Practical Wireless

3D.

AND PRACTICAL TELEVISION

EDITED BY F.J.CAMM

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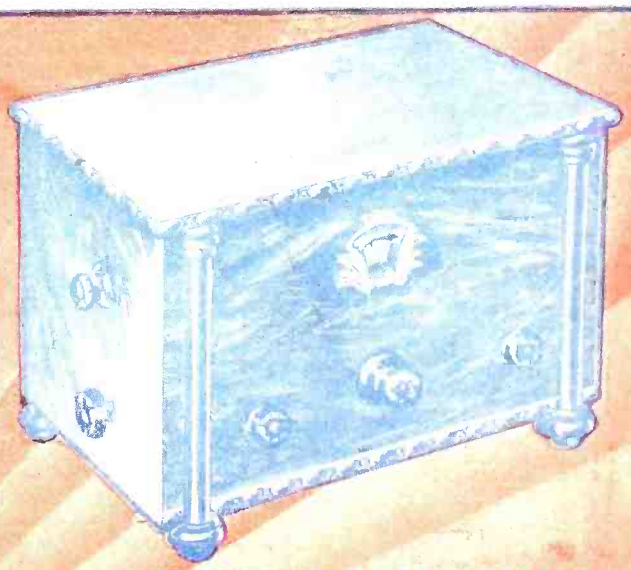
The Price Question Solved!

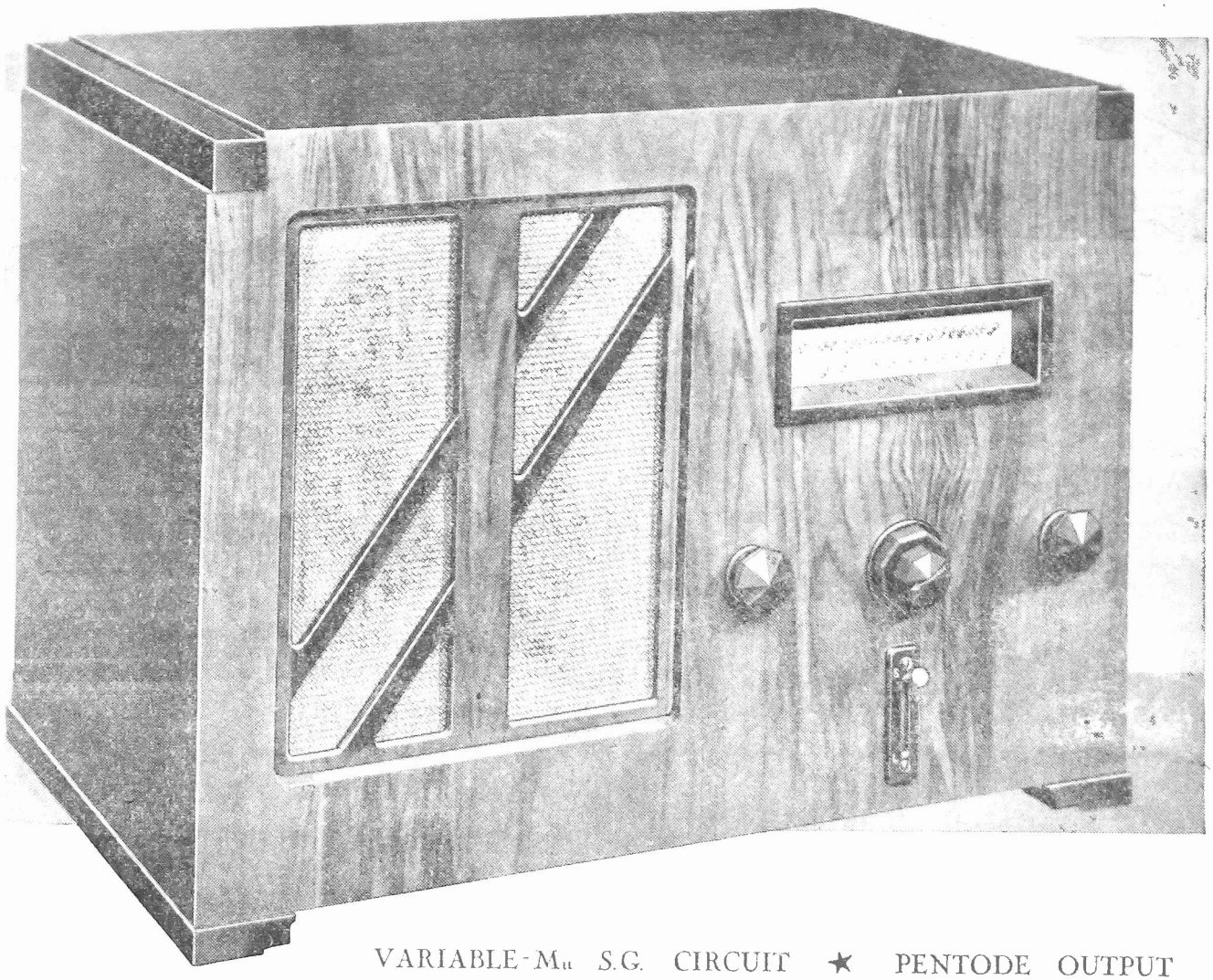
HOME-MADE OR READY-MADE?

The "PRACTICAL WIRELESS" LEADER 3



CHEAP HIRE PURCHASE RECEIVER

NEW *COSSOR All-Electric RECEIVER*



VARIABLE-Mu S.G. CIRCUIT ★ PENTODE OUTPUT

PENTODE DETECTOR ★ ENERGISED MOVING COIL SPEAKER

SPECIFICATION

Cossor All-Electric Receiver Model 435 as illustrated complete with Four Cossor A.C. Mains Valves, viz.: MVSG Variable-mu Screened Grid, MSPEN Screened Pentode Detector, MPPEN Pentode Output and 442 BU Full Wave Rectifier. Mains Energised Moving Coil Speaker, single-knob tuning, illuminated full-vision scale calibrated in wavelengths (200/540 and 900/2,000 metres), wave-change switch, combined volume control and on-off switch. Handsome walnut-finished cabinet 13 in. high, 17½ in. wide, 10 in. deep, with Gramophone Pick-up plug and socket, terminals for extension Loud Speaker and plug and sockets for connecting gramophone motor. For A.C. Mains only, 200/250 volts (adjustable), 40/100 cycles.

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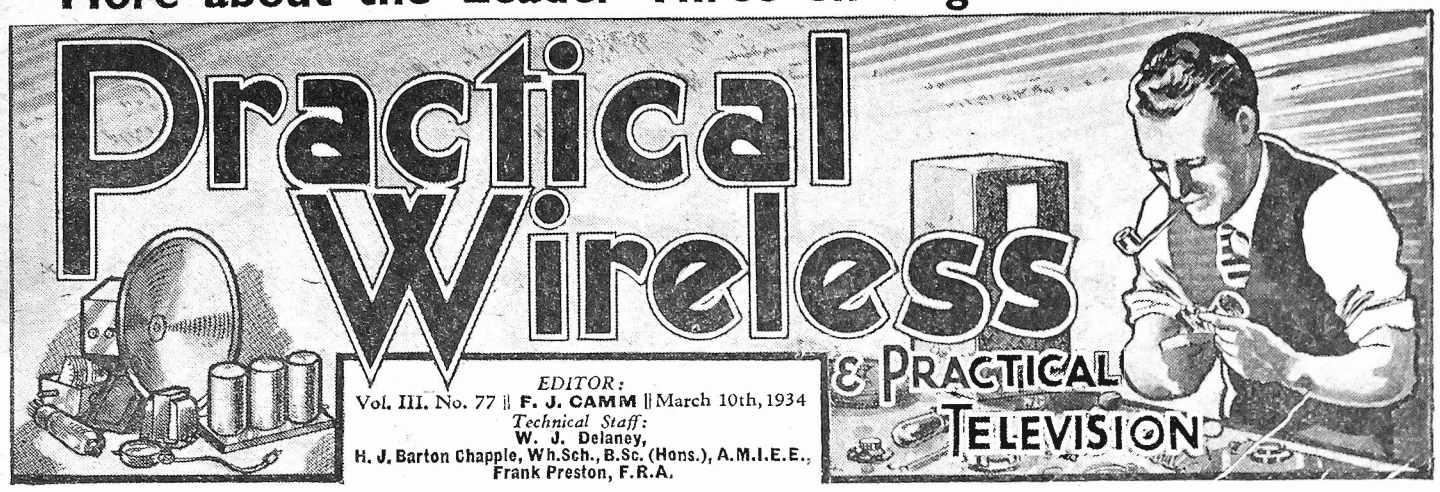
More about the Leader Three on Pages 1134 and 1135



ROUND *the* WORLD *of* WIRELESS

The Leader Acclaimed by Industry and Public

EVER since we made our preliminary announcement regarding our new set, the Leader Three, which, as all readers know, has been designed in conformity with our new policy of low price combined with efficiency, letters have poured into these offices from readers and manufacturers alike. All of them congratulate us upon our bold move and applaud our efforts in the interests of the home constructor. This receiver is, as with all our receivers, guaranteed to perform as claimed by its designer. *That is an important point to remember before you decide to build any receiver.*

New Cossor Pentagrid

WE understand that Messrs. A. C. Cossor, Ltd., shortly intend to place on the market an indirectly heated variable-mu pentagrid valve. The purpose of this valve is, of course, for frequency changing in the superheterodyne receiver, and it has the advantage over other somewhat similar valves that a screen grid is interposed on each side of the signal grid, so that the aerial circuit is completely isolated from the rest of the receiver which, besides preventing re-radiation from the aerial, prevents the annoying trouble known as "dragging," which is the pulling of the aerial circuit out of tune by the oscillator circuit and vice versa. The pentagid has, of course, five grids in addition to the anode, cathode and heater, and requires a 7-pin base (the anode being brought out on the top in a similar manner to a screen-grid valve). We hope to give technical details of this valve in a later issue.

The Boycott of Radio Advertisements

AS during the long winter months in many parts of Scandinavia the wireless entertainments are the sole source of amusement available to a large population, the listening public is strongly averse to any kind of radio publicity. As a strike was not feasible, a proposal has been made to boycott all firms who use the microphone to advertise their wares.

New Interval Signal

ALTHOUGH of relatively low power, broadcasts from the Geneva station (Switzerland) can now be well heard on 748 metres (401 kilocycles). The station can be easily recognised by the fact that it opens and closes its transmissions with the Morse letters R.S.R. (.—. . . .—.), followed by a short excerpt from an old Swiss melody: *Charles Emanuel à Etrembières*, played on a musical box. *R.S.R.* stands for the initials of the *Radio-Suisse Romande*, the Swiss organisation controlling the Lausanne and Geneva studios, of which the entertainments are also radiated through Sottens on 443.1 metres (677 kilocycles).

Soviet Radio Developments

THE sum of sixty-five million roubles has been earmarked for a further development during 1934 of the Soviet broadcasting system. Part of this amount will be expended in erecting a new 500-kilowatt transmitter at Khabarovsk (Eastern Siberia). With a view to increasing the number of listeners, the Government proposes to distribute sixty thousand crystal sets and one hundred and twenty thousand valve receivers in various parts of the country.

Where Outdoor Aerials are Forbidden

OWING to the increasing number of outdoor aerials erected on the roofs of flats in Vienna, the city authorities have decreed that no further licences will be granted to dwellers in apartment houses unless indoor or frame aerials are used. A request has also been made to listeners to take down all outdoor wires as soon as possible, as it is considered that their presence detracts from the appearance of the streets.

A Land Without Radio

OF all the European States Albania to-day is the only one which does not possess a broadcasting station. Wireless enthusiasts, of which there are a few, rely for their entertainment on Jugo-Slavia and Italy. Bari, for this reason, broadcasts daily a news bulletin in the Albanian language.

The Advent of the Radio Taxi

FOLLOWING the example set by New York a company has been formed in Paris to equip taxis with radio receivers for the benefit of passengers. The set would be placed near the driver in order that he may be given the opportunity of listening to the studio concerts and news bulletins whilst waiting on the rank or plying for hire.

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

Explanatory Announcements

IT is now the custom with the German stations, when announcing programmes which are relayed to several transmitters, to state the name of the original studio from which they are actually broadcast. The explanation is a useful one, inasmuch as listeners are frequently puzzled by the list of stations taking the entertainment. It is a detail which might be copied by other Continental countries.

Batteries for Ekco Receivers

WE are informed that Britannia Batteries Ltd. have decided it is undesirable to imitate the small capacity of the battery in the Ekco set, and consequently they are bringing out in the maroon carton series a battery suitable for the Ekco set, but definitely of higher power than at present in the set. The price of this replacement battery is 18s. 6d. and the number is 330.

Radio Publicity in America

DURING 1933, the National Broadcasting Company received roughly twenty-one million dollars for publicity broadcasts; a large sum was also secured by the Columbia System. As against this, some units of the American Press interpret the N.R.A. emblem with the slogan, *We do our Part*, as *Nauseating Radio Advertising, We Kill our Art.* The Press and radio are not good mixers in the United States.

Berlin Short-Wave Transmissions

WITH the opening of the new beam stations for the broadcast of German programmes to Asia, Africa, and North and South America, alterations have been made in the time of the transmissions. The night programme through DJD (25.51 m.) and DJC (49.83 m.) is now carried on from G.M.T. 01.00–04.00. A further broadcast through DJB (19.73 m.) destined to North America is now also made between G.M.T. 12.55–16.00.

New Norwegian Transmitters

IT is anticipated that the new 20-kilowatt station now being built at Trondheim (Norway) will be ready for operating in April; its wavelength will be 476.9 metres, a channel to be shared with Lisbon. Bergen's new transmitter, on 352.9 metres, will not be open before the summer. The 10-kilowatt station which is being put up in the neighbourhood of Vardo, and for which the wavelength of 845 metres has been provided, is being rushed forward and may be testing at an earlier date.

War Against Interference

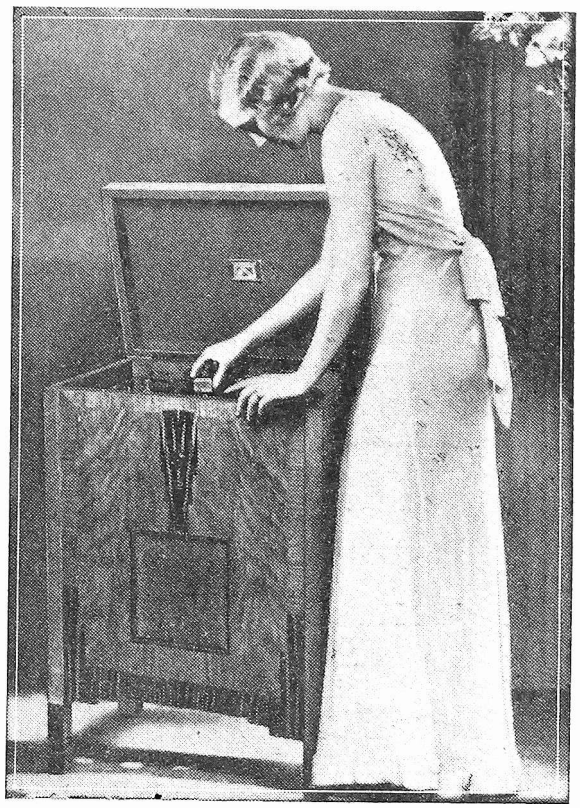
OF all European municipalities which have undertaken concerted action against electrical interference with the reception of radio programmes the town of Baden-Baden (Germany) would appear to have obtained the most successful results. Of 5,323 complaints made by listeners and investigated by the corporation engineers, 5,000, or more than 95 per cent. of the total number, were satisfactorily dealt with. According to local reports, Baden-Baden has become the paradise of radio fans.

INTERESTING and TOPICAL PARAGRAPHS.

Reykjavik on Short Waves

AT the best of times, except in North Britain, broadcasts from Iceland are difficult to receive in the United Kingdom. In the near future, however, many listeners may be given an opportunity of hearing the Reykjavik programmes more regularly as the Danish Ministry of Posts and Telegraphs is planning to erect a short-wave station which, in addition to a relay of the local radio entertainments, will be used at other hours of the day for a public telephony service.

ONE OF THE LATEST RADIOGRAMS.



Trying out the new "His Master's Voice" Superhet Five-Forty Radiogram.

Belgrade Broadcasts Suspended

UNTIL March 10th, Belgrade (Yugoslavia) will be off the air as the station is being dismantled prior to its reconstruction on a new site in the outskirts of the capital. Every effort is also to be made to hasten the installation of the 40-kilowatt station, which is to act as the key transmitter of the Yugoslavian network. The present small plant will then be transferred to Subotica to relay the main programmes.

"Queer People"

THE amazing adventures of John Mytton will be told in play form by John Wyndham in the second of the West Regional broadcast series, "Queer People," on March 15th. John Mytton was born at the end of the eighteenth century. As a child he came into a great fortune; later, he became M.P. for Shrewsbury, while his sporting exploits were world-famous. He died, however, in a debtors' prison.

Sunday Evening Oratorio Broadcasts

CONCRETE evidence of the Belfast music-lovers' enthusiasm for oratorio is afforded by the station's postbag, which invariably reacts most favourably to an oratorio broadcast. In consequence, these broadcasts are being continued on Sunday nights. The next one, which will be given on March 10th, consists of excerpts from different well-known works by Handel, Elgar, and Gounod. Astra Desmond (contralto) will be the soloist.

The Woollen Industry

MR. W. THOW MUNRO will speak on "The Woollen Industry" in the Scotland To-day and To-morrow series on March 13th. Mr. Munro, who has been President of the Scottish Woollen Trade Mark Association for many years, headed, in 1922, the largest Trade Delegation which has ever gone abroad to the United States and Canada. He studied conditions in the textile trade in Europe for the Government in 1931, visiting France, Belgium, Italy, Germany, Austria, etc.

Pianoforte Recital by Victor Hely Hutchinson

VICTOR HELY HUTCHINSON, who has been Music Director of Midland Regional since last October, gives his first pianoforte recital from the Birmingham studio, on Monday, March 12th. He has chosen the sixth of Bach's French suites, and the "Moonlight" sonata of Beethoven. Mr. Hely Hutchinson has been busy exploring the musical resources of the region, and has found several orchestras and choral societies for future programmes. Several of his own compositions are being broadcast on Midland, including "The Charcoal-burner's Son," for which L. du Garde Peach wrote the book.

SOLVE THIS!

PROBLEM NO. 77.

Smith had a mains three-valver which gave good results and which he thought justified the employment of a moving-coil energized speaker. He accordingly purchased one, and as he had read that the field could be used in place of the smoothing choke, he removed the latter component and connected his field in its place. Results were, however, very poor, volume being much reduced and accompanied by distortion. What was wrong? 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. 77, and posted to reach here not later than the first post Monday, March 12th, 1934.

Solution to Problem No. 76

Jarvis overlooked the fact that the increased resistance connected in the anode circuit of the output valve resulted in a large voltage drop, and consequently the output valve was starved of H.T. If he could have increased the H.T. he would have obtained the improved results he desired.

The following three readers successfully solved Problem No. 75, and books have accordingly been forwarded to them:—

O. L. Crossley, 40, Parry Road, Sth. Norwood, S.E.25.
T. C. Bone, Schoolhouse, Lochfoot, Dumfries.
C. C. Lambourn, Nutfield Priory, Redhill, Surrey.

POINTERS in SET DESIGN

The Items to be Considered in Designing a "Quality" Receiver are Dealt With in This Article

By H. BEAT HEAVYCHURCH

IT would be a fair definition of perfect quality to state that it is obtained when the sounds issuing from the loud-speaker form an exact replica of the programme performed before the microphone. Unfortunately, such perfection is not obtainable in practice for many reasons.

In the first place, the broadcasting authorities exercise a certain amount of control prior to transmission. For example, much of the "light and shade," by which is meant the difference in volume between the softer and louder parts of a musical work, is introduced, or, at any rate modified, artificially, at the control panel. Then, in every stage of a radio receiver there are risks of distortion—some of them inevitable and due to inherent imperfections in various components, but many avoidable if the apparatus as a whole is correctly designed and operated. Again, it is not always desirable that the programmes shall be reproduced exactly as they "come over," for individual listeners have their own tastes in "tone," some liking a brilliant performance with plenty of treble response, and others a rounder, more "mellow" tone. Besides this, it is by no means certain that all ears hear exactly alike, and added power in the upper register may be necessary in order to compensate for some deficiency in hearing.

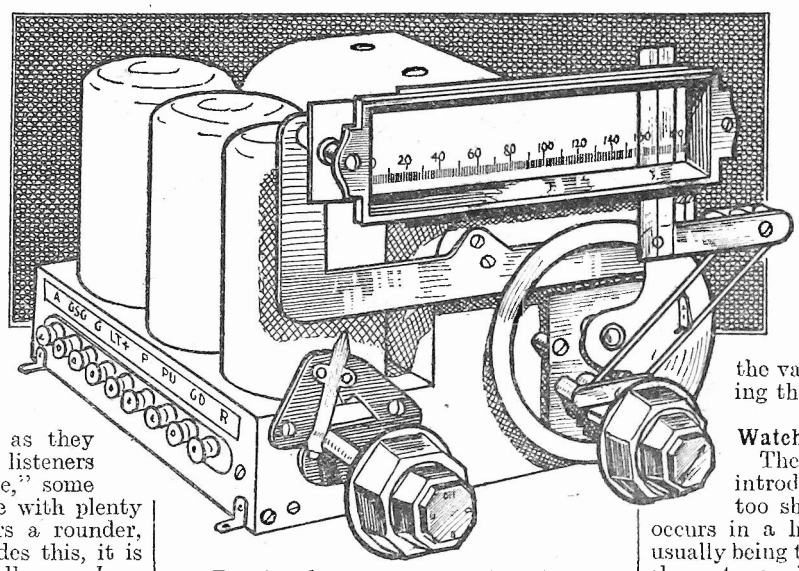


Fig. 1.—Illustration of modern H.F. tuning pack.

Careful Choice of Components

For really good reproduction it is essential that no avoidable distortion should be introduced. To this end, component values and individual pieces of apparatus must be selected very carefully, and optimum operating conditions observed. Moreover, it is often possible to balance out a tendency to faulty reproduction in one part of the circuit by a tendency in the opposite direction in another part of the circuit, while various methods of so-called tone-control are available for modifying the coloration of the final output, either to suit individual taste or to compensate for tonal distortion which has not been corrected elsewhere.

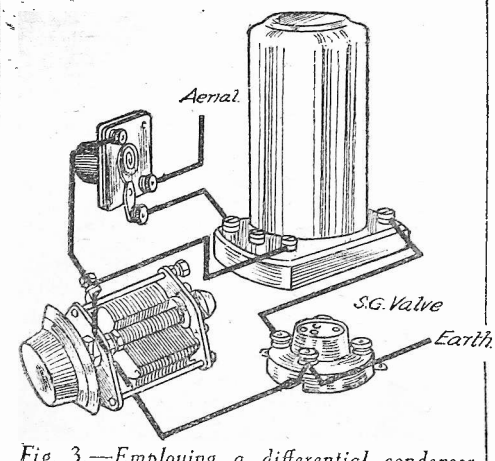


Fig. 3.—Employing a differential condenser for volume control.

On the H.F. Side

Little need be said about the design of the high-frequency stages, although serious distortion can be introduced here. To-day the design of high-frequency amplifiers is to a very great extent standardized. The efficiency of modern screen-grid and H.F. pentode valves is very great, but full advantage of them cannot be taken unless high-efficiency coils and very accurately ganged condensers are used. This necessity is reflected in the production of complete H.F. "packs" combining coils, variable condensers, and often valve-holders, switches and other components required to make up an efficient H.F. unit, such as that illustrated in Fig. 1. In most cases, therefore, the amateur constructor will be well advised to adopt one of the many standard H.F. arrangements, and to confine his designing activities to the detector and audio-frequency portions of his set.

The following points must, however, be kept in mind. First, it is essential to provide some means of avoiding overloading the high-frequency valves when strong signals are being received. Two main methods are available. The first is to fit a pre-H.F. volume control (or, more accurately, an input control) in the form of a potentiometer or a differential-condenser across the aerial circuit (Figs. 2 and 3). This must be provided when ordinary screen-grid valves are fitted. As, however, this form of control is apt to upset the ganging of the tuned circuits, the up-to-date method of employing variable-mu valves will usually find favour, the degree of amplification and the acceptance of the valve being controlled by varying the grid-bias—Figs. 4 and 5.

Watch the Tuning Circuits

Theoretically, distortion can be introduced by making the tuning too sharp. This fault very rarely occurs in a home-built set, the difficulty usually being to make the tuning sufficiently sharp to avoid interference by unwanted stations. But quite serious distortion may result from inaccurate tuning, and it is really well worth while, in a set designed for quality reproduction, to include permanently some device for giving a visible indication of tuning. This matter has been fully dealt with in recent articles in PRACTICAL WIRELESS.

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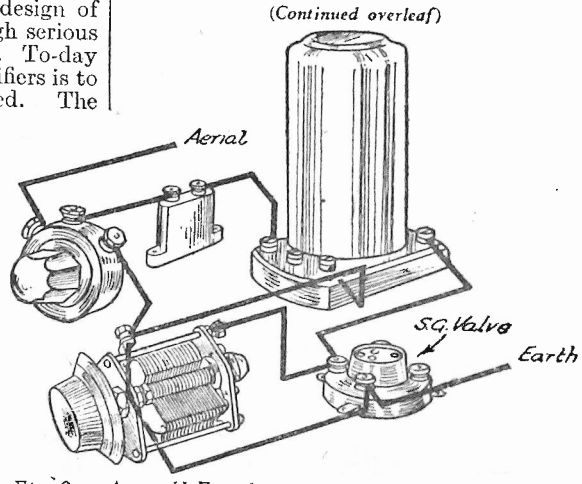

Fig. 2.—A pre-H.F. volume control using a potentiometer.

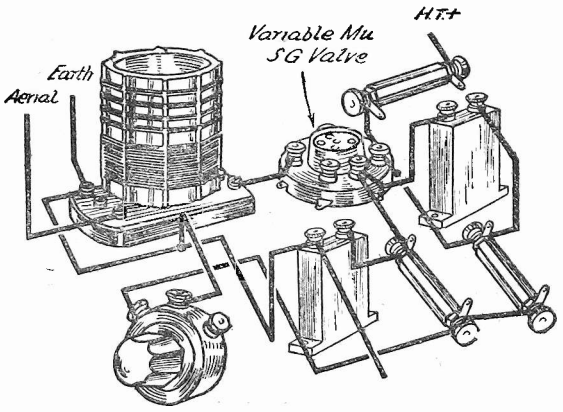

Fig. 5.—Gain control by variable-mu S.G. valve in a mains set.

(Continued from previous page)

Leaving the high-frequency amplifier, attention must now be directed to the detector stage. Reasonable use of input control or of variable-mu gain control, either manual or automatic, should avoid distortion due to overloading in this stage. But to be on the safe side, if the set employs one or more high-frequency stages, the detector, if of the three-electrode type, should be operated on the "power-grid system" when it will handle much greater inputs without distortion. Remember, too, that misused reaction will cause serious distortion. Provision for a touch of reaction may be made in a set having only one high-frequency stage, but with two high-frequency valves reaction should be avoided altogether. Any programme which two high-frequency valves cannot give at good volume without reaction is certainly not worth receiving.

L.F. Amplifier Design

It is in the low-frequency portion of his receiver that the amateur designer has the best opportunities of ensuring good quality reproduction. If the high-frequency and detector stages are built on sound conventional lines, as already described, the output from the detector valve should be reasonably free from distortion. It thus only remains to consider the L.F. portion of the receiver.

There are, broadly speaking, two main plans on which the low-frequency side of a radio receiver may be designed. In the first, the output valve immediately follows the detector stage; the alternative is to provide a further stage of audio-frequency amplification between the detector and the output valve—Figs. 6 and 7.

In the great majority of domestic receivers both battery and mains operated, the first system is employed. It is simple, inexpensive and electrically efficient, and gives reasonably good quality provided it is intelligently operated and its limitations are recognised. By this is meant that the listener should not try to obtain from the amplifier more than it is rated to deliver free from distortion.

Proper Loading

This statement calls for some explanation. If the output valve follows immediately after the detector, the signal energy available in the detector anode circuit will usually be sufficient to load only a comparatively small output valve, giving a maximum undistorted output of certainly not more than 1 watt for a battery set and about 3 watts for a mains receiver. The minimum output to give comfortably audible reception is about 50 milliwatts, and this must be considered as the minimum output during the softest passages of the weakest programme received. Actually, for satisfactory listening, with a high-grade speaker, an output of 250 to 350 milliwatts should be available with signals of average modulation.

But average modulation only represents those parts of a programme which are of moderate loudness—ordinary talks and the usual light orchestral performances. During the loudest passages of music, however, that is, the fortissimo parts, grand climaxes and so forth, the audio-frequency signal may be five or six times as great as during periods of average modulation. It is therefore necessary that the output valve be capable of handling fully-modulated signals without overloading, and this, in its turn, means ability to give a very high maximum undistorted output.

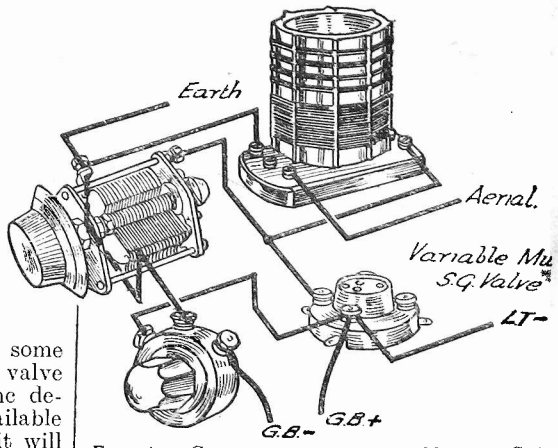

Fig. 4.—Gain control by variable-mu S.G. valve in battery set.

this sometimes makes things a little difficult in the case of replacements. Next, arrangements must be made for separate bias to each valve of the push-pull pair. In the case of an A.C. mains equipment, therefore, many designers prefer to adopt the alternative of using a large single output valve. For battery operation there is no alternative to a push-pull output stage or its more recent modification—Class "B."

Difficulties

If, as many listeners contend, the usual 2.0 or 3.0 watt output pentode, operated direct from the detector, does not provide a sufficient margin of signal-handling capacity and output to accommodate those more deeply-modulated passages of music, recourse must be made to a large output valve.

Immediately two difficulties arise. In the first place these large valves require an anode voltage of from 400 to 500 volts. This means larger and more expensive rectifier equipment—well worth while in the interest of quality, yet a matter to be reckoned with when contemplating the total cost. The second point is that most of these large valves are triodes, and therefore, comparatively insensitive, and requiring grid signal voltages for normal operation greater than can usually be

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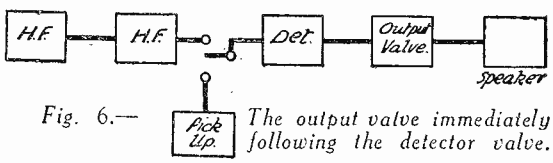


Fig. 6.—The output valve immediately following the detector valve.

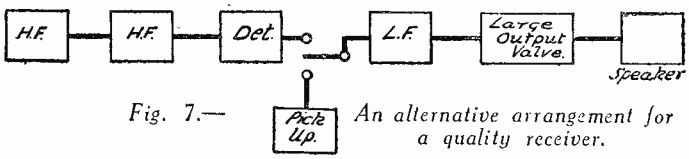


Fig. 7.—An alternative arrangement for a quality receiver.

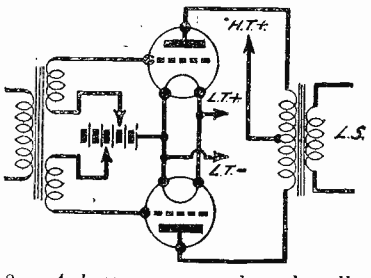


Fig. 8.—A battery operated push-pull stage.

Push-Pull Output

Better quality may be obtained if a bigger output stage is used. One method is to couple two output valves in push-pull, as illustrated in Fig. 8. The chief merit here is that in this arrangement much of the distortion is automatically cancelled out, the second, fourth and all *even* harmonic distortions in the two valves being opposite in phase.

There are a few points in connection with push-pull operation which have militated against the popularization of this system. In the first place, special push-pull input and output transformers are necessary; then the two valves should be fairly accurately matched as to anode current and characteristics, and

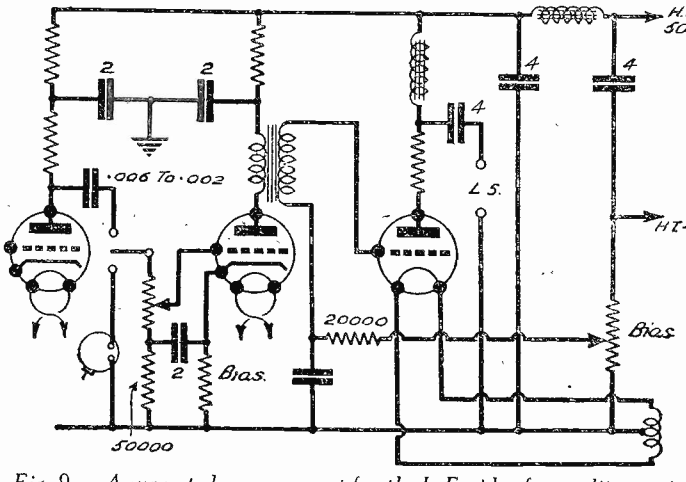
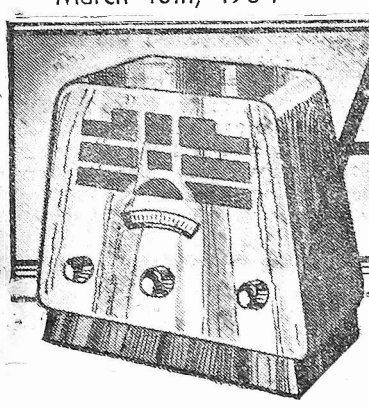


Fig. 9.—A suggested arrangement for the L.F. side of a quality receiver.



Anti-Interference Aerial Systems

Some Notes Concerning Unusual Aerial Schemes and Constructional Details of Various Effective Devices. By W. J. DELANEY

UNTIL a year or so ago it was customary to regard the aerial system of a broadcast wireless receiver as a length of stranded-copper wire suspended above, 30ft. from the ground, with connection to the receiver itself made by means of a continuation of that wire. This continuation, or more correctly the lead-in, might droop from a spot four or five feet from the house attachment of the aerial, or might run straight down the wall, the actual method depending upon whether or not the lead was of bare metal or of the insulated cable type. However, with the increasing use of electrical devices, and the increase in the efficiency of the high-frequency amplification given by the receiver it has gradually become essential to devise aerial schemes which, whilst permitting of the reception, at undiminished strength, of broadcast signals, will prevent the reception of the various forms of interference which are generated by the above-mentioned electrical devices, and which have been given the name "man-made static." Apart from various ingenious schemes, there are a number of devices which have carefully worked-out details based upon a sound theoretical study of the forms of such interference, and some of these have appeared commercially on the English market. I have experimented with some of these, and have also made up one or two arrangements to my own ideas, and the following notes will undoubtedly be of great interest to those who find their reception of the broadcast programmes is marred by cracklings, vari-pitched hums, and other forms of man-made static.

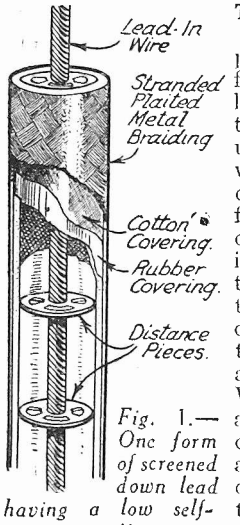


Fig. 1.—One form of screened down lead having a low self-capacity.

The Screened Lead-in

As a result of experiment it has been found that by far the larger part of the interference is picked up by the lead-in wire. In one or two cases it may even be found that this part of the aerial system is, in fact, actually the only effective portion which is in use, due to corrosion of the joint where aerial and lead-in are united. Where, however, the aerial wire is one continuous length, and is simply twisted or otherwise fastened to the "house" insulator and is then carried to the receiver, the total length of wire will no doubt be effective. In any case, where interference is experienced, the first step is to isolate earth and aerial. Perhaps it would be as well, before going any farther, to point out that I do not intend to deal with interference which is received *via* the electric-supply mains, which form of interference is easily overcome by the usual interference suppressor across the mains leads before connection is made to the receiver. When interference is experienced, therefore, the first thing to do is to remove the aerial and earth leads from the receiver in order to determine the source of the interference. If it ceases when these leads are removed, obviously the aerial or earth are responsible. If it continues, the mains are responsible, and the remedy is not so difficult. To continue, then. If the lead-in (or aerial) is introducing the interference, the easiest solution lies in screening, and although it is possible to screen a single lead in a wireless receiver by means of a close-fitting metal sheath, this cannot be adopted in the case of the aerial lead owing to the losses which will result. It must be remembered that the high-frequency currents which are generated in the aerial will take the easiest path to earth, and if we cover the leading-in wire with a close-fitting metal screen, and this screen is earthed, the resultant capacity effect between wire and screen will offer a much easier path for the H.F. currents than the tuning circuit in the receiver, and the result will be loss of signal strength. This is obviously undesirable. A simple way of overcoming this capacity effect is, however, to space lead and screen, and in Fig. 1 is shown one simple way of carrying this out. Here, the actual leading-in wire is fitted with small discs of good insulating material, and the screen is of much larger diameter. The insulating discs fit fairly closely inside this screen and if the discs are placed near together the screen is held away from the wire throughout its length and a much lower capacity results. The screen may consist of a length of metal piping (that known as electrical conduit is very suitable), or in certain cases it may be found possible to call into use a disused rain-pipe, for instance. Provided the lead is held at some distance from the earthed screen so that a low capacity results, the actual method of constructing the lead is not important.

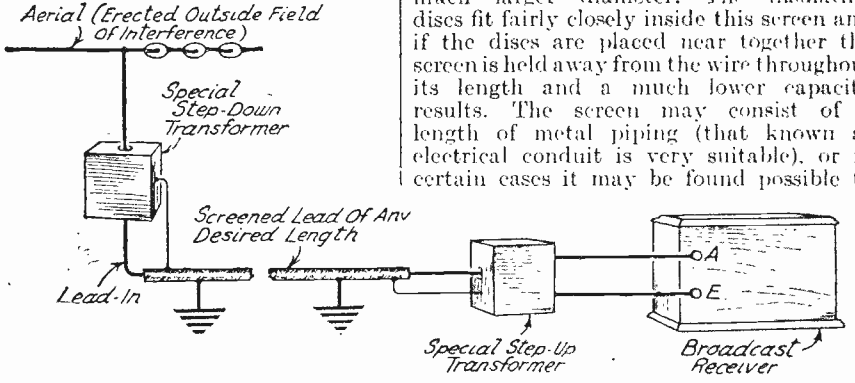


Fig. 2.—Diagram explaining the method of erecting an anti-interference aerial system employing special transformers.

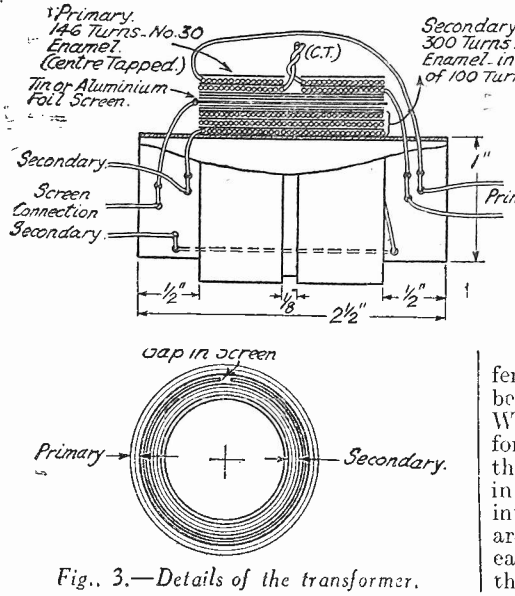


Fig. 3.—Details of the transformer.

Transformer Aerial Schemes

If the interference is picked up by the aerial, due to the proximity of the interference generator, it is obvious that the screened lead-in will not be effective in removing the interference, and it therefore becomes necessary, if long-distance reception is desired, to erect the aerial out of range of the disturbance, and this will probably entail a very long lead to the receiver. It is obvious that a long lead-in will result in inefficiency, and it therefore becomes necessary to introduce some device to maintain the over-all efficiency of the high aerial and short lead-in which

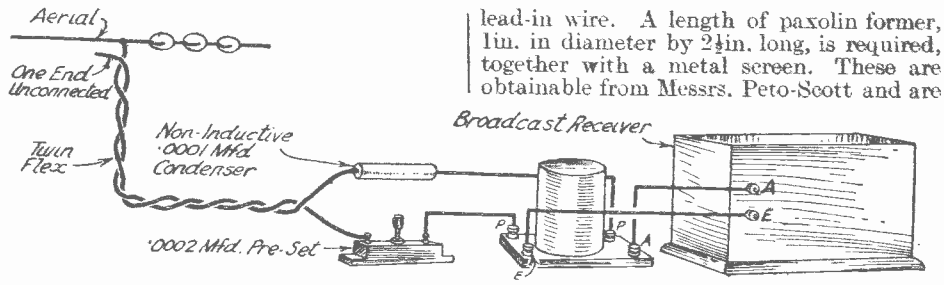


Fig. 5.—Connections for anti-interference device.

may be erected by those who do not experience the interference difficulty. Experiment has shown that this may be carried out very effectively by means of special H.F. transformers. The aerial is erected in some place free of interference, and interposed between the aerial and the lead-in wire is a specially-designed transformer. This has a step-down ratio, and the lead-in is then shielded and carried as far as required to the receiver, where a step-up transformer is interposed. By careful design it is possible so to arrange these components that the actual signal strength of distant stations is practically undiminished, but man-made static is completely removed.

Furthermore, owing to the interposition of the transformers, it is no longer necessary to arrange the lead-in wire on low-loss lines, and the metal screening may be separated from the wire by only a thin insulated covering. It must be effectively earthed, however. I have tried a number of these arrangements, and it is apparent that each individual case requires special treatment, dependent upon the strength of the interference, the type of receiver in use, and the length of the lead-in. In Fig. 2 the scheme is shown diagrammatically, and it will be seen that the transformers are untuned. With this arrangement, however, I found that a good deal of H.F. amplification was required in the receiver, and there was certainly a loss of signal strength. In extreme cases of interference, however, this must be tolerated as it becomes possible to hear stations free from interference which, without the scheme, are completely swamped by noises. The lead-in consists of ordinary flex (14/36's) covered with plaited copper braid, and this is obtainable from several firms at about one penny or three-halfpence a foot. In 100ft. lengths it works out at about 8s. or 9s. This is expensive, of course, but, in view of the advantages to be gained, the money is well spent.

Where only one H.F. stage is employed the loss of signal strength is too marked to make this scheme practicable, and a better device is now detailed.

A Single-transformer Scheme.

This owes its origin to America and has certainly been found to operate in a more accurate elimination of static than the double-transformer scheme, although the adjustment was found to be rather critical if optimum results were to be obtained. Altogether I made no fewer than seven of these transformers before I found one which appeared to act equally in all cases, but I should not like to guarantee that the following details would prove best in all cases. They will, however, form an admirable guide to the reader who wishes to carry out experiments in this direction, and as stated above, individual circumstances may necessitate modifications to either the actual windings, or the length and position of the lead-in wire. A length of paxolin former, 1in. in diameter by 2½in. long, is required, together with a metal screen. These are obtainable from Messrs. Peto-Scott and are similar to those used in the article on home-made coils which appeared in PRACTICAL WIRELESS No. 64, dated December 9th, 1933. The transformer is wound in the following manner. Starting half an inch from one end of the coil, 100 turns are wound on and these are covered by one thickness of thin note-paper, after which another layer of 100 turns is wound, covered with paper, and finally a third layer is wound, the end of this winding being anchored at the end as shown in Fig. 3. Next a strip of good dry brown paper is cut exactly 12in. long by 2in. wide, and this is tightly and carefully wrapped round the winding. The end is stuck down with good quality adhesive. To reduce the capacity between the secondary, which has just been wound, and the primary winding which must next be put on, an electrostatic screen has to be fitted, and this consists of a metal surface surrounding the winding, and fitted with a small air gap. As the exact diameter of the coil in its present condition will vary according to the thickness of the paper which has been used, no exact dimensions can be given, but the gap may satisfactorily be arranged by cutting a strip of aluminium—or tin-foil, obtainable from a cigarette or chocolate box. The width should be 2in., and the length such that the ends do not quite meet. Iron out the foil and wrap it round the coil and stick the end with adhesive. Cut the foil so that a space of about 1/16in. separates the ends and then stick the other end down. A further 1ft. length of brown paper is wrapped over this screen, and the primary is then wound in two sections of seventy-three turns each. The ends of these windings (which must be in the same direction as the secondary), must be level with the ends of the secondary, and this will leave a space of about ⅛in. between the two halves. Each primary therefore consists of two layers, a thin piece of paper separating each layer. Note that the leads for the primaries and the secondary are brought out at opposite ends. Mount the former on a small ebonite base, with the screen lid attached as described in the above-mentioned coil article, and bring the ends of the windings out to terminals. The screen is placed over the coil and this is connected to the terminal on the base, which is connected to one end of the secondary and marked Earth (Fig. 4). This terminal is joined to the earth terminal on the receiver, to which is also joined the normal earth lead. The other secondary terminal is joined to the aerial terminal of the receiver. The junction (centre) of the two primaries is joined also to the earth terminal on the transformer base, and a fixed condenser of .0001 mfd. capacity is joined to one primary terminal, whilst the other terminal is joined to a pre-set condenser having a maximum capacity of .0002 mfd. The lead-in consists of ordinary flex or other insulated twin twisted wires, and only one end of one wire is attached to the aerial. The other wire at that point is left disconnected, and to prevent its coming into contact with the aerial it should be cut and bent back and tied. The other ends of the lead are joined to the two condensers, and the pre-set is carefully adjusted on a weak station for maximum strength with minimum interference. The complete arrangement is shown in Fig. 5.

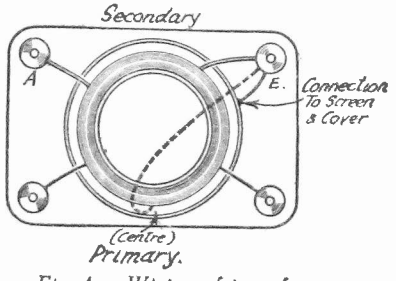


Fig. 4.—Wiring of transformer

POINTERS IN SET DESIGN

(Continued from page 1124)

developed by a detector alone. It is therefore necessary in most cases to interpose another low-frequency stage between the detector and output valve. Most receivers to-day are required to serve both for radio reception and gramophone record reproduction. If the output valve follows the detector, the circuit must be so arranged that the detector can also function as first L.F. amplifier for radio reproduction (Fig. 6).

A Weak Link

With a 2-stage L.F. amplifier, however, the switching from radio to gramophone may occur before the first low-frequency stage, thus avoiding interference with the detector grid circuit; this scheme is indicated in Figs. 7 and 9.

The one weak link in the chain is the low-frequency valve between the detector and the output stage. There is not a very wide choice of valves for the intermediate position. That is to say, most standard general purpose types have a rather small grid base for this service. As, however, most big output valves of modern design do not require the full amplifying power of two transformer-coupled stages before them, the difficulty can be solved either by using resistance-capacity coupling throughout, or resistance-capacity coupling in one stage and transformer coupling in the other.

On the other hand, with two resistance-coupled stages it may be found that the volume on the gramophone side may not be sufficient when using only one valve in addition to the output stage. In general, therefore, the best arrangement is to use a low or medium-gain resistance-capacity coupling between the detector and first low-frequency valve, thus reducing the risk of overloading this stage; and a good quality transformer, preferably resistance-fed, between the first L.F. stage and the output valve.

Good Quality

For the rest, some form of input volume control should be provided in the grid circuit of the first low-frequency valve, to counteract any risk of overloading in this stage with either radio or pick-up. Decoupling of all anode and screen circuits should be thorough and efficient, and grid circuits should also be well decoupled.

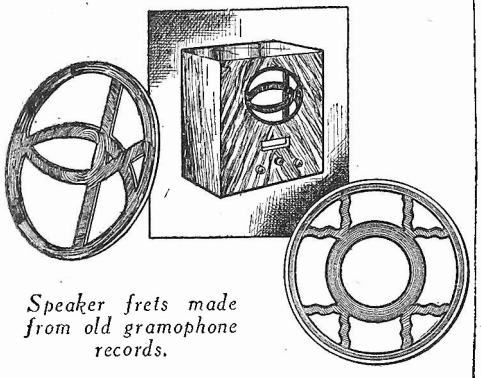
The output circuit should be accurately matched to the valve impedance, the calculation being based on the optimum load recommended by the maker of the output valve.

READERS' WRINKLES

THE HALF-GUINEA PAGE

A New Use for Worn-out Records

THE accompanying sketches illustrate a method of making speaker frets from old gramophone records. The simple

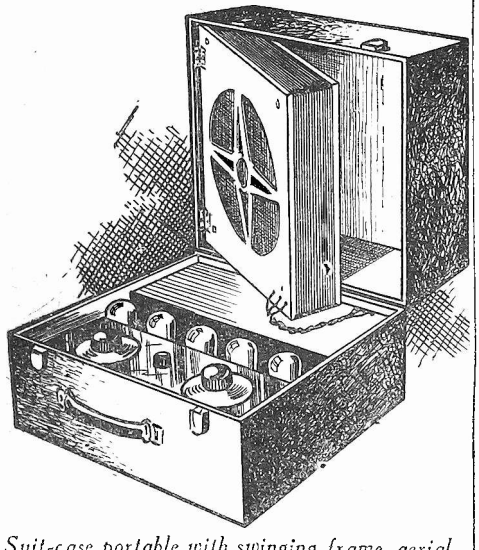


Speaker frets made from old gramophone records.

designs shown can easily be cut out with a fretsaw. A black fret will, of course, give a striking contrast to any cabinet, and a very pleasing effect is given by the groove markings on the record. In one of the most beautiful frets of this kind I have seen the grooves were filled up with various blending shades of sealing-wax to match a walnut cabinet.—W. CAPEWELL (West Norwood).

For Users of Suit-case Portables

SUIT-CASE portables have frequently to be placed in awkward positions for operating, owing to the frame aerial being directional. The following suggestion makes it possible to swing the frame aerial in the



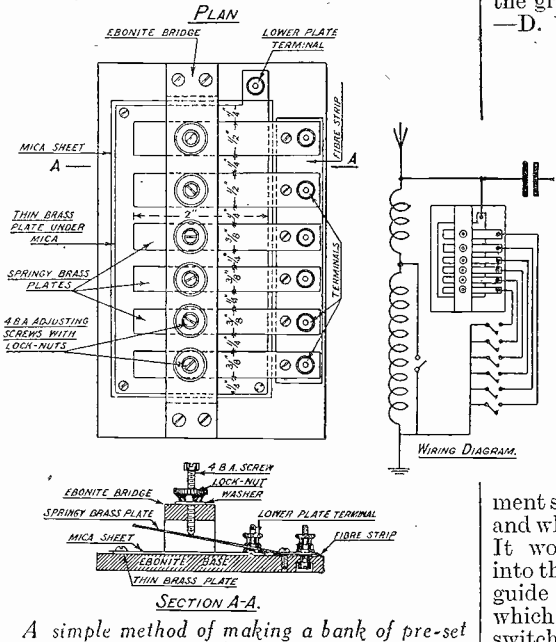
Suit-case portable with swinging frame aerial.

desired direction, without turning the controls away from oneself and greatly facilitates tuning. Remove the four screws from the speaker front and withdraw the complete frame aerial, speaker and baffle. Fix two 1in. hinges to the left-hand side of baffle, as shown in sketch, then lengthen the connecting wires to about 12ins.

When tuning in, the aerial and speaker can now be swung outwards in the direction desired. Flat back to right out will cover all the receiving directions, since the swing does not need to cover more than 90 degrees. To enhance the appearance, a strip of rexine or paper can be lightly glued round the frame aerial, and will also serve to protect it. It will be obvious that there must be some clearance between the edge of the frame and the inside of the lid to allow the former to swing freely.—L. GEORGE (Margate).

THAT DODGE OF YOURS!

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



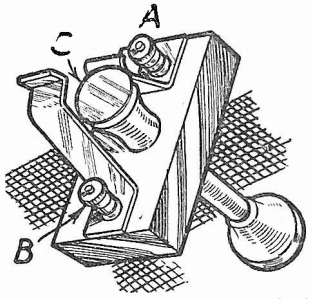
A simple method of making a bank of pre-set condensers.

Bank of Pre-set Condensers

THE accompanying drawings show an easily-constructed bank of pre-set condensers suitable for incorporating in a receiver for tuning in a number of desired stations, any one of which may be selected by the operation of its appropriate switch. Six condensers are shown, but any number may be provided to suit the capabilities of the receiver. If the overlap of the plates is made 2in. as shown, and mica .002in. thick is used, the condensers will have a maximum capacity of .0004 mfd. in the case of those with $\frac{3}{8}$in. wide top plates, and .0005 mfd. for those $\frac{1}{3}$in. wide; the former are intended for tuning stations on the lower wavelengths.—H. H. CRAWLEY (Summertown, Oxford).

Adapting an On/off Switch

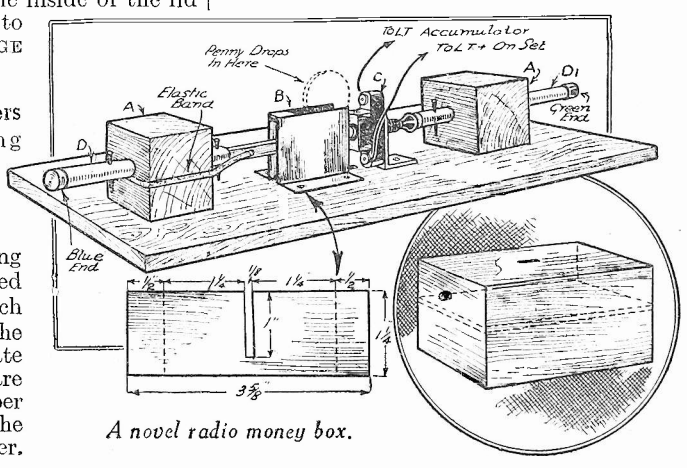
A GRID-LEAK clip, bent to the shape shown in the sketch, may be used to convert an ordinary on/off switch to a two-way switch suitable for changing over from radio to a pick-up. The bent grid leak is screwed under the switch terminal B in place of the original contact arm. A flexible wire soldered on to C is taken to the grid of the detector valve, A being connected to the grid condenser, and B to the pick up.—D. H. PENNINGTON (Marple).



Method of adapting an on/off switch.

A Radio Money Box

AS radio expenses were rather heavy, I devised the arrangement shown in the accompanying illustration, and which I have had in use for some time. It works as follows: A penny is dropped into the slot in the box, and is held in the coin guide B. The blue knob is then pressed in, which pushes the penny against the switch, switching set on. On releasing the blue knob, the elastic band pulls the plunger back to its original position, allowing the penny to drop into the box. To switch off the set the green knob is pushed in, and this puts the switch in the "off"

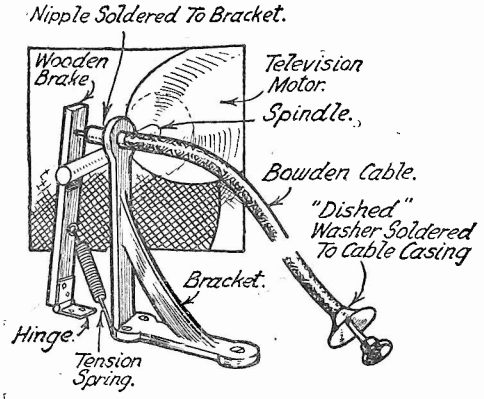


A novel radio money box.

position. The illustration clearly shows how the parts are assembled. The blocks marked A are cut from 1in. square wood, and the plungers are two pieces of dowel rod, the end of the one marked D being cut away, as indicated, so that it slides inside the coin holder. Cut the coin holder from a stout piece of tin, to the measurements given in the bottom left-hand diagram. The switch C is a Telsen push-pull switch, this type being used, as it has "knife" contacts. The two terminals are connected to two terminals on the box, and one is taken to L.T.+ on accumulator and the other to L.T.+ on set. Small pins should be put in the plungers to restrict their movement, and to save them from coming out.—J. F. STALLWORTHY (Catford).

Television Speed Regulator

A CONVENIENT speed regulator for use with television receivers not provided with synchronizing apparatus can be made as shown in the accompanying



Simple speed regulator for a television motor.

sketch. It will be seen that a "brake," made from a strip of hardwood, is fastened to the baseboard by means of a small hinge and is held against the motor spindle by a small coil spring. Mounted on the other side of the spindle is a panel bracket to which is attached the outer casing of a length of bowden cable. The inner wire is fastened at the same end to the wooden "brake." The other end of the cable has a "dished" washer soldered to it, a small knob being attached to the end of the inner wire, either by means of solder (when the knob has a brass inset), or by the side grub screw where this is provided.

The advantage of the scheme is that a reasonably good regulation of the motor speed can be obtained whilst the "looker-in" is sitting back at a comfortable distance from the lens or screen. It will be appreciated that the tension spring must be adjusted so that a suitable braking effect is applied to the spindle to reduce the motor speed a little below the normal one of 750 revolutions per minute. If soft wood were used for the "brake" there would be some danger of over-heating and of the wood charring; that could easily be avoided by fastening a strip of fibre to the face of the "brake."—P. F. (Hatch End).

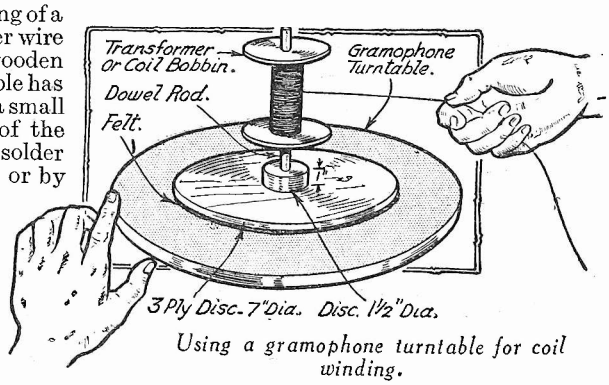
An Easily-made Microphone

THIS microphone consists of a piece of plywood with a circle cut out of the centre about the size of a penny. A piece of mica the same size has a strip of foil glued or merely pressed on it, as shown in Fig. 1, with projecting pieces of foil which make contact with flange "A." This is placed on the wood. The other side of the plywood has a similar piece of mica and foil, with the foil making contact to the second flange "A." The whole is riveted together, as shown in Fig. 2. Small tags are riveted on the flanges to which contact is made with the foil. The central hole in the plywood is filled with carbon granules from an old flash-lamp battery. Other details of construction are shown in Fig. 3. —T. DEAN (Cranwell).

An Excellent Coil Winder

A GRAMOPHONE of either the electrically driven or spring-motor type can be put to use as an excellent winder for tuning coils, transformer windings and the like as shown in an accompanying illustration. First of all a disc of ply-wood about 6in. diameter should be cut out, a hole the same size as the motor spindle being made in its centre and a piece of felt or baize being glued on one side. Next a disc of wood about 1in. thick by 1½in. diameter must be made to fit in the centre of the ply-wood and should be glued, or screwed, to the latter. A hole must be made in the underside of the smallest disc to take the projecting end of the motor spindle, and in the upper side to receive a length of dowel rod. The former of the coil to be wound can then be fitted on to the dowel so that the whole can be rotated by means of the gramophone motor. For larger coil formers a second rod may require to be fixed on the dowel so that it will fit tightly into the coil former.

The advantage of this type of winder is that the speed of winding can be regulated very easily by varying the pressure of a finger against the edge of the turntable as shown. By this means it is possible to wind even very fine wire without danger of breakage. Additionally the motor can quickly be stopped when required by pressing against the turntable.—P. F. (Hatch End),



Using a gramophone turntable for coil winding.

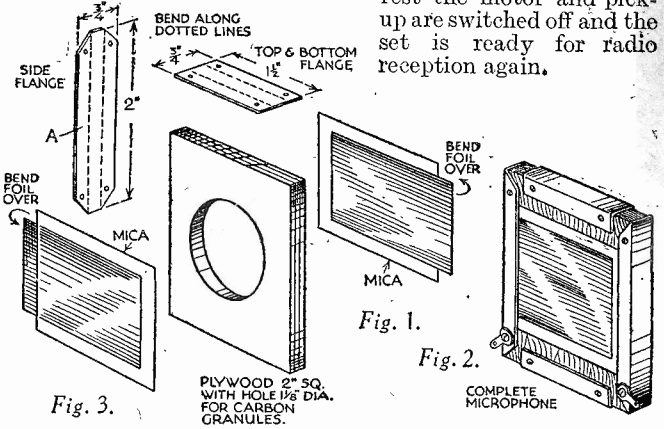


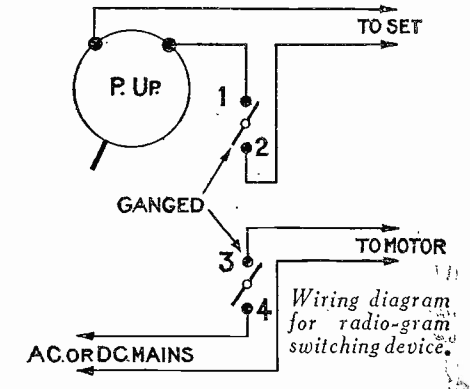
Fig. 3. *Fig. 1.* *Fig. 2.*

Constructional details for an easily made microphone.

An Excellent Radio-Gram. Switching Device

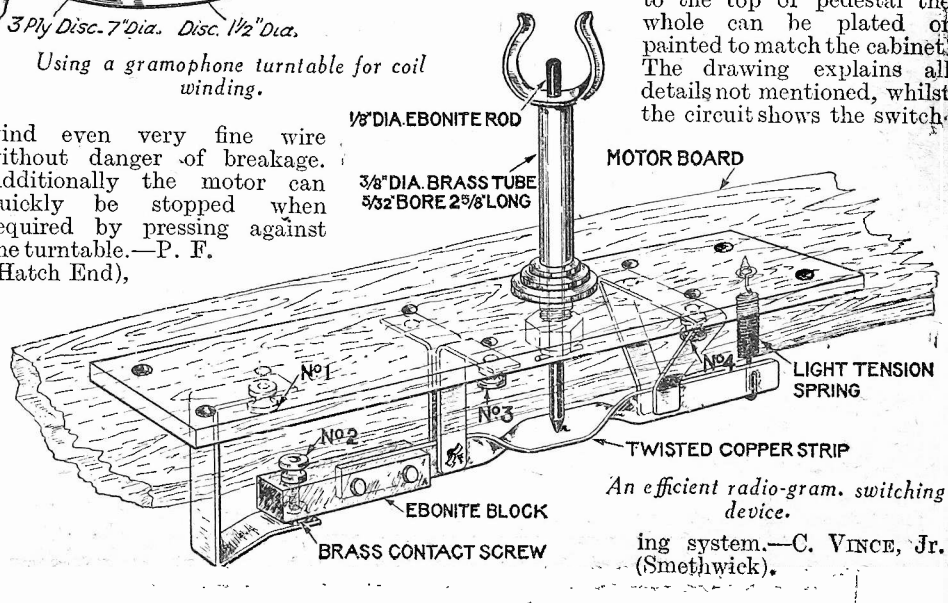
THE drawings herewith show the general constructional details of a combined radio-gram. switch for automatically switching the gramophone motor and pick-up into circuit as the tone arm is taken off the rest, prior to placing it on the record. When the arm is put back on the rest the motor and pick-up are switched off and the set is ready for radio reception again.

The parts required will be found in almost every junk box. They are: a length of brass tubing screwed at one end; A length of copper strip about ⅜in. wide, and 1/16in. thick; a piece of ebonite 4¾in. long by 1in. wide, and a length of ebonite rod.



Wiring diagram for radio-gram switching device.

The base of the pedestal is made up from three brass discs ⅝in., ⅞in. and 1⅛in. diameter respectively, which are all soldered together, after which a ⅜in. diameter hole is drilled through them. This is then placed on the rod in the required position and secured by solder. When the clip is secured to the top of pedestal the whole can be plated or painted to match the cabinet. The drawing explains all details not mentioned, whilst the circuit shows the switching system.—C. VINCE, Jr. (Smethwick).



An efficient radio-gram. switching device.

Pocket Portable

Constructional Details of a Simple Portable Receiver which can be Built in a Cigar Box

By "DIALOG"

THE little set about to be described was made in a cigar box measuring only 5in. by 9in. by 1⅞in.; a box which holds twenty-five cigars is of suitable size. Although small, the receiver works well, bringing in the Regional and National at good strength on the 'phones on a piece of wire 10ft. long as aerial. The set does not work on the long-wave band, as the coil was not wound for this.

The "Pocket Portable" actually has the necessary 2-volt accumulator of the jellied type fitted in the cigar-box, and the complete set will quite easily go into any coat pocket and so, with a 40 or 60-volt H.T. battery and a pair of head-phones, one has a complete receiver which is easily carried about.

Winding the Coil

The coil is made on a paxolin former 3¼in. long by 1¾in. diameter. About the middle of this former wind on a sufficient number of turns of 28 d.c.c. wire (closely wound) to fill up 1¼in., not forgetting to leave a reasonable length of wire for connecting up; this is the grid winding. Leaving a space of ¼in. from the start of the grid winding and using the same gauge of wire, and winding in the same direction, wind on enough wire to fill a space of ¾in., thus completing the reaction coil. A little shellac varnish painted over the windings keeps them taut and firmly in place. For details of the coil see Fig. 1.

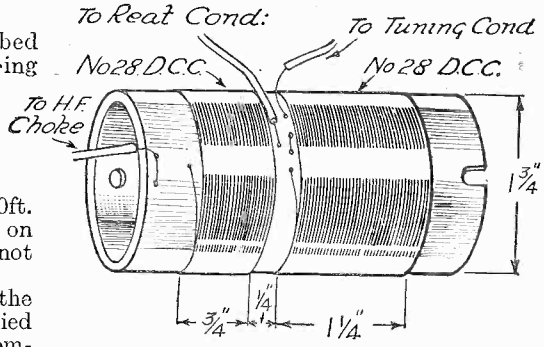


Fig. 1.—Winding details and connections for the coil.

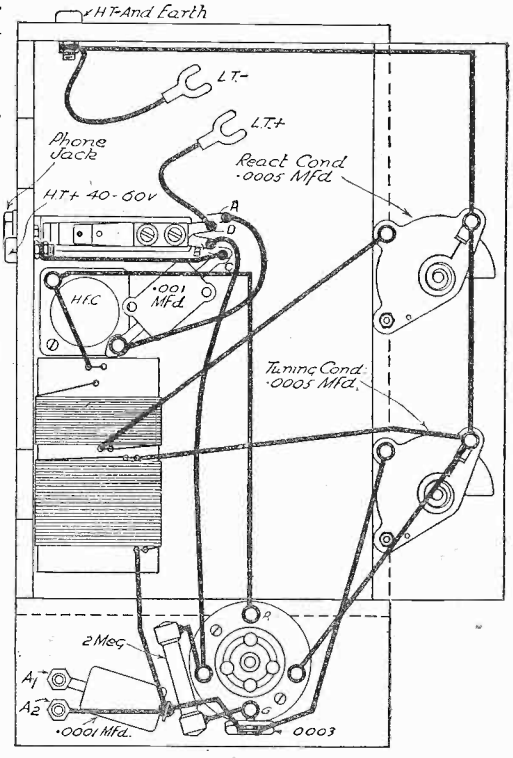


Fig. 2.—Wiring diagram for this neat little receiver.

COMPONENTS REQUIRED

1 4-pin Valve-holder (Benjamin).
2 Bakelite Dielectric Variable Condensers, .0005 mfd.
1 Fixed Condenser, .0003 mfd., tag type (T.C.C.).
1 Fixed Condenser, .0001 mfd., tag type (T.C.C.).
1 Fixed Condenser, .001 mfd., tag type (T.C.C.).
1 Grid Leak, 2 meg., with wire ends (Dubilier).
1 H.F. Choke (Graham Farish).
1 'Phone Jack, type P65 (Igranic).
1 'Phone Plug (Igranic).
3 Banana Plugs and Sockets, red (Clix).
2 Banana Plugs and Sockets, black (Clix).
1 Detector Valve, type 210 Det. (Cossor).
1 2-volt Accumulator, jelly type, small, to fit box (Exide).
1 Paxolin Former, 3¼in. by 1¾in. One ounce 28 D.C.C. Wire, Rubber-covered Wire, Spade Terminals, Screws, Crocodile Clip, etc.

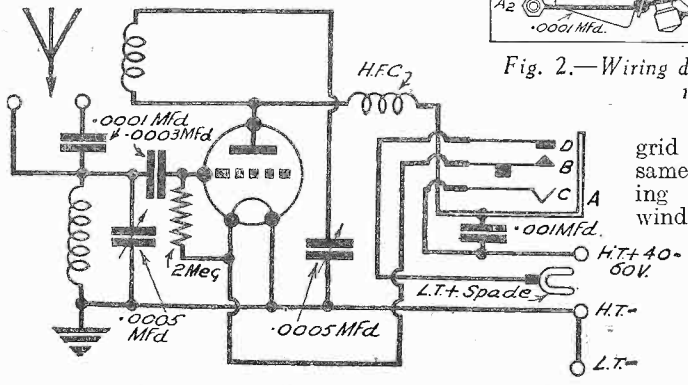


Fig. 3.—Theoretical circuit of the Pocket Portable.

Assembling the Parts

To make the receiver, first drill two holes, one above the other, the diameter of a banana plug socket, in the left-hand side of the cigar box, about 1in. from the back, and mount two red sockets. To one connect one side of the .0001 series-aerial condenser. Now, having wound the coil, place it lengthways in the bottom left-hand corner of the box, as close to the back as possible, and solder the input wire of the grid coil to the other side of the .0001 aerial condenser. Continue with this grid coil wire and solder to the other banana socket. Fasten the coil in place, and secure with a very small screw through the paxolin former to the bottom of the box. This can easily be accomplished by inserting the screw at an angle. Screw down at both ends, and it is as well to note that, owing to the thinness of the wood, all screws will protrude through and in consequence will need filing flat.

Next, take the valve-holder and screw this as close as possible to the coil, allowing for the width of the glass bulb.

The .0005 mfd. tuning and reaction condensers are now fixed into place, on the front of the box, and knobs attached. Connect the grid of the valve-holder to one side of the .0003 grid condenser, and the other side of this condenser to the coil and join this to the fixed vanes of the tuning condenser. Join a fine piece of wire from the moving vanes of the tuning condenser to the moving vanes of the reaction condenser, and allow sufficient length to reach to the right-hand side of the box, to be joined later to earth, the fixed vanes of the latter being now connected to the reaction winding of the coil. The other side of the reaction coil is joined to the plate or anode terminal of the valve-holder. A fine wire, insulated with sleeving, now joins the same anode terminal to one side of the H.F. choke. Solder the other side of the choke to the terminal marked A (see Fig. 2), and to one side of the .001 fixed condenser, the terminal C being joined to the other side of this condenser, and by a piece of thin rubber-covered wire to the socket (red) next to the 'phone jack.

Now solder the grid leak to the grid of the valve-holder, joining the other side of the leak to one of the filament terminals, and by means of some thin rubber-covered wire connect it to the terminal marked B on the 'phone jack. The remaining jack terminal D has now a piece of rubber-covered wire soldered to it—about 4in. long—at the end being fixed a small accumulator spade, which is for connecting to the plus side of the accumulator. There now remains a black banana socket; this is mounted towards the back of the right-hand side of the box. To a 4in. length of rubber-covered wire is fastened a black accumulator spade and it is soldered to this socket. Also, with a piece of rubber-covered wire, connect

(Continued on page 1132)

DESIGNING AN A.C. MAINS UNIT

A Number of the Lesser-known Points regarding the Choice of Components for A.C. Mains Units are Here Dealt With

By FRANK PRESTON

ALTHOUGH there are thousands of wireless amateurs who think nothing of designing and making their own battery-operated receiver, it is rather surprising to find how many there are who cannot trust themselves with the task of working out the main details of construction for a mains eliminator or complete mains receiver. As a matter of fact it is a far simpler and more straightforward undertaking to design a mains unit than it is to design a receiver. Provided that the amateur understands the elements of electricity and has knowledge of a few simple facts, there is little chance of going wrong, especially if safety fuses are employed with fair liberality.

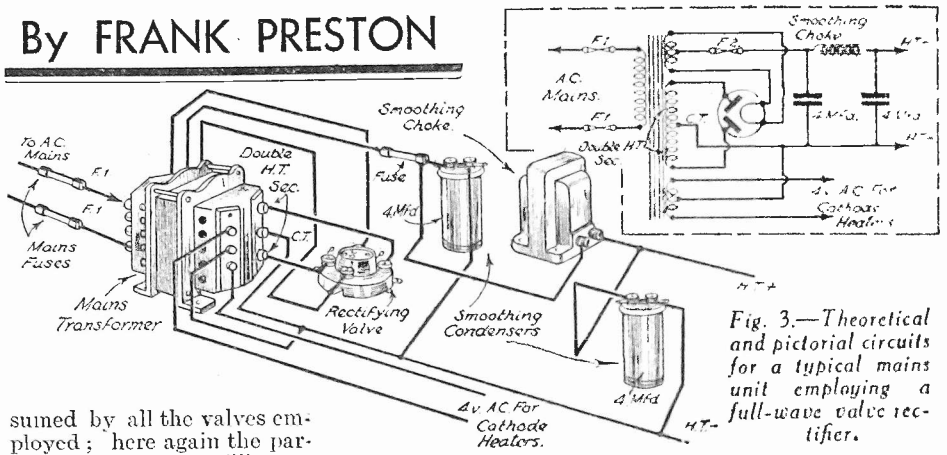


Fig. 3.—Theoretical and pictorial circuits for a typical mains unit employing a full-wave valve rectifier.

The Constituent Parts of a Mains Unit

Before passing on to the actual points of design it will perhaps be better to get a grasp of the underlying principles and also a working knowledge of the component parts of which a mains unit consists. The idea will more readily be understood if reference is made to Fig. 1, where the complete supply unit is divided up into different sections, each of which is represented by a non-committal rectangle. It will be seen that the sections are few in number, and comprise: (1) the mains transformer, the purpose of which is to isolate the actual mains supply wires from the receiver, as well as to change the voltage to that required by the rectifier. In the case of an eliminator or mains unit of the so-called "all-mains" type, the transformer also contains windings which give 4 volts A.C. for heating the cathodes of indirectly-heated valves. (2) The rectifier, the object of which is to change the alternating-current mains supply into direct current which can be used for high-tension purposes. (3) The smoothing system, which contains an iron-cored choke and two or three condensers. (4) The voltage-dropping system, for reducing the total output from the rectifier to the figures suitable for operation of the various valves in the set. This need not necessarily be considered as part of the mains unit, since it is usually (and more conveniently) made integral with the high-tension circuits of the set itself.

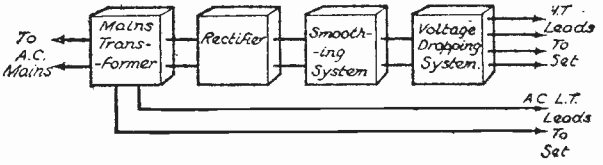


Fig. 1.—This diagram shows the principal parts of a mains unit arranged in their correct sequence. The last section—for voltage dropping—generally forms a part of the receiver.

The various parts will not be described in detail, nor will the theory surrounding their action be given very much attention, since these sides of the question have been adequately dealt with in numerous previous articles; in the present instance we are more interested in the purely practical aspects.

Estimating the Total Power Consumption

In deciding upon the type of mains transformer to be employed we must consider the amount of power required by the set in conjunction with the type of rectifier to be employed. The first item which comes in for consideration is the maximum voltage required by the receiving valves; in the case of a battery set this will be 150 volts, but for a mains set it might be any figure up to 500 volts, according to the particular valves in use. Next we must take into account the total amount of high-tension current which will be consumed by all the valves employed; here again the particular figure, in milliamps, will vary considerably from about 20 to 120. There is yet another point to be borne in mind, which is that the smoothing choke (or chokes) will have a certain resistance and so produce a voltage-drop. In other words, the output from the smoothing system will be at a lower voltage than the output from the rectifier. Smoothing chokes of suitable inductance—generally between 20 and 30 henrys *when passing the maximum current*—can be obtained in a variety of resistance values, but for any given inductance the price of the choke varies inversely as its D.C. resistance. It is often less expensive, therefore, to use a choke of comparatively high resistance, and hence productive of a greater voltage-drop, in conjunction with a rectifier giving a greater voltage output than it is to use a "smaller" rectifier and a lower-resistance choke.

Voltage Losses

For the moment we can leave that point and determine just what loss in voltage the choke will produce. By applying the ubiquitous Ohm's Law, we can find the voltage-drop by multiplying the H.T. current required by all the valves (in milliamps) by the resistance and then dividing the answer by 1,000. For example, if the set takes 25 milliamps and the choke has a D.C. resistance of 1,000 ohms (a fairly average value for a medium-priced component), the voltage-drop across the choke will be 25. This is very low and could often be ignored, but if the set took, say, 75 milliamps, the voltage-drop across the same choke would be 75, so that if proper allowance were not made for this, the set would probably be "starved" of H.T. current and performance would suffer heavily in consequence.

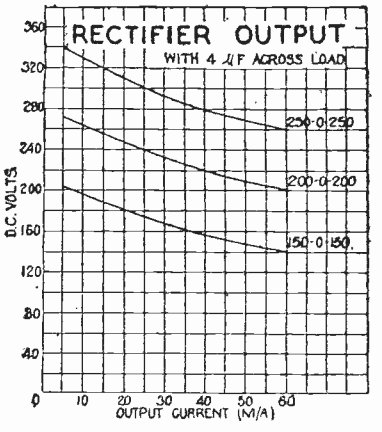


Fig. 2.—Regulation, or output curves for a typical Class A rectifying valve. These are referred to in the text.

The position would become still more serious if it were desired to employ the field winding of a moving-coil speaker for smoothing purposes, because, although this is an excellent system, the resistance of most speaker fields is 2,500 ohms. It can therefore be seen that with a set taking 50 milliamps the voltage-drop across such a field winding would be 125, and this must be allowed for in choosing the rectifier and transformer.

Another little point which must be borne in mind in the case of a unit for use with a set employing indirectly-heated valves is that the grid-bias voltage is also taken from the H.T. supply. Thus, if the set requires 250 volts for high-tension—this is the figure for most of the power pentodes—and the last valve requires 35 volts G.B., the total supply voltage should be 285.

Just as there is a voltage-drop across the smoothing choke, so is there a certain loss in voltage due to the loud-speaker or output transformer connected in the anode circuit of the output valve. But as this component does not carry the H.T. current for the whole set (but for the last valve only), and as the D.C. resistance is usually fairly low, the voltage-drop will not generally exceed 20 volts or so. At the same time, it is well to consider this point when making the necessary simple calculations.

Choosing the Rectifier

Having settled the question regarding the voltage output required from the

rectifier we can decide upon the type of component to be used in this position. Here there is some danger of our remarks becoming controversial, because some experimenters prefer valve rectifiers for every purpose, while others will have nothing but metal rectifiers. It is fairly safe to say, however, that for voltages up to about 200 the metal rectifier is to be preferred, but for voltages of 250 and over the valve is favoured. No hard and fast rule can be laid down in respect of this point, but it might be said that an indirectly-heated valve rectifier offers many advantages when comparatively high voltages are being dealt with, and these were pointed out in a recent article entitled "Important Points about Valve Rectifiers."

In any case, the rectifier should be chosen according to the maximum voltage and current required. At this juncture it might be pointed out that all rectifiers give a voltage in excess of their nominal rating when supplying a current lower than the maximum for which they are designed. The actual output voltages for various current "loads" can always be obtained from the "regulation curves" to be found on the makers' literature accompanying the rectifiers themselves. An example of one set of these curves—in this case it applies to a class A valve rectifier—is given in Fig. 2. This valve is nominally rated to give 250 volts at 60 milliamps when fed from a transformer giving an output of 250—0—250 volts (250 volts to each of the two anodes), but it can be seen that the output voltage is 330 when the "load" is only 10 milliamps, and even more than this at still lower currents. Another interesting point is explained by this curve, which is that the valve will give an output of 180 volts at 20 milliamps when supplied with only 150 volts from the transformer. Thus it is easily possible to obtain almost any required output by choosing the rectifier and transformer to work together. This point will more readily be appreciated if the reader will examine the curves printed in the instruction books issued by the various makers of rectifiers.

We started by referring to the mains transformer, this being the first "link" in the mains unit "chain," but it will now be appreciated that its specification can only be determined after first studying the other sections of the complete outfit. When the transformer is for use with a full-wave valve rectifier (and this type is always to be preferred) it must have an H.T. secondary winding which will give the voltage rating of the valve on both sides of a centre tapping, and it must be capable of supplying that voltage at the maximum current rating of the valve. In the case of a metal rectifier connected on the "voltage-doubler" principle (this arrangement also is nearly always to be recommended) the transformer requires to have only a single (not centre-tapped) secondary which should supply a voltage equal to about two-thirds of the rectifier's rated output and at a current of some three times that at which the rectifier is rated. These figures are only approximate and the makers' recommendations should always be followed implicitly.

The Smoothing Condensers

The only other point which remains to be dealt with is that of the smoothing condensers. In the case of valve rectifiers it is usually sufficient to connect one between each end of the smoothing choke and the H.T. negative lead. It should also be stressed that the condenser on the "rectifier" side of the choke has a good deal of effect upon the maximum rectifier output; increasing its value tends to increase the voltage output, whilst reducing it produces the opposite effect. As a matter of fact, a 4 mfd. condenser is in nearly every case assumed by the makers in stating the output of any particular rectifier.

A similar position occurs in regard to metal rectifiers, but with these, two condensers are used "before" the choke when the rectifier is wired as a "voltage-doubler." Both condensers should usually have a capacity of not less than 4 mfd., and the actual voltage obtained depends upon this. The condenser used "after" the choke is purely for smoothing and is the same as for a valve rectifier. All condensers used in any type of mains unit should have a rated working voltage of not less than twice that actually delivered by the unit, and it is generally better to "play safe" by choosing a "working" voltage of three times that of the output. This ruling is not so important in the case of the "voltage-doubling" condensers because these are wired in series across the output; each may therefore be rated at a voltage not less than one-and-a-half times the rectifier output.

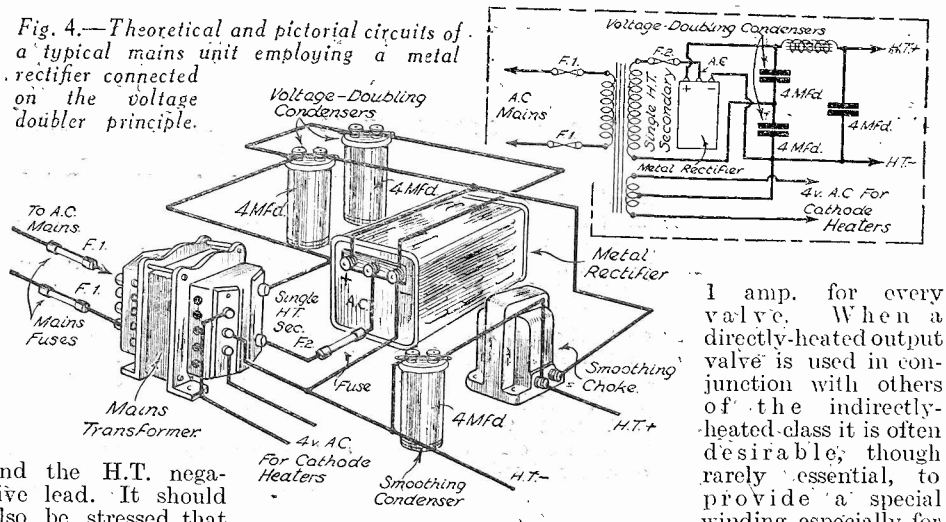


Fig. 4.—Theoretical and pictorial circuits of a typical mains unit employing a metal rectifier connected on the voltage doubler principle.

Two Typical Circuit Arrangements

By way of consolidating the above remarks two typical circuits of mains units are given in Figs. 3 and 4. The first is for a unit employing a full-wave valve rectifier, and the second shows a metal rectifier connected as a "voltage-doubler." The circuits given apply to units for any output, provided that the various components are chosen according to the rules laid down above.

It will be seen that, in both circuits, fuses are used rather liberally in order to avoid possible damage in the event of the failure of any component. With practically any type of unit the fuses marked F.1 should be rated at about 1 amp., whilst F.2 should have a rating equal to about four times the output of the rectifier.

Low-tension Windings

We have not yet given any thought to the matter of L.T. windings on the mains transformer, but these are naturally dependent entirely upon the set with which the unit is to be used. With indirectly-heated valves one secondary should be provided to supply 4 volts at a current of 1 amp. for every valve. When a directly-heated output valve is used in conjunction with others of the indirectly-heated class it is often desirable, though rarely essential, to provide a special winding especially for it. Also, in the case of a valve rectifier, another winding is required to heat its cathode, and it should supply a maximum of 1.5 or 2.5 amps. respectively, at 4 volts, for a class A or class B rectifier; the latter figure also applies to class C rectifiers. In every case there is no harm in using an L.T. winding having a maximum output greater than that actually required, so long as the transformer is a good one of massive design, but it is distinctly unwise to attempt to obtain a greater output than that for which the transformer was designed.

MAKING THE POCKET PORTABLE

(Continued from page 1130)

the remaining filament terminal on the valve-holder and the wire running from the earth side (moving vanes) of the two .0005 mfd. condensers to this same black socket. Fix to the black banana plug two pieces of flex; to one attach a small black H.T. plug and to the other a crocodile clip.

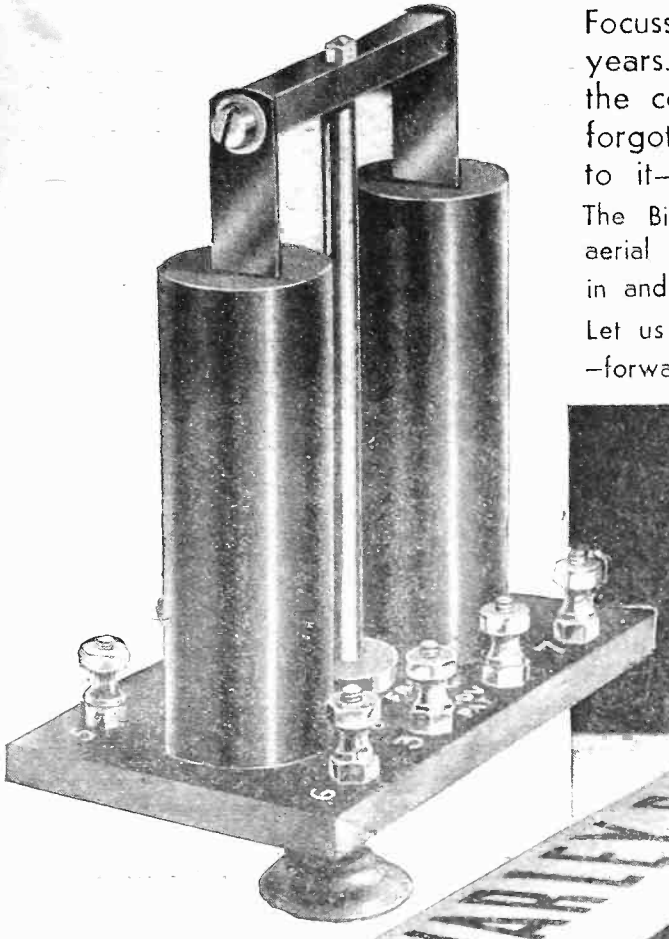
Testing Out

The set is now completely wired up and to test out place the small accumulator in the space left (a piece of wood screwed to the lid close enough to the accumulator will hold this from moving about); join the positive and negative spades to it. Attach to the aerial one of the red banana plugs, and to the other connect some flex. The black plug is put in the negative socket of the H.T. battery and the crocodile clip to an earth wire.

Plug in the aerial and 'phone jack and listen. If on turning the tuning knob nothing is heard, increase the reaction and you will soon pick up the Regional. Now take the aerial plug out of its present socket and replace it into the one with the .0001 series condenser in circuit. On returning, Fécamp and the London National should come in quite well, also with a good outdoor aerial other foreign stations. Drop the H.T. voltage to 40 volts if the reaction is too fierce. Withdrawing the 'phone plug automatically cuts off the L.T. and H.T.

With a good one-valve amplifier and extra H.T. the set works a speaker and occupies very little room.

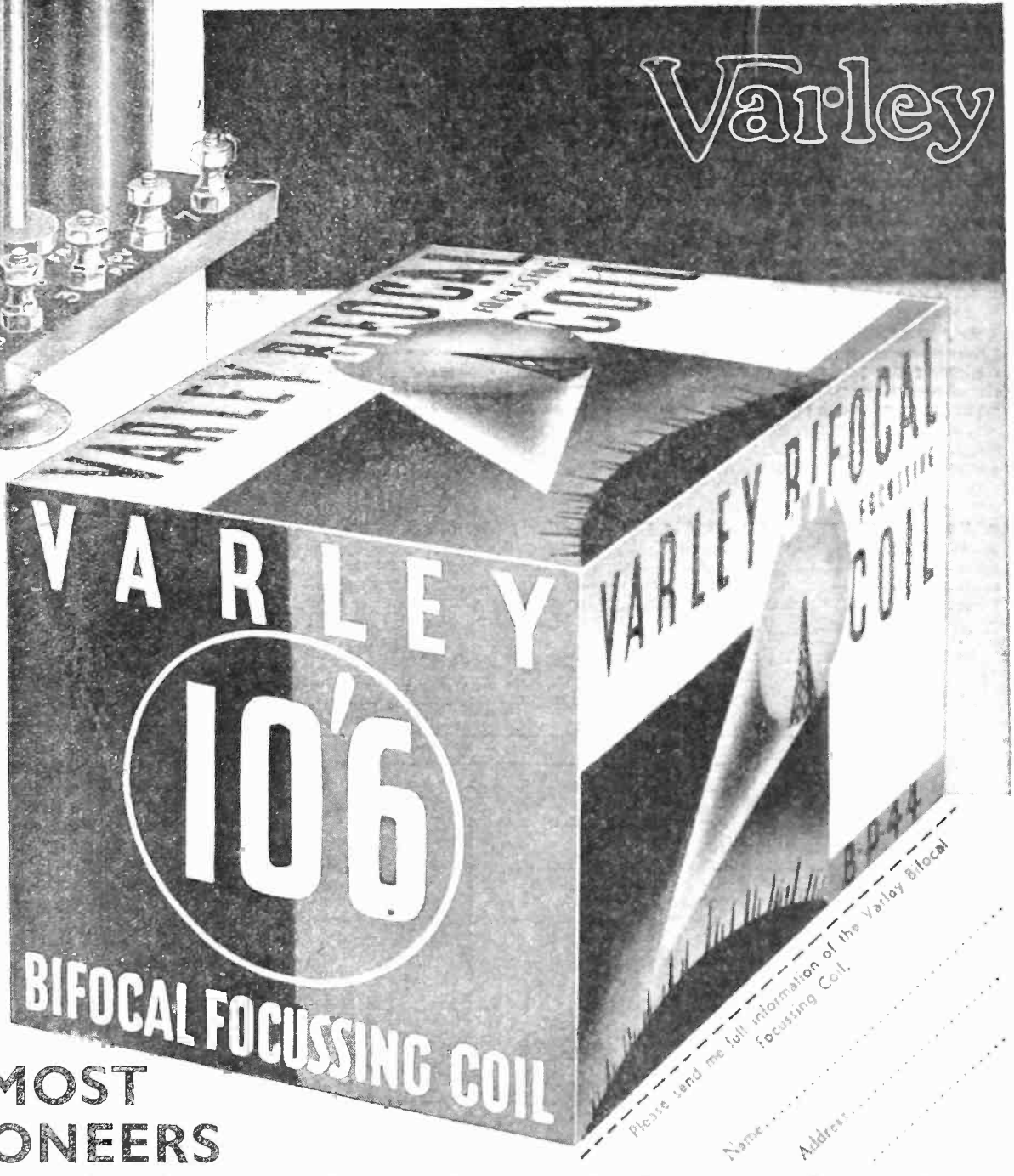
AND NOW BIFOCAL FOCUSSING COILS



Focussed Radio—the most momentous development for years. The formidable possibility of station re-shuffling—the congestion and chaos of the ether—all this may be forgotten! Choose your programme—focus it!—then *listen* to it—to the complete exclusion of all others.

The Bifocal Focussing Coil—a tuning device whereby the optimum aerial coupling can be selected by simply pulling a knob in and out—without altering the setting of the reaction control.

Let us send you further information of this remarkable component—forward the coupon to-day.



All Constructors of the Bifocal Three confining themselves to the specified Components will be guaranteed the results claimed for this wonderful Set.

Please send me full information of the Varley Bifocal Focussing Coil.

Name.....

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FOREMOST AS PIONEERS

Advertisement of Oliver Pell Control Ltd., Kingsway House, 103, Kingsway, London, W.C.2. *Telephone Hol. 5303.*

OUR READERS AND THE RADIO THE LEADER

The New Set that Introduces a New Policy which is Being Acclaimed by

OUR post-bag has already shown that readers throughout the country are as delighted with the "Leader Three" as they are with our new policy which it symbolizes. As we have already explained, the "Leader" is the first of a new series of "Practical Wireless" receivers which will specifically be designed with the idea of low initial and running costs very clearly in mind. It is our firm belief that the recent slight falling-off in the home construction of receivers is entirely due to the fact that so many sets have been described which are good, but fairly expensive, especially when considered in conjunction with the remarkably low prices which now prevail for complete and ready-made receivers on the market.

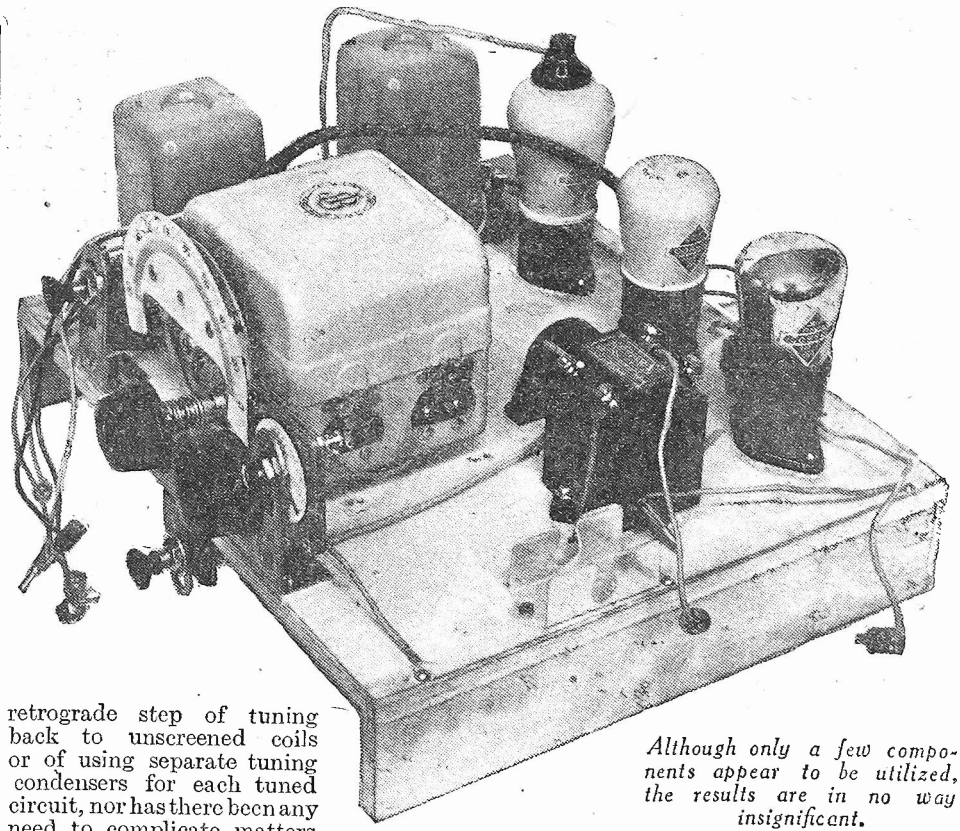
Not a "Stunt" Set

There has never been any doubt that the home-constructed receiver possesses innumerable advantages over the factory-produced one, but, even so, there are many amateurs to whom the question of price must come first and foremost. **It is to these amateurs that the "Leader" and nearly all future "Practical Wireless" receivers will appeal very strongly.** In designing the present receiver we made a definite and successful attempt to produce an instrument which could not only be made more cheaply than ready-made ones of similar type, but which would also be entirely modern and lacking in none of the refinements demanded by the up-to-date constructor. **The "Leader" is not a "stunt" set made to introduce some new component or "gadget," but is a really practicable receiver,** designed around standard components suitable for the keen experimenter and the ordinary listener alike.

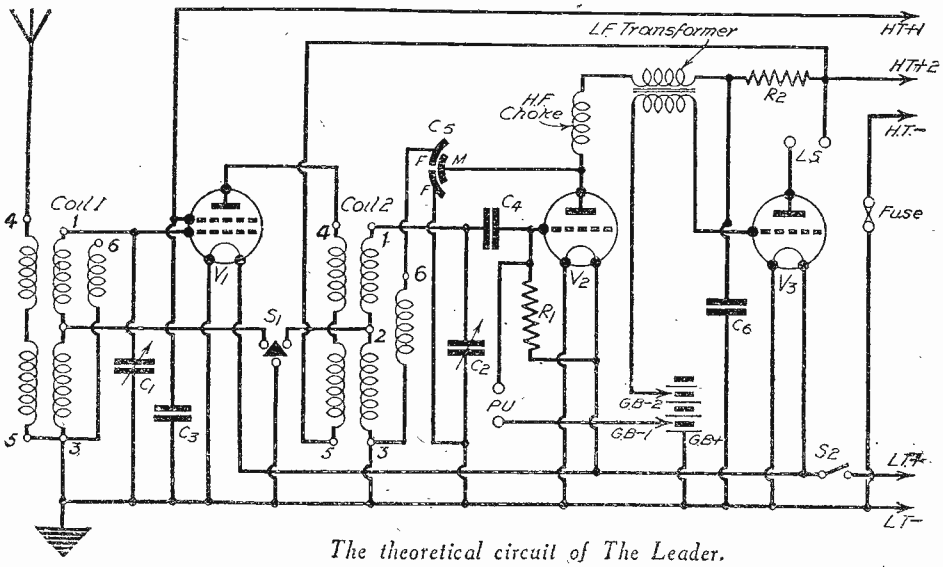
Nothing Sacrificed Except Cost

In other words, nothing of importance has been sacrificed in order to achieve low price.

It has not been necessary to take the retrograde step of tuning back to unscreened coils or of using separate tuning condensers for each tuned circuit, nor has there been any need to complicate matters by fitting a multiplicity of unnecessary control knobs. On the contrary, the "Leader" employs a really modern screened two-gang condenser (with separate trimmers, so that the maximum degree of sensitivity can be secured under all conditions of use) in conjunction with a pair of eminently up-to-date screened coils specifically designed to cover the new range of wavelengths as prescribed under the Lucerne Plan. Controls have been reduced to the minimum compatible with maximum efficiency and the set is built on a metallized chassis, so that it is in keeping with the most modern methods of construction. It has been claimed in some quarters that the constructor and experimenter does not like a receiver with few and simple controls. We do not agree with this point of view, nor do our readers from whom we are pleased to hear so often. So long as all the essential controls are provided we can see no valid reason why anyone should wish for more; the idea of using many knobs is generally dictated by a feeling of snobbishness and not by actual requirements.



Although only a few components appear to be utilized, the results are in no way insignificant.



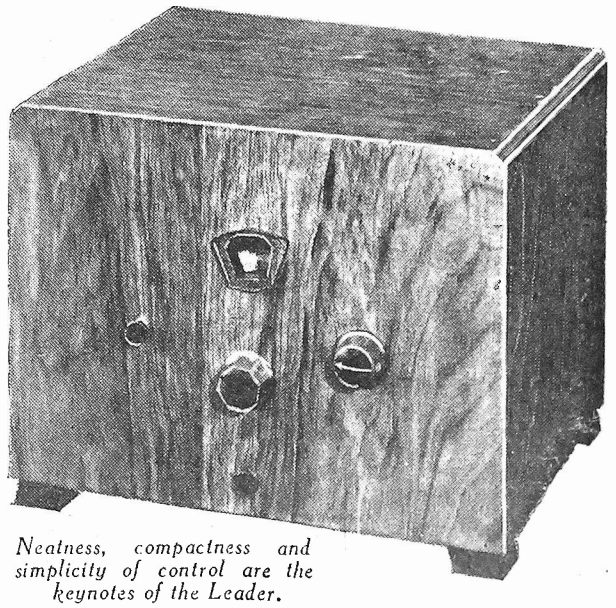
The theoretical circuit of The Leader.

Up-to-date Appearance

In addition to the above-mentioned features, we would add that the "Leader" is quite as up to date in its appearance as in its performance. This is largely accounted for by the fact that one of the latest designs in cabinet work has been adopted. The Peto-Scott cabinet which is illustrated *looks* like the "1934 model" which the set is. We might have saved a few shillings more by employing an old-fashioned cabinet and by dispensing with many other of the important features outlined above. **But that is not our idea of presenting "Practical Wireless" readers with a low-priced set. We prefer to consider quality and efficiency first, and we leave the matter of low cost to careful and skilful design—*not* to a "skimping" of price on a few components.**

INDUSTRY SUPPORT US IN PRESENTING THREE

Readers and Component Manufacturers Alike!



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

A Bold Policy

Readers will appreciate the importance and far-reaching influence of our new policy and will fully realize the boldness of it. At the same time, however, they will clearly understand that it is entirely in their interests. **We believe that we hold our readers' confidence and we feel sure that every home-constructor in the country will give us his support in furthering the interests of a policy which will represent to him a considerable saving of hard cash. Already we have received numerous letters of congratulation from all over the country; these have been not only from amateur constructors, but also from important representatives of the wireless trade who are just as interested in the constructor movement as we are ourselves.** We tender our thanks to all those who have expressed their appreciation of our efforts.

Simplicity of Construction

An important point in regard to the "Leader" which has not been stressed unduly is the extreme simplicity of its construction. The set can very easily be built by any person who is entirely new to wireless and who has probably never undertaken the construction of a receiver before. The full-size blue print which was given free with last week's issue shows how few wires there are and indicates the simplicity of lay-out. The arrangement is so "clean" and simple that no one could possibly feel afraid of tackling the construction. Added to this, however, is the backing of the entirely unique and valuable PRACTICAL WIRELESS FREE GUARANTEE.

That guarantee is the home constructor's surest safeguard, for it ensures that every builder of a PRACTICAL WIRELESS receiver, should he experience the slightest difficulty, is entitled to free and prompt advice. The only reservation is that the set is built around the identical components specified.

Simplicity of Control

After the receiver has been connected up, with the H.T.1 battery plug inserted into the H.T. battery at a voltage of about 60, and the H.T. 2 tapping at maximum volts (120 to 150), the lower knob on the cabinet front is pulled out and the left-hand knob pulled out if it is desired to listen to the Long Waves, and pushed in for the Medium Waves. The central control is then rotated until a station is heard, when the trimmer on the section furthest from the panel is adjusted to provide maximum results. It is then only necessary to rotate the tuning control to select the desired station. Should signals be weak, due to distance or low power, the reaction control (right-hand) is employed to build them up. The receiver is so simple that it may be handled by the youngest member of the household, and maximum results are always obtainable. Where it is desired to experiment a little, in order to ensure that every ounce is being obtained from the receiver, the battery lead H.T.1 may be moved about in the H.T. battery to find a voltage which gives maximum amplification from the S.G. valve, combined with perfect stability. This will be found to be somewhere between 55 and 70 volts, but it will generally be found that 60 volts will give satisfactory results with the majority of valves.

NOTABLE "LEADER" FEATURES

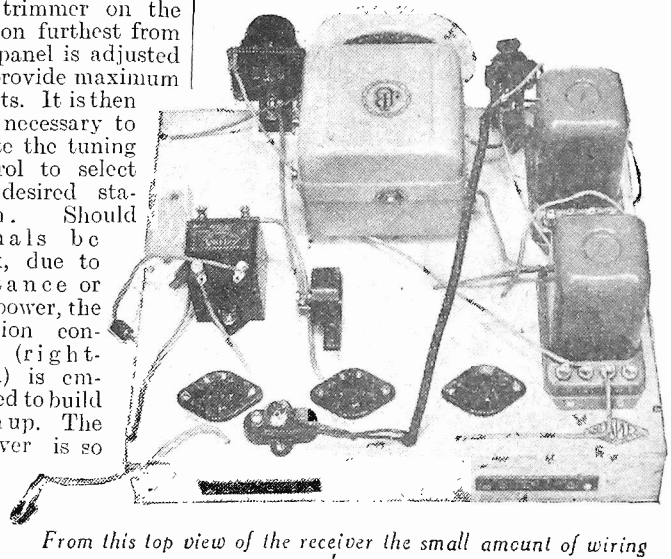
THE LATEST COILS FOR THE NEW "LUCERNE" WAVE-LENGTHS
AN EFFICIENT SCREEN-GRID STAGE FOR DISTANT RECEPTION
TUNED-TRANSFORMER H.F. COUPLING FOR MAXIMUM SELECTIVITY
SELECTIVITY *IN EXCELSIS*
AMPLE VOLUME FOR HOME RECEPTION
METALLIZED CHASSIS CONSTRUCTION
REMARKABLY EASY TO BUILD
EQUALLY GOOD ON "RADIO" OR "GRAMOPHONE"
COSTS ONLY SIXTY SHILLINGS FOR THE PARTS
THE MOST POPULAR CIRCUIT ARRANGEMENT
GANGED TUNING CONTROL FOR EASE OF OPERATION
THE IDEAL SET FOR EVERY CONSTRUCTOR

The Components

Before completing these notes we must thank the component industry for giving their whole-hearted support to this new policy, and especially Messrs. Wright and Weaire, the designers and makers of the coils; Messrs. Jackson Bros., designers and makers of the Nugang condenser; Messrs. Varley, Graham Farish, Dubilier, Bulgin, Belling-Lee, Peto-Scott, W. B. Electrical, Clix, Lissen, and Cossor.

Use these parts for The LEADER and so make certain of excellent results.

One "Metaplex" Chassis, 12in. by 10in. with 1¾ in. runners (Peto-Scott).
One Double-Gang Condenser, "Nugang" Type A. .0005 mfd. (C1 and C2) (Jackson Bros.).
Two "Universal" Screened Coils (Wearite).
One .00015 mfd. Differential Reaction Condenser (C5) (Graham Farish).
One "Niclet" 5 : 1 L.F. Transformer (Varley).
Three Chassis Mounting Valve Holders (W.B.).
One "Snap" H.F. Choke (Graham Farish).
One 20,000 ohm 1 watt Electronic Resistance (R2) (Varley).
One 2 meg. 1 watt Electronic Grid Leak (R1) (Varley).
One .2 mfd. Tubular Fixed Condenser (C6) (Graham Farish).
One 1 mfd. Fixed Condenser, Type 9200/B.S. (C3) (Dubilier).
One .0002 mfd. Fixed Condenser, Type 665 (C4) (Dubilier).
Two Terminal Socket Strips; one marked "A" and "E," the other "L.S." and "P.U." (Clix).
Six Solid Plugs (for use with terminal strips) (Clix).
One Grid Bias Battery Clip Type No. 2 (Bulgin).
One Fuse Holder and Fuse Bulb, Type F.5 (Bulgin).
Two "Junior" On-off Switches, Type S.38 (Bulgin).
One 5-way Battery Cord, fitted with wander plugs marked "H.T.—" "H.T.+2," and "H.T.+1" and spade terminals marked "L.T.+" and "L.T.—" (Belling-Lee).
Three Component Brackets (two long and one short) (British Radiogram).
Three Valves: one S.G.215; one 210 Det., and one 215 P. (Cossor).
One High-Tension Battery (Lissen).
One 9-volt G.B. Battery (Lissen).
One 2-volt Accumulator (Lissen).
One Cabinet (Peto-Scott).



From this top view of the receiver the small amount of wiring may be seen.

SOME REMOTE

It is Often Useful to be Able to Control the Receiver from Some Distant

Suggestions for Doing So

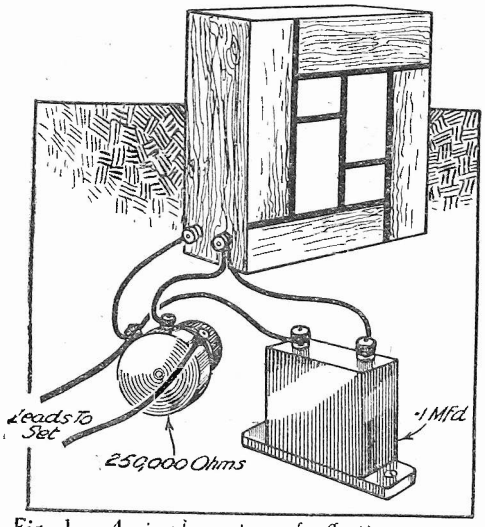


Fig. 1.—A simple system of effecting remote control of volume.

MOST set users and experimenters at some time or other wish to listen to a loud-speaker which is situated at some distance from the receiver, and whilst there is not the slightest difficulty in doing this, it is very trying to be unable to alter the volume or tone, switch off, or change over to another programme without leaving the speaker and going to the set itself. There has been at least one ingenious remote-control unit invented by means of which all the controls of the receiver itself were duplicated on a small panel which could be placed at any convenient place, and at any distance from the set, but the cost of this was far higher than that of the average modern mains-operated superhet. Obviously, such a unit, although extremely desirable in many ways, has little or no appeal to the average amateur, and in consequence, he must consider other ways out of the difficulty. It is therefore proposed in this article to make a number of practical suggestions, many of which have actually been used in some form or other by the writer, in order that the experimenter may try to, very probably, improve upon them.

Remote Volume-control

The control which is most frequently required, once the set has been tuned to the desired programme, is that which enables the volume to be varied according to the particular item being broadcast. Fortunately, it is a perfectly simple matter to provide such a control and to fit it to the loud-speaker so that it can conveniently be operated from one's armchair. The simplest arrangement, and one which can be applied to any set, consists of a potentiometer connected across the loud-speaker terminals as shown in Fig. 1. The value of the potentiometer should be about 250,000 ohms, although a lower resistance (down to 100,000 ohms or so) is sometimes rather better. This component should preferably be of the non-wire-wound type and perfectly "silent." It can be attached to the side of the speaker cabinet or, where permanent extension wires and wall-plugs are fitted, it might be mounted on a switch box fitted to the wall near the "point." There is a little "snag," which sometimes creeps in when using a potentiometer device as described, which is that the tone of reproduction is varied at the same time as the volume. This can easily be overcome, however, by connecting a .1 mfd. fixed condenser between the "dead" end of the potentiometer and the slider; this, also, is shown in Fig. 1.

When Using a Variable-mu Valve

When a set is in use which incorporates a variable-mu valve an even better, though slightly more complicated idea, can be employed. The arrangement in respect of a battery set is shown in Fig. 2, where it will be seen that the variable-mu potentiometer is removed from the set and mounted near the speaker. Three long flexible leads are used to connect it, and these should, preferably, be screened and the screening braid earth-connected. Also, in order to prevent any possible instability due to the long connections, a decoupling resistance of some 50,000 ohms is inserted between the slider of the potentiometer and the lower end of the tuning coil.

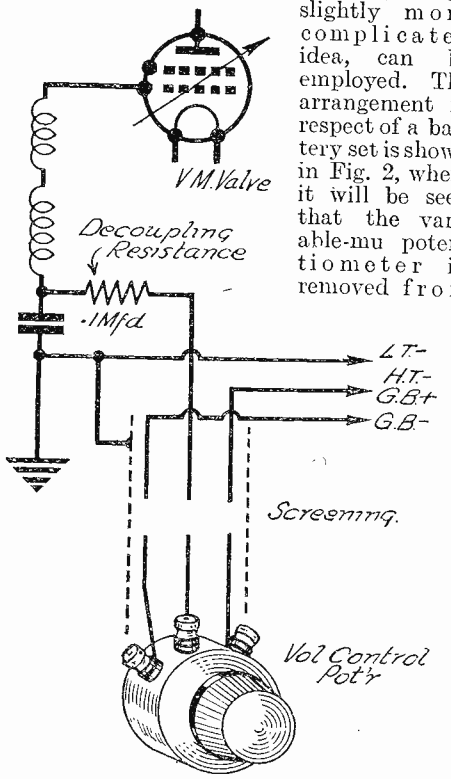


Fig. 2.—Remote volume control is easily arranged in the case of a set having a variable-mu amplifier. The connections shown above refer to a battery-operated set.

When a mains-operated V.-M. set is employed the connections are simpler still, since it is only necessary to take two long leads to the variable resistance normally employed to effect a variation in G.B. voltage, the resistance being fixed at any convenient point. Here again it is desirable, though not always necessary, to screen the extension leads. The general circuit arrangement is outlined in Fig. 3.

In both of the latter systems, there is some danger of upsetting the normal stability of the receiver, but in most cases any such tendency can be overcome by the insertion of extra decoupling resistances in the grid circuits of the V.-M. valves.

Remote Tone Control

A tone control is a useful fitting on nearly every kind of receiver, and a fairly effective one can be provided by connecting a variable resistance (about 25,000 ohms maximum), in series with a fixed condenser of .01 mfd. or .02 mfd.—depending upon whether the output valve is a triode or a pentode — between the two loud-speaker terminals. The connections referred to are clearly shown in Fig. 4, and it need scarcely be mentioned that the variable resistance may conveniently be mounted on the inside of the speaker cabinet, with the knob projecting through the side or back.

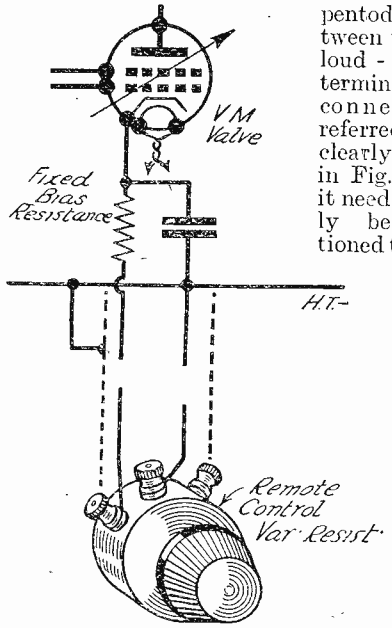


Fig. 3.—This skeleton circuit shows how remote volume control can simply be effected in the case of a mains set having a variable-mu amplifier.

A Useful Unit

Many readers will consider it a good idea to make a complete tone-control-

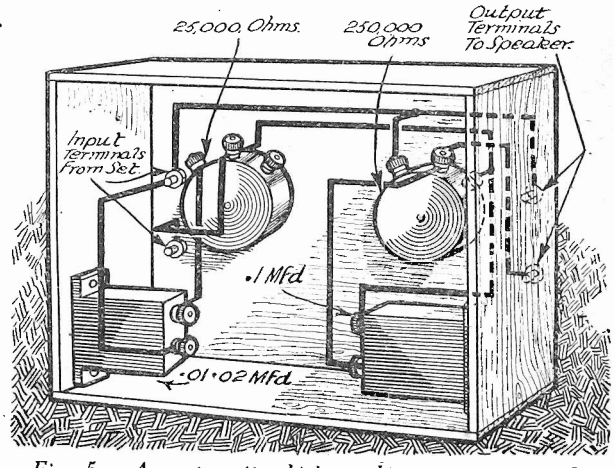


Fig. 5.—A neat unit which combines a tone control and volume control. The unit is connected between the receiver and speaker.

CONTROL IDEAS

Point, and the Writer Here Makes a Number of Useful and Practical

By FRANK PRESTON

plus-volume-control unit for attachment to the loudspeaker, and Fig 5 gives the necessary constructional details. It should be pointed out that the potentiometer used for volume-control should be of the "graded" type so that a smooth variation will be obtained over the complete range of movement of the knob; the connections given in Figs. 1, 2, 3, and 5 apply to a component of this type. The unit illustrated can be made up on a "chassis" of any convenient size according to the position in which it is to be fitted.

Remote Switching

The problem of switching the set on and off from a distance is rather more difficult than those of tone and volume control, which have already been dealt with. At least, that is true in respect of battery-operated sets, although the switching of a mains set can be accomplished very easily, simply by wiring the set to a mains plug in the same room as the speaker.

On first thought it might be considered that a similar arrangement could be employed for a battery set by taking a long wire from one accumulator terminal to one side of a remote switch, and connecting the other switch terminal to the L.T. terminal on the set by means of a second length of wire. This is impracticable, however, unless the length of the flex is only a few yards, because the resistance of the wire would otherwise be so great as to prevent the application of the correct filament voltage to the valves in the receiver. Even when the extension leads are only, say, five yards or so in length, it is well to use really stout mains flex or even vulcanized-rubber cable in order to ensure the minimum voltage drop along it.

A Switching Relay

A considerably better plan is to make use of a relay which can be mounted near the set and operated by means of a push switch. There are, or at least there were until recently, one or two suitable relays on the market, these generally being described as remote control switches. The experimenter will, however, prefer to make his own, and the main practical details are given in Fig. 6. It will be seen that a pair of electro-magnets (these may be taken from an old electric bell) are made use of, and they are mounted on an upright board attached to another horizontal board. Near the magnets is mounted an "L"-shaped strip of springy brass, riveted to which is a strip of soft iron, this forming an armature. The end of the horizontal arm of the brass is formed into a kind of hook and this bears on the teeth of a wheel (which is fitted with a pawl) attached near one end of a screwed-brass-rod spindle. The spindle also carries a wooden drum or bobbin with round-head brass wood screws fixed at equal distances round the circumference. Each of the screws is connected by means of a short length of thin wire to the spindle, which, in turn, makes contact with a brass spring bearing against it. Yet another contact spring is made from springy brass strip, and this is arranged to touch the heads of the screws in the drum. It is scarcely necessary to supply all the constructional details, since those readers who wish to make up the relay will no doubt have sufficient mechanical experience to work out the dimensions, etc., to suit odd parts which are on hand. It will suffice to describe briefly how the device works.

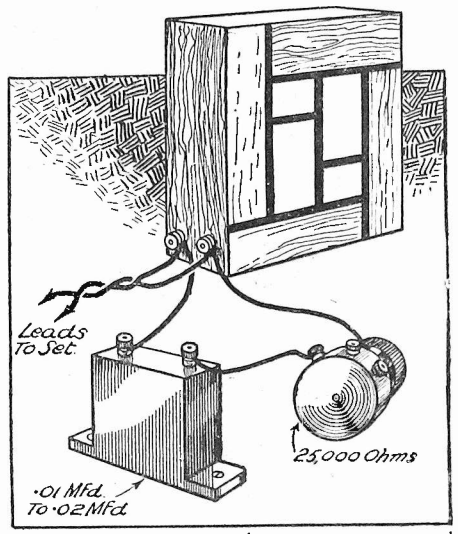


Fig. 4.—A simple and effective remote-control for varying the tone of reproduction. The .01 mfd condenser is not always necessary, but is generally desirable.

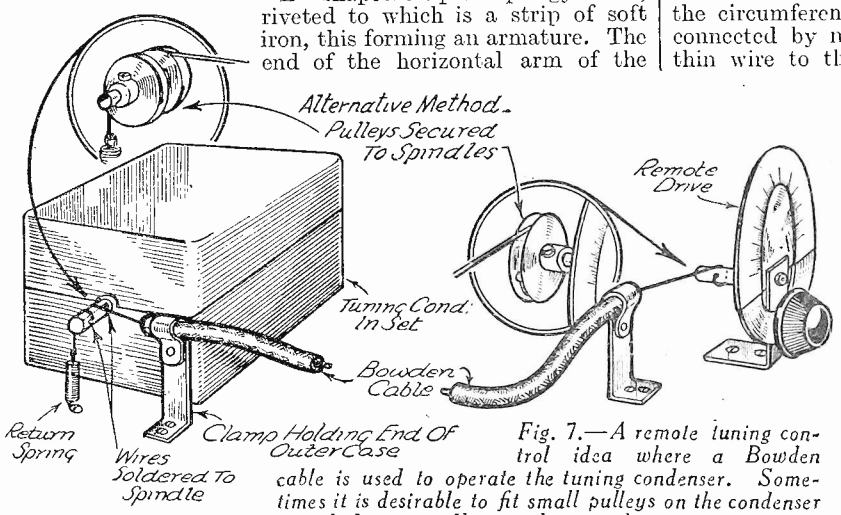


Fig. 7.—A remote tuning control idea where a Bowden cable is used to operate the tuning condenser. Sometimes it is desirable to fit small pulleys on the condenser and drive spindles to obtain a better movement.

In the first place, it should be said that the relay simply replaces the normal on-off switch fitted to the set. When the bell push is depressed current flows from the small dry battery through the windings of the electro-magnets, so causing them to draw the armature towards them. In moving, the armature drives round the toothed wheel and rotates the drum, thus causing the spring contact either to "make" or "break" contact with one of the round-head screws—contact will be "made" on the first depression, "broken" on the second, and so on. Thus, the set can be switched on or switched off simply by operating the push switch.

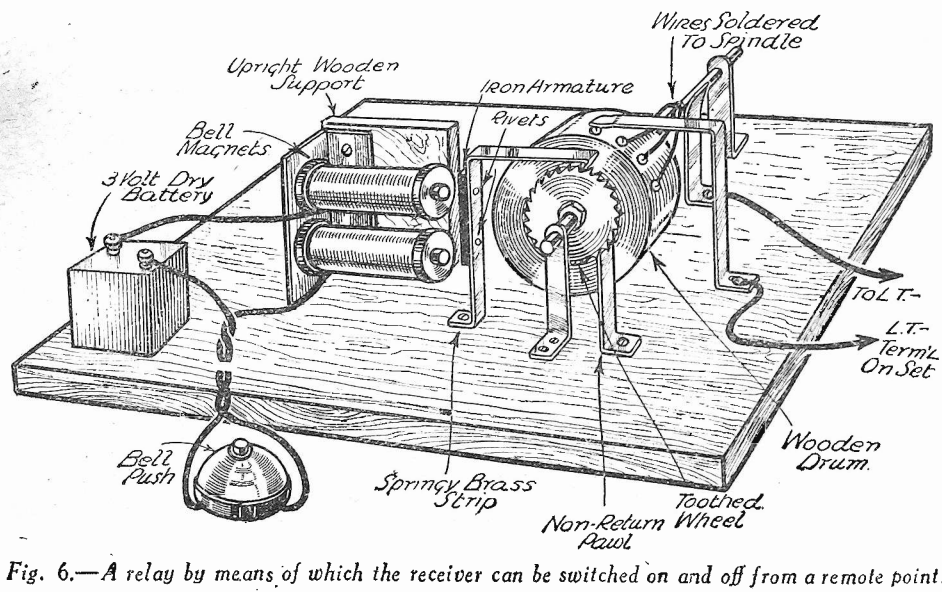


Fig. 6.—A relay by means of which the receiver can be switched on and off from a remote point.

Remote Tuning

There are no very simple methods of tuning the set to different stations from a remote point, although there are some devices which will exercise the ingenuity of the experimenter and which are well worth trying. One is illustrated in Fig. 7, where a length of Bowden cable of the kind used for motor-cycle and cycle brakes, is made use of. The outer casing is securely anchored at each end and the inner wire is attached to the tuning condenser spindle at one end and to a "duplicate" spindle, fixed to a condenser drive at the other. It will be seen that as the "duplicate" or "remote" control spindle

is rotated the condenser spindle is also made to turn. This is quite all right when rotating the spindle in one direction, but the cable does not allow a reversal of direction to be effected. A "return" spring is, therefore,

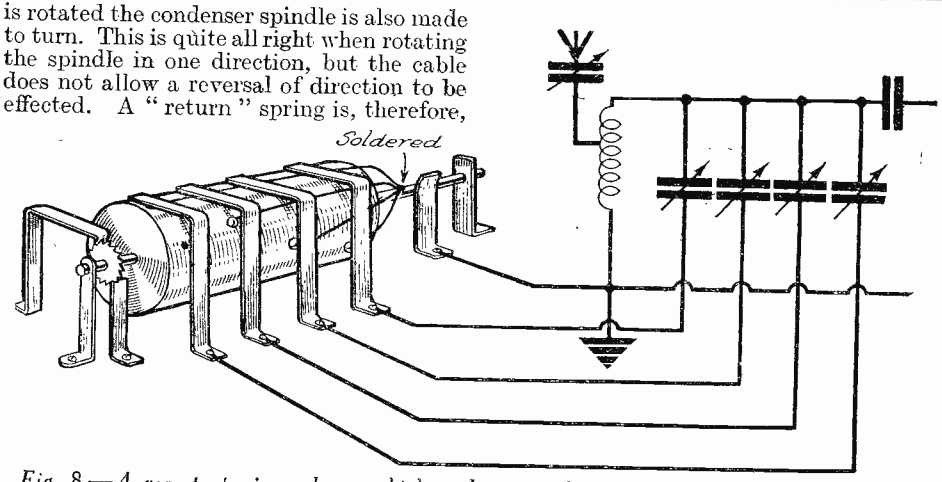


Fig. 8.—A remote tuning scheme which makes use of a relay similar to that shown in Fig. 6. This works in conjunction with a number of pre-set condensers.

mounted near the condenser, and this is attached to a short length of flexible steel wire wound once round the spindle. The whole secret in setting this arrangement into successful operation is to proportion the tension exerted by the spring and the friction of the remote drive assembly so that smooth working is obtained; this *can* be done, as I have proved in practice, but a little patience is called for.

To avoid spoiling the stability of the receiver the control cable should be effectively earth-connected—preferably at both ends.

Another remote tuning-control idea consists of using a relay similar to that shown in Fig. 6 in conjunction with a number of pre-set condensers which replace the usual variable tuning condenser. In this case the wooden drum should have screws arranged in spiral fashion, as shown in Fig. 8. The screws are all connected to the spindle and a number of spring contact arms (the actual number depends upon the number of pre-sets to be used) are arranged side-by-side to touch the screws at certain points of rotation of the drum. Each contact arm is connected to one pre-set as shown, so that each condenser in turn is connected in parallel with the tuning coil. It will be understood that the condensers must first of all be adjusted so that each one enables the coil to tune to a particular station. After that the change can be made from one station to another by pressing the plunger of the bell-push. One objection to this scheme is that one must always pass from one station to another in a definite and pre-arranged sequence, but this only means that in order to receive, say, London Regional, the plunger must be depressed three times when the set is tuned to Fécamp, or that it must be depressed perhaps twice to receive London National.

It is possible to combine the ideas represented by Figs. 6 and 8 by using a single relay and two sets of contacts; in that case the set would be switched off between each programme. The scheme is worth a trial, anyway, if you are mechanically inclined. The arrangement would obviously be somewhat complicated, but it lends itself to much interesting experiment.

A.V.C. at the B.B.C.

Novel ideas on automatic volume control have been devised by the Research Engineers of the Clapham Branch of the B.B.C., and this article, by A. Ashton Stewart, explains how A.V.C. is used on the short-wave super-hets. used for transatlantic relaying.

RECENT transatlantic relays done by the B.B.C. have been so successful that outside listeners have often thought that reception was being done with the Post Office super-hets. at Baldock!

Automatic volume control is used on the seven-stage Post Office sets, and the now-successful B.B.C. short-wave reception is largely the result of automatic gain control as applied to the experimental relaying set. B.B.C. engineers have tried a number of super-hets. for short-wave relaying, but at the end of last year it was felt that the time had come to fit up a really modern short-wave super-het. rack. Moreover, the introduction of new valves for variable-mu high-frequency working, and the popularity of diode detection and of automatic volume control, meant that the new short-wave super-het., when built up, would not be so very different from a really first-rate amateur home-built receiver. It is interesting to study the lay-out of this super-het. as being typical of the way in which automatic volume control is applied to B.B.C. apparatus.

The Receiver Employed

The receiver has a variable-mu stage preceding the first detector, which is of the ordinary triode type. The automatic volume control feeds back into the grid circuit of the variable-mu valve. A separate oscillator, tuned by a .00015 mfd. condenser, is transformer-coupled back into the grid circuit of the first detector. There are two transformer-coupled intermediate frequency stages and a diode second detector.

Diode Second Detector

Now we come to the automatic volume control section of the circuit. After initial experiments with quiescent automatic control it was decided not to use this system, and what is really a much more effective arrangement has been adopted. As a diode is used in the second detector position of the super-het. a separate valve is used for the automatic gain control. It feeds back a variable bias to the grid of the first H.F. valve, as already stated, and, in addition, it feeds back to the first valve in the I.F. stage. The automatic volume control valve itself is coupled to the second I.F. stage, which feeds the diode detector. The control valve is not fed from the same high-tension supply as that which feeds the super-het.; it has its own 120-volt battery. The control valve works as an anode-bend detector, and the setting of the detection point is controlled by a 1,000-ohm potentiometer.

The A.V.C. System

The automatic volume control arrangement is really very simple. The grid bias potentiometer is arranged so that the valve is fairly heavily over-biased in the negative direction. This means that there is no anode current flowing, and as the anode of this automatic volume control valve is connected through a leak to earth, it is virtually at earth potential. It must be remembered that this is only possible because of the entirely separate high-tension supply for the automatic gain control valve.

If the signal voltage increases above a certain amount (this depends, of course, upon the exact setting of the 1,000-ohm potentiometer), a small amount of anode current flows. This, owing to the unusual system of connections, means that the anode of the automatic gain control valve is negative so far as the super-het's earth connection is concerned. This bias is carried back through a suitable decoupling circuit to the grids of the first H.F. valve and the first valve in the intermediate frequency stage.

Manual Control

As a matter of fact, there is a two-pole switch which shifts this bias back on to the grids of the high-frequency and first I.F. valves, while in the other position it enables the hand-controlled potentiometer to be used. This helps the engineers when they are tuning in.

The B.B.C.'s automatic volume control system, it must be realized, is not for the purpose of giving even volume of all stations all round the dial (as is the case with ordinary receivers), but for maintaining an even signal on, say, the transatlantic transmissions, and to counteract fading. The American transmitters are tuned in with the additional 10,000-ohms potentiometer used as a hand volume control. The 1,000-ohms automatic volume control potentiometer is then adjusted so that the set gives the correct gain figure; the separate automatic volume control valve then counteracts all normal fading.

Component Values

A few values of the components used in the super-het. and automatic volume control systems may be of interest to home constructors. It should be noted that the automatic volume control valve, as well as most of the super-het. stage valves, is of the indirectly-heated mains type. The first detector and separate oscillator valves are of the ordinary battery type.

600 Kilocycles I.F.

So far as the super-het. is concerned, it should be noted that the minimum frequency at which the intermediate frequency stages are set to operate is usually 600-kilocycles. This cuts out second-channel interference, a bugbear of short-wave super-het. operation, to a large extent. The intermediate-frequency stages, however, are tuned by separate .0005-microfarad condensers, so that if there

(*Continued on page 1145*)

THE EASY ROAD TO RADIO

THE BEGINNER'S SUPPLEMENT

USEFUL DATA FOR THE WIRELESS AMATEUR

This Article Shows How by the Use of Some Simple Formulæ and Rules-of-Thumb Much Irksome Calculation connected with Radio May be Avoided

THERE is no doubt that the average constructor and experimenter dislikes his wireless mixed with "maths," and carefully avoids calculations and formulæ whenever possible. For this reason any short cuts for arriving at values of resistances, number of turns on coils, size of condensers, etc., are always welcome. In the following paragraphs are given a number of simple facts and formulæ which every serious constructor should know. They are expressed in a form which can be easily remembered, and so can instantly be applied when needed, thus saving the need for referring to books while in the middle of set building.

Rules Regarding Tuning Circuits

Let us first deal with some elementary facts concerning the aerial circuit. We are all familiar with the use of a condenser connected in series with the aerial and used as a selectivity device as in Fig. 1. Now, variations in the capacity of this condenser not only affect the selectivity of the receiver, but also its sensitivity and its wavelength range. It is worth while remembering that a decrease in the capacity of this condenser means: (1) An *increase* in selectivity; (2) a *decrease* in sensitivity; (3) a *lowering* of the wave-range of the receiver. An increase in its capacity, or its removal from the circuit (aerial joined direct to coil) gives the opposite effect.

If you are designing your own tuning coils much calculation can often be avoided by remembering the simple rule that the wavelength of a coil is very roughly proportional to the number of turns. For instance, if a 60-turn coil tunes the receiver to a wavelength of 300 metres, then a similar coil with three times as many turns, namely, 180 turns, would tune to approximately three times this wavelength, that is to 900 metres. In the case of a short-wave coil the same rule applies; thus, if a 3-turn coil tunes to 20 metres then a coil of 6 turns would tune to 40 metres, and so on.

Length of Wire for a Frame Aerial

If you are building a receiver using a frame aerial there is a very easy method of determining the amount of wire necessary. Naturally, the number of turns varies with the size of the frame, but the *total length of wire* remains fairly constant. Thus the length required for the medium-wave band under the Lucerne plan is approximately 70 ft., while for the long waves a total of about 210ft. is required. This is assuming, of course, that the frame is tuned with the usual .0005 mfd. variable condenser. With a knowledge of the length of wire required it takes but a moment to determine the number of turns for any size frame. For

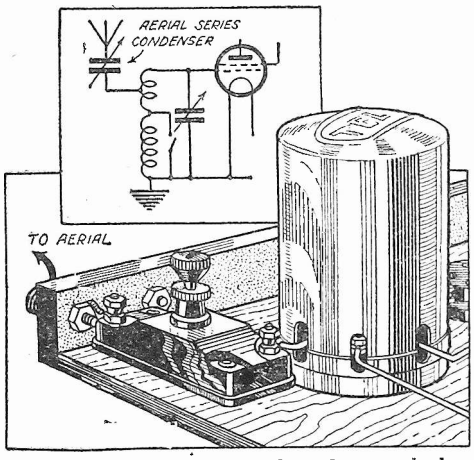


Fig. 1.—The series aerial condenser which is a valuable selectivity device.

example, you may decide on a frame 12in. x 14in. The total length for one turn round the frame is clearly 52in. This length, divided into 70ft. and 210ft. respectively, will give the turns necessary for the two windings, namely 16 and 48 turns.

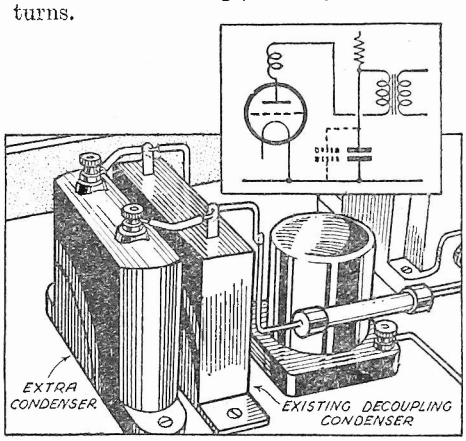


Fig. 2.—Improving the decoupling by increasing the capacity of the by-pass condenser.

Frequency and Wavelength

Nowadays the radiations of broadcasting stations are usually recorded both by their *frequency* and by their *wavelength*. However, it sometimes happens that you may know only the wavelength of a certain station when you wish to know its frequency, or *vice versa*. The key to the conversion lies in the number "300,000." This is worth remembering, for to convert wavelengths into frequency all you have to do is to divide 300,000 by the wavelength, while to convert frequency into wavelength you divide 300,000 by the frequency. *Example:* What is the frequency of a station whose wavelength is 250 metres? *Answer:* $\frac{300,000}{250}$ = 1,200 kilocycles. *Example:* On a receiver calibrated in frequencies a station is received at approximately 950 kilocycles on the tuning scale. What is its wavelength? *Answer:* $\frac{300,000}{950}$ = 315.8 metres.

Selectivity and Number of Tuned Circuits

Regarding the selectivity of a receiver a rough guide is provided by the number of tuned circuits. Thus a receiver with two tuning coils will be more selective than a set with only one similar coil. Similarly, a set with three tuned circuits will be proportionately more selective than one with only two tuned circuits. This is assuming, of course, that similar types of coils are used in each case. For instance, the rule does not always hold good when comparing air-cored coils with iron-cored ones, since the latter are usually more selective.

It does not matter very much what is the position of the tuned circuits. Thus the selectivity of a two-coil set is approximately the same, whether the two tuned circuits are placed both in front of the first valve, as with a band-pass input circuit, or whether one is used as the input circuit and the other as an inter-valve coil.

Another useful point to know regarding selectivity concerns band-pass tuners. If the two coils of a band-pass filter are coupled by means of a condenser, then the tuner will be more selective but less efficient at the short-wave end of the tuning range than at the long-wave end, while the opposite characteristics are manifested when the two coils are inductively coupled.

Transformer Ratios

Turning our attention to the low-frequency stages of the receiver there are one or two useful rules regarding coupling and decoupling.

When an L.F. transformer is used for coupling, the ratio of the transformer is chiefly dependent upon the impedance of the preceding valve. A high-impedance valve should be followed by a low-ratio transformer, and a low-impedance valve by a high-ratio transformer. This rule does not apply in the case of class B amplification.

In determining the values of decoupling condensers and resistances, remember that the higher the resistance which is used the smaller may be the condenser, and *vice versa*. Thus, if sufficient decoupling were provided by the use of a 2 mfd. condenser in conjunction with a 20,000-ohm resistance, then an increase in the value of the resistance to, say, 40,000 ohms would enable a smaller condenser, such as a 1 mfd., to be used. It is useful to know this, since sometimes it is quite permissible to use a large decoupling resistance (such as in the plate circuit of a detector valve, where it may combine the functions of

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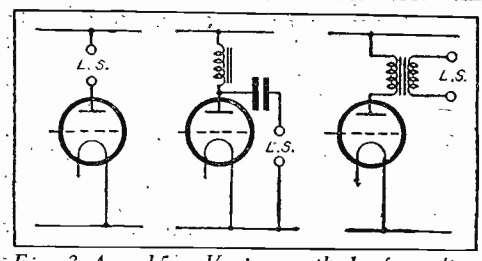


Figs. 3, 4, and 5.—Various methods of coupling the speaker to the output valve.

THE BEGINNER'S SUPPLEMENT

(Continued from previous page)

a voltage-dropping and a decoupling resistance). In which case a comparatively small condenser may be used with a corresponding saving in cost. On the other hand, when a set shows a tendency towards L.F. howling or motor-boating, and where an increase in the value of the decoupling resistances might upset the working conditions of the valves, additional decoupling may be provided by an increase in the capacity of the decoupling condensers, either by using larger ones, or by connecting additional condensers in parallel with the existing ones as in Fig. 2.

There is a very simple rule for finding the approximate grid bias for an L.F. amplifying valve of the ordinary triode type. It is obtained by dividing the H.T. applied voltage by twice the amplification factor of the valve. For example, suppose you have a valve, such as a Cossor 230XP, and want to know the correct grid bias, having mislaid the pamphlet issued by the makers. From PRACTICAL WIRELESS Data Sheet No. 10 you find that this valve has an amplification factor of 4.5. Using the maximum anode voltage of 150 volts, the grid bias required is 150 divided by 9=17 volts (approx.).

In the case of a mains receiver a knowledge of the correct bias voltage is not sufficient. The bias voltage is obtained by means of a resistance across which the required voltage is dropped. The value of this resistance is easily found by dividing the total anode current of the valve into the bias voltage and multiplying the answer by 1,000. Thus, if the makers state that the anode current of the valve is 10 milliamps at the maximum anode voltage of, say, 200, and the necessary grid-bias is 8 volts, the value of the required resistance is $\frac{8}{10} \times 1{,}000 = 800$ ohms. The value thus arrived at also holds good for lower values of applied H.T. voltage, since with a lower voltage the anode current becomes less and so the drop in voltage across the bias resistance becomes less. In other words, when a lower H.T. voltage is used the grid bias automatically adjusts itself to a lower figure. There is one warning needed when calculating the value of a bias resistor for a pentode valve, and that is that the "total anode current" must include the current taken by the screen. For example, to find the value of bias resistor for a pentode taking 60 m.a. anode current and 10 m.a. screen current and requiring a bias voltage of 22 volts you must add together 60 and 10 milliamps, divide this into 22, and multiply the answer by 1,000, thus: $\frac{22}{70} \times 1{,}000 =$ 314 ohms. Say 300 ohms, as the nearest round figure.

When we come to deal with the output stage of a receiver there are three very handy rules-of-thumb which are well worth knowing and which can easily be memorized. The first concerns the impedance of the external circuit when using an ordinary three-electrode valve. What is meant by the "external circuit" is either the speaker windings, when the speaker is connected directly in the plate circuit, as in Fig. 3, or the choke windings, when choke output is used, as in Fig. 4, or, again, the transformer primary, when transformer output is adopted, as in Fig. 5. In each case the impedance of the speaker, choke, or transformer primary should be one and a half to twice the impedance of the output valve. (The impedance of a valve is the same thing as its A.C. resistance).

If you do not know the impedance of your speaker, then you take it as a rule that in the case of a moving-iron speaker it is approximately equal to its resistance. With a moving-coil speaker its impedance if about twice its D.C. resistance.

When endeavouring to match your speaker with the output valve, by means of an output transformer, the ratio of the required transformer is given by the formula: Ratio = $\sqrt{\frac{\text{Optimum load of valve}}{\text{Impedance of speaker}}}$

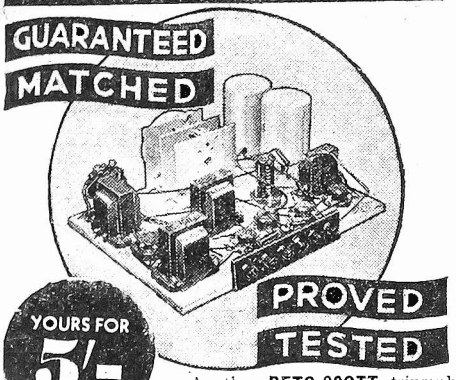
The "optimum load" of the valve means the impedance of the external circuit which is most suitable. We have already seen that this, in the case of a three-electrode valve, is equal to one and a half to twice its impedance. In the case of pentode valves, however, there is no easy rule for finding the optimum load, and the makers should be consulted. As an example of how the formula is used, let us take the case of a speaker whose impedance is 2,000 ohms, and which is to be used with a valve requiring a load of 4,000 ohms. The ratio of the necessary transformer equals: $\sqrt{\frac{4{,}000}{2{,}000}} = \sqrt{2}$. The square root of 2 is 1.41, and, therefore, the ratio of 1.41 to 1. The nearest standard ratio of 1.5 to 1 would be suitable.—W. B. RICHARDSON.

FOR EVERY SET — *there's a*

PILOT AUTHOR KIT

CASH — C.O.D — or H.P.

PILOT CLASS "B" FOUR KIT



Another **PETO-SCOTT** triumph —this latest Class "B" Battery 4 Kit at a popular price. Seven times the volume of an ordinary battery set, with outstanding performance equal to "mains" receiver. Kits supplied with detailed "simple to build" instructions and assembly blueprint. Matched and tested components. Guaranteed for 12 months by Peto-Scott. **KIT "A."** less Valves and Cabinet, Cash or C.O.D. Carriage Paid, £3/10/0, or 5/- deposit; balance in 12 monthly payments of 6/-.

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Recommended **PETO-SCOTT SPEAKER**, if required, add 22/6 to Cash Prices or 2/- to each monthly payment.

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ANY ITEM SUPPLIED SEPARATELY

	£	s.	d.
1 Peto-Scott Chassis 12 x 10 x 1½ins.		3	6
1 J.B. 2 gang condenser type Nugang "A"		17	6
2 Wearite Universal Screened Coils		10	0
1 Graham Farish .00015 mfd. condenser diff. reaction		2	0
1 Varley Niclet Transformer ratio 5 : 1		7	6
3 W.B. 4 pin Chassis mounting valve-holders		1	6
1 Graham Farish Snap type H.F. Choke		2	0
1 Varley Electronic 1 watt type resistance 25,000 ohms.			9
1 Varley „ 1 watt „ „ 2 meg.			9
1 Dubilier .1 mfd. condenser type 4404		1	4
1 Dubilier 1 mfd. condenser type B.S.		2	0
1 Dubilier .0003 mfd. fixed condenser type 665			6
2 Clix Terminal Socket Strips, A.E. & L.S. & Pick-up		1	3
6 Clix Solid Plugs (for use with the above)		1	0
1 Bulgin No. 2, G.B. Battery Clip			4½
1 Bulgin F.5 Fuse and holder		1	0
2 Bulgin Junior on/off switches type S.38		1	9
1 Belling Lee 5-way Battery Cord, marked H.T.x1, H.T.x2 and H.T. and spade terminals L.T.x&—		2	0
3 British Radiogram Brackets (2) 2in. (1) 1½in. with hole		1	9
Wire, Screws, Flex, etc.		2	3
Kit "A" Cash or C.O.D.	£3	0	0

KIT "A" CASH or C.O.D. (Carriage Paid) **£3-0-0**

OR YOURS FOR **5/6**

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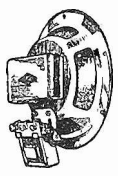
PETO-SCOTT Permanent Magnet MOVING-COIL SPEAKER



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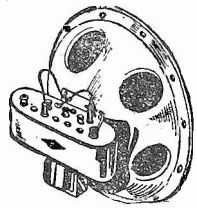

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Practical Television
Conducted by H. J. Barton Chapple, Wh.Sch., B.Sc., Etc.
MARCH 10th, 1934. Vol. I. No. 10.

CHOOSING YOUR TELEVISION MOTOR

A Description of the Functioning of an Electric Motor, with Some Useful Notes Regarding its Maintenance.

FOR nearly all forms of television receivers, the principal exception being those employing a cathode ray tube, a source of rotary motion is required, and the only practicable method of driving a scanning disc, mirror drum, mirror screw, or other form of exploring device, is by means of a small electric motor. Such machines are perhaps rather outside the experience of the average wireless amateur, so a few words of explanation concerning the principles upon which a motor works, the different types of motor available, and hints on the selection and operation of a suitable machine will prove of value to readers.

Electric Motor and Dynamo

To begin with, it is necessary to realize that an electric motor is merely a machine for converting electrical energy into mechanical energy, just as a dynamo is a machine for converting mechanical energy into electrical energy. In fact, the two types of machine are similar in design and a dynamo can often be used as a motor and vice versa. Fundamentally, a motor consists of an arrangement of coils of wire pivoted in a strong magnetic field, means being provided for passing an electrical current through the coils.

First Principles

The action of a motor can readily be understood by making reference to Fig. 1, which shows a single loop coil A, mounted within the circular space between the two poles N and S of a magnet. The reader must imagine a number of lines of magnetic force connecting the two poles, as indicated. Provided that no electric current is allowed to pass through the coil A, these magnetic lines will be undisturbed, but if a current is passed through the loop, the magnetic field will be distorted, as indicated in Figs. 2 and 3.

Here, the small circles A and B represent sections through the upper and lower limbs of the coil, and we will suppose that the current is going down into the page in the case of the top limb and coming out of the page in the case of the lower limb. The magnetic effects of these currents will be as indicated by the concentric circles, which represent the magnetic lines of force due to the current in the coil, the arrows showing the direction of the magnetic force. The diagram shows also the horizontal lines of force due to the poles of the field magnet.

Effect of Magnetism

It will be clear that above A and below B the magnetism due to the coil or "armature" is assisting the field due to the

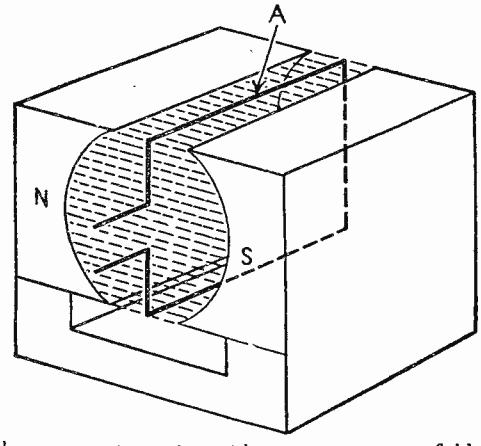

Fig. 1.—A simple coil loop in a magnetic field to illustrate the motor action.

magnet, while below A and above B the armature field is in opposition to the field of the magnet. The resultant field will therefore be something like that indicated in Fig. 3. Now, although it is not a strictly scientific way of thinking about these things, it is both correct and convenient to consider magnetic lines of force as always trying to shorten themselves, and we can imagine the "elastic" lines in Fig. 3 endeavouring to straighten themselves out, and in so doing driving A downwards and B upwards, as indicated by the arrows.

This is exactly what occurs in a motor, and the movement of A and B and of the corresponding wires of the other coils which go to make up the complete armature constitute the rotation of the motor. There is, of course, much more than this in the full theory of electric motors, but enough has been said to give a slight insight into the operating principle.

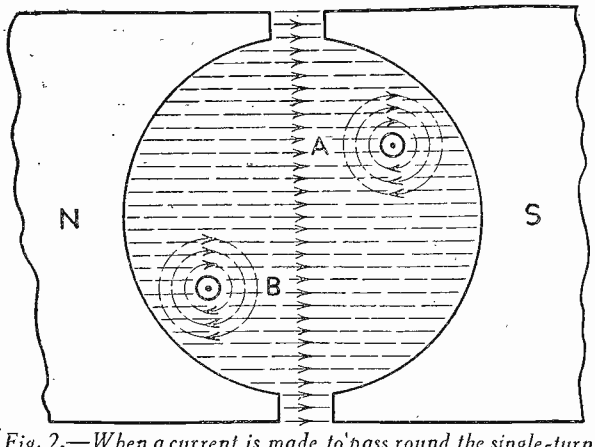

Fig. 2.—When a current is made to pass round the single-turn loop a magnetic field is created round each limb of the loop.

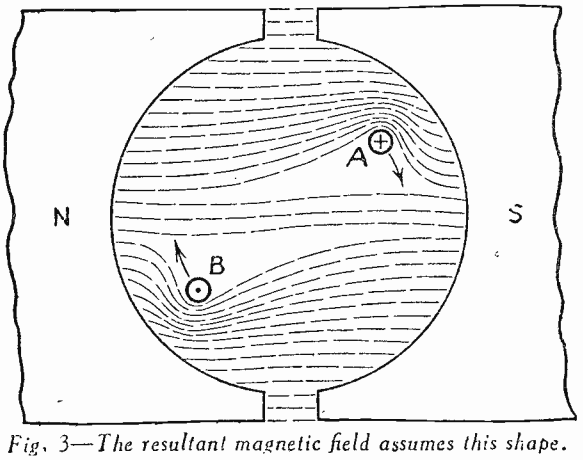

Fig. 3—The resultant magnetic field assumes this shape.

Suitable Types

Whether the motor be a tiny affair, suitable for driving a toy railway, or a machine of several thousand horse-power driving a rolling mill, similar principles are involved. For television purposes only a small amount of power is required, amounting to only a fraction of one horse-power, the average value being about one-thirtieth of a horse-power, although slightly higher ratings are likely to be more reliable—say one-twentieth to one-fifteenth of one horse-power.

In view of the fact that for satisfactory reception the motor has to be run in absolute synchronism with the scanning mechanism at the transmitting end, it is clear that what is required is a motor which normally runs at a steady and constant speed, thus requiring only a slight effort on the part of the synchronizing mechanism to keep it in step. Certain types of motor are better suited in this respect than others.

Considering first those motors intended for operation on direct current, either D.C. mains or some form of battery, there are two main types—those in which the field magnet is energized by a coil of wire connected in series with the armature (known as a series-wound machine) and those in which the field winding is connected in parallel with the armature (known as shunt-wound motors). It is the shunt-wound machine which is the more suitable for television purposes, because, in the first place, it runs at an almost constant speed, and secondly, preliminary speed adjustments can be made easily by connecting a variable resistance in the field circuit. Further reference to speed regulation will be made later in this article.

When we come to consider motors for running on alternating-current mains, there are several types from which to choose. The true synchronous motor is similar to a direct-current shunt motor, but the armature is fed with alternating current, while the field requires separate excitation from a direct-current source. This is a somewhat complicated arrangement for such a small motor, but the transmitter used by the B.B.C. includes one of these synchronous motors, and the end plate of this machine, together with the mirror drum it drives, and the associated optical equipment, are clearly shown in Fig. 4. Synchronous motors are ideal for those areas fed from the same network of A.C. mains which supply the power to this transmitting machine, but at the moment this area only embraces Marylebone and part of Hampstead. When other sections

of the A.C. mains are linked up shortly, however, it is anticipated that this area will be extended considerably.

The pure induction motor, in which the rotor is not connected to the supply, but is simply a short-circuited winding, while fairly constant in speed when running under a constant load, is not amenable to close-speed regulation, and must be ruled out for television, and we are thus left with what is known as the commutator-type A.C. motor, of which several types are made.

For television purposes, however, the most satisfactory is that commonly known as a "universal" motor, because it can be used quite satisfactorily on either an alternating or a direct-current supply. In construction it is almost identical with an ordinary direct-current motor, with the exception that the field magnet is built up from a large number of thin plates or laminations in order to avoid losses due to the generation of "eddy currents" in the metal of the magnet and a certain type of distortion of the magnetic field.

Avoiding Sparking

It should be explained that in both direct-current and universal machines of the type described, it is necessary to introduce the mains current into the spinning coils of the armature by means of contacts called brushes which bear upon a metal ring attached to the armature. This ring is termed the commutator, and is divided up into segments according to the number of windings in the armature, the segments being separated from each other by mica insulation. As the brushes (which are generally small blocks of soft carbon) make contact with successive bars or sections of the commutator, adjacent segments are momentarily short-circuited.

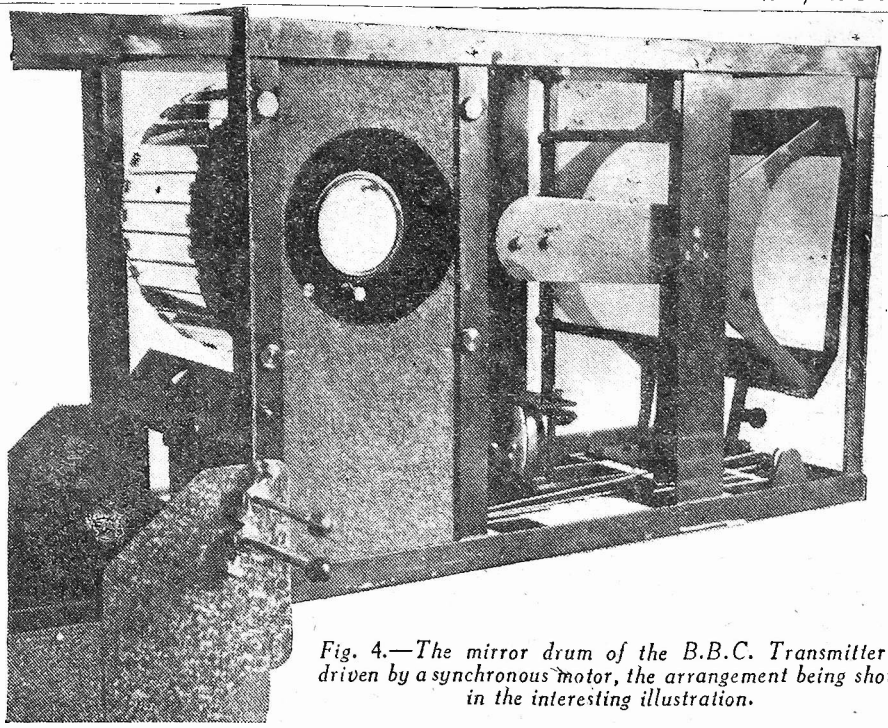

Fig. 4.—The mirror drum of the B.B.C. Transmitter is driven by a synchronous motor, the arrangement being shown in the interesting illustration.

It is therefore essential that the mechanical design of the commutator and brushes, and the electrical design of the machine is such as to avoid sparking at the brushes. In large motors many devices and tricks of design can be employed to this end, but in the small motor most of these are not practicable. For example, in big machines the brushgear can be "rocked" or moved in order that commutation shall occur in a strong magnetic field. Rocking gear cannot be fitted to very tiny motors, but a well-designed motor, whose commutator and brushes are in good condition, can generally be relied upon to run without sparking for long periods before any attention is required.

One device adopted in the design of many small motors is to incline the slots in the armature which hold the coils at an angle to the axis of the armature, and this is shown very clearly in Fig. 5, which depicts the armature of an actual motor I have used with great success in many of my experiments. This avoids certain periodic oscillation of the magnetic flux which is liable to cause sparking.

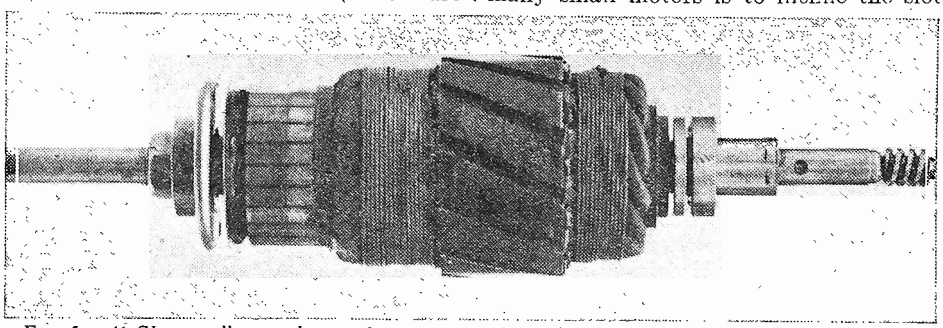

Fig. 5.—"Skewing" or inclining the armature slots of a television motor is sound practice.

Curing the Trouble

Sparking, if it does occur, has a bad effect on television reception, because the radiant energy of the sparks is picked up by the receiver and amplified, producing interference which is reproduced on the image screen as a series of white patches. The secret of sparkless running—provided the machine is of good design—is a smooth commutator, lightly lubricated, and well bedded brushes. The commutator should be cleaned initially with the finest emery cloth. Next, reverse the emery and turn the armature by hand so that the brushes are ground by the emery to the exact contour of the commutator.

Then wipe the commutator perfectly clean with a soft rag, and finally with a rag *very lightly* oiled. The motor should now be run for an hour or so on load, and the tension of the brush springs adjusted. Once running well, the only attention should be to hold a piece of dry, clean rag against the commutator very occasionally when running, to remove carbon dust which may have collected. After a period of use, the commutator will develop a hard, polished "skin," and will then run almost indefinitely without trouble.

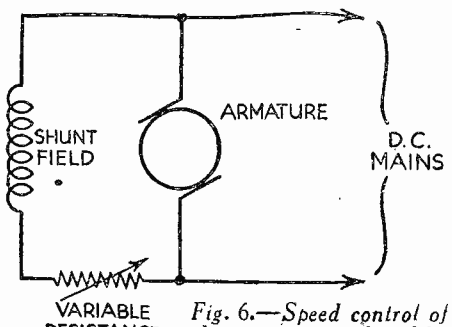

Fig. 6.—Speed control of shunt motors is effected by using a variable resistance in series with the field winding.

Speed Control

The normal speed for a television drive to suit the present transmissions is 750 revolutions per minute, which is rather slow for a small motor, but machines rated to run at that speed are obtainable. It is, however, necessary to provide some method of making fairly accurate speed adjustments. For shunt-wound motors, a variable resistance in the field circuit is the best, see Fig. 6. Increasing the resistance weakens the field and increases the speed, and *vice versa*. Care must be taken, however, to see that the speed regulator has no "off" position, for if the field circuit of a shunt motor is broken, the machine "runs away" and develops a very high speed, which may cause it to fall to pieces.

With the universal motor, speed is best controlled by varying the voltage applied to the motor, and this can be effected by including a variable resistance in series with the machine.

(Continued from page 1138)

is any tendency for the valves to pick up medium-wave interference, the whole of the intermediate-frequency circuits can be retuned.

While the I.F. stages are transformer coupled, parallel-feed is used between the first H.F. valve and the first detector. These circuits are tuned by .0001-mfd. condensers and the coupling is by means of a .001-mfd. condenser.

In the automatic volume control unit the indirectly-heated valve has its grid connected through a .001-mfd. condenser to the output of the intermediate frequency stages, and there is a 1-megohm leak and 2-mfd. condenser between the grid and cathode. The automatic volume control potentiometer has a winding of 1,000 ohms, while the hand control potentiometer for the bias of the two variable-mu valves is in series with a 10,000-ohms resistance. Both these resistance windings are shunted by a 2-mfd. condenser. There are 1-megohm leaks in series with each lead back to the grid circuits of the two variable-mu valves.

Just how effective this automatic volume control system is can be proved by listening to any transatlantic relay conducted by the B.B.C. engineers.

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

DISTURBANCE SUPPRESSION

THE different kinds of disturbance met with in wireless reception, their causes and cure are dealt with in a booklet bearing the above title, and recently issued by Belling Lee, Ltd. Particulars are given of the Belling Lee condenser suppressor, and various diagrams show how this useful component can be connected in circuits. Particulars are also given of a D.C. ripple suppressor designed to eliminate hum and other L.F. noises from "rough" D.C. mains, such as those fed from mercury arc rectifiers. Chokes for H.F. mains disturbance are also dealt with in this useful booklet, copies of which can be obtained for 3d., post free, from Belling and Lee, Ltd., Cambridge Arterial Road, Enfield, Middlesex.

MARCONIPHONE PRODUCTS

PARTICULARS of the latest Marconiphone receivers and radiograms are given in an attractive folder just issued by the Marconiphone Company, Ltd. Amongst the receivers there are a 7-valve all-mains super-het; a 5-valve super-het; a 6-valve super-het battery portable with M.C. speaker and A.V.C.; a 4-valve battery receiver, incorporating Ferrocart coils; and 3-valve and 2-valve battery receivers, the latter model being priced at only 4 guineas, complete with a well-finished cabinet of modern design. The radiogram section includes 7-valve and 5-valve super-het models for A.C. or D.C. mains working, at prices varying from 50 guineas to 20 guineas. P.M. moving-coil speakers in cabinets, and the new Marconi pick-up are also listed. Copies of the leaflet can be obtained from the Marconiphone Co., Ltd., Radio House, 210–212, Tottenham Court Road, London, W.1.

THE COSSOR WIRELESS BOOK

A NEW edition of this useful little book has recently been issued by A. C. Cossor, Ltd. Its pages are packed with particulars of all the new types of Cossor valves, and various phases of radio technique. Besides assisting in the selection of the correct types of Cossor valves for a particular receiver, the book also helps to solve many problems that frequently arise in radio reception. Among the subjects dealt with are Resistances, Chokes and Condensers; Inter-Valve Coupling; Method of H.F. Coupling; Class B Amplification; and the Super-het—and How it Works. A useful table of Resistance Values for Decoupling and Voltage Dropping, and lists of European Broadcasting Stations and the Chief S.W. Stations of the World are also included, together with a miniature Broadcasting Map of Europe. At the end of the book seven pages are devoted to definitions of various radio terms. Readers are advised to write for a copy of this invaluable little book to A. C. Cossor, Ltd., Publicity Dept., Highbury Grove, London, N.5.

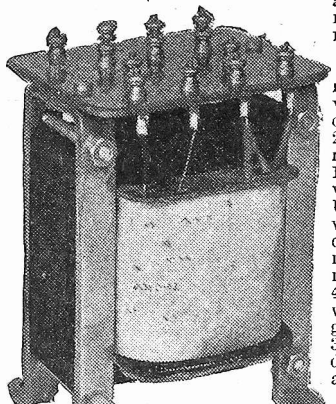
Facts and Figures

Components Tested in our Laboratory

BY THE PRACTICAL WIRELESS TECHNICAL STAFF

McDANIEL MAINS TRANSFORMER

THE transformer illustrated below is Type A.1, manufactured by G. McDaniel and Co., of Romford. As may be seen, it is of the unshielded type, and is provided with a substantial terminal board on its upper surface. The core is of substantial dimensions, and the frame bolts do not pass through the core, The model submitted for test was, unlike some unscreened models of this type which we have seen, firmly bolted up and no troubles were experienced from hum due to vibration of the laminations of the core. The windings are carried on a paxolin former, and care has obviously been expended in arranging the windings to ensure good insulation, etc. The terminals are rather on the small side, but provided the connections are soundly made this will not prove of much moment. The particular model under review is rated to deliver 250-0-250 volts at 60 m/A; 4 volts at 1 amp., and 4 volts at 3 amps. Under test it was found to be conservatively rated, and the regulation of the 4-volt windings was very good. The 3-amp. winding delivered 4 amps at 3.9 volts and would therefore satisfactorily operate four indirectly heated valves without trouble. In view of the price of this transformer, namely 22s., it represents very good value. Messrs. McDaniel make a number of other ratings, as well as transformers for model motors, lighting sets, etc., and a copy of their list should be obtained. The address is 178, Mawney Road, Romford, Essex.



The McDaniel mains transformer.

ANOTHER DRYDEX BATTERY

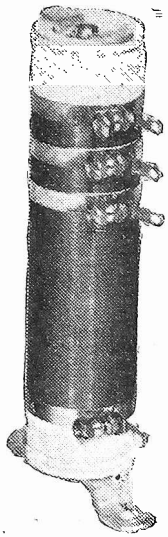
A NEW Drydex 132-volt battery, with tappings at 1.5, 3, 4.5, 9, 63 and 132 volts has been introduced as suitable for the Philips 834B receiver. The new battery is type H.1088, of the Yellow Triangle series, and its dimensions are 9⅞in. by 6⅝in. by 3 1/16in. The list price is 16s.

GOLTONE SHORT-WAVE COILS

THE illustration at the foot of this page shows a representative collection of the special Goltone short-wave coils, together with some special porcelain stand-off insulators, which, whilst not intended specifically for mounting the coils, will prove very useful for that purpose. The coils are manufactured from soft-drawn copper tube in either 3-16th or ¼in. diameter. The ends are flattened and drilled to take a quarter-inch screw. In view of the fact that these coils are intended for very high frequencies, where all resistance effects have to be avoided, the coils are lacquered to prevent oxidization. The diameter of the coil is 3ins., and they may be obtained in any number of turns from 1 up to 15, at 4d. per turn for the small size tube, and 5d. per turn for the quarter-inch tube. The insulators cost 9d. each, and the corrugations provide a large leakage surface, whilst the 2 B.A. thread at the upper end provides a convenient fitting for the short-wave coils. Many other uses will occur to the experimenter, such as an anchor for leading-in wires, etc.

EVRIZONE ALL-WAVE SUPERHET

DETAILS have been received of a super-heterodyne receiver which operates on all wavelengths from 13 to 2,300 metres. The receiver is self-contained and intended for A.C. mains operation. A special tuning system is employed and this provides for four sections on the short-wave band (13 to 33, 24 to 56, 48 to 100 and 90 to 160 metres), and the usual two broadcast bands, namely 250 to 600 and 1,000 to 2,300 metres. No coil changing has to be carried out, a special patent short-wave coil unit being fitted, and this is operated by a knob on the control panel. Rectification of the mains supply is effected by a metal rectifier and a moving-coil loud-speaker is fitted. Two I.F. stages of the variable-mu type are incorporated, and the price is £32 complete. A battery version, employing a Class B output stage is also obtainable at £25 complete with cabinet and batteries. The makers are S. Nott, Evrizone Works, 69, Albert Road, Bromley, Kent.



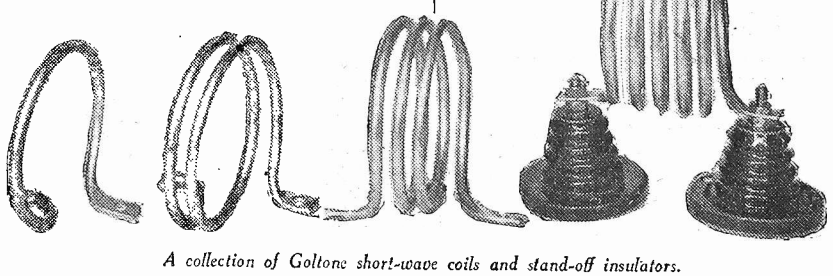
One of the skeleton D.C. mains resistances manufactured by Messrs. Bulgin, and described on this page last week.

"SME" SOLDERING PASTE

IN view of our recent discussion, "Soldering or Terminals," readers who favour the soldered method of connection will welcome the introduction of a paste which combines a flux and solder in one. The product is put up in tubes and dispenses with the necessity for a separate stick of solder. To use it, the part to be joined is cleaned, a small quantity of the paste smeared over the joint and a hot iron applied. The paste hisses for a moment and then suddenly clears away, leaving a neat blob of solder round the joint, which is firmly made and is no different in aspect or efficiency from a normally soldered one. The makers, in fact, guarantee it to be real solder, to electrical standard, and non-corrosive. It appears actually to be finely ground solder mixed with a paste flux, although it possesses the added advantage that it was found in a number of cases unnecessary to effect any preliminary cleaning of the joined parts. A badly corroded piece of copper and a rusty piece of steel, for instance, were thoroughly coated with the mixture and the iron applied, when a perfectly sound joint was made. The distributors of this material are A. R. Findlay, 17, Robertson Street, Glasgow, and a small tube costs 7½d. It may also be obtained in 1lb. tins.

"TONASTAT"—A CORRECTION

Owing to a printer's error in the advertisement of TX Products Co., which appeared in our issue of February 17th, 1934, the word "Tonax" was used. This, of course, should read "Tonastat."



A collection of Goltone short-wave coils and stand-off insulators.

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).

Data on Output Valves

SIR,—I have been very interested in your paper, PRACTICAL WIRELESS, and have taken it since the first issue. I should like to ask you on behalf of other readers if you could publish either a "data sheet" or some other such supplement to "P.W." giving the names of all the various output valves obtainable, both pentode and triode, or A.C.-D.C. mains and battery operation, and *giving their max. undistorted output in milliwatts.* I know that such a thing is possible, and I think it would appeal to a lot of fellow readers, especially those who design their own sets.—C. SALTER (Ingleton, Yorks).

[*A data sheet giving the undistorted output, etc., of high voltage output valves was given in our issue of February 24th. A similar data sheet giving the required particulars of battery-operated valves will be published shortly.*—ED.]

Radio Ramblings and Jazz Music

SIR,—I wonder why people get so upset because you express your own personal opinion of jazz music? Cannot they realize that you are one of thousands who think the same, and they likewise are one of thousands who do not? Those who object can always switch off or tune to an alternative programme. I have always appreciated the fact that "Radio Ramblings" has always been devoted to your own views on any topic, but must agree with Robert J. Wright, of Ashford, whose letter you published on February 24th, that radio topics only are appreciated more than criticisms. However, it is your corner, and even a critic can be interesting, so carry on.—ERIC S. WALKER (Ilford).

Amateur Morse and Short-wave Work

SIR,—I think the statements of A. R. Coomber in the February 17th issue of PRACTICAL WIRELESS are very unjust. First of all his statement about amateur morse being very badly sent. It may interest him to know that before any amateur is granted a transmitting licence he must satisfy the G.P.O. that he can send and receive code at no less than twelve words per minute.

He says that short-wave work is not worth bothering about. I do not know the circuits he has tried, but I can say this, if he pays attention to the layout of even a two-valve receiver and uses the parts specified he will have a different opinion of short waves.—A. E. BEAR (Rotherhithe, London, S.E.16.).

W2GOQ "Replies to Broadcast Queries"

SIR,—I find on looking through "Replies to Broadcast Queries" during the past few weeks that there have been several inquiries for the address of W2GOQ, and note that you invariably reply "no details," or words to that effect, and I am taking the liberty of giving details of this station herewith.

"W2GOQ is attached to Radio WABC and W2XE, who are operated by the Atlantic Broadcasting Corporation, at Wayne, N.J., U.S.A. This station operates on the following frequencies:
CW—3,550 kcs., 3,817.5 kcs., 7,100 kcs., 14,200 kcs., 28,400 kcs.
Phone — 3,950 kcs., 14,200 kcs., 28,400 kc.
ICW—28,400 kcs."

I expect that most of your inquiries are regarding the 14mc band 'phone transmissions, which are usually well received in this country just after midday Sundays. For these an R.C.A. Xmtr is usually employed with an input of 1 kW. Eight different operators are on the active list, and I am told that the address, W2GOQ, Wayne, N.J., is quite sufficient. I have had several QSO's with this station, so that this information is quite first hand.—R. A. HISCOCKS (Radio G6LM, Chippenham).

The "Good Companions"

SIR,—I have received my "Good Companions" safely, in other words, the Pocket Tool Kit, and I must congratulate you on producing such a fine kit. It arrived just when I was occupied in constructing a set, and, of course, I began to use it at once, and it really speeds up the construction of a wireless set considerably.—D. A. S. SICHEL (Claremont, S. Africa).

CUT THIS OUT EACH WEEK.

Do you know

—THAT if a milliammeter is connected in the anode circuit of the output stage it will indicate distortion, and also the correctness of the bias applied.

—THAT general kicking of the needle in an upward and downward direction indicates overloading.

—THAT if the needle kicks upward, it denotes that too much bias is being applied.

—THAT if the needle kicks downward it denotes that the valve is under-biased.

—THAT L.F. instability may be cured by shunting the primary or secondary (or both) of an L.F. transformer by a resistance.

—THAT it is impossible to fit satisfactory A.V.C. to a "straight" short-wave receiver.

—THAT a temporary mains aerial may be obtained by twisting a piece of wire round any convenient mains flex.

—THAT under the new wavelength plan a number of stations giving the same programme are now fairly close together on the dial, and on powerful receivers may produce an effect of flat-tuning.

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.

HULL SHORT-WAVE RADIO SOCIETY

It may interest PRACTICAL WIRELESS readers in Hull and district to know that the above Society has recently been formed in Hull. Meetings are held fortnightly, the next one being on March 14th, when Mr. F. Dearlove (G2QO) will give a talk on his experiences with short-wave apparatus in Labrador. Anyone interested in the society is invited to apply for particulars to the Hon. Sec., R. G. Drewery, 274, Park Avenue, Hull.

THORNTON HEATH RADIO SOCIETY

A meeting of this Society was held a t St. Paul's Hall, Norfolk Road, on Tuesday, February 20th. Mr. S. J. Meares gave a talk and demonstration of a short-wave receiver constructed by himself, on lines suggested in recent lectures by some well-known amateur transmitters. Full particulars of future meetings can be obtained on application to the Hon. Sec., Mr. Jas. S. Webber, 368, Brigstock Road, Thornton Heath.

SLADE RADIO

"Short-wave radio communication" was the title of a lecture given by Mr. D. R. Parsons (Eddystone) at the last meeting of this Society. The lecture was divided into four sections. During the evening the following three receivers were exhibited and inspected by the members with great interest: Amateur-band two, All-wave four, and a five-metre receiver—Hon. Sec., 110, Hillaries Road, Gravelly Hill, Birmingham.

SMETHWICK WIRELESS SOCIETY

At the meeting held at the New Talbot Inn, on Friday, February 16th, Mr. Valentine, of the Mullard Technical Service Department, gave a lecture on "Modern Radio Practice." He began by referring to the history of H.F. amplification, through the triode, tetrode, and H.F. pentode, and briefly dealt with the various difficulties which had been overcome in each stage of the development. Passing on to the question of detection, Mr. Valentine gave the modern conception of the leaky-grid rectifier and an explanation of the action of the diode. From this, he proceeded to deal with the new double-diode triode valves, and discussed their use in various A.V.C. systems. —Hon. Sec., Mr. E. Fisher, 33, Freeth Street, Oldbury, Nr. Birmingham.

THE CROYDON RADIO SOCIETY

Mr. P. W. S. Valentine, D.F.H., A.M.I.E.E., gave a lantern lecture on "Modern Radio Practice," in St. Peter's Hall, South Croydon, on Tuesday, February 13th, the Vice-Chairman, Mr. C. L. Amos, presiding. The lecturer described how simple automatic-volume was obtained and showed how delayed control was effected.

Mr. H. Bevan-Swift, past president of the Radio Society of Great Britain, presided at the meeting of the above Society, held in St. Peter's Hall, Ledbury Road, South Croydon, on Tuesday, February 20th. The president, Mr. H. Rivers-Moore, lectured on "Re-diffusion systems as the solution of ether jamming for the ordinary listener." PRACTICAL WIRELESS readers are reminded that the Society's second half of session is now in full swing, and new members are welcomed.—Hon. Secretary, E. L. Cumbers, Maycroft, Campden Road, South Croydon.

UNIVERSAL RADIO DX CLUB

This organization was formed in December, 1933, to fill a long-felt want among DX enthusiasts. In short, to supply them with up-to-the-minute DX news. This is sent to members every week or so in a very interesting little paper. It is also broadcast from KPCB, Seattle, Wash. Subscriptions to this organization are as follows. First year $1.20 and 85 cents a year thereafter. Owing to the fluctuation of money values between the U.S. and Great Britain, it is necessary to send International money order for the amount in American money. Subscriptions should be sent to Mr. Charles C. Norton, 2559, Polk Street, San Francisco, California, U.S.A. Mr. Leslie W. Orton has been appointed a Vice-President of the U.R. DX Club.

ANGLO-AMERICAN RADIO AND TELEVISION SOCIETY

The lecture-demonstration held, under the auspices of the Uxbridge District Branch of the Anglo-American Radio and Television Society, at Denham Lodge Hall, Uxbridge, on February 21st, was a huge success, and the hall was crowded. The lecture-demonstration, delivered by Mr. J. Louis Orton, on "Personality and Radio," was illustrated by means of gramophone records of radio and other personalities, and experiments in which members of the audience joined. Full particulars of this Society can be obtained from Mr. Leslie W. Orton, 11, Hawthorne Drive, Willowbank, Uxbridge, by enclosing a stamped addressed envelope.

BOLTON RADIO CLUB

On February 23rd, Mr. J. E. Prescott gave a lecture and demonstration on speakers, from a small-battery model to a 12-watt Auditorium type, amongst which were Micro and Equilode models. The speaker

(*Continued on next page*)

(*Continued from page* 1149)

explained the advantages of the various units to an audience of 108 members and friends who were greatly interested. Before the meeting closed many questions were asked, and answered, on various radio topics. Meetings are held every Thursday—Mr. Prescott, Secretary, 125, Deansgate, Bolton.

EXETER AND DISTRICT WIRELESS SOCIETY

March
12th "Radio Receivers for 1934." Lecture by Mr. W. A. C. Maskell, of the General Electric Co., Ltd.
19th "Interesting Faults in Short-Wave Receivers." By Mr. H. A. Bartlett (G5QA).
26th "Radio Servicing (Causes, Cures, and Suggestions.)" By Mr. R. C. Lawes, M.I.W.T.

Hon. Sec., W. J. Ching, 9, Sivell Place, Heavitree.

MEDWAY AMATEUR TRANSMITTER SOCIETY

This society, which is approaching its second birthday, held a meeting on the 6th inst., at which Mr. Page (G6PA) gave a lecture upon a new type of transmitter control which he has developed in conjunction with Mr. Thomas (G5YK). This method of control, although eliminating the crystal usually employed, still ensures perfect stability as with the more orthodox methods. Meetings are held on Tuesdays at 8 p.m., and there is plenty of room for more members. Interested readers are invited to write for particulars to the Hon. Sec., S. Howell, 117a, Trafalgar Road, Gillingham, Kent.

INTERNATIONAL S.W. CLUB (EXETER CHAPTER)

The first meeting of the Exeter Chapter was held at 3 p.m. on February 11th, Mr. Bear, I.S.W.C. representative, and Mr. Hunter, the Chairman of the London Chapter, attended the meeting. An interesting lecture entitled "Short-wave Propagation" was given by Mr. Bear, and after this followed a demonstration of the possibilities of short-wave reception. Good results were obtained from VK2ME, Sydney, W3XAL, Boundbrook, W8XK, Pittsburg, and also the local European transmitters. A general discussion of the points raised in the lecture followed. Will all those interested in the club please write to the Secretary, Mr. W. Warner, 56, East Grove Road, Exeter.

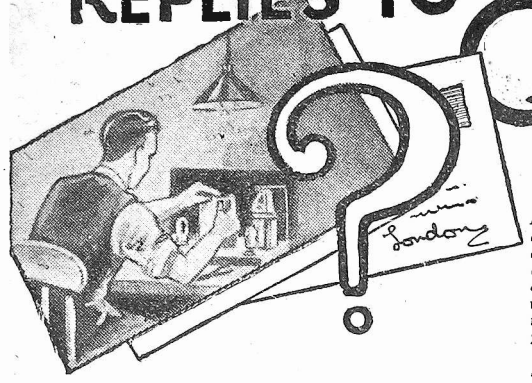
REPLIES TO BROADCAST QUERIES.

EDITOR'S NOTE: Querists must limit their queries to three per letter.

C. H. NOTHER (Portland): ZL4CM, M. A. Mathie, 20, France Street, Oamaru, New Zealand; ZL2FJ, W. R. Taylor, Makino P.B., Fielding, New Zealand; VK2XW, A. J. Voysey, 109, Bland Street, Ashfield, N.S.W.; XU5FM, write: Box 685, Shanghai, China; U5KDA, write: S. K. W., Ipatievsky Per 14, Varvarka, Moscow, U.S.S.R. CONSTANT READER (Coventry): F8OK, A. Jullien, 24, Boulevard du Roi René, Angers, France; F8JA, Francis Bonnal, 6, Allée de la Fontaine, Ermont (Seine et Oise), France; F8VT, Georges Guidon, 4, Rue des Ecôles, Aulnay-sous-Bois (Seine et Oise), France; ON4MNE, Belgian amateur call, but regret cannot trace, the latter part appears to be mutilated. NOSTUH (Boston): FZM, Bamako (French West Africa), 19.50; 19.51 m.; WKT, Sayville (New York), 16.949 m. GLT, believe Ongar (England). CLEVELEYS (Blackpool): ON4ND, M. Cheron, 18, rue Ferrer, Quaregnon, Hainaut, Belgium; ON4MAD, regret cannot trace; the latter part of the call appears to be mutilated as only *two* letters should appear after the figure; F8WM, Georges Vruchard, 47, rue des Deux Capucins, Chartres (E. & L.), France; F8AA, A. Riss, 56 (bis) Boulevard Sainte-Feuve, Boulogne-sur-Mer, France; F8LR, M. Cotteret, Billa Suzanne-Alice, Boulevard Châteaubriand, Paramé (Ile et Vilaine), France. S. F. NEWBY (Dalton): G6ZX, A. C. Brown, "Amulree," Clarkston, Glasgow; G2IN, given as: E. R. Radford, 33, White Hall Park, London, N.19; G2RA, F. F. Warner, 220, Folley Lane, Swinton, Manchester. ACID DROP (Aylesbury): G6PA, H. Page, Plumford Farm, Ospringe, near Faversham; G2IC, G. Chapman, 109, Cheriton Road, Folkestone; G6LL, J. W. Matthews, 173, Evering Road, Clapton, E.5. J. B. ELPHICK (Durham): Call given F8CS. P. Sergent, etc., correct; the second address given also correct, but was a typographical error, and should have been F3CS. L. J. STEVENS (Bristol): YI5KM, experimental amateur, Iraq; address not given; W2DEW, Jack Quinn, 39, Fielding Crescent, South Orange, New Jersey. L. NORMAN (Charlton-cum-Hardy): Budapest; the interval signal is a musical-box. E. WALKER (Sheffield): We can trace the following callsigns: F8VP, Chambat, Chemist, Pont du Château (Puy-de-Dôme), France; PAOAM, G. H. van Vliet, Ridderstrasse 40a, Rotterdam (Holland); G6RX, Rugby is on 69.44 m. working with CGA, Drummondville (Quebec); GBC, Rugby is on 60.3 m. J. ELPHICK (Durham): We can trace the following call signs: OK2AL, Miloslav Svejena, 180, Telc, Moravia, Czecho-Slovakia; F8UR, René Archambault, *Receveur de L'Enrègistrement*, Neuville (Vienne), France; G2DR, S. R. Wright, "Greenway," Lees Road, Bramhall, Stockport; G2FR, L. Fryer, 2, Murray Villas, Hough Road, Port Patrick (N.B.); If G2H*R*, H. Harte, 43, Earl's Court Square London, S.W.5; G2IL, H. R. Goodall, Winchester Road, Bassett, Southampton; G2JK, P. R. Coursey, 67, Queen's Road, Richmond (Surrey); G2MQ, P. W. Harris, 29, South Ridgway Place, Wimbledon, London, S.W.19; G2PO, N. C. Hardman, "Mayfield," Cloughfold, Rawtenstall, Rossendale (Lancs.); G3PA, W. F. Jones, 24, Maesglas Road, Newport (Mon.); G2QB, R. W. Bailey, "Baylea," Pitt Lane, Widnes (Lancs.); G2YL, Miss M. Corry, "Redholme," Walton-on-the-Hill (Surrey); G5QL, L. Herrington, 54, New Street, Ashford (Kent); G5DL, P. W. Simmans, 68, Netherfield Gardens, Barking (Essex); G5FV, W. A. Clark, "Lynton," Hull Road, Keyingham, Hull (Yorks.); G5JB, J. S. Bamford, "Craigvar," Liberton Brae, Edinburgh; G5TZ, W. G. Sherratt, 11, Bath Road, Cowes (I.O.W.); G6GL, G. R. Lee, 25, Boundary Road, Grange, West Kirby (Cheshire); G6TX, J. Fynn, 24, The Broadway, Woodford Green (Essex); G6TA, C. D. Abbott, 120, Cavendish Road, Balham, London, S.W.12; G6JT, J. D. Shrouder, "Beech Lea," Maghull, Liverpool; GLSQ, ss. *Olympic;* GMBJ, ss. *Empress of Britain;* GMPR, ss. *Quebec City;* HB9M, Hans Prechbuehler, Hotel Baeren, Muenchenbuchsee, Switzerland; Write to: *Ente Italiana Audizioni Radiofoniche, Rome, Italy.* Hamband (Bearsden): We can trace the following call signs: W2GOQ, experimental amateur, Wayne (N.J.); W2RM, Nathan Pomerand, 222, West 39th Street, New York City; W2TM, C. Davis Belcher, 20, East 14th Street, New York City; W3ZX, Carroll D. Kentner, 1,107, Park Avenue, Collingswood, (N.J.); VK2NR, J. Scott, 41, Carlingford Road, Epping, New South Wales; VE1BV, C. S. Taylor, "Stewiacke," Novo Scotia; ON4PA, Mons. Anthierens, La Pinte-lez-Ghent, Belgium; OK1AN, Experimental amateur, Czecho-Slovakia, write: *C. A. V., Box* 69, *Prague* 2, *Czecho-Slovakia;* G2DQ, H. G. Collin, Highfields Cottage, Rectory Grove, Southend Road, Wickford (Essex); G2HN, E. Howell, 6, St. Pauls Street, Chippenham (Wilts); G2MA, D. D. Marshall, 8. Roclair Gardens, Hillfoot, Bearsden; G2MG, C. C. Miller, "Arndene," Bearsden; G2NN, F. C. Crocker, "Deepside," 17, Cross Deep, Twickenham (Mdx.); G2YL, Miss N. Corry, "Redholme," Walton-on-the-Hill (Surrey); G6CV, T. S. Garrard, 50, Lambeth Road, Linthorpe, Middlesbrough (Yorks.); G6LL, J. W. Mathews, 178, Evering Road, Clapton, London, E.5; G6OX, R. H. Quentin, 10, Minden Place, St. Heliers, Jersey, C.I.; D4KA, experimental amateur, Germany; LA2N, Gunnar W. Bergstrand, 43, O. Storgt, Drammeu, Norway; OH5NG, Armas Wahlstedt, 36, Pontuksenkatu, Viipuri, Finland; SP1TI, experimental amateur, Poland, write: *P.Z.K., 6, Bielowskiego, Warsaw, Poland;* presumably U1AS, N. Scheptunoff, 75, Moskowskaia, Novosibirsk, U.S.S.R.; CT1TU and CT1HF, experimental amateurs, Portugal, write: *Emisores Portugueses,* 333, *Rua Primiro de Dezembro, Lisbon,* Portugal. M. U. D. (Tottenham): We can trace the following call signs: G2NP, F. A. Pride, 524, Anlaby Road, Hull (Yorks.); G2IS, J. W. Paddon, Bussock Hill House, Newbury (Berks.); G2AO, O. H. Relly, "Gavinwood," Willingdon Road, Eastbourne; G2AF, G. Bryant, 5, Creffield Road, Colchester (Essex); G2HN, E. Howell, 6, St. Paul Street, Chippenham (Wilts.); G2XS, H. W. Sadler, "Redways," Wootton Road, Gaywood, Kings Lynn (Norfolk); G2XK, E. Knowles, "The Caravan," Springfields, Hemsworth, Pontefract (Yorks.); G2DF, F. A. Vost, 26, Pinewood Avenue, Warrington (Lancs.); G5FR, J. L. Jeffree, 2, Fernhurst Road, Croydon (Surrey); G5HK, H. S. Beckett, 55, Mona Road, Crookes, Sheffield; G5YB, R. C. Ashton, 41, Sithney Street, St. Budeaux, Plymouth; G5KD, F. M. Smith, 253, Westbourne Avenue, Hull; G5XA, H. Ransom, 86, Seymour Road, Hornsey, E.8; G5UI, J. E. Perkis, 67, Arthur Street, Ryde, I.O.W.; G*I*5QX, J. N. Smith, 73, Oakland Avenue, Bloomfield, Belfast; G5XO, Captain L. Bratt, "Ravensdene," Holden Avenue, North Finchley, N.12; G5UF, A. A. Barrett, 14, Cliff Avenue, Cromer (Norfolk); G6JI, J. W. Ismay, 6, Douglas Avenue, Walthamstow, E.17; G6HR, W. D. Keiller, 21, Newton Way, Cambridge Road, Upper Edmonton, N.18; G6FR, A. Freeman, 2, Carpenters Road, Lozells, Birmingham; G6FK, F. A. Clarke, 48, Wilbury Road, Hove (Sussex); G6FM, D. Milner, 64, Bury Street, Lower Edmonton, N.9; G6PC, C. D. Price, "Ardath," Park Lane, Wednesbury (Staffs.); G6XF, C. Powell, 3, Monway Buildings, Holyhead Road, Wednesbury; G6MZ, F. S. Mizen, 28, Brunel Road, Bridgewater Road, Bristol; G6CV, T. S. Garrard, 50, Lambeth Road, Linthorpe, Middlesborough; G6AF, R. H. Rice, 79, Seaside, Eastbourne; G6AS, G. A. Swinnerton, 109, Shirland Road, Smethwick (Staffs.); W1BM, H. E. Nichols, 82, Elmwood Avenue, Bridgeport (Conn.); W5AQY, Texas A. & M. Radio Club, Box 1,666, College Station, Texas; W9BH, Kenneth H. Goode, 6,142, Kimbark Avenue, Chicago, Ill.; F3CO, G. Thomas, 9, rue du Chapitre, Saint Brieuc (Côtes du Nord) France; F8VX, Jacques Pogtioli, 2, rue d'Hangard, Villers-Bretonneux (Somme), France; F8VO, Petitier, 51, Rue du 11 Novembre, Savigny (Seine et Oise), France; F8HK, R. Dubreuil, Saint-Savinien (Charente), France; F8CO. G. Inchauspe, 106, Avenue de la République, Paris (11e), France; F8PE, A. Acedot, 11, Cours Valatour, Luner (Herault), near Montpellier, France; F8VT, Georges Gurdon, 4, rue des Ecôles, Aulnay-sur-Bois (Seine et Oise), France; F8UI, E. Potin, 62, Rue des Epis, Sotteville-lez-Rouen (Seine), France; F8UJ, Gauthier, Impasse du Jeu de Paume, Verdun (Meuse), France; F8VP, Chambat, Chemist, Pont du Château, (Puy de Dôme); F8RP, Jean Dort, rue Virginie Laurière, Bagnères-de-Bigorre (Haute-Pyrénées), France.

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.

MORSE RECORDER

"Could you tell me through the columns of your paper whether there is any gadget on the market that I can fit to my receiver (in the place of the loud-speaker) that will automatically record morse signals? Alternatively, would it be possible for you to publish such a circuit on making the above?"—M. B. (Brighton).

A simple morse recorder may easily be made at home. Full details will be found in "Simple Electrical Apparatus," published by this House at 1/-.

METAL RECTIFIERS IN SERIES

"I have got two metal rectifiers and several old mains transformers amongst my collection of apparatus. I wish to build up a mains unit to deliver 500 volts H.T., but the rectifiers which I have will only give 200. Could I connect them in series across a transformer giving an input of 500 volts to obtain a rectified 500 volts output? I should like you to give me the necessary connections in order to do this if possible, and if it is not, could you please state the reason?"—Y. S. (Bradford).

You do not state the actual type of rectifier which you intend to use. If they are of the voltage-doubler type, you could connect them in series across two separate mains transformers, each delivering an input to the rectifiers as required by the particular units in use. Alternatively, you could connect the two rectifiers in series with an input from a transformer exactly double that required for the individual rectifiers. With this method you will obtain just over double the total voltage of the two units, whilst with the first method the output will probably be slightly under double. The actual connections must be carefully made, and we would advise you to obtain a copy of the 'All Metal Way' from the Westinghouse Brake and Saxby Signal Company, in which connections for this method are given.

USING A NOVOTONE

"I have bought a Novotone compensator which was recently described in your pages, but it seems to have a peculiar effect on my set. When I was using the pick-up alone, fed into three good L.F. stages, I got very good quality and good volume. I am very keen on good tone, and, therefore, thought that the addition of the tone compensator would help me to still further improve the quality. I find, however, that there is distortion, the music being harsh, and bad hum. I do not believe it can be due to the tone device in view of your report, so should like to know whether it can be due to anything else."—A. H. G. (Kettering).

You have probably overlooked the fact that the tone compensator, in addition to improving the tone, adds to the volume slightly, the amount of amplification depending upon the model you have obtained. The increased amplification is no doubt resulting in overloading of the input valve, and you should fit a volume control across the compensator, the valve being chosen according to the maker's recommendation. The hum may be due to the fact that the leads are long, or may be a result of the improved low-note response which you are now getting. Screen the leads from the pick-up and earth the screening, as well as the case of the tone compensator. When you overcome these points you will find that there is an undoubted improvement in the use of the arrangement, and you should study the notes in the booklet entitled "Realism from Records," which is issued by the makers of the device.

QUESTIONS NOT TO ASK

"I have built the X receiver described in 'The Radio Journal,' but find difficulty in adjusting the preset condensers. Can you tell me how to test the circuit for best results, or how to improve on it.?"

When a receiver has been built from a design published in a contemporary journal we regret that we cannot give any operating details or suggest modifications. The designer of the receiver should be consulted in such cases. We are also sometimes asked to suggest how a certain receiver may be modified to incorporate a circuit published in this journal. The same remarks apply in this case.

"Can you send me a blue-print of the 'Famous Portable' manufactured by Messrs. Wireless Sets, Ltd.?"

We have no blue-prints of commercial receivers, and where it is desired to have a full knowledge of the circuit details of a commercially-made receiver the makers should be communicated with. If you are unable to find their address we shall be pleased to give it to you on receipt of a stamped addressed envelope.

"I heard a band playing the well-known 'Lazybones' last night just above the Midland Regional. Could you tell me what station it was?"

As Dance Music is transmitted from a number of stations in the evening it is essential to give some indication of the actual wavelength. In all queries relating to station identification it is necessary to restrict the search to a narrow band, and, therefore, the nearest stations on either side of the tuning-point, or some indication of the type of announcement or interval signal should also be given.

CALIBRATED DIALS

"I have purchased a tuning pack from a friend, and he guarantees that he has not tampered with it in any way, and yet I cannot get the dial to remain matched. The wavelengths are marked, and I have turned the trimmers in all directions, but although it gives the correct readings in some spots it is right out in other parts of the dial. Does the aerial make any difference? I do not see how the makers can guarantee the settings, as they do not know what aerial and earth will be used."—T. B. G. (Hackney).

The calibrations are carried out on the coils which are included in the detector stage (in the case of an H.F. tuning pack), or in any other coil in the unit which, unlike the aerial coil, has a constant load. The aerial coil is usually flatly tuned, owing to the damping of the aerial and earth, but it may be sharpened and actually matched to the other coils by the use of a series aerial condenser. You will find, therefore, that if you fit a pre-set condenser in the aerial lead, and adjust the trimmers on the remaining coils so that the calibration points agree, the series condenser, in conjunction with the trimmer on the aerial coil, will enable the adjustment to be made to hold good throughout the scale.

D.C. HEATER CONNECTIONS

"Is there any rule to be adopted in the case of wiring up the heaters of the D.C. indirectly-heated valves? I have noticed that in some commercial sets the valves are simply joined in series, whilst in other sets I have examined there seems to be a scheme which makes the detector valve the last in a chain, the other valves being arranged in all sorts of different ways. I should like to know whether there is anything definite."—W. D. E. (Pimlico).

Although there is no rule to be regarded in wiring D.C. heaters, it is advisable, in the interests of the removal of hum, to wire the circuits so that the heaters of all the valves act in the form of a smoothing circuit for the detector heater. Thus, a very good arrangement will be found to consist of wiring the output valve in the positive end of the line, and the detector at the negative. Obviously, where heaters of different voltage and current ratings are employed it will be necessary to modify this arrangement in order to supply each valve with the correct potential. Remember, generally, that the detector valve requires the smoothest supply, and similarly all valves, the output from which is subjected to subsequent amplification, must be supplied with hum-free sources of voltage.

MAINS TRANSFORMER WINDINGS

"In reading a recent article in 'Practical Wireless' dealing with the construction of mains transformers I noticed that the L.T. secondary winding was stated to have '32 turns, with centre tap.' Does this mean there should be 32 turns in all, or 32 on each side of the tapping."—R.B. (Reading).

There should be 32 turns in all, the tapping being taken after winding on 16.

FREE ADVICE BUREAU COUPON

This coupon is available until March 17th, 1934, and must be attached to all letters containing queries.

PRACTICAL WIRELESS, 10/3/34.

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 Ratio 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. ½amp., 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.

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.

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 mf., 1/9.

T.C.C. Electrolytic Condensers, 440 volts working, 8 mf., 3/-; 15 mf., 50v. 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 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. 6mfd. 50v. electrolytics.

PLEASE mention PRACTICAL WIRELESS when ordering.

PREMIER SUPPLY STORES

20-22, High Street, Clapham, S.W.4, 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.625s, 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.24B.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./HL.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, 89's, 238s, 239s, 244s, 12/-; 227s, 226s, 245s, 280s, 9/6; 242s, 232s, 11/-; U.X.250s, 281s, 17/6. Dubilier or Eric 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.

TELEVISION DISC KIT 50/-. Illustrated Constructors' Handbook 1/-. "P.W." Specifications Listed. Bennett Television, 50a, Station Road, Redhill.

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

REPAIRS—REWINDING—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., Weedon 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.

WANTED good Modern Wireless Parts, Sets, Eliminators, Meters, Valves, Speakers, etc. Spot Cash waiting. Send or bring. We pay more than any other dealer. Open 9-8.—University Radio, 142, Drummond St., Hampstead Rd., N.W.1.

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 Transformer 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.

MICROPHONES.—Buy from the actual makers at Rock bottom Prices. Button capsules complete for detectaphone and other experiments, only 1/-. Transformer, 3/6. No. 11 Home Mike, bakelite body, 2in. diam., unbreakable, 5/6. Table PW.11, a handsome announcer's rectangular model, 3in. by 3in., on brass stand, a self-contained Mike and Transformer, with switch, 10/6. Tall pedestal Broadcasting Model 12B, with Microphone hung in ring, 12in. high, 18/6. Complete Deaf Aid sets to assist those hard of hearing, 18/6. Special P.A. makes for Dance Bands and Public address. All parts in stock for Home Constructors, granules, blocks, diaphragms, mouthpieces, etc. Headphones, 2/6 pair. Write for Lists "N" 1 and 2.—Electradix Radios, 218, Upper Thames Street, London, E.C.4. Tele.: Central 4611.

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

A.C. Eliminators, Alco; 105-250 v. outputs, 60v. S.G. 130 v. 20 m.a., 24s.; with charger, 34s.; complete and guaranteed.—P. and D. Radio, 1, Goodinge Road, N.7.

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