairo station takes the air special broadcasts will be made for the lower classes of the population, including the fellahin, or workers on the land. In addition, the Abu Zabal station will transmit every morning portions of the Koran, and may in this way replace the Muezzin's call to prayer.

AN "EKCO" OF A CHRISTMAS DRAMA.

Captain C. N. Forbes, of the lighthouse steamer "Hesperus," and his Ekco Model 74 Receiver.

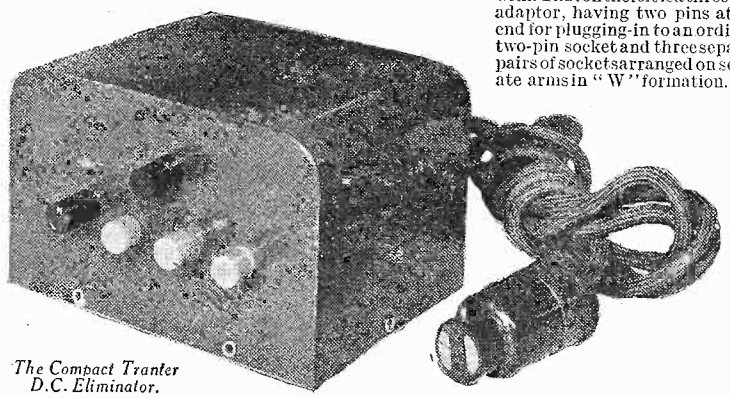
Facts and Figures

Components Tested in our Laboratory

BY THE PRACTICAL WIRELESS TECHNICAL STAFF

TRANTER D.C. ELIMINATOR

THE small D.C. mains unit illustrated below is manufactured by Norman Tranter, of 9, Gorse Road, Blackpool, and some idea of its compactness may be gauged from a comparison of the mains plug and lead. Actually the unit measures 5¼in. by 4in. by 3¼in. high. The mains lead projects through a grummet at the rear and is firmly anchored, whilst the various tapping points are brought out at the front to sockets. The plugs fitted to these are of the Belling type, wherein the necessary leads may be anchored through side holes and connection easily made by pushing the plug into its respective socket. The latter are identified, in addition to the usual red and black colouring; the upper socket is marked Earth, whilst the left-hand socket is H.T.—. The remaining red sockets are marked respectively S.G., Det., and Max. The latter socket delivers approximately 150 volts, whilst the S.G. tapping will deliver a suitable potential for the screening grid of the standard H.F. valve. The detector socket will supply a potential of round about 70 volts. The actual unit which we have tested gave 60 volts on the S.G. socket, 65 volts on the detector socket, and 135 volts at the maximum tapping, with currents of 8 mA, 3 mA, and 20 mA respectively. It will be seen, therefore, that the unit is admirably suited for operating the standard type of broadcast receiver.



The Compact Tranter D.C. Eliminator.

NEW TUNGSRAM CLASS B VALVE

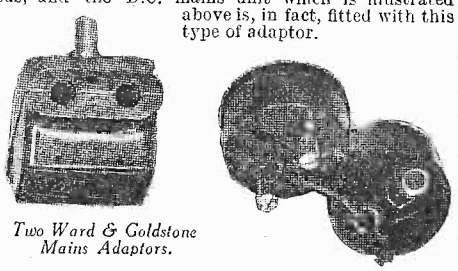
DETAILS have just been received of a new Tungsram high-power Class B valve for operation from a 2-volt accumulator. The filament consumption is 1.75 amps. with an anode voltage of 200, at which figure it will deliver an output in the neighbourhood of 10 watts (undistorted). It is thus admirably suited for small public address outfits and for super-quality receivers for home use, in view of its good signal-handling capabilities. It must be remembered that this is not the usual double type of Class B valve, but is one-half, under which conditions two such valves are required for full Class B working. The output is consequently doubled, giving just over 20 watts undistorted. The total filament current is then 3 amps. and the H.T. may advantageously be increased to 400 volts. The price of the valve is 14s. 6d.

MORE NEW EVER-READY BATTERIES

THE Ever-Ready Company have just produced three new high-tension batteries to meet the requirements of new radio sets just produced by Messrs. Kolster Brandes and Marconiphone, Ltd. The first of these batteries (which is marketed under list number W.1226) has a high-tension voltage of 120, tapped at 60, 72, 90, 99, 108, 114 and 120 volts. The battery also contains a grid-bias section of 9 volts, tapped every 1½. The measurements of the battery are 8in. by 7in. by 3in., and the list price is 12s. This battery is suitable for Kolster Brandes models 333A, 363, and 364. For Kolster Brandes model 393 a battery (list number Port.12) has been produced. This has 100 volts H.T., tapped 60, 70, 80, 90, and 100, and a grid-bias section of 7.5 volts, tapped every 1½ volts. This battery measures 8¾in. by 6in. by 3in., and the list price is 10s. For Marconiphone Model 285 (which utilizes an output stage of the Q.P.P. type) a battery of 175 volts has been produced. Its list number is W.1219. It contains a high-tension section of 166 volts, tapped 60, 72, 132, 140, 147, 155, 162, and 166. The grid-bias section of 9 volts is tapped every 1½. This battery measures 10¾in. by 7 9/16in. by 3¼in., and the list price is 16s.

GOLTONE MAINS ADAPTORS

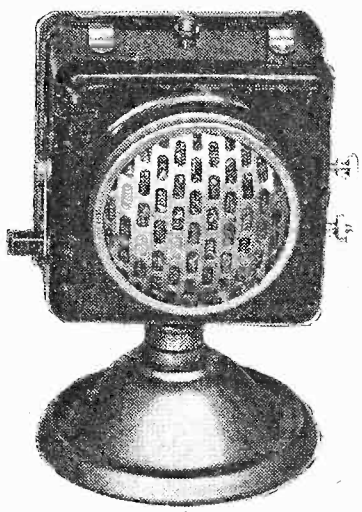
A NUMBER of convenient mains plugs and adaptors are manufactured by Messrs. Ward and Goldstone, two of which are illustrated herewith. That on the left is a three-way adaptor, having two pins at one end for plugging in to an ordinary two-pin socket and three separate pairs of sockets arranged on separate arms in "W" formation. The adaptor may be obtained for 5 and 10-amp. sockets at 8d. and 1s. respectively. On the right is a combined plug which is fitted at one end with a standard lamp (bayonet) fitting, and connection to the plug is made at the opposite end to two pins. This portion of the adaptor is removable, but to prevent loss is attached by a short length of cord. Thus, when the two halves of the adaptor are fitted together the apparatus to which it is attached may be plugged into an ordinary lamp socket, whilst if it is desired to connect to a standard 5-amp. socket of the two-pin type it is only necessary to separate the two portions of the adaptor and plug in the upper portion. This device costs 9d. It will be noticed, no doubt, that the majority of the manufacturers of mains equipment now fit an adaptor of this nature to their apparatus, and the D.C. mains unit which is illustrated above is, in fact, fitted with this type of adaptor.



Two Ward & Goldstone Mains Adaptors.

ELECTRADIX MODEL 11 MICROPHONE

THE microphone illustrated possesses a number of novel features, the principal one being that the small moulded bakelite case contains, in addition to a 2in. microphone, a complete input transformer. As may be seen from the illustration, a switch on one side and two terminals on the other facilitate the connection and switching of the mike. The switch arm is of the combined socket type and thus forms one of the connecting points. On the upper surface are two small lugs which may be employed when it is desired to suspend the microphone, the small pedestal base being then unscrewed if desired. The base and grille are finished in bronze, whilst the bakelite

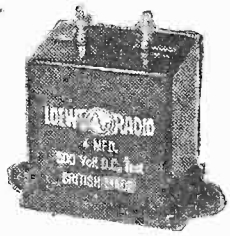


A new Electradix microphone.

is of dark colour, thus giving the complete instrument a very pleasing appearance. Sensitivity is very good, very little background noise being obtainable, and the instrument being very suitable for musical items. The case is filled in with pitch so that extraneous sounds are damped out unless directed into the front of the instrument. At 10s. 6d. this will be found a splendid piece of apparatus for home-broadcasting or small P.A. work. The makers are Electradix Radios, of 218, Upper Thames Street, London, E.C.4.

LOEWE CONDENSERS

WE have received some sample condensers from the Loewe Radio Company, Ltd., of Fountayne Road, Tottenham, London, N.15, makers of the well-known vacuum resistances and multiple valves, etc. The condenser illustrated below is of the paper type, contained in a brown bakelite case and fitted with neat terminals for connection. Moulded feet are provided for mounting purposes. These condensers are impregnated and sealed under vacuum, thus ensuring that moisture and air are, as far as possible, excluded from the finished condenser, with consequent stability of capacity and high insulation resistance. The samples submitted were tested and found to be very accurate in value, the makers' tolerance of ± 10 per cent. being a very good safeguard. The working voltage is 250 volts D.C., and the prices of the condensers in 1, 2 and 4 mfds. are 2s., 2s. 6d., and 4s. respectively. Condensers are also obtainable from the same firm in metal cases (with soldering lugs or terminals) and rated up to 1,500 volts D.C. test.



A Loewe Condenser.

Amongst the other interesting components which Messrs. Loewe manufacture may be mentioned pick-ups, volume controls, tubular condensers, and speakers. Readers desiring details of these accessories should write to Messrs. Loewe for copies of their lists.

STOP PRESS—NEW LINES.

MESSRS. FERRANTI.—New design of resistance consisting of tube of refractory material with high-conductivity surface. Paper condensers and electrolytic condensers, and potentiometers.

MESSRS. VARLEY.—New model A.V.C. Unit. Permits of delayed and controlled volume control. Improvement on original model.

THE HIGH VACUUM VALVE CO., LTD.—New S.G. Valve and a double pentode for Q.P.P. working.

WESTINGHOUSE BRAKE COMPANY.—New model Westector. Specially designed for use at radio frequencies up to 1,500 kc/s.

MESSRS. ELECTROLINX.—New 9-pin valveholder of the chassis-mounting type.

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).

Radio Developments in Western Australia

SIR,—It may interest you to know that the only local development of note recently has been the introduction of the all-wave circuits for home constructors. These, of course, are all superhets, and complete kits can be purchased from £12 for a five-valve and rectifier, using separate oscillator valve, to £26, for a nine-valve and rectifier, using the converter principle. Short-wave reception has been very good—GSB being excellent.

The latest circuit published—I have not yet had time to get full details—is for a two-valve superhet.

The CA7 battery-pentagrid valve is now available here, together with the universal A.C.-D.C. valves, so that from the valve point of view we are well catered for.—R. E. PARRY (Perth, W. Australia).

Six-Seven Valve 230-Volt A.C. Mains Superhet.

SIR,—I am one of the regular readers of your paper, and I am pleased to note from your December 30th issue that Mr. Gordon Harrower, of Singapore, has taken the lead to write you for particulars and diagrams of a six or seven-valve A.C. mains superhet short-wave set. I agree with Mr. Harrower that your Eastern readers would very much appreciate such a design, and I sincerely trust that our hope will be fulfilled.—LOOI TIAN GEOK (Penang, Straits Settlements).

S.W. Transmission from Arizona

SIR,—Many thanks for the answers to my inquiries in the Broadcast Queries column. I recently received a verification QSL card from the amateur station W6DRE in Arizona. He requests short-wave listeners to keep a watch for him. He is on every day from 20.00-21.30 G.M.T., on 14,380 kcs, with 450 watts. His address is 80, W. Lewis Ave., Phoenix, Arizona, U.S.A.—A. E. DOWDESWELL (London, W.11).

D.C. Receivers

SIR,—With reference to a paragraph in the February 24th issue, replying to T. Y. (Hackney), regarding D.C. circuits, I feel I must write in support of him. You state that D.C. mains users are in the minority. According to articles published in PRACTICAL WIRELESS appertaining to mains users since No. 1, the D.C. mains' man has been given about 1 per cent. and the A.C. mains' man 99 per cent. Surely the D.C. minority is not so low as all this. I personally have been waiting for a good D.C. circuit since the advent of PRACTICAL WIRELESS, but have so far been sorely disappointed. The A.C. man has been given two, three and four-valve circuits, while the D.C. man has had to be content with only a two-valve circuit.

Please let us have some good D.C. circuits, including three, four and five valves.—J. McRAE (Poplar).

[*You are in error in stating that we have only dealt with one D.C. receiver. We have dealt with the D.C. ACE (three valves), the A.C.-D.C. Two, and the D.C. two-valver. We have other designs in hand. We have also described D.C. units for several of our battery receivers.*—ED.]

Wireless Sets in S. Africa.

SIR,—I beg to draw attention to the fact that out here we have windows full of foreign wireless sets—mostly American. This is a great pity, and it reflects sadly on the enterprise of British manufacturers.

There are many good British sets that are not even obtainable in South Africa—why they neglect this market is a mystery—at present I should say that twenty foreign sets are sold to one British.

Could you bring this matter forward in the right quarter. Your fine journal is a real live book.—J. HAYNES (Pretoria).

[*Radio manufacturers please note.*—ED.]

Jazz *versus* Strauss

SIR,—A question arousing much controversy of late seems to be that of Dance Music. I quite agree with Jace that the majority of the great B.P. under the age of forty seems to be dance-music mad. Nearly all the youth of to-day seem to know a good number of dance tunes, but I wonder how many of the waltzes of Strauss they are acquainted with. Might I suggest "hideous and cacophonous" coupled together as more useful and descriptive epithets.—A. J. CROSLAND (Huddersfield).

CUT THIS OUT EACH WEEK

Do you know

—THAT the delay voltage for A.V.C. in a mains receiver may be obtained from the biasing resistance of the L.F. valve.

—THAT heterodyne whistles may be cut-out by including a filter circuit in the L.F. stages.

—THAT the above filter circuit consists of a choke and condenser, or combination of chokes and condensers.

—THAT a close-wound coil of wire is of no use as a screen unless all turns are short-circuited.

—THAT between six and eight times is the maximum amplification which may be expected from an aperiodically-coupled H.F. stage.

—THAT the aerial lead should not be permitted to pass close to the output side of a receiver, that is, near the output valve or the loud-speaker leads.

—THAT, similarly, the batteries should not be arranged so that they are close to the aerial or leading-in wire.

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.

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.

PORTSMOUTH AND DISTRICT WIRELESS AND TELEVISION SOCIETY

Apart from its normal lecture and demonstration this Society hopes to acquire a suitable room for fitting out with the necessary facilities to afford up-to-date research and experiment in short-wave, ultra short-wave, television, micro-wave, modern receiver and transmitter design and so forth. In this way it is hoped to provide an avenue whereby the large number of experimenters, otherwise limited in home facilities, may develop their ideas under laboratory conditions.—Hon. Sec., Mr. S. Holland, 54, London Road, Portsmouth, Hants.

THE SIDCUP AND DISTRICT RADIO AND TELEVISION CLUB

Members of this Club at their last meeting had the pleasure of listening to a lecture by Mr. N. Partridge, B.Sc., A.M.I.E.E. The subject was "The Design of Mains Transformers, etc." Mr. Partridge began by explaining the theory of the transformer, and then passed on to their design and manufacture. The Secretary of this Club is Mr. W. F. Smith, 4, Rowley Avenue Marlborough Park, Sidcup, Kent.

SLADE RADIO

The last meeting of this Society was devoted to "Questions and Answers." A considerable number of questions were raised, but in every case a ready answer was given by either Mr. G. T. Peck or Mr. N. B. Simmonds. Many of the questions were of a very interesting nature, and the replies provided much valuable information. Anyone interested who desires full information concerning membership, etc., is requested to write to the Hon. Sec., 110, Hillaries Road, Gravelly Hill, Birmingham.

THE INTERNATIONAL SHORT-WAVE CLUB (LEICESTER CHAPTER)

It may be of interest to readers in Leicestershire who are interested in short-wave work to know that a Chapter of this club has been reorganized in Leicester by Mr. W. Vendy, of 9, Cecilia Road, Leicester. Several members of this Chapter received the special transmission arranged by Mr. E. A. Bear, the British Representative of the International Short-Wave Club, from PAOASD on Sunday, February 25, at 03.00 G.M.T. Anyone interested in this club is invited to apply to Mr. Vendy or to the Hon. Sec., Mr. C. Cramp, 49, Avenue Road, Leicester, who will be pleased to supply particulars of the Chapter.

THORNTON HEATH RADIO SOCIETY

A joint meeting of the Thornton Heath and Croydon Radio Societies was held at St. Paul's Hall, Norfolk Road, on Tuesday, the 27th ultimo. Mr. Keasley introduced Mr. L. H. FitzGibbon, of Messrs. J. J. Eastick and Sons, who proceeded to give a demonstration of the Eelex M4 Super short-wave converter.

Mr. FitzGibbon explained the circuit of the converter and the difficulties which had had to be overcome in order to obtain the greatest efficiency over its range, which is from 15 to 115 metres.

The Hon. Sec. of the Croydon Radio Society is Mr. E. L. Cumbers, 14, Campden Road, Croydon.

The Hon. Sec. of the Thornton Heath Radio Society is Mr. Jas. T. Webber, 368, Brigstock Road, Thornton Heath.

LEICESTER AMATEUR RADIO SOCIETY

On Tuesday, Feb. 27, the above Society held their fortnightly meeting. A lecture on Public Address Amplifiers was given to the members by Mr. H. A. Hughes. The construction of amplifiers and components was described, and then gramophone records were played and amplified; the different musical instruments and their reproduction commented upon. The amplifiers used were 2½, 5, and 10-watt output. The Society extends an invitation to all PRACTICAL WIRELESS readers in the district. Particulars can be obtained from the Secretary, A. Stimpson, 88, Welford Road, Leicester.

ANGLO-AMERICAN RADIO AND TELEVISION SOCIETY

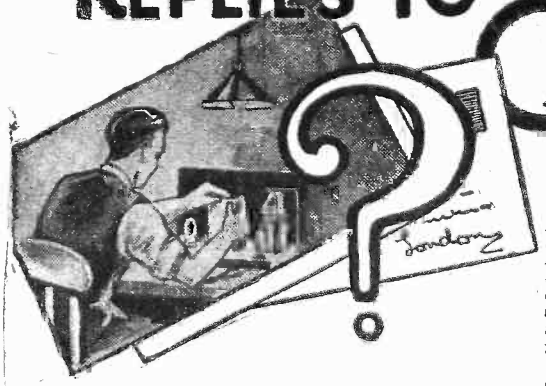
Enthusiasts from Osterley, Eastcote, Ruislip, Ealing, and Beaconsfield attended the second television demonstration held by the Uxbridge District Branch of the Anglo-American Radio and Television Society on February 28. The receiver employed was of the scanning disc type, and was unusual in that it employed a gramophone governor to keep the speed constant. Mr. Leslie W. Orton announced that a third television demonstration would be held in the near future. The U.D. branch holds meetings at 11, Hawthorn Drive, Willowbank, Uxbridge, at 7.30 p.m., each Wednesday. There are no charges, and everyone interested should write to Mr. Leslie W. Orton, at the above address, enclosing a stamped addressed envelope for details.

THE CHATHAM AND DISTRICT RADIO SOCIETY

At a meeting of the above Society, held on the 26th ult., an interesting lecture was given by Mr. Power, of Messrs. Clarke and Co. The lecturer outlined the uses of an eliminator and described in detail all the various components and their functions, explaining the principles of rectification and smoothing. Inquiries for membership should be addressed to the Hon. Sec., J. Holden, Downham Road, Chatburn, Lancs.

LET OUR TECHNICAL STAFF SOLVE YOUR PROBLEMS

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 is 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.

UPKEEP COSTS OF MAINS SETS

"I am anxious to get a set to work from the A.C. mains, but would first like to know the respective upkeep costs of the following types of receiver: 1. Battery-type set operated from mains eliminator. 2. Mains set operated with metal rectifier. 3. Mains set with half-wave valve rectifier, and 4. Mains set with full-wave valve rectifier. The initial cost does not interest me much."—T. Y. (Blackheath).

The battery set with mains eliminator will necessitate a trickle charger in order to keep the accumulator in condition, although it will in all probability employ a metal rectifier for the H.T. voltage. Thus this will cost more for upkeep than the second alternative you give. The half-wave valve rectifier will require a separate secondary winding to heat the filament of the valve and thus will be slightly more expensive than the metal rectifier, although if a voltage-doubler circuit is employed with the metal rectifier the H.T. secondary winding might consume slightly more current than the half-wave valve. The full-wave valve will require a larger secondary for H.T. and will take slightly more current. Therefore, the mains set with metal rectifier will probably be cheapest, although there will not be found to be very much difference in actual expense over a long period.

CORRECT PICK-UP CONNECTIONS

"I have a two-valve commercial set with a one-valve amplifier attached to it. I get plenty of stations at full volume, but when I connect a pick-up volume is too low. The pick-up is new and has been tested. The pick-up works best on the L.F. valve. Can you tell me how to get more volume from it?"—A. C. (Briton Ferry, Glam.).

You should connect the pick-up in the grid circuit of the detector valve. Join one side of the pick-up to the detector grid, and connect the other side to the 1½-volt grid-bias tapping. To prevent radio breaking through simply turn the tuning dial to a spot where no station is heard. Volume should then be ample.

METALLIZED OR UNMETALLIZED?

"I am going to build Circuit No. 17 in the Constructors' Enclyclopædia, but I have an unmetallized S.G. valve. Could I use this in place of the recommended one? Also, I have a pentode-matched M.C. speaker. Could I dispense with the L.F. choke in the plate circuit of the pentode valve?"—W. R. (Seven Kings).

The non-metallized valve will no doubt work satisfactorily in place of the recommended metallized one, but if instability is experienced you will have to fit a metal (earthed) screen round the valve. As your speaker has an input transformer fitted to it, it may be joined in place of the L.F. choke. Simply connect one end of the transformer to the plate of the valve, and the other to H.T. positive. The filter condenser will not, of course, be required.

SIGNALS GETTING WEAKER

"I have a five-valve A.C. receiver with two H.F. stages and a push-pull output stage. Until recently the set has been working satisfactorily, but now a great falling off in strength has taken place. I can only get the local stations and no long wave stations. All valves are O.K., as I have had them tested. Can you please offer any solution?"—W. McG. (Renfrewshire).

If the valves (including the rectifier) have been tested, we can only suggest that you check the anode voltage of each valve by means of a good high-resistance voltmeter. If this is normal in every case, then you must look to your aerial and earth system and the tuning circuits. Make certain that no aerial joints have come adrift and you could try a temporary new aerial and earth lead, the former consisting of a length of ordinary wire simply carried down the garden without the trouble of raising it on the present mast. A different earth, say a water-pipe, if you are using a buried earth, will enable you to check the efficiency of that connection. If these prove in order, the coils should be checked for breaks or disconnection.

WHAT TYPE OF ELIMINATOR?

"I have a commercial Q.P.-P. receiver at present working off H.T. batteries, with a 15-volt Grid-Bias battery. I am shortly having electric light installed and wish to operate the set from the mains. Can you tell me what type of eliminator I must get and how to connect the grid bias to it?"—J. C. F. (S.W.1).

You should obtain one of the newly-introduced stabilized eliminators, designed especially for Class B and Q.P.-P. working. The grid bias will be obtained most satisfactorily from batteries, and the connections will be exactly the same as at present, that is, grid-bias positive will be joined to H.T.— on the eliminator, instead of to H.T.— on the H.T. battery. A suitable eliminator, if you wish to make your own, was described in PRACTICAL WIRELESS No. 65.

WRONG MICROPHONE CONNECTIONS

"I recently purchased a microphone and connected it to my mains set, but it would not work. I took it back to the shop and was told that it was tested when I bought it and worked satisfactorily, and the shopkeeper said I must have dropped it or otherwise damaged it. I tried it on my friend's set (battery) and it worked all right. Can you tell me how to get it to work on my set?"—E. A. T. (Cricklewood).

As the mike works on your friend's set it points more or less to the fact that it is in working order, and you must, therefore, have joined it to your set in the wrong manner. You will have to connect it between cathode and grid, not earth and grid. Did you do this?

L.T. FIRST

"I have an H.T. unit which gives also the grid bias, and I find that the set switch does not work when in the off position, as the set goes on playing until the unit is switched off from the mains. Is this in order? If so, can I disregard the set switch and remove same without doing harm to the set. Also I am trying out a second-hand coil which has ten tappings controlled by contact studs and a movable coil inside the former which controls the volume. Am I using the right circuit (straight three) for this coil?"—T. C. W. (Thornton Heath).

It is obvious that the set switch is not disconnecting the accumulator. You must not, of course, leave the filaments burning when the set is not in use owing to the drain on the accumulator. If the H.T. unit is supplying also the heater voltage (with indirectly-heated valves), then the set switch may be ignored and left in the "on" position or removed and ignored. If an accumulator is employed, the set switch should be pulled on first, then the H.T. unit should be switched on. When listening is finished, the H.T. unit should be switched off, then the set. We regret that you give insufficient details to enable us to advise you concerning the coil.

QUESTIONS NOT TO ASK

"I wish to buy a ready-made receiver and have narrowed my choice down to the Betta Super and the Radiogrande. Which of these do you recommend?"

We cannot undertake to recommend any commercial make of receiver in view of the difficulty of knowing what the users' local conditions are likely to be. The only advice we can give in such cases as that quoted above, is to go to the nearest radio dealer and ask for a demonstration, if possible in your own home. In this way you are more able to judge just what pleases your individual requirements than are we, who have no knowledge of your musical tastes, etc.

"I noticed a Wrinkle from A. B., of Shipley Marsh in last week's issue, but cannot see how he gets the idea to work. However, can you put me in touch with him so that I can write and ask him if he wishes to dispose of the unused valves."

We cannot give any reader the name and address of contributors, as it will be appreciated that some readers may not care to be bothered with communications from others. Therefore, we can only suggest that we will forward on any communication which is addressed to the contributor, c/o this office, and then the contributor will be able to decide whether or not he desires to enter into correspondence.

FREE ADVICE BUREAU COUPON

This coupon is available until March 24th, 1934, and must be attached to all letters containing queries.

PRACTICAL WIRELESS, 17/3/34.

Miscellaneous Advertisements

Advertisements are accepted for these columns at the rate of 3d. per word prepaid — minimum charge 3/- per paragraph—and must reach this office not later than Tuesday for the following week's issue. All communications should be addressed to the Advertisement Manager, "Practical Wireless," 8 Southampton Street, Strand, London.

PREMIER SUPPLY STORES

offer the following Set Manufacturers' Surplus New Goods at a fraction of the original cost: all goods guaranteed perfect; carriage paid over 5/-, under 5/- postage 6d. extra (Ireland, carriage forward).

PREMIER SUPPLY STORES announce the purchase of the entire stock of a world-famous Continental valve manufacturer. All the following types of standard mains valves at 4/6 each. H. HL. L. Power. Directly heated 6-watt Pentode. Directly-heated 9-watt Pentode. High magnification Screen-grid, low magnification Screen-grid. Variable-Mu Screen-grid. 250 volt 60 milliamp. full-wave rectifiers.

THE following types 5,6 each. Indirectly-heated Pentode. 350 volt 120 milliamp. full-wave Rectifier. 500 v. 120 ditto, 6/6. Dario Battery Valves 4v. filament. Set of 3, consisting of Screen-Grid, Detector and Power or Super-Power, 6/6 the lot. Power or Super-Power, 2/6.

ELIMINATOR Kits, including Transformer, choke, Westinghouse metal rectifier, Dubilier condensers, resistances and diagram, 120v. 20 m.a., 20/-; trickle charger 8/- extra; 150v. 30 milliamps., with 4v. 2-4 amps. C.T. L.T., 25/-, trickle charger 6/6 extra; 250v. 60 milliamps., with 4v. 3-5 amps. C.T. L.T., 30/-; 300v. 60 m.a., with 4 volts 3-5 amps. C.T. L.T., 37/6; 150 volts 50 milliamps, 27/6.

AMERICAN Triple Gang 0.0005 Condensers, with trimmers, 4/11; Premier chokes, 25 milliamps. 20 henries, 2/9; 40 milliamps. 25 hys., 4/-; 65 milliamps. 30 hys.. 5/6; 150 milliamps. 30 hys., 10/6; 60 milliamps. 80 hys., 2,500 ohms. 5/6.

HARLEY Pick-up, complete with arm and volume control, 12/6.

BRITISH RADIOPHONE Wire Wound Potentiometers, with mains switch incorporated, 10,000 ohms, 3/6.

PREMIER British-made Meters, moving iron, flush mounting, accurate, 0-10, 0-15, 0-50, 0-100, 0-250 ma.. 0-1, 0-5 amps.; all at 6/-.

SPECIAL offer of Mains Transformers, manufactured by Philips, input 100-120v. or 200-250v., output 180-0-180 volts 40 m.a., 4v. 1 amp., 4v. 3 amp., 4/6; 200-0-200v.. 4v. 1a.. 4v. 3a., 4/6.

ALL Premier Guaranteed Mains Transformers have Engraved Terminal Strips, with terminal connections, input 200-250v. 40-100 cycles, all windings paper interleaved.

PREMIER H.T.8 Transformers. 250v. 60 m.a., rectified with 4v. 3-5a. and 4v. 1a. C.T. L.T., screen primary, 15/-; with Westinghouse rectifier, 25/-.

4V. 3a. C.T., 6v. 2a. C.T., 9v. 1a., 12v. 1a., 7/6 each; 4v. 3-5a., 22v. 1a., 8/6 each; 10v. 3a., 14v. 4a., 10/- each.

PREMIER H.T.9 Transformer, 300v. 60 m.a., with 4v. 3-5a. and 4v. 1a. C.T., L.T., and screened primary. 15/-; with Westinghouse rectifier, 26/-.

PREMIER H.T.10 Transformer, 200v. 100 m.a., rectified, with 4v. 3-5a. and 4v. 1a. C.T., L.T., and screened primary, 15/-; with Westinghouse rectifier, 26/-.

PREMIER Mains Transformers, output 135v. 80 m.a. for voltage doubling, 8/6; 4v. 3-4a., C.T., L.T., 2/- extra; Westinghouse rectifier for above, giving 200v. 30 m.a., 8/6.

PREMIER Mains Transformers, output 250-0-250v. 60 m.a., 4v. 3-5a., 4v. 2-3a., 4v. 1-2a. (all C.T.); with screened primary, 15/-.

PREMIER Mains Transformers, output 350-0-350v. 90 m.a., 4v. 3-5a., 4v. 2-3a, 4v. 1-2a (all C.T.). with screened primary, 15/-.

PREMIER Mains Transformers, output 400-0-400v. 100 m.a., 4v. 4-5a., 4v. 2-3a., with screened primary, 15/-.

PREMIER Auto Transformers, 100-110/200-250v., or vice versa, 100-watt, 10/-.

MULTI Radio Output Transformers, 4/6, Twin Screened Wire 3d. per yard.

CENTRALAB Potentiometers. 50,000. 250,000 half meg., any value, 2/-; 200 and 400 ohms., 1/-.

RELIABLE Canned Coils with Circuit, accurately matched, dual range, 3/- per coil. Please state whether Aerial or H.F. required. Ditto iron core, 3/6.

PREMIER L.T. Supply Units, consisting of Premier Transformer and Westinghouse rectifier, input 200-250v. A.C., output, 2v. ½amp., 11/-; 8v. ½ amp., 14/6; 8v. 1 amp., 17/6; 15v. 1 amp., 19/-; 6v. 2 amp., 27/6; 30v. 1 amp., 37/6.

MAGNAVOX D.C. 152, 2,500 ohms, 17/6; D.C. 154, 2,500 ohms, 12/6; D.C. 152 Magna, 2,500 ohms, 37/6, all complete with humbucking coils; please state whether power or pentode required; A.C. conversion kit for above types, 10/-; Magnavox P.M., 7in. cone, 18/6.

GRAMPIAN M.C. Loud-speakers, 2,500 ohm field, 9in. cone, handles 5 watts; 21/-.

GRAMPIAN P.M. Loud-speakers, 9in. cone, handles 4 watts; 18/6.

(Continued at top of column three)

Easy Terms

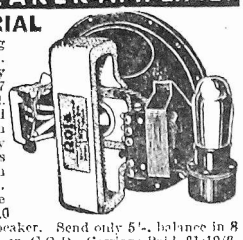
Strict Privacy Guaranteed —we deal with you direct

ROLA CLASS 'B' SPEAKER-AMPLIFIER

SENT ON 7 DAYS' TRIAL

Complete Class B Amplifying Unit, with Valve and Rola P.M. Moving-coil Speaker. Send only 5/- for 7 days' trial. If approved balance in 11 monthly payments of 6/6. Cash or C.O.D. Carriage Paid. £3.11.0

5/- DOWN



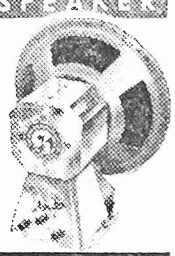
ROLA F.R.6 P.M. Class B. Speaker. Send only 5/-, balance in 8 monthly payments of 4/9. Cash or C.O.D. Carriage Paid, £1/19/6.

W.B.P.M. 4 MICRODE MOVING-COIL SPEAKER

SENT ON 7 DAYS' TRIAL

With Switch-controlled multi-ratio input transformer. Send only 5/- for 7 days' trial. If approved, balance in 8 monthly payments of 5/3. Cash or C.O.D. Carriage Paid, £2/2/0. W.B.P.M.6. Send only 2/6. Balance in 8 monthly payments of 4.3. Cash or C.O.D. Carriage Paid, £1/12/6.

5/- DOWN

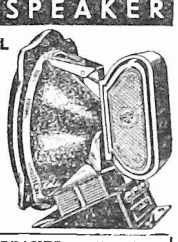


BLUE SPOT 29 P.M. MOVING-COIL SPEAKER

SEND FOR IT ON 7 DAYS' TRIAL

A very popular P.M. Moving-coil Speaker for operation from Power or Pentode. Send only 2/6 for 7 days' trial. If approved, balance in 8 monthly payments of 4.3. Cash or C.O.D. Carriage Paid. £1/12/6.

2/6 DOWN

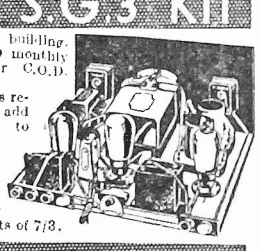


BLUE SPOT 99 P.M. MOVING-COIL SPEAKER. Complete with tapped input transformer. Cash or C.O.D. £2,19,6, or 11 monthly payments of 8/-.

TELSEN S.G.3 KIT

Complete kit of parts for building. Send only 4/6, balance in 9 monthly payments of 4.6. Cash or C.O.D. Carriage Paid, £1/19/6. If valves required, add £1/19/0 to Cash Price or 7.3 deposit and 11 monthly payments of 7/3.

4/6 DOWN



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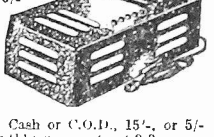
FOR A.C. MAINS. SENT ON 7 DAYS' TRIAL

25 m/a., 120 volts, 4 tappings. Suitable for all outputs, including Class B and Q.P.P. Send only 5/- for 7 days' trial. If approved, balance in 8 monthly payments of 4/6. Cash or C.O.D. Carriage Paid. £1/17/6. D.C. MODELs. Cash or C.O.D., 15/-, or 5/- down and 3 monthly payments of 3/9.

5/- DOWN



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ADDRESS .....
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(Continued from foot of column one)

WESTERN ELECTRIC Condensers, 250v. working, 2 mfd., 1/-; 2 mfd. 400v., 1/6.

B.T.H. Truespeed Induction Type (A.C. only) Electric Gramophone Motors, 100-250v.; 30/-, complete. Type YH 100/250v. A.C. or D.C., 42/-.

SPECIAL Offer of Wire Wound Resistances, 4 watts, any value up to 10,000 ohms, 1/-; 8 watts, any value up to 15,000 ohms, 1/6; 15 watts, any value up to 50,000 ohms, 2/-; 25 watts, any value up to 50,000 ohms, 2/6.

POLAR 2-gang, with complete disc drive, padding condenser and trimmer, 0.0005 6/6.

CYLDON Capacitors (Double Trimmers), 1/-. Utility .0005 2-gang Bakelite Condensers, concentric Uniknob Trimming and Disc Drive, complete, 3/6.

EDISON BELL Double Spring Gramophone Motors, complete with turntable and all fittings, a really sound job, 15/-.

AMPLION Cone Loud-speaker Units, 1.9, complete with 12in. cone and chassis, 3/11 each. Worth treble.

ORMOND Condensers, 0.0005 2-gang, semi-shielded, 2/6; brass vanes, with trimmers, 3.6.

WIRE Wound Potentiometers, 15,000 ohms, 1/6; 50,000 ohms, 2/-; 500,000 ohms, 3/-.

HOME Radio Microphone, complete, 5/-; simply plug in to pick-up terminals.

A LARGE Selection of Pedestal, table and radiogram cabinets, by best manufacturers, at a fraction of original cost for callers.

WESTERN ELECTRIC Mains Transformers, 500-0-500v. 150 m.a., 4v. 3-5a., 4v. 2-3a., 4v. 2-3a., 4v. 1a. C.T., 4v. 1a C.T., 19/6.

1,000 Ohm 150 m.a. Wire Wound Variable Resistance, 2/-; Burndept 2-watt resistances, all values from 0.5 to 50 ohms, 3d. each; holders, 2d. each.

T.C.C. Condensers, 250v. working; 2 mfd., 1.9.

T.C.C. Electrolytic Condensers, 440 volts working, 4 mf. or 8 mf., 3/-; 15 mf., 50 v. working, and 50 mf. 12v. working, 1/-; 25 mf. 25v. working, 1.3.

T.C.C. Block Condensers, 250v. working, 2 x 2 x 2 x 0.1, 2/-; 2 x 2 x 2 x 1. 2 3; the above condensers at same price by Dubilier 300v. working.

H.M.V. Block Condensers, 400v. working: 4 x 4 x 1 x 1 x 1 x 0.1 x 0.1 x 0.1, 6/-; 4 x 2 x 1 x 1 x 0.5, 4,6.

DUBILIER Condensers, 2 mf. 1,200v. working, 4/-; 8 mfd. dry electrolytic, 450v. working, 3/-.

THE Following Lines 6d. each, or 5/- per dozen.—Chassis valve holders, 5, 6 or 7 Pin, screened screen-grid leads, any value 1-watt wire end resistances, wire end condensers, 0.0001 to 0.1, R.I. .0005 varicaps, trimming condensers, T.C.C. 6 mfd. 50v. electrolytics.

PLEASE mention PRACTICAL WIRELESS when ordering.

PREMIER SUPPLY STORES

20-22, High Street, Clapham, S.W.1, MACaulay 2188. Closed 1 o'clock Wednesdays; open to 9 o'clock Saturdays. Nearest Station, Clapham North Underground.

THE following valves are guaranteed unused and perfect, and any valve differing from the makers' characteristics will be exchanged; and all latest types. A.C./Pens, P.T.4s, A.C.S.G./V.M.s, Pen.4.Vs, M.V.S.G.s, M.V.S/Pens, D.P./Pens, A.C.S.2/Pens, M.M.4Vs, P.T.025s, V.M.S.4s, D.C.2/Pens, D.P.T.s, P.M.24M.s, M.P.T.4s, V.M.4V.s, A.C.S.1/V.M.s, P.M.2HB.s, D.C.2.S.G.V.Ms, S.P.4s, 11/-; M.S.4s, M.S.4B.s, A.C.S.G.s, S.4V.A.s, S.4.V.B.s, M.S.G., L.A.s, D.S.B.s, A.C.S/2s, D.C.2S.G.s, 9/6. "Class B": P.M.2.B., P.D.220, 220.B, 8/6, M.L.4s, A.C.P.s, P.M.24s, 8/-; A.C./H.L.s, 164V.s, 354V.s, U.10s, U.U.60/250s, M.H.4s, M.H.L.4s, 7/6; V.S.2s, 215S.G.s, 220S.G.s, P.M.12s, 9/-; 442B.U.s, D.W.3s, 8/6; 215P.s, 220P.s, L.P.s, 5/-; H.L.210s, 4/-. All types of Brand New American Valves in Stock, first-class makes: 247s, 235s, 224s, 236s, 237s, 233s, 18's, 15's, 59's, 58's, 80's, 238s, 239s, 244s, 12/-; 227s, 226s, 215s, 280s, 9/6; 212s, 232s, 11/-; U.X.250s, 281s, 17/6. Dubilier or Erie resistors 1 watt type, 7d. Westinghouse rectifiers unused H.T.8., H.T.9, H.T.10, 11'3. "Regentone" Transformers for H.T.8. or H.T.9., 7/6. Dubilier or T.C.C. electrolytic condensers 8 M.F.D., 3/9. Magnavox, D.C. 152 (2,500 ohms) or 6,500 ohms, 9in. cone, 25/-. Superhet Radiopaks £2/12/6. "Clydesdale" Eliminators, unused, D.C., 12/6. A.C. (Westinghouse) 25/-. Rola F.6, 26/6. Carriage Paid. Cash with Order or c.o.d.—Ward, 45, Farringdon St., E.C.1. Holborn 9703.

ERICSSON 3/1 L.F. Transformers. List Price 17/6. New and guaranteed. Our price, 2/3 post free U.K.—Pioneer Radio, Coptic Street, London, W.C.1.

REPAIRS RE-WINDING—OVERHAULS. Loud speakers, 4/-; Blue Spots, 5/-. New cones fitted to Moving Coil speakers, 6/-. Eliminators, Mains transformers, etc., quoted for. Special components and sets made to order. Quick service. Laboratory tested. Repair Dept. C., Wordon Power Link Radio Co., 80, Lonsdale Avenue, East Ham, London, E.6. 'Phone Grangewood 1837.

GRAMOPHONES. Radiograms, 64 page. How to make 'm, 3d. Motors, Arms, Pick-Ups, Speakers, Horns, Springs, Repairs, Accordions.—Regentprac, 120, Old Street, London, E.C.1.

RAD-AUTO-GRAM buy Modern Second-Hand Components for Cash.—39, Tulketh St., Southport.

SOUTHERN RADIO'S Bargains.—Set manufacturer's guaranteed surplus.

VARIABLE Condensers.—Lotus 3-gang 0.0005, 12/6; Lotus 2-gang, 0.0005, 8/6; Lotus Dyblock single, 0.0005, 4/9 (list 9/6); all these condensers are complete with dials, escutcheons, knobs, fully screened with trimmers, and boxed; Igranic variable, 0.0003 and 0.0005, 2/3; Hydra block condenser, 16 mfd. (2+2+8+2+1+1), 1,000 v. D.C., 7/- each; 20 mfd. (2+2+2+2+2+2+2+2+1+1+1+1), 1,500 v. D.C., with terminals, 11/6; Dubilier 4 mfd. (2+1+1), 1,000 v. D.C., 2/9; 4.5 mfd. (2.25+2.25), 3/-; fixed 4 mfd., 2/3; 2 mfd., 1/6; 1 mfd., 1/-.

SPEAKERS.—Blue Spot permanent magnet, with Universal transformer for power, pentode, super power or class B, 23/- (list 39/6); D.C. mains energised, all voltages, 16/6; Celestion Soundex P.P.M. permanent magnet, 17/6 (list 27/6); Blue Spot 100U inductor, complete with chassis, 13/6 (list 39/6); Celestion permanent magnet type P.P.M.W. universal transformer, 25/- (list 49/6).

BLUE Spot, 66K, complete in cabinet, 16/- (list 42/6); G.E.C. Stork, in magnificent cabinet, 19/6 (list £3/15); all speakers new in original cartons.

PICK-UPS.—Blue Spot, model "88," with volume control, 26/- (list 63/-); Marconi No. 19 (1934), 26/- (list 32/6).

CONSTRUCTORS' Kits.—Ready Radio Meteor "A" 3-valve screened grid kits, with cabinet and moving coil speaker, less valves, £3/7/6; with valves, £4/10 (list £8/7/6); Ready Radio S.T.400 kits, all specified components, by Scott Taggart, £2/19/6 (list £4/17/6).

FRAME Aerials.—Lewcos dual wave 235-550 metres and 1,000-2,000 metres, 10/- each (list 37/6).

IGRANIPAK complete tuning unit, comprising (1) Completely screened coils with built-in wavechange switch; (2) Igranic 3-gang Condenser with cover; (3) Escutcheon and Disc Drive Assembly with pilot lamp attachment; (4) Mains Switch; (5) Three 5-pin Valve holders; (6) Grid Leak and Condenser; (7) Engraved Terminal Board. Complete with circuit. List price 57/6. 27/11.

MISCELLANEOUS.—Ferrocart coils, G.1, G.2, G.3, with switch, 31/9 (list 39/6); Benjamin Class "B" universal output chokes, 6/6 (list 11/-); Ready Radio Instamat Universal transformers, for matching any value to speaker, 11/6 (list 37/6); Rotorohm and Radiophone volume controls, all values, 3/- each; with switch, 3/3 (list 10/6); S.T.500 coils, 5/6 per pair; Hellesen's 8 mfd. electrolytic condensers, 2/9 each; Westinghouse metal rectifiers, H.T. 6, 7, 8, 9/3 each; Amplion loud-speaker units, 2/3; Ferranti choke, 20 henry 60 m.a., 6/9 each; Kolster Brandes gramophone motors, dual, for A.C. or clockwork, complete with turntable and all accessories, 110-250 volts, 25/- each (list 63/-); Ready Radio L.F. transformers, 5-1, 3-1, 3/3 (list 8/6); B.T.H. transformers, 3/6; Lewcos superhet 8-way bases, complete with valve holders, grid leak, fixed condenser, type "48," 2/- each.

SPECIAL Bargain Offer of Lewcos Spaghetti Resistances. All sizes in original sealed boxes, 4/- per dozen. Assorted. Special Price to the trade, 36/- per gross.

RECEIVERS.—G.E.C. Osram Music Magnet 4. A.C. Model, 110/250 volts, complete with "B.C. 1532" Power Unit and G.E.C. Permanent Magnet Speaker in magnificent Floor Cabinet and 4 Osram A.C. Valves. Brand New 1934 series in original sealed cartons, £8 15s. each (List, £21).

BURGOYNE "Popular" 3-Valve Battery Set. Complete with 3 Mullard Valves, Exide Batteries, etc., and Speaker in attractive transportable Cabinet. £3. Brand New, in original cartons. Every set guaranteed.

MAINS Transformers and Chokes.—Please send for complete list; specials can be supplied within 3 days of order.

ALL Transformers and Chokes Guaranteed for 12 months.

ALL Goods Guaranteed and Sent Carriage Paid.

BRANCHES at 271-275, High Rd., Willesden Green, N.W.10, and at 46, Lisle St., W.C.2; please send all post orders to 323, Euston Rd., N.W.1.

SOUTHERN RADIO, 323, Euston Rd., London, N.W.1 (near Warren St. Tube). 'Phone: Museum 6324.

HIGHEST allowance made on used wireless goods in exchange for new; balance payable on easy terms. Sets and parts bought for cash (state prices required).—R. Wigfield, Furlong Road, Goldthorpe, Yorks.

EPOCH.—Annual sale of surplus loud speakers of all kinds, also sets, amplifiers, cabinets, and useful parts of every description for experimenters and wireless dealers; thousands of bargains for callers; second abridged list on application.

EPOCH.—Great bargain in 11in. super P.M. speakers, the finest moving coil in its class; these units are brand new, perfect, and guaranteed 12 months; they are slightly different from standard in design, but equally as good in performance; optional with 10-ratio or Class B transformers; worth 45/-, to clear at £1 each, carriage paid.

EPOCH RADIO, Exmouth House, Exmouth Street, E.C.1 (at junction of Rosebery Avenue and Farringdon Road).

LINACORE Band Pass Tuner. Brand New. Cost 69/6. Battery Type. Bargain 49/6. Box A.100.

YOU CAN TAKE IT FROM ME!

ELECTRADIX

BARGAIN SALE LIST

Will Save You Pounds

ELECTRADIX

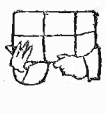
"N.W." 11 TABLE RADIO MIKE should be with every Wireless Set. Be your own announcer. A bakelite production containing the high-ratio transformer. Fitted battery plug switch and output terminals. The excellent results and low price have made this one of our most popular models. Only **10/6**

MICROPHONE BUTTONS are wonderfully interesting for experiments with Phones **1/-**

The BATTERY SUPERSEDER makes H.T. from your L.T. 2-volt battery, rectified and smoothed. Gives 3 tappings and lasts indefinitely. A boon to those who are not on the mains. **Reduced from £3/15/-. New and Guaranteed 37/6.**

No. "N.W." 11 **10/6**

PARCELS of useful oddments for the Experimenter who wants **Coils, Magnets, Wire, Chokes, Condensers, Switches,** etc., mostly ex-W.D. parts. Worth a lot more. 10lb. **7s.**, or 7 lb. **5s.**, post free. *British Isles only.*



1,000 other Bargains in our March Sale List "N."

ELECTRADIX RADIOS,

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Telephone: Central 4611.

ENGINEERS!

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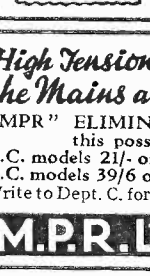

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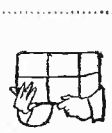

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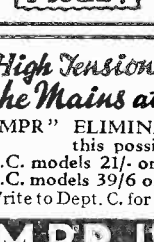

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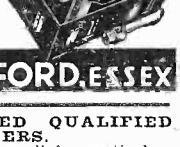

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