S. W Coils

FREE BLUE PRINT OF NEW LIGHTWEIGHT PORTABLE—NEXT WEEK!

Practical Wireless

3D.

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APRIL 29th, 1933.
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Solving the Portable Problem



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for the Home Constructor!



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Here is the All-Electric "Skyscraper."

So phenomenal has been the success of the Battery "Skyscraper"—so universal the delight expressed by its builders in its simplicity, in its great power, in its wonderful ease of operation, that *Lissen could not bear to give this famous name to an All-Electric set* UNTIL ABSOLUTE SAFETY—the one feature for which the home constructor has previously looked in vain in any Mains-driven set—had been achieved by the Lissen designers. IT TOOK MONTHS, BUT HERE IT IS. There are two chief safety features in this set. First, the Lissen "Skyscraper" Power Unit . . . . so completely enclosed and protected in sheet metal, so rigorously designed within for safety as well as electrical efficiency, so simplified, that YOU USE IT JUST LIKE A BATTERY. *Actually you connect up the terminals of this "Skyscraper" Power Unit exactly as though they were the battery terminals of a battery set.* Second, THE SAFETY FUSE PLUG. You simply plug in to the mains from which you are going to draw your power, and instantly the set is completely protected. For in *each* lead from the mains inserted ingeniously into the plugs is a tiny fuse, which adequately protects the receiver from harmful effects of excess current. Thus, when you have built the All-Electric "Skyscraper" you and your set are perfectly protected.

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"SKYSCRAPER" SAFETY



ROUND *the* WORLD *of* WIRELESS

Fighting for the Long Waves

IT would appear that seven European countries to whom wavelengths in the medium band were originally allotted have now put forward claims to broadcast on channels above 1,000 metres. As, at present, the upper band can only accommodate eleven transmitters on wavelengths already allocated to some of the older established transmitters, it is very doubtful whether, and how, the Lucerne Conference will see its way to satisfy all applicants.

More Russian Stations

IF news from Finland is to be believed, when Moscow has launched its 500-kilowatt broadcaster on the air the Soviet authorities will begin the construction of a further twenty high-power transmitters with a view to flooding Europe with official news bulletins. These transmissions will be carried out in various languages. As capital is required for this further development of the Russian broadcasting system, with the exception of members of the Red Army, all owners of wireless apparatus will now be compelled to pay an annual radio tax. It is stated that, in view of the fact that Germany has suppressed all communist organizations, including newspapers, the new super-power Noghinsk transmitter will devote most of its time to propaganda and special bulletins destined to that country.

Radio Vatican Time Table

AS we have received a number of queries from readers in respect of the Vatican broadcasts, it may be of interest to detail the transmissions carried out by this Italian station. On 19.84 m. daily a bulletin is issued at 11 a.m. G.M.T. for missionaries throughout the world. It is given out in various languages, namely, Italian (Monday and Friday); English (Tuesday); Spanish (Wednesday); French (Thursday); and German (Saturday). Every evening Papal *communiques* are broadcast in Italian at 8.0 p.m. G.M.T. on 50.26 m. On Sundays, between 11.00 and 11.30 a.m. on 50.26 m. prayers are transmitted in Latin and French, followed by an Italian sermon. They are destined to the sick and chronic invalids who cannot attend Mass. This transmission occasionally closes down with a short programme of Sacred Music.

Jugoslavia Wants More Stations

DURING the course of the present year the Belgrade station is to be endowed with a 40-kilowatt transmitter, and the older plant will be transferred to Subotica, as a relay. Another 8-kilowatt station is to be erected at Skolpje. Zagreb also will transfer its existing transmitter to Spilt (Spalato) and will replace it by a broadcaster capable of radiating some 20 kilowatts. With this development of the system Jugoslavia will control a network of five stations.

Tune in to Caracas

IF you care to search the 49-metre band towards 3.0 a.m. G.M.T., you should have no difficulty in picking up YV1BC, Caracas, on 49.02 metres. During intervals between somewhat oldish numbers of gramophone records you will hear an English announcement: *This is the station YV1BC broadcasting on a frequency of 960 kc/s (312.3 m.) and also on 6,120 kc/s (49.02 m.). We are located in Caracas, Venezuela, and welcome reports from foreign listeners, which are acknowledged.* The acknowledgment consists of a profusely illustrated booklet in Spanish and English with descriptions of the Venezuelan capital and the transmitting station, all complete with maps.

NEXT WEEK:

FREE BLUEPRINT
(FULL-SIZE)
OF
F. J. CAMM'S NEW FEATHERWEIGHT PORTABLE (CLASS B) FOUR.

AN ENTIRELY NEW RECEIVER WITH MANY NOVEL CONSTRUCTIONAL FEATURES.

And Another Star Short-waver

W2XE, the Columbia Broadcasting System's new transmitter at Wayne, N.J., is now working at increased power. It is on the air daily alternately on three separate frequencies; namely, from 4.0 p.m.–6.0 p.m. G.M.T. on 15,270 kc/s (19.646 m.); from 8.0–10.0 p.m. on 11,830 kc/s (25.36 m.) and from 11.0 p.m.–4.0 a.m. G.M.T. on 6,120 kc/s (49.02 m.). The transmissions carried out on 19.646 m. (15,270 kc/s) are made with an aerial specially directional to Great Britain in order to assist in the reception of the broadcasts. They are very well heard towards 5.0 p.m.

Wireless for New Air Services

ALL the aircraft for the new air services operated by Hillmans Airways from their aerodrome at Romford are to be fitted with Marconi equipment, which will enable the pilots to keep in touch with aerodrome stations throughout their flights.

Experience has shown that air-and-ground wireless services of this kind are practically essential to the safe and regular operation of modern air routes, which are expected to operate to schedule under conditions when even land and sea transport services are sometimes severely dislocated. Wireless assists the pilot by keeping him informed of changing wind and weather conditions all along his route, the state of aerodromes, and other vital matters, while with the type of Marconi equipment installed in the Hillman aircraft the pilot himself can also "ring-up" the nearest air port and ask for any information he may require.

"Bulgin" is Now a Registered Trade-Mark

A. F. BULGIN & CO., LTD., have recently been notified by the Registrar of Trade-Marks that their name "Bulgin"

"PRACTICAL WIRELESS" DATA SHEETS
Data Sheet No. 19, given with this issue, completes the first series. A second series is in course of preparation, and an announcement concerning them will be made in an early issue.—ED.

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

is now registered as a trade-mark. It is on very rare occasions that a surname is granted this privilege.

In order to substantiate the claim that the name "Bulgin" was alone in the Radio Industry, and so justify the registration, it was necessary for the firm to obtain some hundreds of affidavits from wholesalers, dealers and heads of trade organizations, and from all the leading radio trade journals, wherein they started that the name "Bulgin" had been used for the past nine years, and that the name had never been used by anybody else connected with the industry.

Wireless at the Ideal Home Exhibition

AN interesting and unusual feature of this year's Ideal Home Exhibition at Olympia (which closes on April 29) is the special display entitled "Rooms of the Scientists."

This section of the Exhibition provides a glimpse of the studies and laboratories of some outstanding figures in scientific research and discovery, from Archimedes to Marchese Marconi.

Among such names as Newton, Lister and Darwin, the progress of electricity is represented by Faraday and Marchese Marconi.

Faraday's Laboratory

A CORNER of Faraday's laboratory at the Royal Institution has been copied with remarkable fidelity, while the reproduction of part of the wireless room in Marchese Marconi's famous steam-yacht *Elettra*—his floating laboratory—represents the most modern application of Faraday's basic discoveries.

The "Elettra"

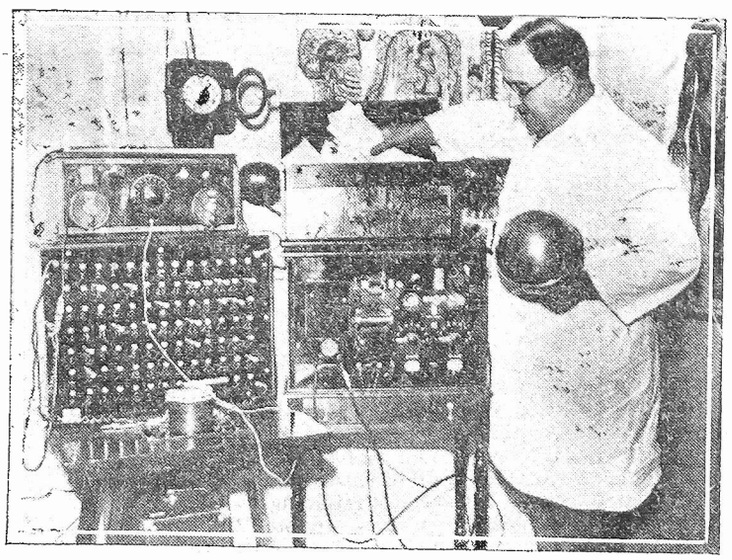
THE *Elettra* cabin has been furnished with a Marconi short-wave transmitter, Type SWB4, of the class used by Marchese Marconi for his early experiments in long-distance ship-and-shore wireless telephony, and also in March, 1930, for the transmission of the special signal from the S.Y. *Elettra*, lying off Genoa, which lit the lamps of an exhibition at Sydney, New South Wales. An example of the new Marconi micro-wave apparatus is also in the cabin. Other apparatus represents the newest developments in marine wireless equipment, such as the Marconi Type DFM4 direction finder and radiogoniometer, which operates with a small fixed loop aerial, a marine receiver, Type 394, which has a wave-range of 100-2,000 metres and is designed particularly for loud-speaker reception of telegraph or telephone signals, and a telegraph transmitter of the emergency type.

Sponsored Concerts from Athlone

ARRANGEMENTS have now been completed to broadcast sponsored concerts from the Athlone (I.F.S.) high-power station on 413 m. every evening between 9.45 and 10.45 p.m., B.S.T. The Irish Free State Army Band will be one of the regular features of these special entertainments.

INTERESTING and TOPICAL PARAGRAPHS

THE RADIO DOCTOR!



An American doctor has devoted his efforts to developing electro-therapeutic broadcasting devices by means of which he could cure body infections by remote control machines. He is seen in picture examining one of the 48 machines he has so far assembled.

It operates on a short wavelength, enabling him to give remote control treatments to 100 patients a day within a radius of 150 miles. without their knowledge that he is giving them treatment, as long as they are wearing his crystal receiving set (a small metal tin containing crystals composed of the various elements that go to make up the human body.)

SOLVE THIS!

Problem No. 32.

Miller made a one-valve set using an all-metal chassis, wooden panel, and a baseboard mounting type of anti-microphonic valve-holder. The receiver was completed, the valve plugged into the socket, and the on-off switch pulled out. Immediately, the fuse blew. A new fuse of higher rating was inserted in the holder, and again it blew directly the on-off switch was operated. Valve and fuse were removed, and careful tests were carried out in the circuit, but there were definitely no short-circuits anywhere. A fresh fuse was, therefore, tried, but with the same result. Even the highest value fuse obtainable was blown as soon as the set was switched on. The valve was perfectly in order. What do you think 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, London, W.C.2, and mark your envelopes Problem No. 32. Do not enclose any other correspondence with your solution, and post to reach this office not later than May 1st.

SOLUTION TO PROBLEM No. 31.

The grid leak of the resistance stage in Smith's receiver was faulty, and therefore the coupling condenser was accumulating a charge which partially choked the first L.F. valve.

The following three readers received books in connection with Problem No. 30:—

L. C. Jones, 24, Whitworth Road, S. Norwood, S.E.25; A. E. Peck, 15, Pelham Road, Wood Green, N.22.; A. A. Dodd, 6, Ferndale Road, Banstead, Surrey.

Cyclones and Short-Waves

DURING April, when strong magnetic disturbances are to be expected, relays on short-waves from Europe by the American broadcasting nets are cut down to an absolute minimum. According to the Radio Corporation of America, during such periods atmospheric disturbances are such that considerable interference is experienced, even on short-wave channels.

Military Training by Radio

THE Spanish broadcasting stations have been instructed to include in their transmissions to schools special courses on military subjects and lectures relative to the physical training of Army cadets.

Radio Toulouse Partly Destroyed

A SEVERE fire recently greatly damaged the transmitting plant of Radio Toulouse; the studio was completely destroyed. As it is estimated that repairs to the building and plant will cost some £20,000, a request has been made to the authorities to bring the new St. Agnan station into operation for which, up to the present, no licence has been granted. So far permit has been refused, as it was feared that the broadcasts from a 60 kilowatt transmitter would interfere with those of the State station (Toulouse Pyrenées) in the same city.

More Wireless Telephony Services

IN addition to the public telephony service which was recently opened between Paris (St. Assise) and Bouffarik (Algiers), the latter has now initiated shore-ship communication with steamers in the Mediterranean and Atlantic. A wireless telephony service has also been officially opened between Great Britain and Palestine. On this side messages are transmitted *via* Rugby and received at Baldock; the corresponding stations being Abu Zabal (Cairo) and Mahdi, in Egypt. The route then taken to Jerusalem, Haifa, Jaffa, and Gaza is by land-line, with repeater stations at Ismaila and Lydda. All controls of the service are situated respectively at the London and Cairo Telephone Exchanges.

Belgium and Congo Broadcasts

THE Belgium Government is carrying out tests in an endeavour to relay the Brussels wireless programmes to the Congo, *via* the Leopoldville station. The experiments are being made by the Ruysselede (Bruges) short-wave transmitter.

No Summer Time in Portugal

BEAR in mind that as Portugal has *not* adopted Summer Time this year, if you wish to hear the broadcasts from CT1AA, Lisbon, on either medium or short-waves, they must be tuned in one hour later than their usually advertised G.M.T. times.

WE ALWAYS LEAD AND SHOW THE WAY!

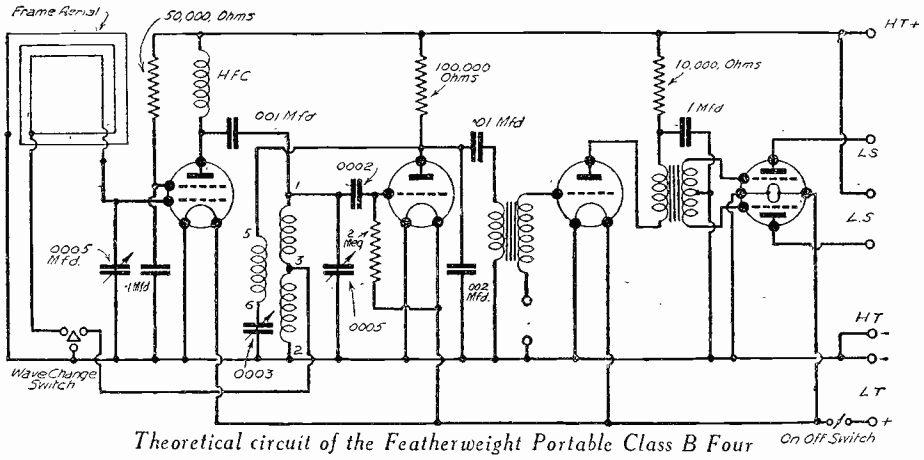
Solving the Portable Problem



Advance Details of our powerful Featherweight Portable Class B Four-Valver, with many novel features, Blueprint of which will be given next week.

By F. J. CAMM

IT has become accepted by the radio industry that wireless is a seasonal hobby. It is my firm conviction that it has been seasonal in the past mainly because no one has taken the trouble to make it anything else. Obviously, in the brighter weather, people follow outdoor pursuits, but there is no reason why radio should not be enjoyed in the open as well, and at the same time. Portable sets with this idea in view have been produced which have merely given a new meaning to the word portable. Apparently it has been assumed that any wireless receiver which may be awkwardly humped a few yards is a portable receiver. Of course, it is absurd to expect anyone, especially in the hot weather, to carry a wireless receiver on a hiking tour, or even to the venue of a picnic, when its weight would give rise to the greatest discomfort, even admitting that all hikers and all those who wish to picnic were members of a race of Goliaths. It is fair comment to say that few portable receivers at present available are really intended for such use. As room-to-room sets, or for use in the garden, they may be ideal, but for taking on the river or on a picnic they would be useless. **Accordingly, when designing the Featherweight Portable Class B Four, which forms the subject of next week's free gift full-size Blueprint,** I determined to tackle the problem of weight reduction. A preliminary survey showed that weight was not a necessary appendage to first-class performance, for there are many extremely efficient but lightweight components such as transformers, valve-holders, condensers, etc., which lend themselves admirably for portable purposes.



Theoretical circuit of the Featherweight Portable Class B Four

SPECIFICATION OF FEATHERWEIGHT PORTABLE.

Two Utility Bakelite Condensers, .0005 Type W. 297.
One Wearite H.F. Choke, Type H.F.P.A.
One Lissen Dual Range Shielded Coil.
One Graham Farish Litlos Condenser, .0005.
One Graham Farish Ohmite Spaghetti Resistance, 15,000 ohms.
One Graham Farish Ohmite Spaghetti Resistance, 50,000 ohms.
One Graham Farish Ohmite Spaghetti Resistance, 100,000 ohms.
Three Clix 4-pin Chassis Type Valve-holders.
One Clix 7-pin Chassis Type Valve-holder.
One Bulgin On-Off Switch, Type S. 38.
One Bulgin Wave-Change Switch, Type S.36.
Four Bulgin Frame Aerial Spacers, Type I.12.
One Bulgin Senator Transformer, Type L.F. 12.
One Lissen Class B Driver Transformer.
One 2 megohm Grid Leak, with wire ends, Lissen.
One T.C.C. .01 mfd. Fixed Condenser, Type M.
One T.C.C. .0002 mfd. Fixed Condenser, Type M.
One T.C.C. .002 mfd. Fixed Condenser, Type M.
One T.C.C. .1 mfd. Fixed Condenser, Type 50.
One T.C.C. 1 mfd. Fixed Condenser, Type 50.
One T.C.C. .001 mfd. Fixed Condenser, Type M.
One Cossor 220 S.G. (Metallised) Valve.
One Cossor 210 H.F. (Metallised) Valve.
One Cossor 215 P Valve.
One Cossor 240 B Valve.
One Rola Loud-speaker, Type F.5-PM-14-Class B.
2 ozs. 24 D.C.C. wire and 2 ozs. 34 D.S.C. wire for frame.
One Ediswan 120 volt H.T. Battery, ref. 69706.
One Ediswan 9 volt Grid Bias Battery, ref. 69807.
One Ediswan 2 volt accumulator, E.L.M.2.
Four Wander Plugs, (H.T.+, H.T.—, G.B.+ and G.B.—).
Two Spades (L.T.+ and L.T.—).
One coil Glazite, flex, screws, wood for case, carrying handle, etc.

IT was revealed that the average commercial portable cabinet weighs anything between 10lbs. and 12lbs., and I decided that practically all of this could be usefully dispensed with whilst retaining the necessary rigidity. I therefore adopted the same methods of weight reduction as are used in the aircraft industry. The case of the Featherweight Portable Four is an easily-assembled structure made from 1in. by ¼in. stripwood which, when covered with thin cardboard, and finally with leather cloth, has produced a cabinet *which weighs only 1lb.* I carried the stripwood idea even farther, for the baseboard merely consists of three spaced strips of the same wood, between which the components are screwed.

Another problem which I sought to solve was the usual difficulty of assembling a portable set, for normally, with this type of receiver, it is necessary to fiddle about in the restricted space usually allowed in order to connect the components to the controls. This arrangement necessarily endows the receiver with numerous obscure corners in which it is impossible adequately to get the fingers in order to tighten terminals or attach wires. As a consequence, I decided that the stripwood baseboard should be attached to a fretted front built from ¼in. stripwood and that the frame aerial, speaker, and all components should be mounted on it as well. This front comprises the receiver proper, and the remainder of the case is merely a protective covering providing also accommodation for the small H.T. battery, grid-bias battery, and accumulator. The front, with all the components attached, is merely hinged at the bottom to the covering case, and is secured at the top with a simple swing hook which locks it. It is thus only necessary to release the hook in order to swing the set outwards on its hinges when adjustments may readily be carried out. I also decided that in order to reduce H.T. consumption, and further to enhance the compactness of the receiver, Class B amplification was necessary. The total consumption is only 8 milliamps, and bearing in mind that this is really a 5-valve receiver (the Class B output valve really constituting two valves in one) this is extremely economical. The overall size of the complete receiver is only 15in. by 12in. by 6in., and it may quite

(*Continued on page 246.*)

SELECTIVITY IN SIMPLE TERMS

Ways and Means of Increasing Selectivity in Ordinary Three-Valve Sets

By F. WHITE

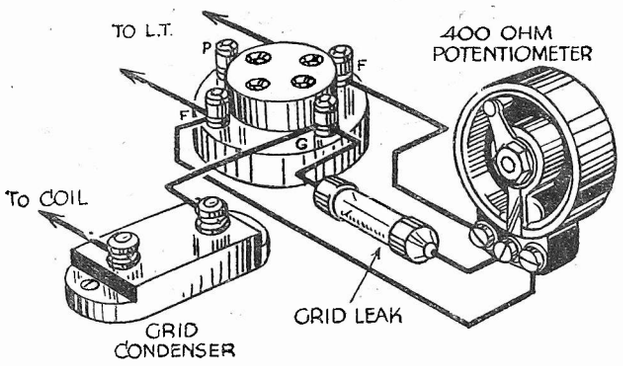


Fig. 1.—Obtaining smooth reaction.

TWO or three years ago the ability of a receiver to "get foreign stations" depended on its sensitivity more than its selectivity. Now that the position is reversed and there are numerous stations working at high power, selectivity is of vital importance.

The ideal method of obtaining the required selectivity is to use a multi-stage H.F. receiver with many tuned circuits. Such a solution is expensive and rather laborious if the receiver is home-constructed. It will be the object of the writer to show means of increasing the selectivity of a simple receiver. Let us consider a three-valve set—a detector and two L.F. stages.

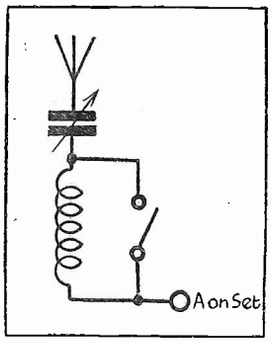


Fig. 2.—An arrangement for preventing the medium wave station breaking through on long waves.

Single Tuning Circuit

Such a set has only one tuning circuit (in absence of band-pass filter) and the most has to be made of this. The lower the resistance of the circuit and the higher its inductance, the greater will the selectivity be. Now the aerial and earth system adds to the circuit resistance, and so blunts the tuning to some extent. The earth should be a large buried object in moist soil. A water-pipe makes a good earth, and one should be used which goes directly to mains, and not one which runs all over the house and into the tank. Use a short stout earth wire.

The aerial should be as short as the sensitivity of the set will allow, but such a procedure will, of course, not favour the weaker stations. These will not then interfere with their powerful neighbours (in kilocycles), and surely it is better to receive a few stations clearly than many which interfere with one another.

The degree of selectivity is dependent on the coil employed. It has already been shown that a shield or screen on the coil in such a receiver is unnecessary and only blunts selectivity. Choose then a dual-range coil in which the long-wave portion is not wound right next to the medium-wave portion. If these two portions are very near then the long-wave coil (when shorted) exercises a damping effect on the medium-wave coil which blunts selectivity. Choose a coil which is tapped, or, better still, one which has several tappings. You can then use that tapping most suitable to your conditions. Alternatively use a coil with aperiodic aerial winding, *i.e.*, one which has a separate winding for aerial and earth. The degree of selectivity can then be varied by loosening or tightening the coupling between the two coils.

When the aerial is long, and the coil has only a centre tapping, greater selectivity can be obtained by the use of an aerial series condenser. This may be a solid dielectric type with a maximum capacity of .0003 mfd. It is connected between the aerial and aerial terminal of set. Unscrewing it increases selectivity, but decreases the volume. A satisfactory setting must be found by experiment. Signal strength may be increased by the use of reaction.

Reaction

Reaction is a good servant but a bad master. Used properly it will increase signal strength and also selectivity. If it is fierce or "ploppy," then it is of no use at all. Increasing it from zero to maximum should at some point result in a gentle hissing from the loudspeaker to be followed by oscillation as the reaction is advanced. Oscillation should cease (when *decreasing* reaction) at that point where it commenced. If the reaction dial has to be moved through several degrees before oscillation stops, then you are not obtaining the best results. You may be using an unsuitable valve in the detector stage. Try varying the detector tapping (on H.T. battery) to get smooth reaction. The best results are obtained when the grid-leak is returned to the slider of a potentiometer across the L.T. battery instead of being connected to L.T.+. Such an arrangement is shown in Fig. 1. The slider is slowly advanced to the negative side of potentiometer till the best position for working is found.

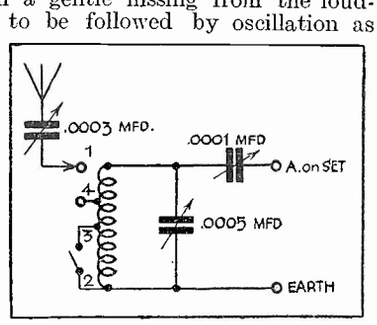
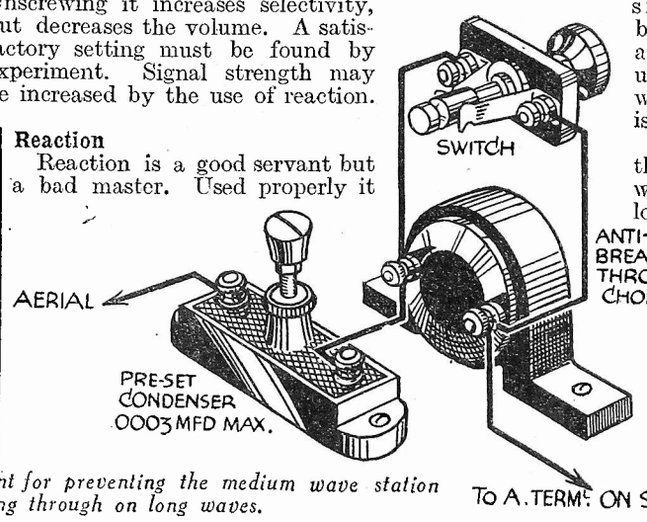


Fig. 3.—An additional coil to provide a "band-pass" effect.

On the Long Waves

On the long waves a simple set (such as the type mentioned) suffers badly from lack of selectivity. What sometimes happens is that the two London stations (or two local stations) are heard together over half the dial. We will not go into the theory of this form of interference called cross-modulation, but a cure is given. It consists of the use of a specially designed H.F. choke, which is so designed that the impedance to medium waves (*i.e.*, to frequencies of about 1,500 kc/s to 600 kc/s) is very much greater than the impedance to long waves. Thus, while medium-wave signals are completely blocked, long-wave signals are passed through almost unchecked. The method of wiring the choke into circuit is shown in Fig. 2.

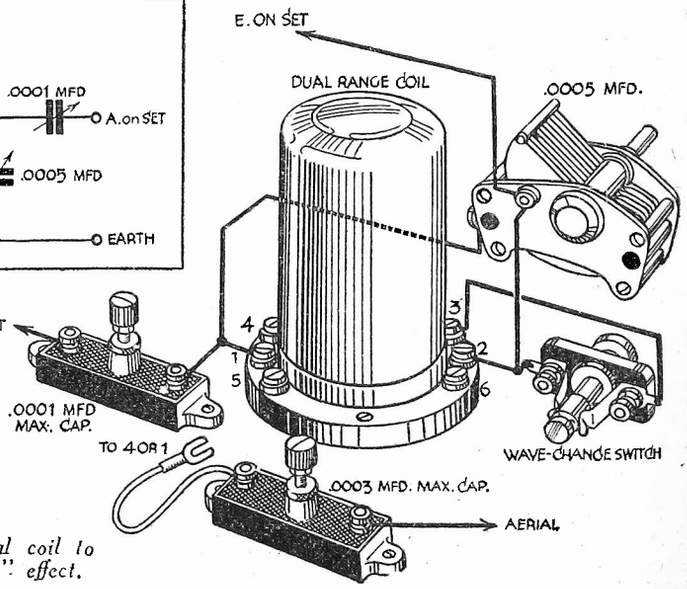
The switch is closed when the medium waves are worked and left open when long waves are received. The .0003 mfd. maximum condenser is set at a suitable setting, its value not being very critical. If greater selectivity is required another compression condenser may be added to the previously described unit. It is placed between the aerial and the terminal marked aerial on unit.



Double-Circuit Tuning System

So far the schemes for improving selectivity have been very simple. It is quite possible that after trying the aerial series condenser, and other simple devices, that

(*Continued on page 232.*)



SAFETY FIRST!

A Few Suggestions for Protecting the Receiver and its Accessories from Damage.

By FRANK PRESTON, F.R.A.

DESPITE the above title, I do not wish to suggest that by following our fascinating hobby we are at all likely to be electrocuted or injured in some other way. What I have in mind is the safety of the receiver and its components. I have heard it said—probably truly—that over fifty per cent. of the breakdowns and failures of certain components, especially valves, high-tension batteries, resistances, transformers, and even loud-speakers, are due to carelessness or lack of forethought. It is also said that "to be forewarned is to be forearmed," so perhaps I may be excused for giving a few friendly warnings and suggestions which might result in a saving of time, temper and money.

A switch for connecting the aerial to earth when the set is out of use is always recommended, its ostensible purpose being to protect the receiver in case the aerial is struck by lightning. The switch also transforms the aerial-earth system into an efficient lightning arrestor, which affords protection to the house. Of course, the probability of an average aerial being struck by lightning is extremely remote, but it is by no means impossible for atmospherics of the most powerful kind to cause minor injuries to components in the aerial tuning circuit, and on this score alone the aerial switch is justified.

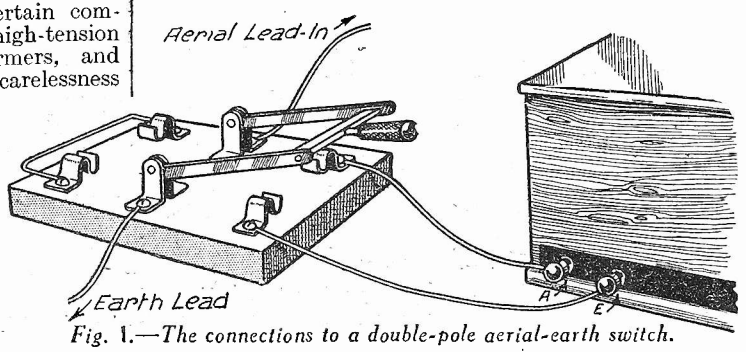


Fig. 1.—The connections to a double-pole aerial-earth switch.

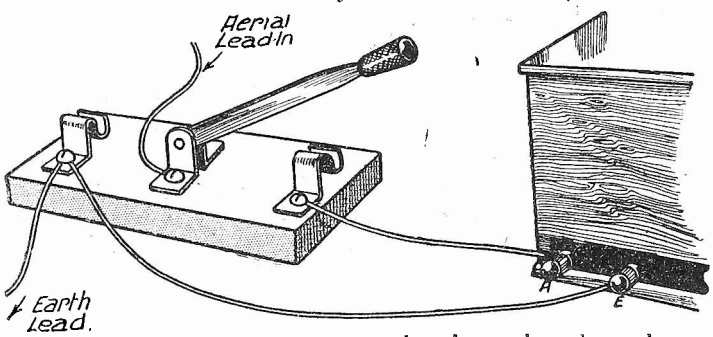


Fig. 2.—The connections to a single-pole aerial-earth switch.

Single-pole and Double-pole Switches

There are two principal kinds of switches in common use, one called a single-pole, and the other a double-pole change-over switch, and they are connected as shown in Figs. 1 and 2. When using the single-pole component the aerial is connected to the set (*via* the earth wire) even when the switch is "off," but with the other type both aerial and earth are entirely disconnected. It is because of this that we are often told that the single-pole switch does not offer real protection. Actually, however, it is perfectly "safe," provided that the earth lead is reasonably efficient, because any electrical charge which reaches the aerial will always leak away through the path of least resistance, which is, of course, the earth lead. The position of the switch is probably of greater importance than its type, and it should be mounted as near as possible to the aerial and earth leads-in. Theoretically, the best place would be outside the house on the window frame, but there are very few of us who feel like taking a walk in the garden last thing before going to bed. It is not necessary to do so, for, provided the switch is screwed to the window-sill near the lead-in wires, all will be well.

A Spark Gap

Quite apart from lightning discharges, it is probably not fully realised to what extent very powerful atmospherics can be harmful, especially when the set is in use. They act rather like strong signals, and, coming so suddenly, are liable to produce rapid voltage surges in the set which might even cause the breakdown of a transformer or valve. For this reason it is always wise to switch off when atmospherics become really troublesome. In any case, reception cannot be enjoyable, but one is sometimes tempted to hang on until a programme is finished. If for any reason it is particularly necessary to keep the set in use in spite of atmospherics, some measure of protection can be secured by fitting a spark gap between the aerial and earth leads; this will allow any exceptionally strong discharge to leak away without doing much harm. The gap may be made quite easily from the simple parts indicated in Fig. 3. Incidentally, it might be added that a number of aerial-earth switches are now fitted with a suitable spark gap of the type illustrated in the sketch of Fig. 4. In addition to serving the purpose mentioned above the spark gap is a good stand-by when one forgets to turn off the switch, for in case of lightning it will provide a reasonably low-resistance path between aerial and earth for electrical discharges, although having no effect on

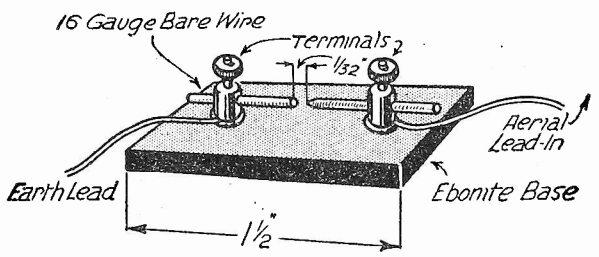


Fig. 3.—A simply made spark gap for connecting between the aerial and earth.

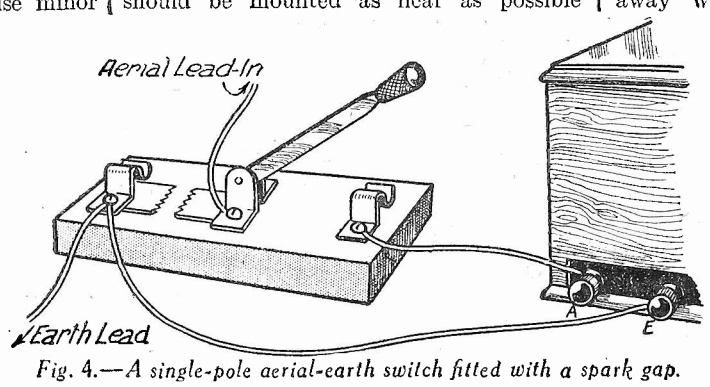
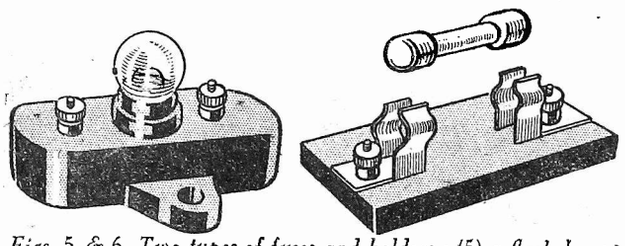


Fig. 4.—A single-pole aerial-earth switch fitted with a spark gap.



Figs. 5 & 6. Two types of fuses and holders: (5) a flash-lamp-bulb fuse and (6) a cartridge fuse

normal reception. For the benefit of newcomers to wireless I might mention that although atmospheric discharges are practically unknown in winter, they are frequently very troublesome during hot and sultry weather. Consequently, if an aerial-earth switch has not yet been installed it might pay to attend to the matter before summer comes along.

Fuses

Whenever one thinks of safeguarding the receiver the idea of fuses immediately comes to mind. And no wonder, because they are particularly useful, especially to the constructor and experimenter. We are none of us infallible, and little mistakes will occur; let the accumulator spade terminal fall on to the H.T. battery terminal and, unless a fuse is fitted, we must say good-bye to a set of perfectly good valves; it only needs a loose wire in the set to short-circuit the high-tension terminals to result in the ruination of the battery or eliminator. A newly-made set should never be tried out without making sure that a fuse is fitted in the negative H.T. lead.

There are two or three kinds of H.T. fuses, but of these the cartridge and flash-lamp bulb types, which are shown in Figs. 5 and 6, are most popular. Whatever kind is employed, it should be connected between the H.T. negative and L.T. negative terminals; one way of doing this is illustrated in Fig. 7, where the wire which has been removed is shown in broken lines. Another very convenient way of fitting a fuse to an existing set is to replace the ordinary H.T. negative wander plug with a special one of the type shown also in Fig. 7. The "Wanderfuse," as this plug is called, is of tubular construction, and is made to hold a cartridge-type fuse.

With a battery set the fuse should be rated at about 60 milliamps, which means to say that it will burn out when any current greatly in excess of the latter figure is passed through it. As a matter of fact, most fuses are designed to "blow" at a current 50 per cent. greater than that for which they are rated. It is unwise to use an ordinary flashlamp bulb as a fuse in a set having less than three valves, because it might possibly carry sufficient current to impair, even if not to burn out, the valve filaments. Special fuse bulbs are made, however, in ratings of 60 and 120 milliamps, which are suitable for all requirements. In addition to the fuse in the H.T. negative lead, it is often an advantage, especially with an experimental receiver, to fit one in all except one of the positive tappings. It can be seen that the latter tappings often have a sufficiently high voltage between them to damage the valve filaments in case of a wrong connection, and besides this, a short-circuit of even a portion of the battery might render the whole component more or less useless.

Fuses in Mains Receivers

In the case of a mains-operated receiver the question of fuses is a little more involved. Those of the flash lamp bulb type are practically useless since the contacts are so near together that the higher voltages (especially when A.C.) have no difficulty in "jumping" across them, so forming an electric arc which itself will carry sufficient current to do no end of harm. The shorter cartridge fuses are unsuitable for the same reason, and most firms make a special one having a length of about 1¼ins., and which is therefore proof against the latter potential source of trouble.

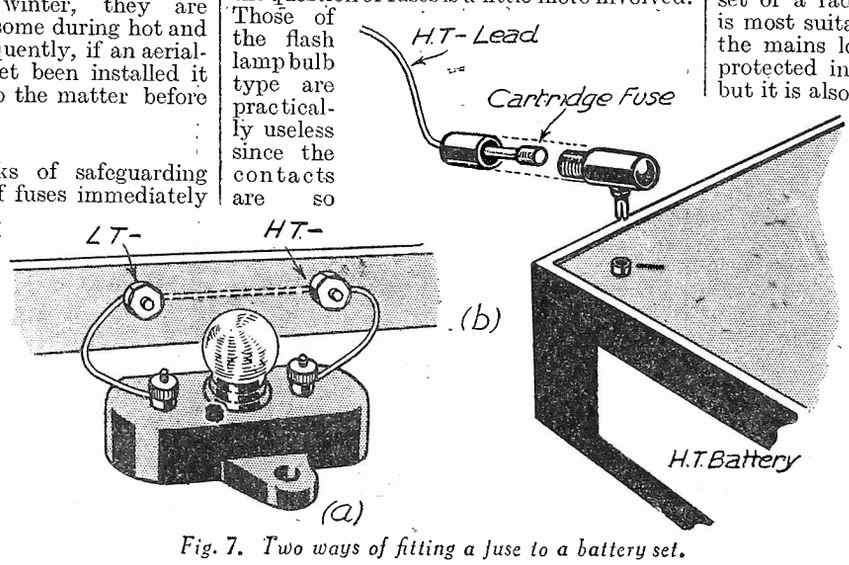


Fig. 7. Two ways of fitting a fuse to a battery set.

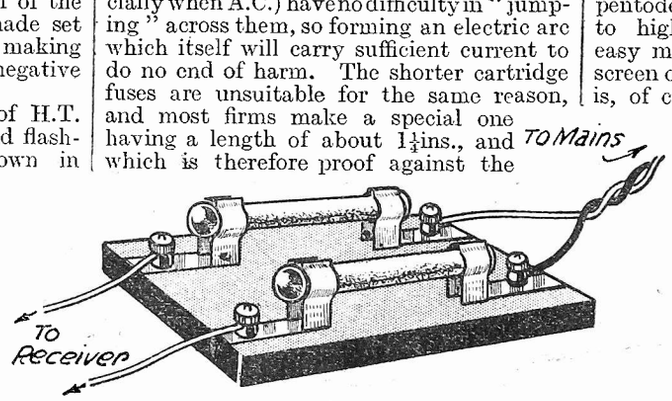


Fig. 8. A double mains fuse

A fuse should always be inserted in at least one of the mains leads to a receiver, eliminator or trickle charger, whilst with D.C. supplies it is generally preferable to include one in each lead. This applies in particular when it is not known which side of the mains is earthed. Double fuses, of the type shown in Fig. 8, are most convenient for the latter purpose.

Fuse Ratings

The beginner is often at a loss to know what size of fuse is required for any particular circumstance, but there is no difficulty in deciding this question. A simple rule to remember is that the fuse should have a rating of about twice the current it is normally called upon to carry; it will then burn out before sufficient current could be passed to do any harm, but will not be affected by the comparatively heavy surge which occurs on first switching on. As an example it can be stated that a .5 amp. fuse is just about right for any mains receiver having up to four valves. For a bigger set or a radiogram a 1 amp. component is most suitable. By connecting a fuse in the mains lead the set will be fairly well protected in the normal course of events, but it is also worth while to wire a second one on the output side of the rectifier to prevent damage to the latter component in the event of a condenser breakdown. Alternative positions for the fuse are shown in the circuits of Figs. 9 and 10, where a valve and metal rectifier are represented. (Fig. 10. is unavoidably held over this week, but will be included in the next article—Ed.)

Safety Connectors

Another useful "safety first" tip is to employ insulated connectors for the flexible wires which are used to make contact with the anode terminals of S.G. valves and with the priming grid terminals on pentodes. These wires are connected to high tension positive and it is an easy matter to let one slip on to a metal screen or the metal coating of a valve (which is, of course, joined to H.T. negative). If a fuse is fitted no real harm will be done, but the fuse will have to be replaced, and that means more expense. Safety anode connectors are made by two or three firms and an illustration of one of these connectors will be given next week. A plug contact is fitted inside an insulated tube and this fits into a corresponding socket which is screwed on to the valve in place of the terminal nut. These connectors are quite cheap and might effect a saving of many times their cost.

(To be continued.)

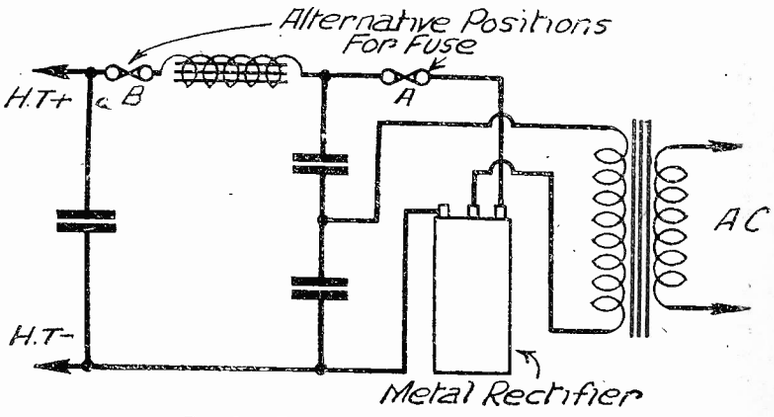
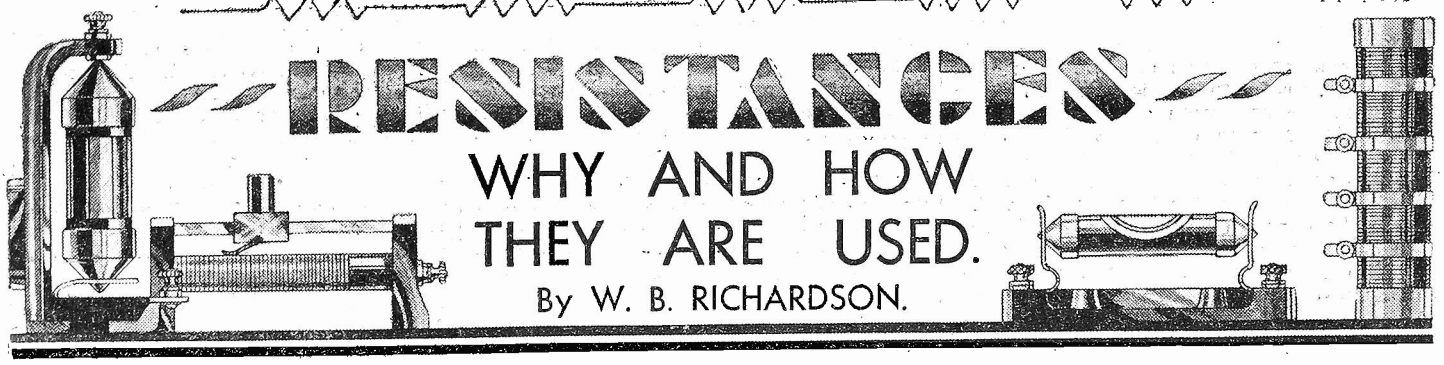


Fig. 9.—Fitting a fuse in a mains unit.



RESISTANCES

WHY AND HOW THEY ARE USED.

By W. B. RICHARDSON.

Part I: Resistances in a Battery Receiver

ONE very noticeable feature of modern design is the use of an increasing number of resistances of all kinds. Whereas a few years ago such things as decoupling and grid-bias resistances were almost unknown, nowadays receiving sets, especially of the all-mains type, seem to be positively bristling with resistances of all types and varieties. It is small wonder, then, that the home-constructor, when building a set requiring, perhaps, ten or twenty different grid leaks, fixed resistors, potentiometers and what not, is often a little confused as to the reason for so many. Again, in the case where he is building from a circuit diagram he may be in doubt as to the correct value and type to use in each position, since such details are not always given by the designer. It is for this reason this information is now given.

I am going to take two typical examples of modern receivers and endeavour to explain the use of all the resistances used therein, besides giving some practical hints on their values and the types to use in your own set.

I shall first deal with the resistances in a typical battery operated three-valver of the S.G.-det. pentode type, the circuit diagram of which is given in Fig. 1.

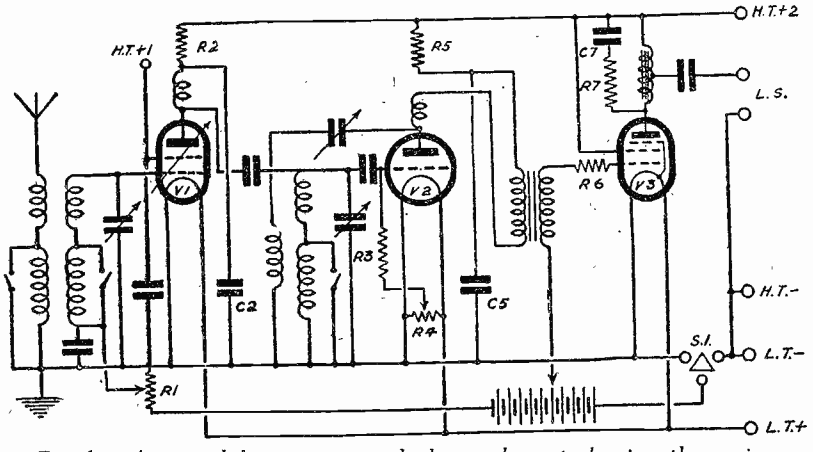


Fig. 1.—A typical battery operated three-valve set showing the various resistances used.

Bias for the Variable-mu Valve

Starting from the left of Fig. 1 the first resistance we come across is R1. This is a potentiometer controlling the grid bias of the first valve, a variable-mu. If you follow out the circuit you will see that it is placed across the ends of the grid-bias battery. Naturally, in this position current will flow through the resistance all the time it is in circuit. In order that the grid bias battery shall not be rapidly discharged the resistance is made very high, say about 25,000 ohms or 50,000 ohms. Of course, from the point of view of obtaining a variation of grid bias, for which it is intended, it does not matter much what its value is. It would be just as efficient if of 200 ohms as 20,000 ohms. The sole reason for making it of high value is, as I say, to prevent undue wastage of current from the grid bias battery. Another precaution, with the same object in view, is the provision of the 3-point switch S1, instead of the usual 2-point filament switch. The third contact enables the resistance R1 to be disconnected from the grid-bias battery directly the set is switched off; thus the battery does not discharge when the set is not in use.

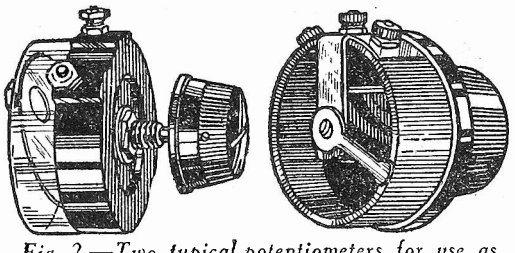


Fig. 2.—Two typical potentiometers for use as volume controls with variable-mu valves.

Why a Potentiometer is Used

Now let us see how R1 works. As you know, variation of the grid-bias on a variable-mu valve provides an almost ideal volume control, thus, when the bias on the grid is zero, that is, at the same potential as the earth-cum-filament connections, the valve gives maximum amplification, but when it is gradually made negative so the amplification is reduced until at about 15 volts negative it is very small indeed. To obtain a variable control the grid of the valve is connected (*via* the secondary of the tuning coil in this case) to the slider of R1. Now as one end of R1 is connected to the positive end of the 15-volt G.B. battery (which is at the same potential as earth) and the other to the negative end, it stands to reason that one end of the resistance is at zero, and the other end at 15 volts negative. Therefore, any intermediate point along the resistance must be at some potential between 0 and —15 volts. By moving a slider along the resistance any voltage between these two points may be obtained; hence the reason for connecting the grid of the valve to the slider.

As you know, the resistance, complete with slider, is called a potentiometer. It is also sometimes called a "volume control." This latter term is not a very good one to use as there are various types of volume control. "Potentiometer," on the other hand, has only one meaning.

Two types of potentiometer, each of which would be suitable as R1, are illustrated in Fig. 2. A very suitable value to choose is 20,000 ohms. This is quite high enough to ensure very small current consumption from the G.B. battery, and will not give rise to the slight crackling noises which sometimes occur when operating a 50,000 or 100,000 ohms instrument. If you care to work out the consumption of current you have only to apply Ohms' law. Thus, in the case of a 20,000 ohms resistance the current from a 15 volt battery would be $\frac{15}{20,000}$ amps=.00075 amps!

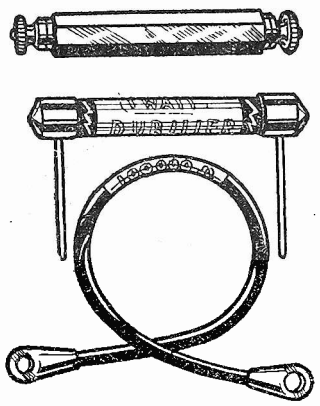


Fig. 3.—Three types of resistances suitable for decoupling purposes in the early stages of a battery set.

Decoupling Resistances

The next resistance we arrive at is R2. This in conjunction with condenser C2 is used for decoupling purposes, and prevents instability in the H.F. stage. The condenser C2 is large (1 mfd.), therefore, a very high resistance is unnecessary. One of 500-1,000 ohms is quite suitable. It should preferably be non-inductive, although so long as it is not placed right next to an unscreened coil or choke, it does not matter very much. Three suitable types are shown in Fig. 3. There is no objection to using higher values than 1,000 ohms, except that it cuts down the voltage on the anode. If this is already only just sufficient as supplied by the H.T. battery you can see that it must not be too large if the valve is to operate under the best conditions. Not all sets are fitted with R2 and C2, as, if the circuit and layout is well designed, there may be no need for them.

Current-carrying Capacity

With resistances such as R2 which are placed in the anode circuit of a valve there is always the question of current-carrying capacity, that is to say, they must be able to pass the maximum anode current the valve is likely to develop without overheating or breaking down. The current in the anode of the valve V1 is unlikely to be more than 4 milliamps, in which case the normal spaghetti, composition, or metallized resistance, would be working well within its capacity. A glance at the makers' catalogues shows that the average

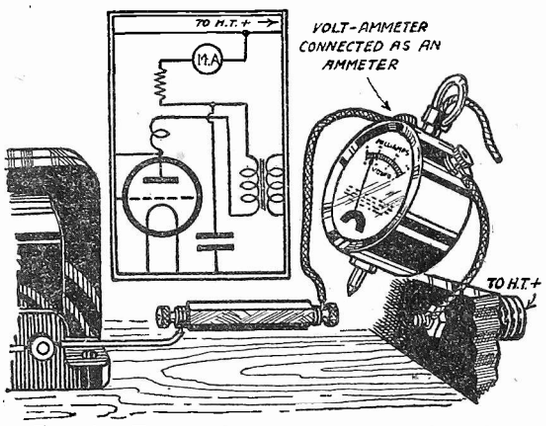


Fig. 4.—Testing the current passing through a resistance in the anode circuit of a valve.

resistance of 1,000 ohms in any of these types will stand a current of about 30 milliamps, so there is more than a sufficient margin of safety. It may seem rather superfluous to mention this point here, but all examples do not work out quite so satisfactorily as this one. Sometimes, on calculation, you will find that the resistance you were about to use would be seriously overloaded, and you are then able to substitute one of heavier rating before any trouble occurs. It is usually with the higher values that overloading is likely, since with most makes the higher the resistance is the smaller is its current-carrying capacity. As an example, I have before me a table of the ratings of a series of resistances of well-known make. I see that a 100 ohms component will stand 100 milliamps. The equivalent 1,000 ohms resistance will safely pass 31 milliamps; but the 50,000 ohm one will only stand 4.6 milliamps.

While on the subject of rating it may be mentioned that some resistances are sold as 1-watt, 2-watt, 3-watt types and so on. This rating indicates the power which may be dissipated with safety through the resistance. The power in watts is arrived at by multiplying the maximum current permissible by the maximum voltage. For example, a 10,000 ohm resistance may pass 10.00 milliamps without overload. It would, of course, require a voltage of 100 to pass this current through it. (By Ohms' law voltage = current × resistance $= \frac{10}{1{,}000} \times \frac{10{,}000}{1} = 100$ volts.) The power rating of such a resistance would thus be 1 watt. $(\frac{10}{1{,}000}$ amps × 100 volts = 1 watt.)

Grid Leaks

Taking them in numerical order the next resistance in the circuit is the grid leak R3. Here the question of current carrying ability does not arise since the grid current is of infinitesimal proportions. However, the value of the leak is of some importance. It used to be the common practice to use a 2-megohm leak in conjunction with a .0003 mfd. condenser as striking the happy medium; but it is found that with a screen-grid stage before the detector this value is somewhat too high for the heavier transmissions so that during the loud passages the grid charge does not leak away fast enough. In extreme cases the grid may become so heavily charged that the valve refuses to function for a fraction of a second.

To avoid any possibility of this it is usual to use a .0001 mfd. condenser and a 1 meg. or ½ meg. leak. With this arrangement the detector may not be quite so sensitive to very weak transmissions; but gives better reproduction from the louder ones.

The potentiometer R4 is a refinement which is not often found in a receiver but since it *may* be there I will say a few words about it.

Its function is precisely the same as that of R1, namely, it is used to control the grid-bias. In this case, of course, it is the bias on the detector. When there is no potentiometer fitted it is usual to connect the grid leak return to L.T.+ thus making the grid 2 volts positive in respect of the earthed end of the filament. This connection is better as regards sensitivity than connecting the leak to L.T.—, but is inclined to give "ploppy" reaction. The best connection is somewhere between these two points, but is not so critical that a slider is essential. In fact a fixed potentiometer with one or two tappings is practically as useful as one with a slider. Taking the grid-leak return to one of these points provides just the happy mean between the two extremes and is a great help in smoothing the reaction. A tapped potentiometer is illustrated in Fig. 5. It has four terminals, two of which are connected to the filament leads while the other two are the tapping points.

The value of the potentiometer, whether of the sliding or fixed type, need not be greater than 1,000 ohms, since there is only 2 volts across it. Many instruments sold for this purpose are, in fact, only about 400 ohms. There is, of course, no wastage of current when the set is not in use as the potentiometer is connected across the filament leads and is thus put out of action as soon as the valves are switched off.

Overcoming Battery Resistance

Resistance R5 is a low-frequency decoupling resistance. Together with the condenser C5 it performs in the L.F. part of the set much the same function as R2 C2 does in the H.F. part. The idea behind its use is to prevent coupling between one valve and another through the common impedance of the H.T. battery. It is usually due to the internal resistance of the H.T. battery that a set starts to howl or "motor-boat." You will notice that it is always when the battery is running down that the howling is most likely to occur. This is because when the battery is "on its last legs" it has a very high internal resistance. This resistance being common to the plate circuit of all the valves tends to produce an undesirable coupling between them. To prevent this the resistance R5 is used in conjunction with condenser C5. The resistance offers an impedance to the passage of L.F. current and the condenser provides an alternative path. For full benefit to be derived from this device the impedance of R5 must be large compared with the impedance of the H.T. battery, and also with that of C5. Generally speaking the condenser should not be smaller than 1 mfd. With this a resistance of 30,000 or 40,000 ohms would be suitable. If a 2 mfd. condenser is employed then the resistance may be reduced to 20,000 ohms.

Voltage Drop

The idea of using a lower resistance with a larger condenser is to keep the drop which would naturally occur in the H.T. voltage applied to the valve as small as possible, otherwise a higher voltage H.T. battery would be necessary to make up for the volts lost across the resistance.

There still remains the question of the current varying capacity of R5, but as the anode current of the detector valve is unlikely to exceed 3 milliamps the usual 1-watt type of resistance will be quite up to the job. If the valve V2 were a power valve it would be a different matter. The current taken by such a valve would be considerably more and might very easily overload a low rated resistance.

Controlling Tone with a Resistance

R6 is what is called a grid-stopper resistance. Its purpose is to prevent any H.F. currents which may have got past the H.F. choke in the plate circuit of the detector valve from arriving at the grid of the pentode V3. A suitable value is 100,000 ohms, but if it is desired it can be increased up to 250,000 ohms, when it will act to a certain extent as a tone compensator by offering a higher impedance to the upper frequencies and so counteracting the over-emphasis of the high notes which is peculiar to a pentode. As it is in the *grid* circuit of the valve the question of current carrying

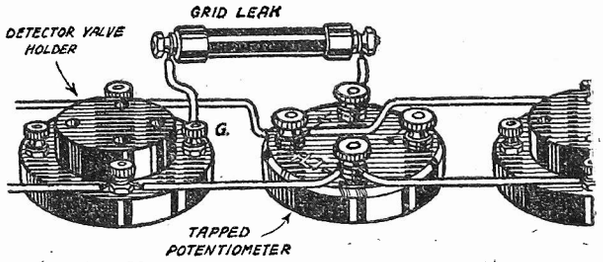


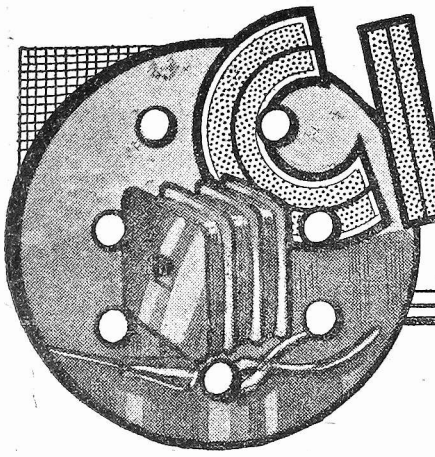
Fig. 5.—Using a tapped potentiometer in the filament leads.

ability does not arise. A resistance of the grid-leak type is quite suitable.

R7 used in conjunction with C7 is the tone control proper. Its value may be from 20,000 to 50,000 ohms according to the tone required. The lower the resistance the more the high notes are reduced. The value of the condenser is .01 mfd. If it is desired to vary the tone while the set is in operation then a potentiometer of the type shown in Fig. 2 may be used instead of the fixed resistance. Connection would then be made to the slider and one end of the resistance element, the other end being left free. If a fixed resistance is used then one of those illustrated in Fig. 3 would be suitable. A "power" type is not necessary as there is no D.C. passing through it.

In the next article the resistances in an all-mains set will be dealt with.

NEXT WEEK!
FREE BLUEPRINT OF A NOVEL LIGHT-WEIGHT PORTABLE (CLASS B) FOUR.



Class "B" components!

In this Practical and Explanatory Article, All Necessary Particulars are Given for the Construction of a "Driver" Transformer and an Output Choke.

THERE is no doubt whatever that Class "B" amplification has come to stay. That it offers undoubted advantages in the way of large signal output for a most economical input of H.T. current cannot be denied, whilst the excellence of the results to be obtained (previously described in PRACTICAL WIRELESS) is beyond question. Perhaps the greatest deterrent to the immediate adoption of Class "B" is the necessity for special components, namely a "driver" transformer and output transformer or choke. Admittedly, a number of manufacturers have already produced suitable components, and at prices which are by no means high, but many constructors will not feel disposed to buy the new parts when this will involve scrapping old ones which are on hand.

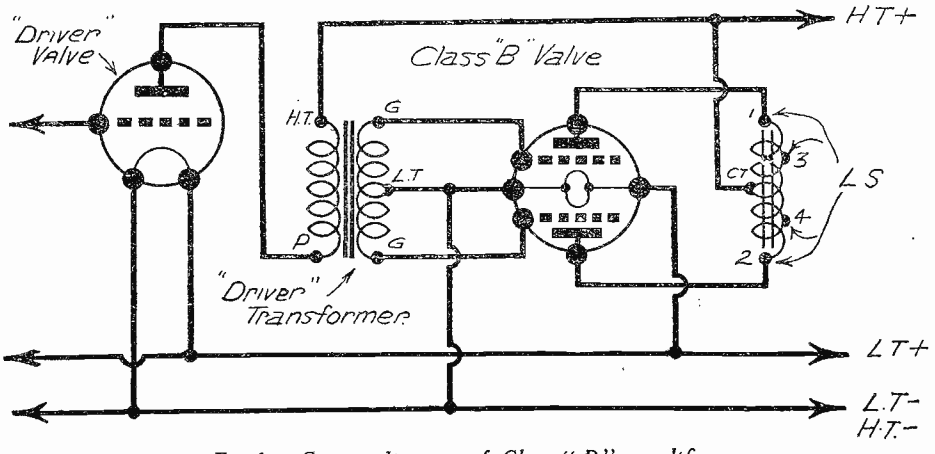


Fig. 1.—Circuit diagram of Class "B" amplifier.

The Cost of a Class "B" Amplifier

The total cost of converting an ordinary three-valve set for Class "B" works out at something like forty-five shillings, inclusive of the necessary valve, but anyone who cares to make his own transformers can just about halve this expenditure. In the hope that a large number of PRACTICAL WIRELESS readers may take full advantage of the latest system of L.F. amplification it is proposed to give constructional details of the necessary apparatus. It must be pointed out in the very first place, however, that the home-made parts will neither be quite so efficient nor so neat as the factory-produced articles but they will not fall far short if care is expended on their construction. Moreover, the making of the parts will prove extremely interesting and also instructive.

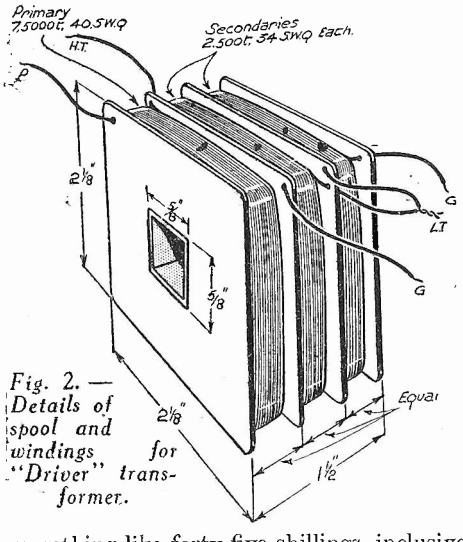


Fig. 2.—Details of spool and windings for "Driver" transformer.

Circuit Requirements

Before passing on to the actual constructional work, it will be as well to sum up the position and study the requirements of the circuit arrangement. The latter is shown in Figure 1, where it can be seen that a "driver" valve (this may be the first L.F. amplifier of the existing set) is used to feed the special push-pull transformer which supplies the grids of the Class "B" valve. The "driver" valve may be one of the small power type and it is normally biased to a point at which its anode current is between 2 and 3 milliamps. Under these conditions its "optimum load" will approximate to some 10,000 ohms, and therefore the primary of the transformer must be designed to provide this load. The secondary has to supply power (not merely voltage as in the case of an ordinary L.F. transformer) to the output valve, and therefore it must be of low resistance. In practice a resistance of not more than 150 ohms on each side of the centre tap is found to be required. Additionally, to enable the transformer to supply the necessary power it must have a *step-down* ratio of between 2 : 1 and 3 : 1 to each half of the secondary. Expressed in other words, the turns ratio between primary and the *whole* secondary must be from 1 : 1 to 1.5 : 1.

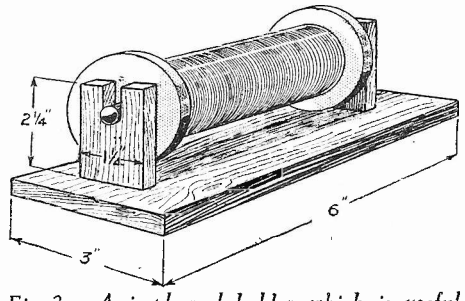


Fig. 3.—A simple reel holder which is useful when winding the spools.

The output from the Class "B" valve must be supplied to the loud-speaker through a push-pull output transformer or a centre-tapped choke. Both methods of coupling are equally effective but since the choke is rather easier to make we shall assume the use of this component in the present case. The choke must, of course, be centre-tapped to feed both anodes of the valve and it should offer a total impedance of approximately 10,000 ohms at average audio frequencies. To enable the valve to be matched to different moving-coil speakers two tappings are taken so that a step-down ratio of about 2 : 1 can be obtained. Although the output choke carries an average D.C. current of 8 milliamps or less it has to deal with "peak" values up to some 50 milliamps and it must therefore be capable of handling the latter current. Another requirement of the choke is that its D.C. resistance shall not exceed about 400 ohms, otherwise there will be a loss of signal output.

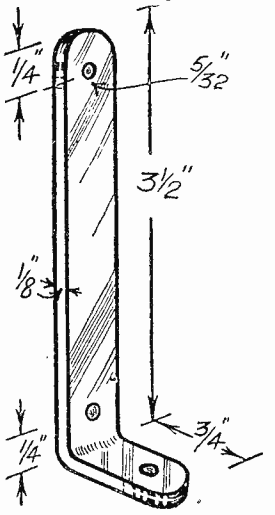


Fig. 4.—Dimensions of transformer core clamps—four are required.

Designing the "Driver" Transformer

In working out the design of the "driver"

(*Continued overleaf.*)

(Continued from previous page.)

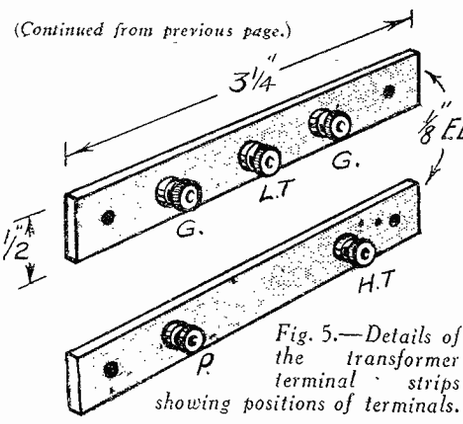


Fig. 5.—Details of the transformer terminal strips showing positions of terminals.

transformer for amateur construction it is very difficult to comply exactly with all the requirements without making the component unwieldly or using extremely fine wire which is difficult to handle. Consequently some compromise has been made with a result that the transformer to be described has the following characteristics :—Primary Inductance under working conditions, about 25 henries ; Primary Turns, 7,500 turns of 40 gauge enamelled wire ; Primary Resistance (D.C.), 1,350 ohms ; Secondary Turns, 5,000 turns 34 gauge enamelled wire ; Secondary Resistance (each half), 125 ohms ; Step-down Ratio (to each half of the secondary), 3 : 1. The transformer is perfectly satisfactory for use after a Cossor 215 P or similar " driver " valve and can be made for about five shillings. The materials required are : 3 doz. No. 5 Stalloy stampings ; piece of mild steel hoop 18 in. by ½in. by ⅛in. ; four 1½in. by $\frac{5}{32}$ in. bolts and nuts ; 4 ozs. 40 gauge enamelled wire ; 9ozs. 34 gauge enamelled wire ; sheet of fibre, $\frac{1}{16}$ in. thick ; strip of ½in. ebonite, 6½in. by ½in. ; five 6 B.A. terminals ; odd pieces of flex, etc.

The Winding Spool

The first job is to make the winding spool, of which all dimensions are given in Figure 2 ; it consists of a square tube with four fibre cheeks. The tube is made by winding a strip of good cartridge paper (or, better still, presspahn in 10 mils thickness) round a ⅝in. square wooden rod. Thin glue is applied whilst winding so as to produce a fairly rigid tube having a thickness of about $\frac{1}{16}$ in. After winding, the tube should be removed from the rod and allowed to dry. Next, the four fibre cheeks should be cut out—with a sharp chisel or saw—to the sizes indicated and made to fit tightly in the tube, where they are held in position with glue. To prevent the possibility of the middle cheeks slipping due to side pressure of the windings a few turns of Empire tape should be wound round each section of the finished spool.

Windings

The windings must next be put on, and this job can be done most easily if a lathe is available. If not, a hand-drill held horizontally in the vice will make a good substitute. Should neither of the latter tools be available it is possible to do the work entirely by hand, but this will prove rather tedious. Whatever method of winding is finally adopted the spool must first be put on to the wooden rod so that it can be rotated without difficulty. Start with the primary and solder a 12in. length of thin flex to the end of the 40 gauge wire. Resin should be employed as a flux to avoid subsequent corrosion, and the joint should be covered with a spot of sealing wax. Pass the end of the flex through a small hole in the end cheek and wind it once round the spool. You can then continue to wind on the 7,500 turns required, taking care to arrange them as evenly as possible in layers. Try to keep an even and steady tension on the wire, but not sufficient to stretch or break it. There is no need to count the turns, since the exact number is not too important and will certainly not be far wrong if one section of the spool is just barely filled. After winding, the wire can be cut off and another length of thin flex soldered to it, taken once round the spool and anchored by passing it through a hole in the end cheek.

The secondary winding can now be proceeded with ; this actually consists of two equal windings of 2,500 turns each, which are arranged in the remaining slots. They are both wound in exactly the same way as the primary, but using the thicker (34 gauge) wire. To ensure that both halves of the secondary are alike it is well to count the turns with reasonable accuracy. It should be mentioned that the bobbin of wire from which the windings are taken must be mounted in some kind of holder so that it can rotate easily without any danger of the wire becoming entangled or broken ; details of a simple holder are given in Fig. 3. If a break *does* occur, the ends of the wire must be properly soldered and the joint covered with sealing wax, or a slip of paper, to prevent any rough edges scraping the insulation from adjacent turns. After the windings have been completed they should be covered with Empire tape, which will protect them from injury.

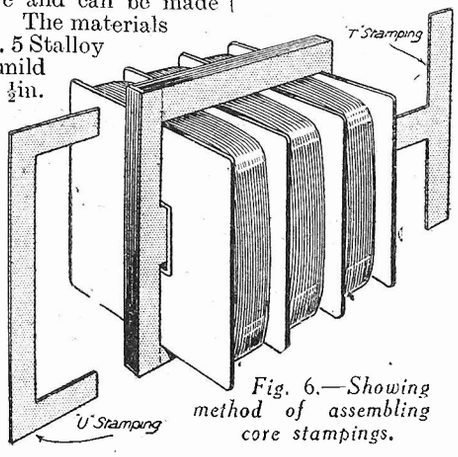


Fig. 6.—Showing method of assembling core stampings.

Core Clamps

The next step is to prepare the core clamps and terminal strips according to particulars given in the sketches of Figs. 4 and 5. Mild steel hoop is employed for the clamps, and this material is obtainable from any ironmonger's.

Lastly the core stampings can be fitted and the transformer completely assembled. The method of fitting the stampings is shown in Fig. 6, where it can be seen that a " T " and a " U " piece is inserted first from one end of the spool and then from the other until the " tunnel " is quite full. Fig. 8 shows the appearance of the complete instrument and the positions of terminals to which all connections are made.

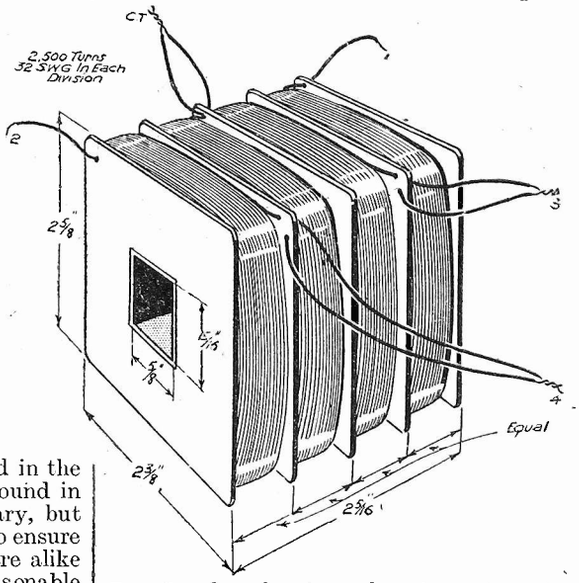


Fig. 7.—Details of spool and windings for output choke.

The Output Choke

In order to obtain a sufficiently high inductance combined with a low D.C. resistance the output choke is somewhat larger than the transformer and is built up round a core consisting of 3 dozen pairs of No. 4 Stalloy stampings. The other materials required are : 1½ lbs. 32 gauge enamelled wire ; piece of mild steel hoop, 20in. by ½in. by ⅛in. thick ; four 1½in. by $\frac{5}{32}$in. bolts and nuts ; sheet fibre $\frac{1}{16}$in. thick ; strip of ⅛in. ebonite ; 7½in. by ½in. ; five 6 B.A. terminals ; odd pieces of flex, etc. This component will have approximately the correct inductance and a D.C. resistance of about 250 ohms. The total cost of all materials works out at just over six shillings.

(Continued on page 239.)

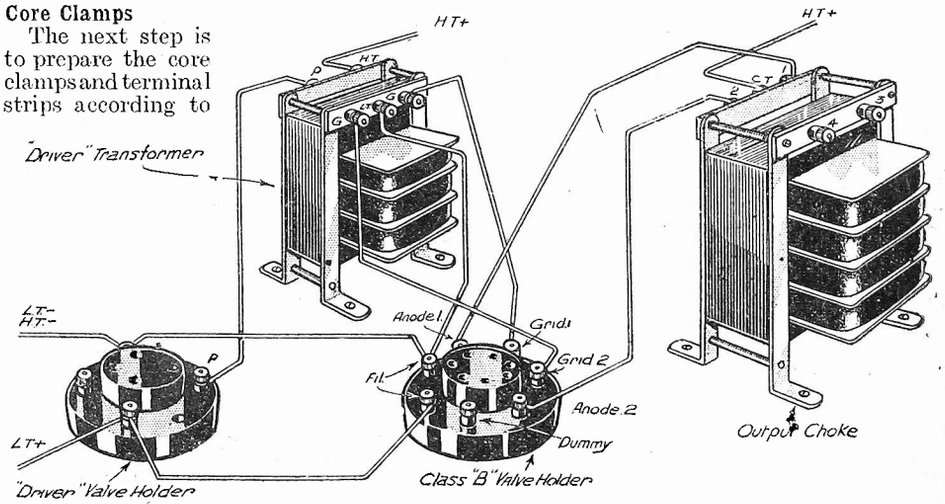


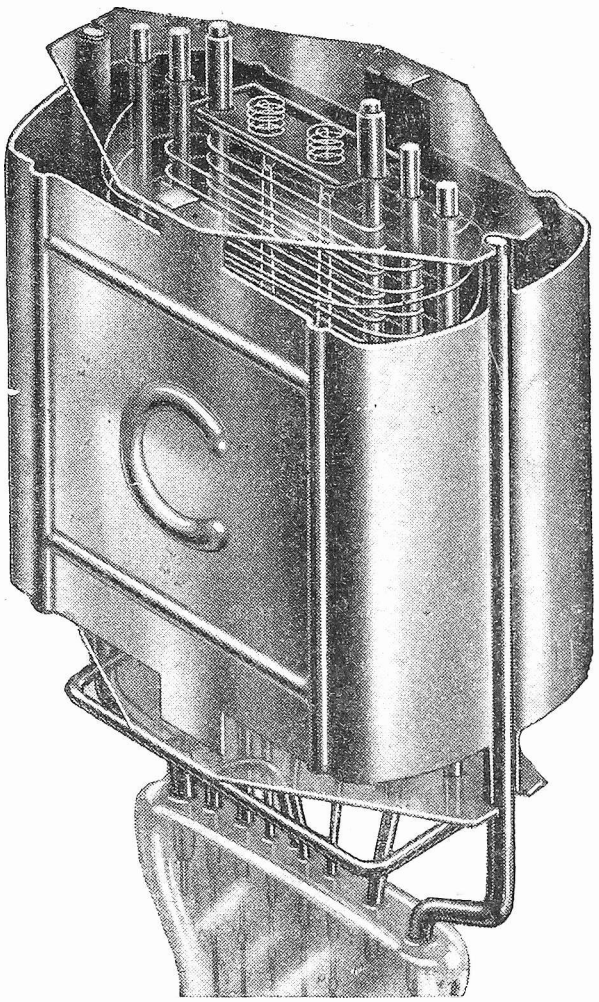
Fig. 8.—This sketch shows how the home-made components are connected up.

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*210 H.F.	·1	75-150	15,000	24	1·5	7/-
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210 L.F.	·1	75-150	10,000	14	1·4	7/-
215 P.	·15	75-150	4,000	9	2·25	8/9
220 P.	·2	75-150	4,000	9	2·25	8/9
220 P.-A.	·2	100-150	4,000	16	4·00	8/9
230 X.P.	·3	100-150	1,500	4·5	3·00	12/-
230 P.T.	·3	100-150	—	—	2·0	17/6
220 H.P.T.	·2	100-150	—	—	2·5	17/6
220 P.T.	·2	100-150	—	—	2·5	17/6
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COMPLETING and OPERATING THE A.C. TWIN

By W. J. DELANEY

The Final Details for Constructing this interesting All-mains Two-Valve, Two-Pentode Receiver, with Operating Instructions

THE A.C. Twin is nearly completed, and before adding any more connections I must mention the dial light, which, although fitted in the original receiver, is not really essential. If you are installing the receiver in a dark corner of the room the light will greatly facilitate dial setting, but there is a much more important reason why I advise you to fit this light. When you switch the receiver on (by means of the switch on the side of the cabinet), you may forget to also set the room switch controlling the plug to which the receiver is connected. The result will be that you will stand waiting for the programme to come through, and may perhaps think that something has gone wrong. The light, however, will come on instantly the switch is operated, if the mains are connected, and you will then know that the receiver is "alive" and not perhaps miss an important item waiting for an unnecessary time with no supply to the receiver. The fitting for the light is supplied with the variable condenser, and before fitting it to the nut which retains the escutcheon window, you should solder two 8in. lengths of flex to the two soldering tags on the holder. Twist these lengths of flex together and then fit the lamp holder behind the retaining nut. Now carefully slide in the shelf, and before it is right home lift up the flex lead to the lamp so that it comes above the shelf, then push the shelf right home. The ends of the flex are attached to two terminals marked 4 volt, nearest to the loud-speaker, and these are not shown on the wiring diagram given last week. Pass the plaited length of flex, which comes through a slot in the lower base, up through the corresponding slot in the shelf and connect the four leads carefully, taking your guide from the letters on the diagrams in last week's issue.

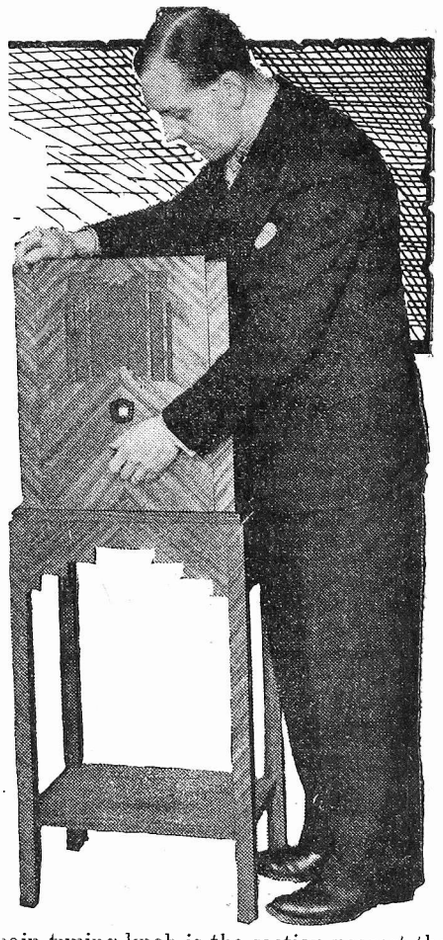
Mains Connections

The wire "d" is the H.T. positive lead and is attached on the main base to terminal No. 1 on the Varley choke. On the shelf this must be joined to the 4 mfd. condenser together with the flex lead which is joined to the left-hand terminal on the loud-speaker transformer. The twin flex supplying the heaters of valves V1 and V2 is next joined to the two 4 volt terminals nearest the speaker, and lead "c" is joined to the earth socket. One side of the mains connector is joined to terminal marked 50P. on the mains transformer, and the other lead on this connector is joined to the on-off switch. The short lead already attached to this switch must be joined to the terminal above 50P. which bears the rating of your particular mains. If there is no exact mark corresponding to this voltage you must use the nearest value above. For instance, if your mains are rated at 230 volts, you would use the terminal marked 240. Attach the 15,000 ohm resistance to the left-hand side of the .01 condenser, and join the short flex from the other side of this condenser to the loud-speaker terminal No. 1. The flex on right-hand terminal "F" on the speaker is next connected to the 2.5 terminal and the long flex on speaker terminal No. 1 is passed down through the hole in the shelf ready for connection to the pentode. A similar length of flex is now joined to the aerial terminal and taken down to terminal A on the base of the Lewcos coil.

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Connecting the Valves

The Cossor rectifying valve is inserted in the socket on the shelf and the S.G. valve (the metallized one) is inserted in the right-hand socket, marked V1. The L.F. pentode is inserted in V2, and the lead hanging from the shelf is joined to the terminal on the side of the base. The short flex on the H.F. choke must now be attached to the terminal on top of the S.G. valve and the receiver is now ready for its preliminary test out. The plug of the Mains connector must, of course, be supplied with a length of flex suitable for connection to the nearest mains socket in the house, and this should be plugged into the socket at the rear of the shelf. Now switch on, and the dial should light up. If all is well, after a short interval of about 15 seconds, a very faint hum will be heard from the loud speaker. If at the end of 30 seconds no hum can be heard with your ear quite close to the speaker grille, you should switch off and make quite certain that the house socket is alive and that all connections are intact. Remember, however, that the valves take at least 15 seconds to obtain the necessary temperature for emission, and that the receiver is "dead" for this period. As soon as the faint hum can be heard, the tuning knob should be slowly turned. The



main tuning knob is the section nearest the cabinet and the local station should soon be heard. When it is found, turn the front part of the tuning knob to obtain the best signal strength, and there should be a definite position for this, on each side of which the strength falls off. If you find, however, that this small knob has to be turned to its maximum position to either right or left, turn the cabinet round and with a thin piece of wood carefully push round the star-wheel on the rear of the variable condenser. This must be set so that on any station the rotation of the small condenser knob to right or left results in a decrease of signal strength. The wavechange switch on the side of the cabinet will enable the long or short waves to be received, and the upper knob on this side will bring up the strength of the distant stations. There are no other adjustments and the receiver is, therefore, an ideal one for general household use, being practically a one-knob receiver. At least a dozen stations can be heard by mere rotation of the tuning knob, although, as pointed out in the preliminary remarks, the receiver is designed primarily for those who wish to have a neat, small, self-contained receiver which will give a choice of two or three programmes at really high quality and good volume with a minimum of expense. As with all PRACTICAL WIRELESS receivers, if you are in any difficulty, drop a line to us, marking your envelope "A.C. Twin," and you will receive a reply by return, for which no charge is made. Finally, remember that this is yet another Guaranteed Receiver.

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COMPONENTS FOR THE A.C. TWIN

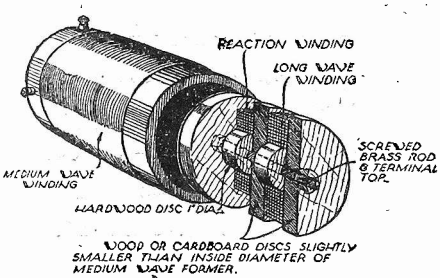
One Lewcos Band-Pass Filter, Type 51, B.P.F./R.
One Polar Uniknob 2-Gang Condenser, .0005.
One Igranic Transformer, Type T/24/B.
One Lotus .0003 Reaction Condenser.
One Bulgin Standard H.F. Choke (H.F.9).
One Varley 300 Henry L.F. Choke (D.P.16).
One .0001 fixed Condenser (Type S), T.C.C.
One .001 fixed Condenser (Type S), T.C.C.
Two .01 fixed Condensers (Type 34), T.C.C.
Three 1 mfd. fixed Condensers (Type 50), T.C.C.
One 2 mfd. fixed Condenser (Type 50), T.C.C.
Two 4 mfd. fixed Condensers (Type 84), T.C.C.
Two 5-pin valve-holders (Clix Chassis type).
One 4-pin valve-holder (Clix Chassis type).
One ½ megohm Erie Resistor.
One 12,500 ohm Erie Resistor.
One 400 ohm Erie Resistor.
One 2,500 ohm Erie Resistor.
One 30,000 ohm Erie Resistor.
One 10,000 ohm Erie Resistor.
One 15,000 ohm Erie Resistor.
One Heayberd Mains Transformer (Model A.C. Twin).
One Grampian Energized Speaker, Type E.1.
One Bulgin Mains Toggle Switch, Type S.80.
One Bulgin Small Mains Connector, Type P.21.
One Clix Terminal Strip.
Two Clix Wander Plugs (One black and one red).
One Cossor 442 B.U. Rectifying Valve.
One Cossor MS-PEN-A (H.F. Pentode Valve).
One Cossor MP-PEN (Pentode Out-put Valve).
One Smith Lyric Cabinet.
One coil Glazite, 3 yards red and black flex, screws, bulb for panel light, etc.

THE HALF-GUINEA PAGE

Radio Wrinkles FROM READERS

Home-made Coil Construction

A TYPE of dual wave tuning coil popular with home constructors is made with a paxolin former on which are fixed cardboard or plywood flanges between which the reaction and long wave windings are wound. No doubt many have discovered

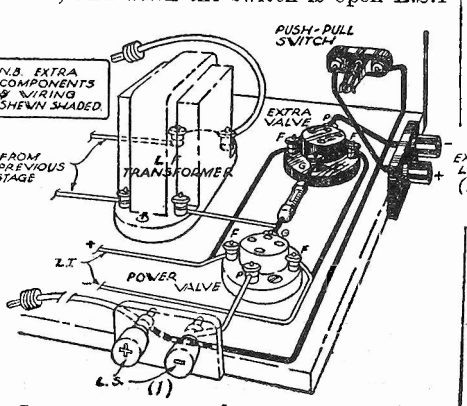


A neat method of making a dual-wave coil.

that cutting the flanges to fit well is a tedious job. A neater method is to make a bobbin on which to wind the long wave and reaction windings. To construct the bobbin cut three discs from cardboard or plywood the diameter of the inside of the former and two discs about 1in. diameter and ¼in. thick. The smaller discs may be cut from a cotton reel or a cork. Holes are made in all the discs which are then threaded on to a bolt, first a large disc, then a small one, and lastly the nut. The bolt should be about ¼in. longer than the thickness of the completed bobbin. The windings having been put on, the bobbin is pushed inside the former and the ends of the windings connected to the terminals on the former, allowing sufficient wire to enable the bobbin to slide from one end of the former to the other. This is a great advantage as it renders it possible instantly to find the position which will give the smoothest reaction. A terminal may be screwed on to the bolt by which means it is easy to slide the bobbin up and down.—READER (London).

Output Valves in Series Parallel

INSTEAD of using two ordinary valves in parallel with a negligible increase in volume, the following method may be of interest. An extra valve-holder, switch, and terminals are mounted, and connected in "series-parallel," as shown. Thus the speakers (2) are wired, one in each anode circuit, and when the switch is open L.S.1



Connecting output valves in series-parallel.

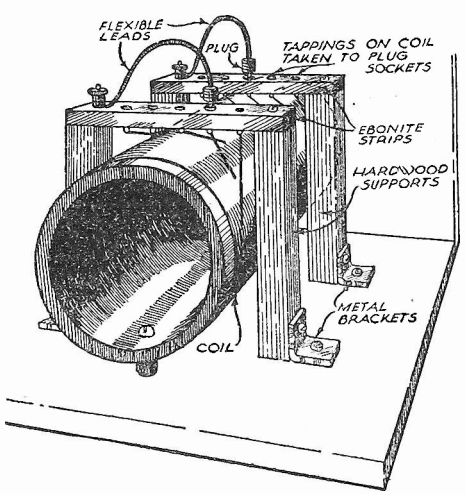
is working, and when closed, both valves and both speakers are working, with a consequent increase in volume. The second loud-speaker may well be mounted in another room, when the increased output will more than compensate for the long leads.—G. E. WALCHON (Derby).

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.

Tapping Home-made Coils

MANY constructors may have experienced a difficulty in tapping home-made coils, and I have found this little device very useful for the purpose.



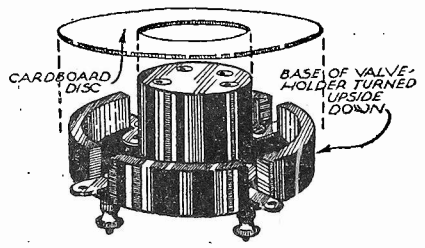
Mounting and tapping a home-made coil.

All it consists of is two strips of ebonite (about one inch wide and varying in length according to the size of the coil) mounted on some strips of wood, some sockets, and two ordinary plugs. The construction, as will be seen from the sketch, is very simple, and does not need very much explanation. After boring the holes and inserting the sockets in the ebonite, mount this on the strips of wood which have been previously fixed to the baseboard by means of small angle brackets. Wires can now be soldered from the required taps on the coil to the sockets. When another tapping is required on the coil, the plug is simply put into a different socket, according to the number of turns it is desired to take in.—K. F. FRIENDSHIP (Harpenden).

FREE FULL-SIZE BLUEPRINT OF A NOVEL LIGHTWEIGHT CLASS B PORTABLE NEXT WEEK!

Adapting Valve-holders for Chassis Mounting

WHEN wanting some chassis mounting valve-holders, but only having the ordinary kind on hand, I turned them inside out by removing the nuts and screws and taking the four-pin socket out of the



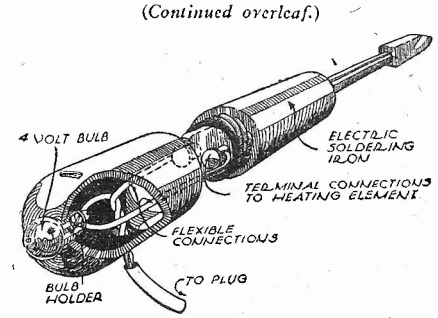
Adapting an ordinary valve-holder for chassis mounting.

terminal ring. I then turned it the other way round and screwed it back, as shown in sketch. If turned round the right way the grid and plate will go in their own places, only the filament pins being reversed. Most of these holders will fit a one-inch hole in the chassis, and on a metal chassis, to prevent shorts, it will be advisable to cut a cardboard ring to fit round the socket and over the springs.—H. CHURCHMAN (London).

For Users of Electric Soldering Irons

NOWADAYS, when one has to watch the pence totalling up on the meter, this threefold wrinkle should prove useful. It provides a visual indication that the soldering iron is on, prevents you wasting current and getting burnt, and acts as a local fuse, which is quickly replaced. Remove screw-cap and detach flex from terminals, drill out flex entry hole to fit a small saddle type torch bulb holder, remove saddle and connect one flex end to bottom terminal of bulb; connect about 2in. of flex to side terminal of bulb. Push holder into hole from inside cap until flush with outside, then connect the flex to the terminals on iron, as depicted in the sketch. A fresh entry hole for the flex can be drilled through the side of the cap. Assemble handle and insert a 4-volt torch-bulb, switch on and this will light up, whilst the iron is on. The average electric iron takes about 75 watts or .26 amperes at 240 volts., which is sufficient to light the bulb filament. Should your iron take more or less current, a little experiment in different sized bulbs will be necessary.—L. GEORGE (Margate).

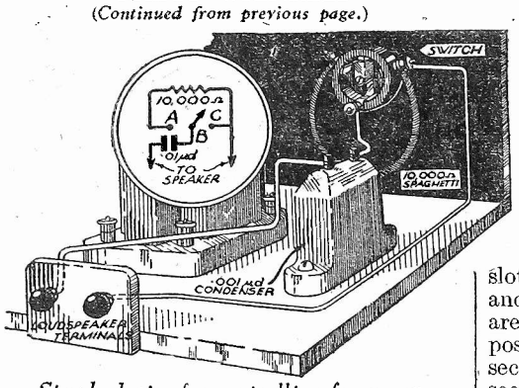
(Continued overleaf.)



Fitting an indicator to an electric soldering iron.

RADIO WRINKLES

(Continued from previous page.)



Simple device for controlling frequency response.

Controlling Frequency Response

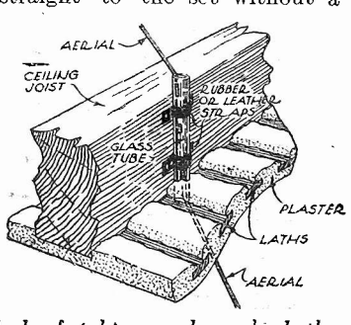
I HAVE recently discovered a simple device for controlling the frequency response of a receiver which uses a pentode valve. The novelty of this tone control lies chiefly in the method of control used, as the customary condenser and resistor form the basic circuit. The parts required are as follows:—

1 .01μ condenser.
1 10,000 ohm resistor.
1 Single-pole change-over switch.

The first two parts may be already incorporated in the receiver, when the switch only would be required. The condenser and resistance should be disconnected and wired as shown. When the switch shorts B and C, the tone will be deep and mellow; when it shorts A and B, the tone will be normal, but when the switch remains central, the tone will be brilliant, due to the uncorrected pentode valve. The two terminals should be connected across the loud-speaker, as indicated, or, better still, the output choke or transformer. It may be used in the first L.F. stage by connecting the terminals across the L.F. transformer secondary winding. This system is also applicable to Q.P.-P. when it is connected across the loud-speaker transformer input terminals.—A. MACIVER (Leicester).

Down-lead Tube for Loft Aerial

WHEN taking a down-lead from an aerial in the roof space, care should be taken in bringing it through the ceiling. A convenient method of doing this is shown in the accompanying sketch. Secure a strong glass tube, and make a hole in the ceiling, big enough to push the tube through, at the side of one of the joists and fix the tube as shown in sketch by means of strips of rubber or leather. The aerial can then be taken through the tube and led straight to the set without a break

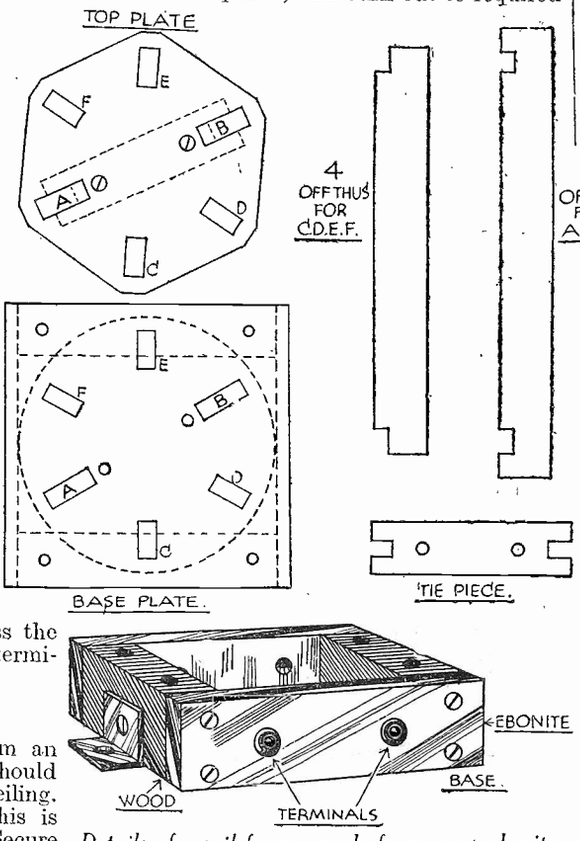


Method of taking a down lead through a ceiling.

and without fear of damaging the plaster of the ceiling if the aerial should start swinging.—WILLIAM MUIRHEAD (Falkirk).

Making Coil Formers from Scrap Ebonite

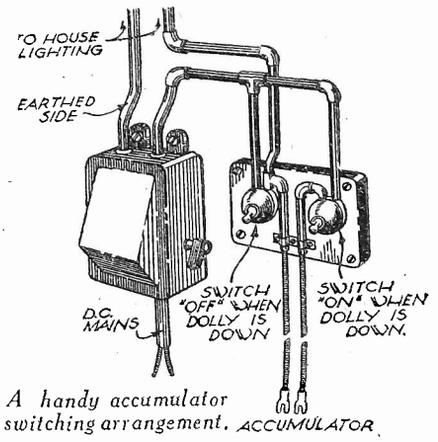
THE accompanying sketches show a method of turning scrap pieces of ebonite into a useful coil former. I have omitted all dimensions as these will depend on size of coil and thickness of ebonite, but it will be noticed that the slots in the top, and baseplate, marked A and B, are the full width of the strut. These are the fastening struts which are held in position by the notch at each end, and by a secured tie piece (marked in dotted lines) secured by two small bolts. Terminals can be fitted on the two ebonite sides of the base for the winding connections. To obviate filing the slots marked off top and baseplate, and drilled holes for tie pieces. The parts are bolted together with two small bolts. Drill two or three small holes where slots are required, and burn out to required size with a file tang heated in a fire; clean up and fit strut finally with a small file. With the aid of data sheets No. 5 and 6 any amateur should be able to make an efficient dual wave tuner.—J. W. HESLOP (Sunderland).



Details of a coil former made from scrap ebonite.

Switching Arrangement for Accumulator Charging

THE accompanying sketch shows a handy switching arrangement that I have successfully rigged up for accumulator charging from D.C. mains. The advantages of this arrangement are that standard tumbler switches are used; minimum cost; absolute safety is assured for operator; no interference with house lighting when changing over, and all connections are made in the switches themselves, thus avoiding outside connectors. It will be noted that one switch



A handy accumulator switching arrangement.

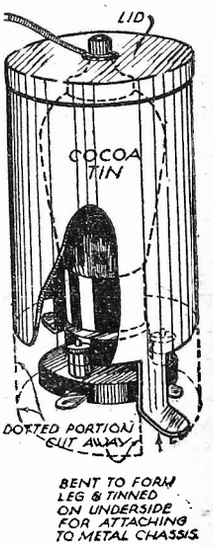
is inverted to enable the dollys to be raised or lowered together, thus facilitating a bar connector to absolutely ensure that accumulator is not shorted.—W. JONES (Smethwick).

Set Sales

ACCORDING to figures recently published, relating to the number of complete receivers sold in this country during the past year, battery and mains sets have sold in almost equal numbers—653,000 as against 684,000 to be exact. As one might expect, the three-valver has been most popular, and its sales have actually been greater than those of all other types combined. Surprising though it may seem, the two-valve set has proved to be second in popularity. It is interesting to note that the sale of superheterodynes has by far exceeded that of any previous year. This is hardly to be wondered at in view of their extremely low prices and undisputed advantage in the way of selectivity, and I should not be surprised to find the superhet. actually rivalling the three-valver in a couple of years or less. I believe that in America this kind of set is by far the most popular even at the present time.—F.P.

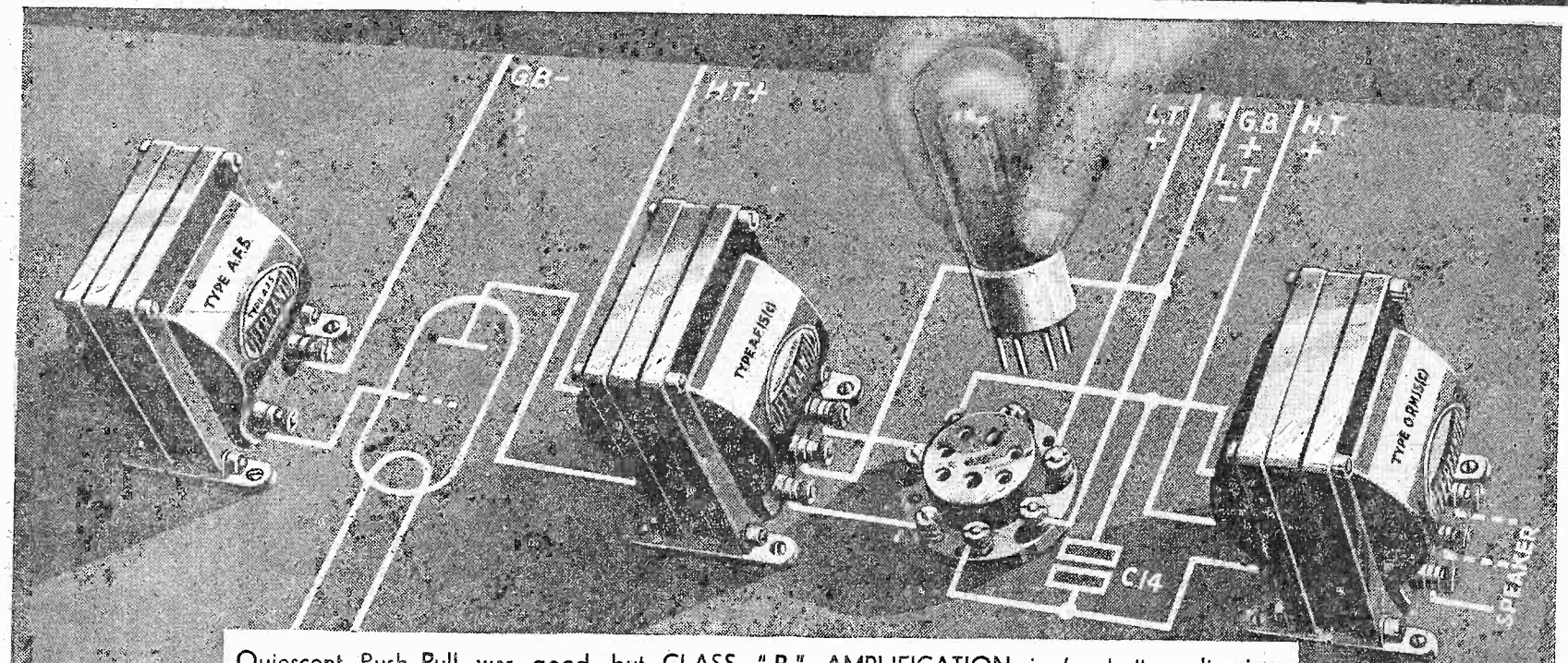
A Cheap and Efficient Valve Screen

HERE is a useful hint regarding valve screens that will be found most useful besides being economical. Procure a tall tin that will clear the soldering tags on the valve holder—a ½lb. cocoa tin meets these most useful requirements perfectly. Remove the paper round the tin, cut along the dotted lines as shown in sketch and then bend the two "legs" at right angles, about ½in. up. Tin the underside of each foot, smear a little flux on the chassis or metalled baseboard, press a hot iron on and then you have a securely fixed, efficient screen with ample room to get to the valve terminals, and a negligible danger of "shorts." To finish off the job, take off lid and hammer out the printing, drill a hole in the top just big enough to take the terminal stem or screened lead which will automatically earth itself against the lid.—A. S. HALE (Clapham).



A valve screening can made from a cocoa tin.

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Output Transformers. Type OPM 15c. Ratios 1/1, 1·6/1 and 2·7/1. For high resistance speakers and low resistance Moving Coil Types with built-in output transformers. Primary D.C. Resistance 110 ohms each half. Total Primary Inductance 35/10 henrys. 0/20 m/A. Price **26/6**

Type OPM 16c. Ratios 15/1, 22·5/1 and 45/1. For low resistance Moving Coil Speakers—5 to 20 ohms. Primary D.C. Resistance 110 ohms each half. Total Primary Inductance 35/10 henrys. 0/20 m/A. Price **26/6**

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FERRANTI COMPONENTS

The latest and greatest boon to the Battery-set builder.



By H. T. GODLEY, F.R.A.

In this article the author deals with the various methods of coupling, and tone control of modern pentode valves.

THE history of the development of the thermionic valve is marked by a series of achievements which stand out as milestones along the path of radio progress. One of these milestones, the Pentode, is now in universal use, and it is thought that a simple explanation of its construction and the way in which it differs from the ordinary output valve, may be of interest. Furthermore, as the full benefit from a pentode is not derived by merely inserting it into the last valve-holder, the various methods of coupling the pentode to the loud-speaker, methods of tone-control, etc., are discussed fully.

Evolution of the Pentode

Perhaps it will be as well to commence by explaining how the pentode came by its name. Any valve which contains only two electrodes, the filament and the anode, such as the early Fleming valve, and the modern half-wave rectifying valve, is known as a "diode." Hence the term "diode-rectification" in which a two-electrode valve is used for detection. The first really practical wireless valve, was actually the Fleming diode into which a third electrode, the grid, has been introduced. As the valve now possessed three electrodes, it became known as the "triode" which type of valve is still, of course, widely used. Then, in order to obtain extremly high amplification for high-frequency valves, an additional grid was introduced into the triode, and now having four electrodes, the valve was known as the "tetrode"—the familiar S.G. valve.

Attention then turned to the output stage, and in order to obtain much greater sensitivity and amplification than was possible with a triode output valve, the tetrode was modified by the addition of yet another grid, as will be explained later, and now possessing five electrodes, was logically enough, termed the "pentode." The pentode is then primarily an output valve possessing five electrodes, the filament, and anode, the control-grid, and two additional grids which are termed respectively the "screen" or "auxiliary" grid and the "earth" or "suppressor" grid, as shown both symbolically and pictorially in Fig. 1. I have said that the pentode is primarily an output valve; that is so, but pentodes are sometimes used as detectors, and even as H.F. amplifiers, but as such, their use is at the present time chiefly confined to America, where they are known as R.F. (radio-frequency) pentodes.

The general theory of the thermionic valve has already been fully discussed in previous articles, and it is therefore necessary for me to touch only very briefly on the functions of the usual three electrodes as contained in the triode.

Function of the Triode

The filament, upon being heated from an accumulator, emits a copious stream of negative electrical particles which are termed "electrons." Largely by virtue of the fact that the anode is maintained at a high positive potential, these electrons are attracted through the vacuum existing in the valve to the anode, and this steady electron stream is the "anode-current." The normal or "control" grid, is interposed in the valve in such a way that the electrons on their way from the filament to the anode, have to pass through the fine wire mesh or gauze of which the grid is composed.

When there is no signal from the preceding valve, this electron stream remains at a constant value, and is called the "standing" or "quiescent" anode-current. But when a signal is being received from the aerial or from the preceding valve, the grid potential becomes alternately positive and negative in sympathy with the signal oscillations. When the grid potential is negative, the presence of the grid tends to keep back some of the electrons, but when it is positive, the reverse is the case and the electron flow is greater than when no signal is being received. Thus the anode-current oscillates in sympathy with the signal oscillations impressed on to the grid, and therefore small voltage changes in the grid circuit produce comparatively large voltage changes in the anode circuit, and that is briefly the principle upon which the valve amplifies.

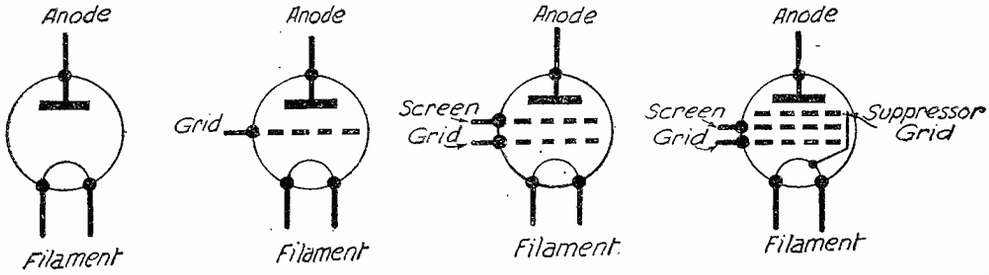


Fig. 1.—The evolution of the pentode valve.

Now as I have already said, the grid is composed of fine wire mesh almost like a cage between the filament and the anode, and as the electrons have to pass through the grid, obviously the closeness of the mesh affects very considerably the characteristics of the valve. For example, the super-power valve is a "low-impedance" valve, *i.e.*, the mesh of the grid is so open that it offers little resistance or impedance to the electron flow which, in practice, results in the fact that such a valve will handle fairly large grid-swings and will deliver a considerable undistorted output, but it will not amplify to any great extent the signals impressed on its grid.

Therefore, the closer the mesh of the grid, the higher is the impedance and, consequently, the greater is its amplification factor. It follows, therefore, that an ordinary power valve with a fairly high impedance will have a larger amplification factor and will amplify weak signals to a greater degree than would a super-power valve. On the other hand, the super-power valve will handle a stronger signal input without distortion and will deliver a much greater undistorted output.

The pentode valve possesses the advantages of both types of valve—it is much more sensitive to weak signals than a low-impedance triode, and yet, for a given grid-swing, will deliver a much greater, undistorted output than the triode. This happy result is achieved by the use of the two additional grids already referred to, the "screen" and "suppressor" grids. In order to explain the functions of these grids, it is necessary to consider the S.G. tetrode.

Amplification Factor

I have already made it clear that the closer the mesh of the grid, the higher is the amplification factor, but it will be easily appreciated that in endeavouring to obtain extremely high magnification, a point occurs where the mesh is so close that it forms a definite barrier to the electron stream, thus preventing the flow of current from filament to anode and rendering the valve useless. This difficulty is overcome in the S.G. valve, by interposing between the control-grid and the anode an additional grid, the "screen." This additional grid is maintained at a potential of some 75 volts.

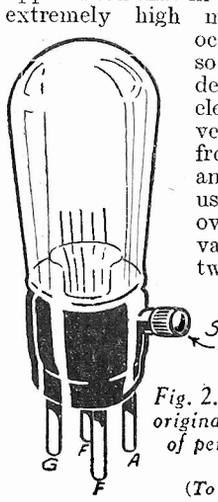
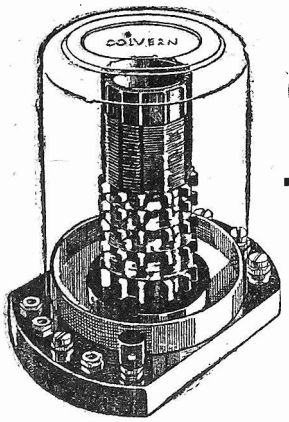


Fig. 2.—The original form of pentode.

(To be concluded next week—Ed.)

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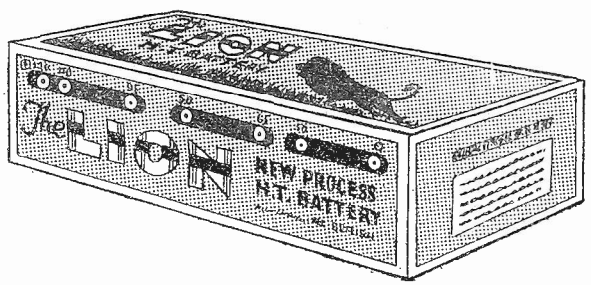
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SELECTONE A.C

By FRAN

LAST week preliminary details of the "Selectone Two" were dealt with and simple instructions for building the instrument are now given.

The constructional work is perfectly straightforward, as can be gathered from the photographs and from the complete wiring plan, Fig. 3. It is best to commence by drilling the panel according to the scale drawing in Fig. 2. The positions of the four holes for the switches and tone control potentiometer are clearly indicated in the latter figure whilst those for the spindle and escutcheon of the tuning condenser are most easily obtained by using the metal template conveniently supplied with this component. The template should be laid on the back of the panel and the holes marked through by means of a scriber or sharp pencil. A circular hole is required for the spindle, and is made in the usual way with a brace and bit. The opening for the escutcheon plate, however, is of irregular shape and can best be made by drilling a series of small holes just inside the lines and then cutting between them with a sharp knife or chisel; the rough edge can finally be smoothed with a half-round file.

The arrangement of baseboard components can readily be followed by reference to the wiring plan and photographs. Half-inch screws are suitable for mounting everything except the L.F. transformer (to which the "Tone Compensator" is attached), and for this two 1¾in. (8's) screws are required. The only parts which are not screwed down to the baseboard are the four fixed resistances, which are mounted directly by means of their connecting wires.

Wiring

Little explanation seems necessary in regard to the wiring; it is straightforward, and there will be no difficulty in following it in Fig. 3. The majority of connections are made in Glazite insulated wire, but those between the filament terminals of the valve holders and corresponding terminals on the transformer are in twin flex. Two flexible wires are attached to the smoothing choke instead of the more usual terminals, and these are, of course, joined directly to the other components. Nearly all the wires are secured under the heads of terminals, but there is a variation of this method in respect to the tuning condenser; this is not fitted with terminals, but has two tubular soldering tags instead. The wires may be soldered to the latter, if desired, or may be attached by inserting them into, and nipping up, the tubular tags. Notice that a wire is taken from one of the holding-down screws of the H.F. choke to high tension negative; the object of this is to "earth" the metal screen.

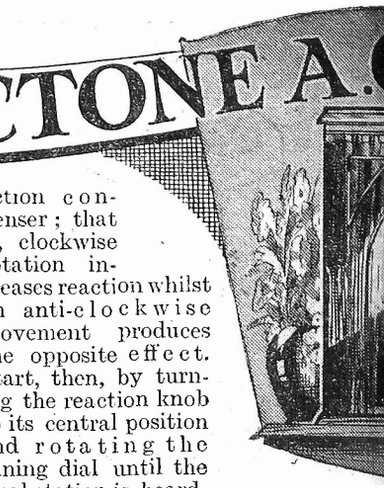
One wire from the mains flex is attached to the .5 amp fuse, whilst the other must be taken to one of the three primary terminals on the mains transformer, marked "200v." "230v." and "250v.," respectively. Naturally, connection must be made to that terminal which is appropriate to the mains voltage available. In case the latter is not exactly the same as that marked on any terminal the wire should be joined to the one which most nearly corresponds to the mains voltage. For example, if the voltage were 220, the wire would be taken to the "230v." terminal, or if it were 240, connection could be made to either of terminals "230v." or "250v."

Operating Note

Having completed the constructional work you will be ready to give the set a thorough test. Insert the metallized valve in the left-hand holder and the power valve in the other one. Connect the earth lead and then an external aerial or the mains aerial tapping. It now only remains to put the plug of the mains lead into a convenient lamp-holder and to switch on. Switching is, of course, done by means of the bottom right-hand knob; the first slight movement closes the contacts, and any subsequent rotation affects reaction control. For "radio," the top left-hand switch knob is pulled out, when the lower switch sets the tuner for long waves (pushed in) or medium waves (pulled out).

Tuning

The method of tuning is the same as with any ordinary type of detector-L.F. set, and the variable resistance used for reaction is operated in precisely the same way as is a reaction condenser; that is, clockwise rotation increases reaction whilst an anti-clockwise movement produces the opposite effect. Start, then, by turning the reaction knob to its central position and rotating the tuning dial until the local station is heard. Next the strength can be adjusted as necessary by means of the



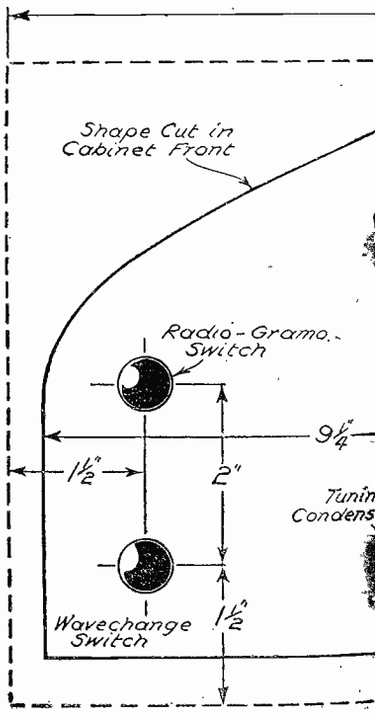
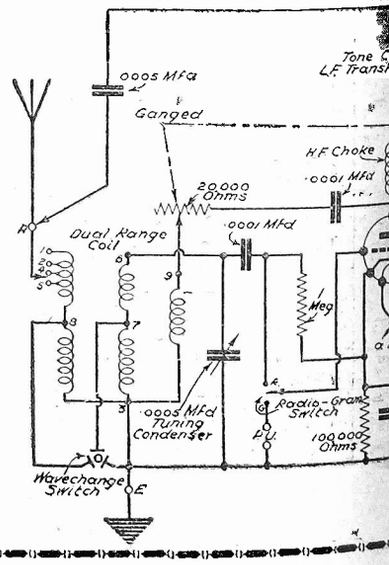


Fig. 2.—This drawing s

A "PRACTICAL WI



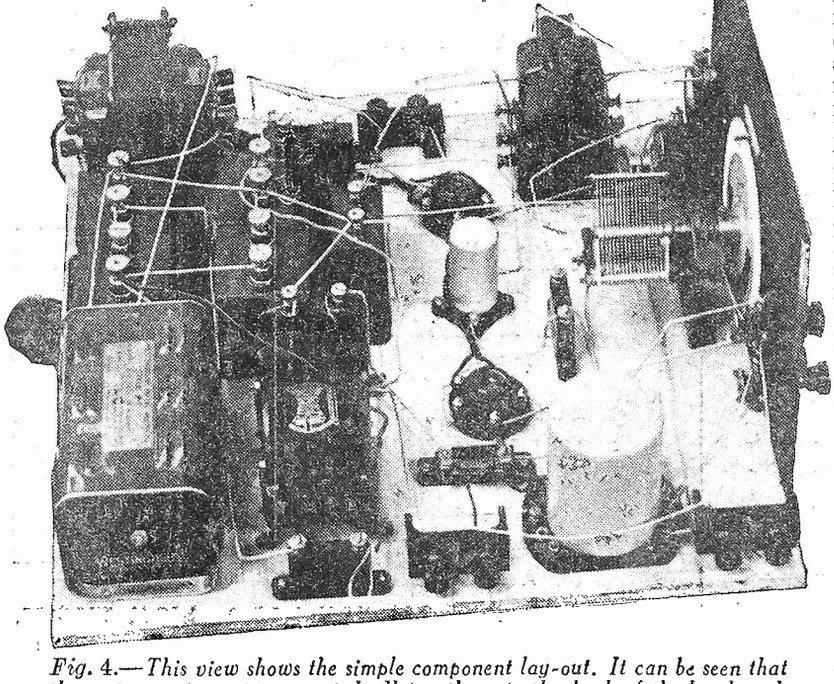
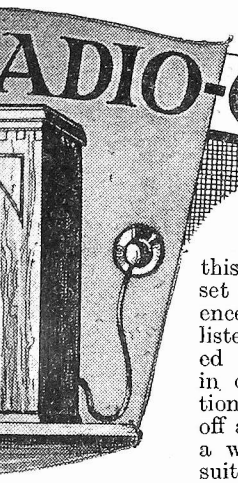


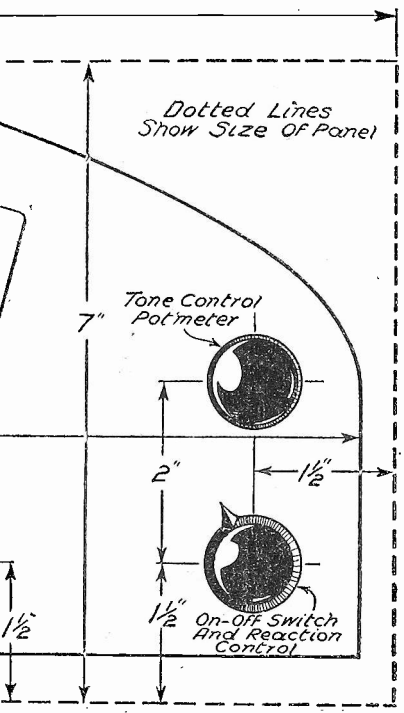
Fig. 4.—This view shows the simple component lay-out. It can be seen that the mains equipment is mounted all together at the back of the baseboard.

ADIO-GRAM TWO



ON, F.R.A.

reaction control. It might be added at this juncture that the set can cause interference to neighbouring listeners if it is allowed to oscillate, and, in consequence, reaction should be slacked off at the first signs of a whistle. Having suitably adjusted the volume, try the effect of the tone control. By turning the potentiometer knob to the right there should be an increase in high-note response and a consequent reduction in bass; rotating the knob in the other direction gives a reverse effect. It should be noted that variation in tone alters to a certain extent the overall volume, and this is at a maximum when the control is set to its midway position.



t of all panel components.

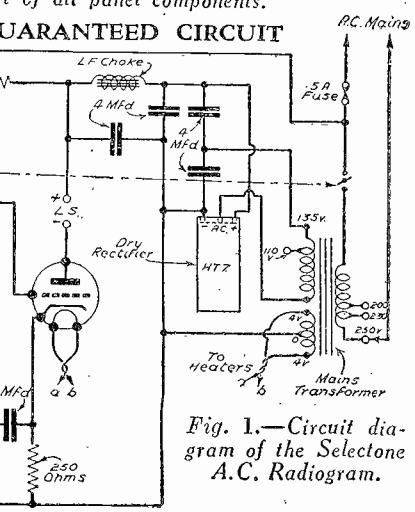


Fig. 1.—Circuit diagram of the Selectone A.C. Radiogram.

Adjusting the Selectivity

As previously mentioned, the degree of selectivity can be varied by inserting the coil plug into different sockets. The least amount of selectivity and, incidentally, the greatest volume, is obtained when the plug is in socket number "1"—by putting it into sockets "2," "4," and "5," the degree of selectivity is progressively increased and there is a corresponding loss in maximum volume. When using the mains as aerial it will probably be found best to put the plug into socket number "1," but in the case of an outside aerial its best position will be dependent entirely upon the length and characteristics of the particular aerial in use; a certain amount of experimentation will, therefore, be necessary in this respect.

Results

In describing the results obtained from the "Selectone A.C. Radio-Gram. Two" over fairly lengthy tests I am not going to give a long list of stations received. I have actually brought in a fair number even when using the mains aerial, but I much prefer to consider this set as an ideal "quality" receiver for local work. There has always been an ample volume of really good well-balanced reproduction from at least three stations (the two locals and Daventry); by setting the reaction control "full-on" the volume has been found to be more than sufficient easily to fill a very large room, whilst it could be reduced to little more than a whisper by slacking-off reaction and putting the coil plug into socket "4" or "5."

It might be of assistance to mention the approximate tuning positions of a few stations, since they will give you some idea as to where your own local transmitters are to be found. On th medium wave-band (switch pulled out), London National comes in at 60 degrees, Scottish National at 80 degrees, North National at 90 degrees, London Regional at 115degrees, Scottish Regional at about 120 degrees, Midland Regional at 135 degrees, and North Regional at 150 degrees. On long-waves, Daventry is received at about 150 degrees and Radio-Paris at 165 degrees.

Aerial and Earth

It has been found very important that a really good earth lead should be employed, but the aerial is of much less consequence, especially within thirty or forty miles of the local station; up to such distances the mains aerial is perfectly satisfactory and probably better than a short indoor one. At least, this has proved to be the case with the mains on which the set has been tested, but it should be pointed out that occasionally one finds that a particular mains supply is unsatisfactory for use as an aerial, due to the fact that it carries a good deal of H.F. current, which produces an unpleasant hum, or some kind of instability. In a case of this kind it is generally better to employ an external aerial, although an improvement can often be obtained by connecting a suitable H.F. choke in series with each supply lead—special chokes are made for this purpose, since those of the usual type are incapable of carrying the necessary current.

If you wish to make up these chokes yourself, you will require for each choke a piece of ebonite or paxolin tube 3in. long by 1¼in. in diameter. The winding of each choke consists of 100 turns of No. 22 D.C.C. wire. The ends should be anchored, and the two coils should be mounted at right-angles to one another, and then, to avoid the risk of shocks, they should be enclosed in a small wooden box. Two input leads, and two output leads of heavy flex, or, alternatively, an input and output mains socket, completes the unit.

The method of mounting and connecting the gramophone motor and pick-up will be described in the next article.

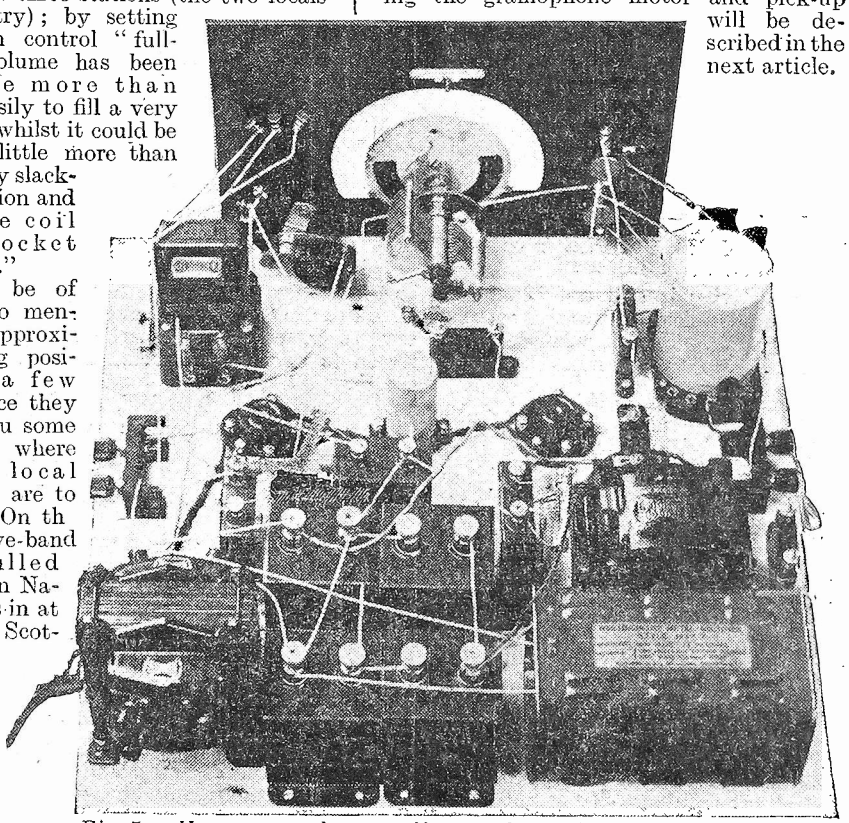


Fig. 5.—Here you see the set itself removed from the cabinet—Simplicity and ease of construction are the keynote.

COMPONENTS FOR THE SELECTONE A.C. RADIOGRAM

1 Polished Plywood Panel, 10in. by 7in. (supplied with Cabinet specified).
1 5-ply Baseboard, 15in. by 14½in. (supplied with Cabinet specified).
1 Utility "Mite" .0005 mfd. Condenser with disc drive.
1 "Wearite" 3-point Wavechange Switch (Type G.W.C.).
1 "Wearite" Changeover (Radiogram) Switch (Type G.C.O.).
1 "Wearite" 20,000 ohm volume control with combined Mains Switch.
2 Lotus 5-pin Valve Holders.
1 Colvern Type "T.D." Coil.
2 Dubilier .0001 mfd. Fixed Condensers.
1 Dubilier .0005 mfd. Fixed Condenser.
1 Graham Farish Ohmite 1 megohm Grid Leak.
1 Graham Farish Horizontal Grid Leak Holder.
1 "Wearite" Screened H.F. Choke (Type H.F.P.).
1 Lissen "Hypernik" L.F. Transformer.
1 Lissen "Tone Compensator."
3 Belling-Lee Terminal Mounts.
6 Belling-Lee Type "R" Terminals, 2 marked "Pick-Up" and 1 each marked "A," "E," L.S.+, L.S.—.
1 Heayberd Type W.25 Mains Transformer, giving outputs of 135 volts, 70 mA. and 2—0—2 volts, 4 amps.
1 Heayberd Type 751 Smoothing Choke.
1 Westinghouse Style H.T.7 metal Rectifier.
4 Dubilier (400 volts D.C. working) 4 mfd. Condensers.
1 Dubilier (400 volts D.C. working) 2 mfd. Condenser.
2 Dubilier (400 volts D.C. working) 1 mfd. Condensers.
1 Belling-Lee Fuseholder with .5 amp. fuse.
1 Graham Farish Ohmite 100,000 ohm, 1 watt Resistance.
1 Graham Farish Ohmite 50,000 ohm, 1 watt Resistance.
1 Graham Farish Ohmite 1,000 ohm, 1 watt Resistance.
1 Graham Farish Ohmite 250 ohm, 1 watt Resistance.
1 Heayberd Mains Flex with Lamp Adaptor.
2 Coils Glazite, screws, short length flex.
1 Mazda A.C.2 H.L. Valve, metallized.
1 Mazda A.C.P. Valve.
1 Simpsons Electrical Turntable.
1 Becker Q.M.B. On-Off Switch.
1 B.T.H. "Minor" Pick-up.
1 Celestion "Soundex" Speaker Chassis.
1 "Camco" Selectone-Tablegram Cabinet.

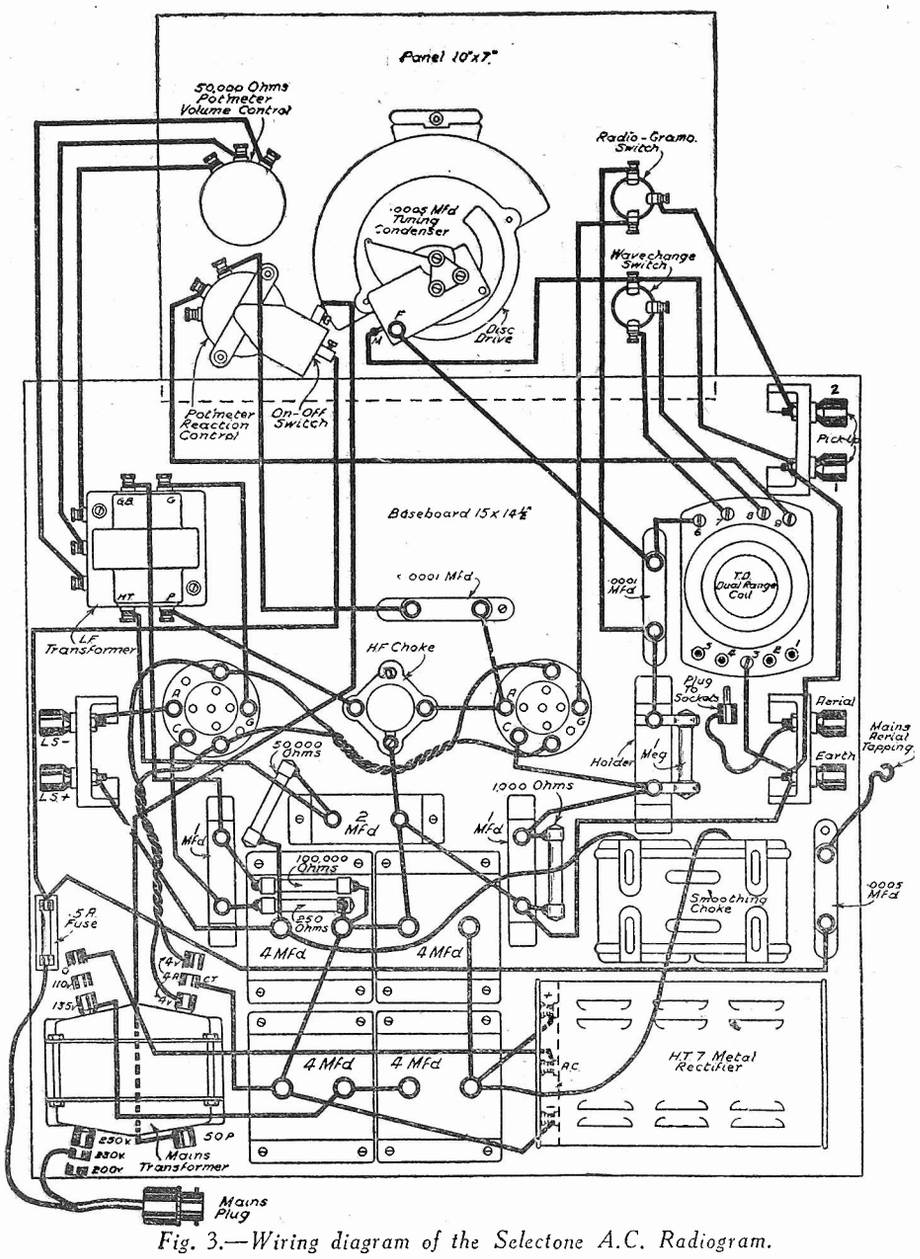


Fig. 3.—Wiring diagram of the Selectone A.C. Radiogram.

SELECTIVITY IN SIMPLE TERMS

(*Continued from page* 216.)

adequate selectivity is still not obtained, in which case a double circuit tuning system must be employed. This means that some form of band-pass tuning must be used. Now to buy a commercial unit and ganged condensers will cost anything from 25s. to £2. Few people will want to spend that amount and so an add-on circuit is here described. This unit will convert your present set into one with band-pass tuning.

The parts required are :—

1 .0001 mfd. compression condenser.
1 .0003 mfd. compression condenser.
1 .0005 variable condenser.
1 dual-range coil and wave-change switch, terminals and wire.

The dual-range coil must be totally screened and the screen earthed. This stipulation is made because direct coupling (which would otherwise upset tuning) between the two coils would be difficult to eliminate. Moreover, a screened coil enables greater compactness to be obtained.

The circuit and wiring diagram are shown in Fig. 3.

The aerial is connected to A. Terminal marked "A on set" is joined by a *short* wire to the aerial terminal on set. If tappings are used on coil in set they should be discarded, and the short piece of wire joined to the "grid end" of coil. Terminal marked E on set is earthed. The coil screen is earthed by terminal on top of screen.

This is connected to MV, terminal 2, or to the earthing terminal: whichever is more convenient. The aerial series condenser may be joined either to 4 or 1. Connection to 1 is to be preferred on the score of volume.

To use the unit tune in a station (one not too powerful) on both dials for greatest volume. If the station still persists even though condenser dials are turned through a space of five degrees the .0001 mfd. compression condenser must be slackened off till the station occupies one or two degrees on the dials.

A second station far removed (in frequency) from the first is then tuned in. The .0001 mfd. compression condenser is re-set to give the required results. Finally, this condenser is left in a position intermediate between the two settings. Stations are then tuned in on the two dials alone. If a powerful station comes in at two settings on the dial the .0003 mfd. compression condenser is slackened off till only one reading is obtained. Long-wave stations are received by opening the wave-change switch (*i.e.*, pushing it in). One last word on this arrangement. A short aerial is a disadvantage when used with this arrangement. You lose too much volume. This does not contradict previous statements on short aerials, as a moment's consideration will show.

An article on selectivity would hardly be complete without a word or two on wave traps. A wave trap needs to be very good. Good does not mean the ability to cut out one station only. There are plenty of good wave traps in that respect. Some of them reduce the strength of wanted stations very much; thus making the final state of affairs as bad as the first. When considering the use of a wave trap don't run away with the idea that you can use two—one for each local. Each individual wave trap functions perfectly by itself, but when the two are connected in series the probability is that they will couple with one another and upset each other's adjustment: thus making the use of two ineffective.

The BEGINNER'S SUPPLEMENT

THE EASY ROAD TO RADIO

Conducted by F.J. CAMM



Cowl Insulator

AN insulator so called because of its hollow conical shape. A good example is illustrated in Fig. 1. The object of such a design is twofold—firstly, it offers a long path to any currents which might tend to leak across the surface, and, secondly, by virtue of the cowl shape, the inside surface is kept dry in wet weather, so that even under these conditions the risk of surface leakage is small. Thus its insulating properties in the wet are comparable with those in dry weather.

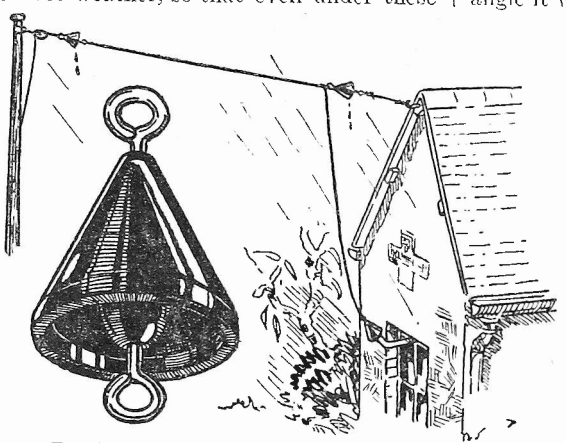


Fig. 1.—Cowl insulator showing method of use.

If you examine the illustration you will see that any current which may try to leak from one ring to the other must travel over the outside surface, across the edge, along the inside, and down the centre part. If it is only dry right up inside the apex of the cone it will offer a barrier to the current. Of course, the conical shape is also inducive to rapid draining as the water runs off from the edge.

Some types of lead-in are also fitted with a conical cowl similar to a cowl insulator. The lead-in is bent so that the apex of the cone points upwards, thus the underside is always dry. Cowl insulators, if kept clean, are as efficient as any, and more so than most.

Crystal Control

A method of controlling the wavelength of a transmitting station by means of a quartz crystal. This has nothing to do with the ordinary type of crystal used as the detector in a crystal set. A quartz crystal would be quite unsuitable for this purpose. The property of the quartz crystal which determines its use in a transmitter is that mechanical vibrations are set up in it by the passage of an alternating current of suitable frequency. By cutting the native crystal at a certain angle it will exhibit the desired characteristics when the current is applied to opposite faces. The thickness of the crystal determines within very fine limits the frequency to which it will respond, thus by cutting the crystal the right thickness and connecting it in a suitable manner in the transmitting circuit, the oscillations in the latter can be maintained at one frequency or wave-length all the time.

A quartz crystal in the various stages of cutting and grinding is shown in Fig. 2.

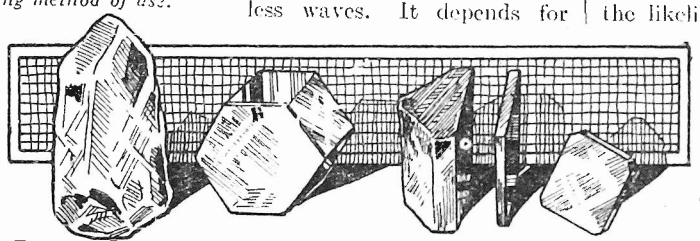


Fig. 2.—Stages in the cutting of quartz crystals as used for crystal control.

Crystal Detector

A device used for rectifying or "detecting" wireless waves. It depends for its action on the fact that the mineral "crystal" it contains permits an electric current to pass through it in one direction only. If an attempt is made to pass current through it in the opposite direction its resistance is very high indeed.

As you know, wireless waves arriving at the receiving aerial set up electric currents in the aerial coil of the receiver. These currents oscillate backwards and forwards so rapidly that if they were taken straight to the headphones there would be no response at all. That is to say, no sound would be produced. This is because as soon as the diaphragm of the 'phone started to move in response to the current in one direction the effect would be immediately cancelled by the current instantly flowing in the opposite direction. The crystal overcomes this neutralising effect by cutting out the reverse current. The telephones are then able to respond to a current always flowing in one direction.

The crystal used in the detector may consist of various natural minerals. A very popular one is galena, which is another name for lead sulphide. The type suitable for wireless purposes is a hard grey substance which when broken exhibits a bright metallic surface composed of small crystals. It is usually sold in pieces about the size of a large pea, and may trade under various high-sounding proprietary names usually ending in "ite." The crystal is held in a metal cup by means of set screws or plastic metal and the other contact is made by means of a thin coiled wire called a "cat's-whisker." The cat's-whisker is so mounted that it can be moved over the surface of the crystal until a sensitive spot is discovered. The object of the cat's-whisker is to give a very light contact. This is important, and the results obtained depend very largely on getting the setting of the whisker just right.

The need for careful adjustment and the likelihood of its being disturbed by a slight jar when once obtained is one of the chief drawbacks to crystal reception. Another is that no amplification of signals is obtained with a crystal as with a valve detector, so that the strength of reception is dependent entirely on the power picked up by the receiving aerial.

(Continued on page 234.)

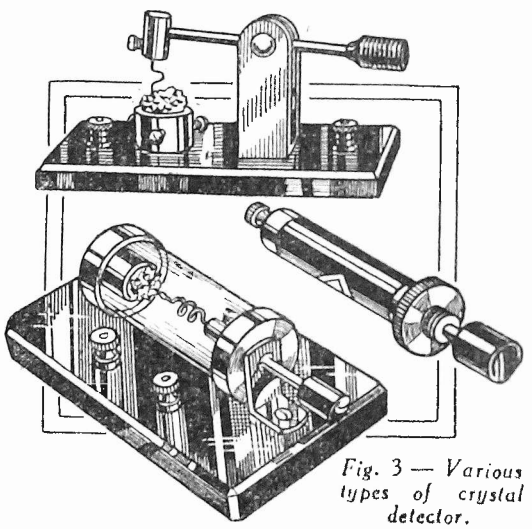


Fig. 3 — Various types of crystal detector.

THE BEGINNER'S A B C OF WIRELESS TERMS

Continued from page 196, April 22nd issue.

(Continued from page 233.)

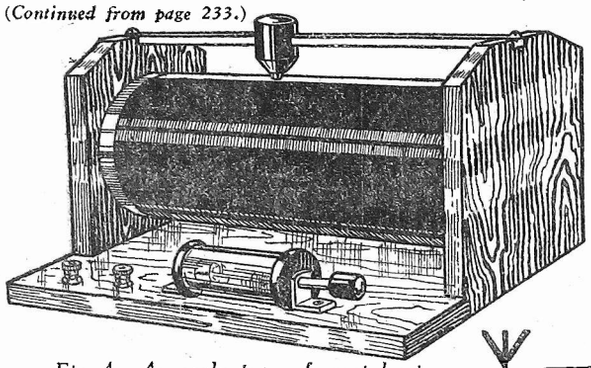


Fig. 4—An early type of crystal set.

There are other kinds of crystal than galena. Some of these do not require a cat's-whisker, and are therefore of a more permanent nature. However, although being more stable, they are usually less sensitive. Some well-known crystals are carborundum, zincite, and bornite, "Perikon" and silicon. Carborundum is used with a steel spring pressing on it instead of a cat's-whisker. Zincite and bornite are two other minerals which are used together. The two crystals are mounted in cups facing one another, and held in contact by means of a spring. "Perikon" is a similar pair, but using copper pyrites and zincite, while silicon is used in the same manner as galena.

Three typical examples of crystal detectors are shown in Fig. 3. The one above is of the cat's-whisker variety. It will be noticed that control of the whisker is obtained by mounting it on a small arm working on a ball joint. The crystal is held in place by means of set screws so that it can be moved easily and re-inserted another way round if it becomes insensitive after long use.

The detector in the centre is of the semi-permanent variety, and is intended to be mounted on the panel by the usual one-hole-fixing method. The knob allows of a limited amount of adjustment. The lower detector is similar to the top one, but the cup is mounted horizontally and totally enclosed by a glass or celluloid tube. This prevents the crystal from becoming covered in dust, which is a frequent cause of failing performance.

Crystal Set

A simple type of receiver employing a crystal detector instead of valves. Owing to the fact that a crystal does not give any amplification of the signals received, the use of such a receiver is limited to within a few miles of a broadcasting station. A crystal set necessitates the use of headphones, but it is generally possible to use several pairs without any very great loss in signal strength. This is the best way if several people wish to listen at once, as the use of a loud-speaker, even under the most favourable conditions, is practically impossible. There are admittedly one or two amplifiers of the microphone type still on the market which it is claimed will boost the signals sufficiently to make speaker reception possible, but the results do not in any way compare with the average cheap valve set.

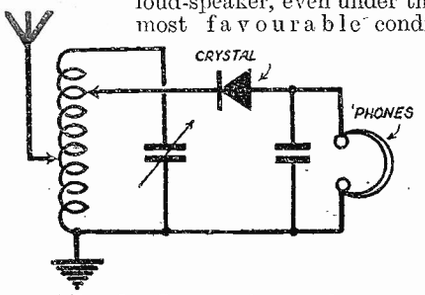


Fig. 5—Circuit of crystal set.

One of the early types of crystal set is shown in Fig. 4.

A circuit for a crystal set is given in Fig. 5. For best results the tuning coil must be of an efficient type wound on a fairly larger former, and not screened in any way. The aerial tapping is for the purposes of selectivity. The nearer it is taken to the earthed end of the coil, the sharper will be the tuning and the weaker the signals. The other tapping is used to adjust the circuit according to the resistance of the crystal used. The condenser across the 'phones is not absolutely essential, but is recommended by many designers. Its value should be round about .001 mfd.

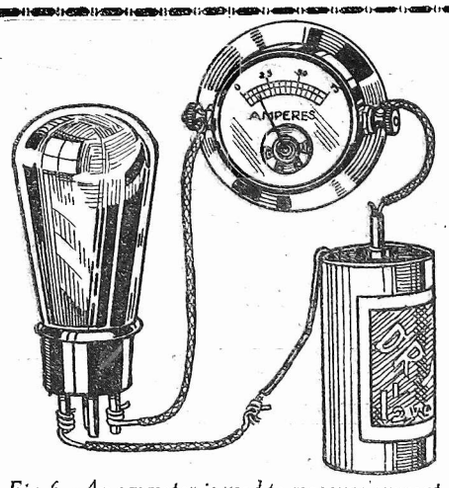
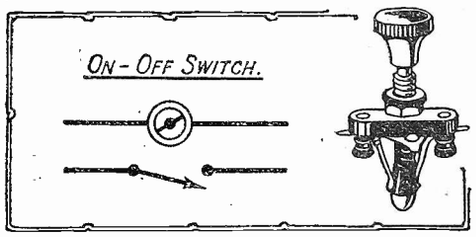


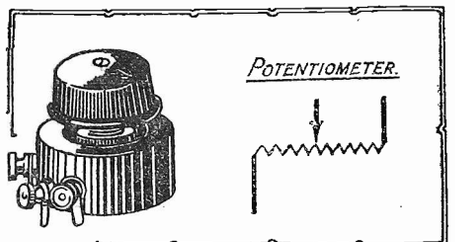
Fig. 6—An ammeter is used to measure current. The illustration shows a valve under test.

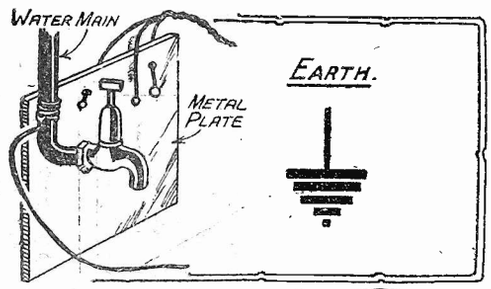
Current is the flow of electricity along a wire or other conductor. It may flow in one direction only, when it is called a *Direct Current*, or it may flow first in one direction and then in the opposite direction. In this form it is called an *Alternating Current*. Alternating current is again divided into two kinds. If the alternations or flow backwards and forwards is at a very fast rate, or "frequency," it is spoken of as a *high-frequency* current; but if it is comparatively slow, then the current is called a *low-frequency* current.

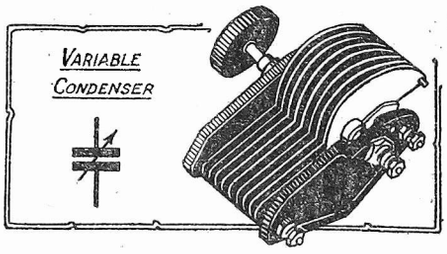
The rate of flow of current is measured by means of an ammeter, the unit of current being the *ampere*. Fig. 6 shows the current passing through a valve from a small battery being measured.

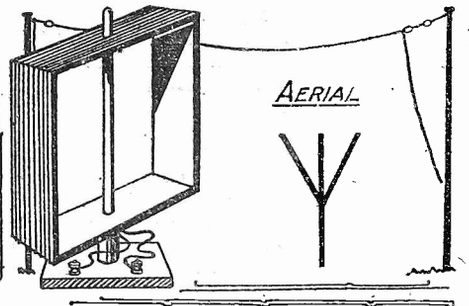
THE SHORTHAND OF WIRELESS—(*Concluded*)

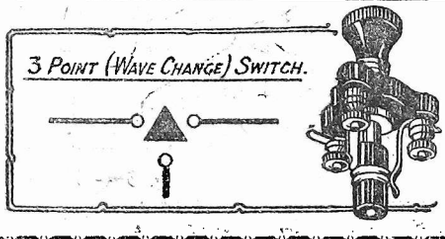


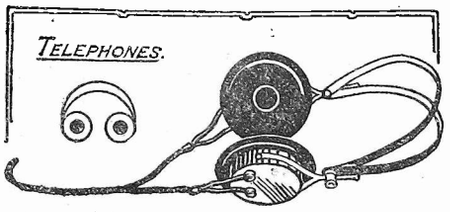


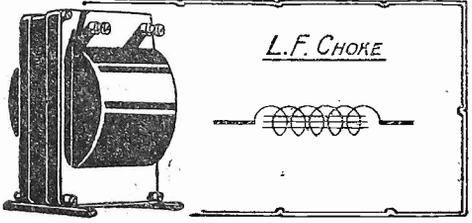




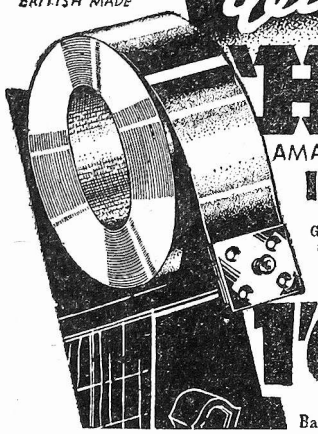








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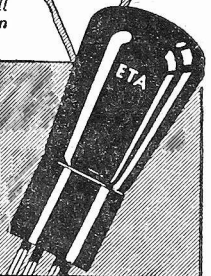
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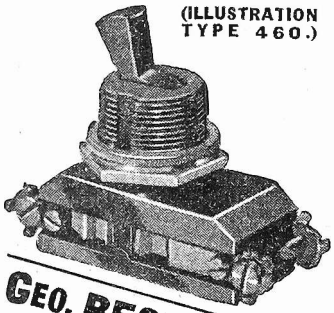
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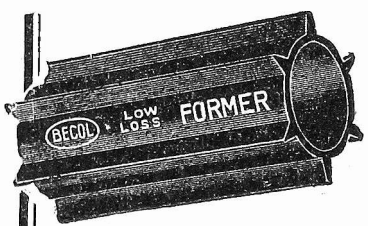
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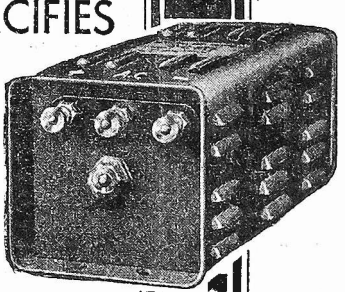
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Auto-Tone Balance

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

In this article the author explains a method of counteracting distortion caused by reaction.

WHEN the sound emanating from a loud-speaker differs from that performed in the studio, it is said that "distortion" has been introduced. Distortion can occur in almost every stage of a receiver, but in most cases it is a simple matter to guard against it by using components of good design and high quality and by keeping a careful watch on operating conditions in order to ensure that valves and other apparatus are not overloaded, and that correct grid bias and anode voltages are applied.

There are, however, certain conditions under which a definite amount of distortion is inevitable. It cannot be prevented from occurring, and until recently distortion of this kind has had to be endured with what patience the listener could command.

The Use of Reaction

Distortion of the kind referred to is that due to the effects of reaction. Practically every receiver of reasonable efficiency is capable of reproducing at good volume the programme radiated by the local station without recourse to reaction, and a modern set employing a screened grid high-frequency stage should be able to give a fairly wide choice of programme without the reaction knob requiring attention. If the more elusive foreigners are to be picked up at comfortable strength, however, the additional fillip to sensitivity given by wisely applied reaction is of great assistance.

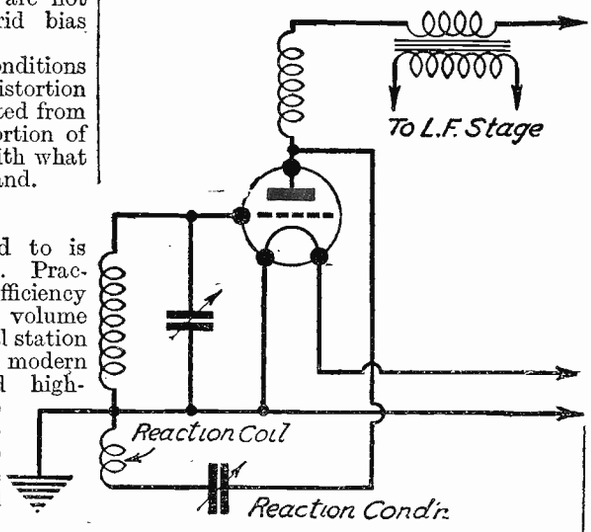


Fig. 1.—The conventional form of capacity reaction control.

As most listeners know, reaction is a process in which part of the energy in the anode circuit or "output" circuit of the detector valve is returned to the grid circuit and is re-amplified. The amount of energy so fed back is controlled, in a modern set, by a variable condenser, which passes more or less energy, according to the adjustment of the vanes, back to a reaction coil which is coupled to the grid coil, the normal scheme of connections being indicated simply in Fig. 1.

Now not only does reaction greatly increase the volume of sound from the loud-speaker, but it adds also to the apparent selectivity of the set, that is to say, the receiver can be more sharply tuned when a fair amount of reaction is applied than when the reaction control is turned back to zero. But undue sharpening of the tuning has the effect of cutting off some of those all important side bands which represent the higher tones of the musical scale. The reproduction, therefore, tends to become gruff and "drummy"; the brilliance of the treble notes and the "tone colour" due to the higher harmonics are reduced, and the programme quality becomes decidedly unpleasant.

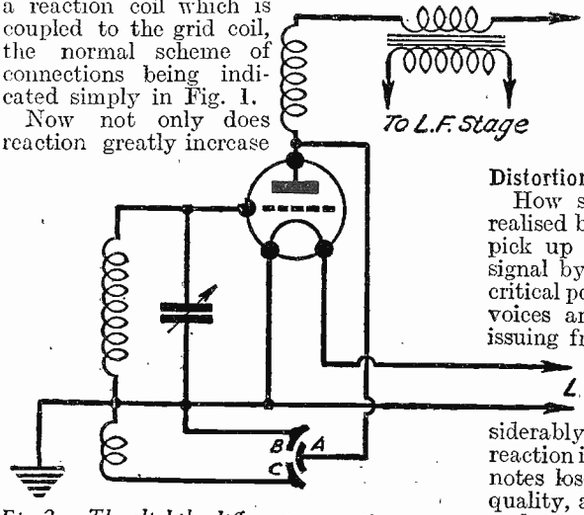


Fig. 2.—The slightly different connections when using a differential reaction condenser.

Distortion With Distant Reception

How serious this distortion can be is realised by anyone who has ever tried to pick up a very weak and distant signal by pushing reaction to the critical point. The hoarse, croaking voices and the travesty of music issuing from the loud-speaker are scarcely distinguishable as a programme. Even when a considerably less amount of reaction is used the "top" notes lose much of their quality, and this is quite understandable when it is stated that deterioration may well affect all notes above upper "C" on the piano, and even some notes between middle and upper "C."

As already stated, until recently no satisfactory method of counteracting this form of distortion has been available. It is now possible, however, to compensate almost completely for high note losses due to the use of reaction.

The method is, briefly, this: Since the losses in high notes become greater as reaction is increased, can we not find a piece of apparatus or a circuit arrangement in which the high tones are automatically strengthened as reaction is increased? The practical solution to the problem is a development of a method of balancing out losses, well known and practised frequently in the past with varying degrees of success. In the original scheme, known deficiencies in one part of a circuit were compensated by known increases in another part of the circuit, and by carefully choosing components with suitable characteristics, various elements of distortion and loss were cancelled out.

"Hit-or-Miss" Principles

Such principles are usually of the "hit-or-miss" type, and as examples mention may be made of the use of a pentode output valve in conjunction with a movin-coil loud-speaker known to be rather "boomy." Again, needle scratch in a pick-up circuit, which means in effect, the addition of extra and unwanted high notes, can be reduced by using a filter to divert all or a part of the notes above a certain frequency from the amplifying stages.

Usually, too, no attempt was made to ensure that these compensating devices should be self-adjusting. Based entirely upon the electrical characteristics of various pieces of apparatus, the arrangement was so planned that tolerably good quality

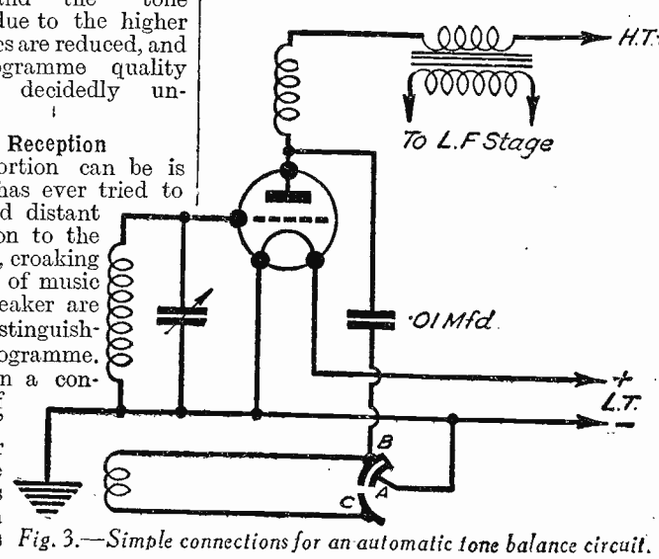


Fig. 3.—Simple connections for an automatic tone balance circuit.

RADIO RAMBLINGS

condenser (anything from 1 to 4 mfd. will do) is joined between that L.S. terminal which is connected to the plate of the output valve, and the loud-speaker. The second speaker terminal is joined to an odd length of metal tube, which can be pushed into the soil in the corner of a flower bed. This arrangement applies equally well whether the speaker is a moving-coil, balanced armature, or any other type.

The Popularity of S.W.

THE other day I happened to be talking "shop" (in every sense of the word) with a friend who owns a large radio store, and he was deploring the fact that business had fallen off rather considerably with the early approach of summer-like weather. I suggested that he might improve matters by booming short-wave sets and components, since these were bound to attract the interest of the D.X. "fan," who was deprived the pleasure of long-distance reception on the higher wavebands during the light weather. He rather astonished me by saying that he had tried this idea on previous occasions, but with negative results. In fact, he went so far as to say he had enough S.W. kits in stock to make a hundred sets, but there was very little call for them. It is amazing that this should be the case, because I should think that every reader of PRACTICAL WIRELESS knows that short waves are almost the only medium for long-distance reception, at low cost, in summer time. There is no doubt that a two or three-valve short-waver will give excellent reception of American and other distant transmissions all the year round, and the idea that wireless is of only seasonal interest is long since dead.

"Make or buy a short-wave set now and enjoy D.X. the whole year round!" would be a very apt slogan.

Tuning a Short-waver

THE same dealer friend told me of an incident he experienced a short time ago which had rather disgusted him. A customer had bought a short-wave adaptor, and, after having had it for a couple of days took it back to the shop saying it was faulty. The unit was examined and tested and found to be in perfect order. The owner thereupon took it away again, only to return with the same complaint. Eventually it was found that the only trouble was that he was unable to tune it—not because tuning was difficult, but simply because he had not appreciated the need for rotating the dial slowly enough. When one considers that on a wavelength of, for example, 30 metres (one that is very productive of signals just now, by the way), a movement of a quarter of a degree of the dial of a .0002 mfd. condenser covers the same band of frequencies as does a movement of about ten degrees of the condenser in an ordinary broadcast receiver, it can easily be appreciated that tuning must be carried out very slowly indeed if anything is to be heard at all.

"Wireless in the Car"

IN view of the recent article in PRACTICAL WIRELESS, on "Wireless in the Car," it is interesting to note that a suggestion has been put forward that the time is ripe for motor-car manufacturers to consider the possibilities of making radio receivers as standard fittings of cars coming within the "de-luxe" category. Apparently this would create a little difficulty, for it appears that if the set were made a "fixture" it would become necessary to obtain a broadcast receiving licence specially for it. Bearing this fact in mind, it seems that the most satisfactory solution would be to make provision for housing a portable set and to devise some means by which its power supply could be derived from the car accumulator. A compact receiver, without batteries, could then be used in the car when required, or operated in the house as a normal domestic receiver. In that case a loud-speaker could be built into the car as a permanency, and the bare set made to be easily portable.

I have been experimenting with the latter system and find it an easy matter to build a four-valve set in a shock-proof case, measuring only 6in. square by 12in. long. This can be mounted under the dashboard of quite a small car and held in position by stout elastic bands.

CLASS B COMPONENTS

(*Continued from page 222.*)

A spool must be made in similar manner to that for the transformer, but of different dimensions and having four sections; particulars are given in Fig. 7. To simplify the winding process the turns are arranged in four equal parts, which are connected together on completion. A total of 10,000 turns of 32 gauge enamelled wire are used, and the weight of this is approximately 1½lbs. Again, it is not essential to count the turns so long as each section is almost filled and contains as nearly as possible the same amount of wire. Core clamps and terminal strips are the same as those for the transformer, except that the former have a total length of 4¼in. and the latter of 3⅜in.

The transformer and output choke described above can be used in practically any Class "B" amplifier or any receiver using this form of amplification, but to avoid possible confusion a pictorial wiring plan is given in Fig. 8 of an amplifier using the circuit diagram of Fig. 1. The "driver" valve will normally be part of the receiver to which the amplifier is connected, and is that immediately following the detector. It will be fed in the usual way through a transformer or even an R.C.C. unit and should be a small power valve, such as a Cossor 215P, Mazda P.220, or a similar type in another make. As explained before, it may be biased rather more heavily than usual until its anode current is reduced to 2 or 3 milliamps. At the time of writing there is only one Class "B" valve on the market—the Cossor 240B.—but others are shortly to be introduced and the components described should be suitable in every case. Maximum loud-speaker output will depend very largely upon the H.T. voltage employed; for example with 90 volts H.T. an output of some 1,000 milliwatts are available, or approximately 2,000 milliwatts when the voltage is increased to 150.

As most readers will be aware, the Class "B" valve has seven pins and thus requires a special holder of which the connections are shown in Fig. 8; it can be seen that one terminal is a "dummy" and does not require any connection. When the loud-speaker is designed for use with a pentode it should be joined to terminals 1 and 2 on the output transformer, but if it is normally intended to work with a power or super-power valve it will be connected to terminals 3 and 4.



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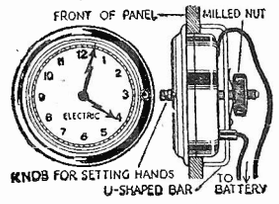
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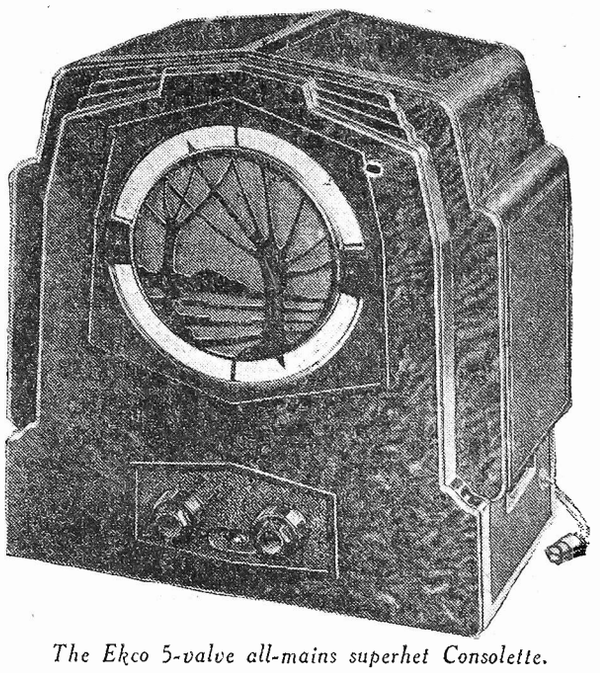
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RECEIVERS AND THEIR RECORDS

Superhet Consolette (Model SH25)
Ekco 5-Valve All-Mains

So long as there exists a great number of high-power stations working on neighbouring wavelengths, the greatest degree of selectivity is required, and in these circumstances the superheterodyne circuit easily holds its own. Several makers have placed instruments of this type on the market, and of these, the Ekco model SH25 is an outstanding representative. Generally speaking, the circuit does not depart to any extent from conventional superhet practice, but considerable attention has been paid to the lay-out of components and to many minor details to which so much care is not always devoted. The receiver is very well constructed, and it is housed in a modern bakelite cabinet of prepossessing appearance. Possibly, the large station dial will be the first feature to attract attention; it indicates at a glance both the station and the respective wavelength to which the set is tuned. Although, at first sight, this patent tuning device, whereby a broadcast is actually selected by the name on the dial, may appeal to a certain class of listener, I do not think that it affords all the advantages claimed for it. There are over two hundred and thirty stations in Europe alone, and it is evident that no dial of reasonable size could possibly show all their names. Providing, say, twenty or thirty names were given on that portion of the dial allotted to the medium band, and which, with their corresponding wavelengths, would act as landmarks, it would be better practice to calibrate the rest of the dial in degrees *only*. In the receiver under test, I noticed that neither Leningrad nor Warsaw—both giant transmitters—were marked; in the same way, on the medium band, no mention was made of Bordeaux-Lafayette, Breslau, Stockholm, etc., whereas prominence had been given to such stations as Kosice, Cork, and so on—namely, broadcasting transmitters which are much less frequently heard by distant listeners.



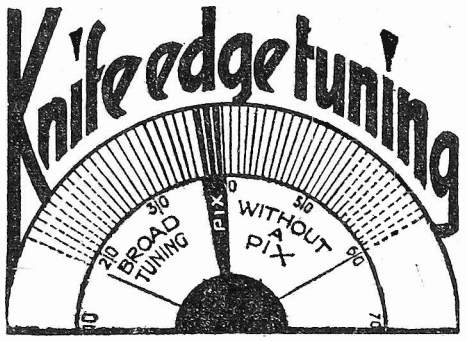
The Ekco 5-valve all-mains superhet Consolette.

The Ekco Superhet SH25, which can be supplied in either A.C. or D.C. mains-operated models, comprises five valves in superhet sequence, namely, variable mu 1st detector, and intermediate frequency stage, an oscillator, 2nd detector, and pentode output feeding a built-in moving-coil loudspeaker. In the A.C. version, a metal rectifier is used for the mains supply. The receiver is available in three types: A.C. 200/250 v. (40-80 cycles); 100/125 v. (40-80 cycles), and D.C. 200/250 volts. Either model can be easily adjusted to suit individual mains requirements.

The handling of the instrument has been rendered very simple and good results are immediately obtainable, even in the hands of the most unskilled novice. Actually, on the front of the receiver there are only two knobs; on the left, the main tuning condenser, on the right, a volume control. Smaller knobs concentrically mounted act respectively as a combined wavechange and gramophone selector, and also as a local and distance switch. In addition, to damp the higher frequencies, and at the same time assist in suppressing interference, there is a small lever which, bringing into operation a filter device to the second detector valve, effects a considerable alteration in the tone of the output. The ordinary "on" and "off" Q.M.B. switch is placed on one side of the cabinet.

Best reception results, of course, are obtained with an outside aerial and earth of the standard type, but the receiver is also provided with an internal aerial, which will give excellent results with some of the more powerful transmissions. The volume control is very efficient on both the "short" and "long" wavelengths; its action is smooth and progressive. Provision has been made for the adaption of a pick-up for the electrical reproduction of gramophone records; it is essential, in this case, to use a separate control potentiometer, as the one incorporated in the receiver does not act when the change-switch is fixed at "gram." In the A.C. model under test, the electrical current consumed was roughly 50 watts—an economical figure—and one which compares very favourably with other receivers of the multi-valve class. In the matter of selectivity, the *Ekco Superhet SH25* reflected great credit upon its designers; it is an easy matter to log a large number of stations in a very short space of time, and the strength of the signals, even in the case of low-powered stations, is such that the majority of them can be listened to in comfort.

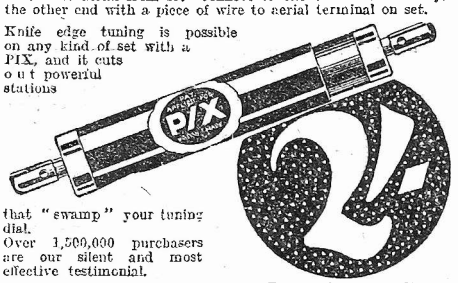
This up-to-date superheterodyne is made by E. K. Cole, Ltd., Ekco Works, Southend-on-Sea (Essex). At the price of twenty-four guineas, it will, without doubt, assist in establishing the popularity of what is really the only type of receiver which deals satisfactorily with the modern chaotic condition of the ether.



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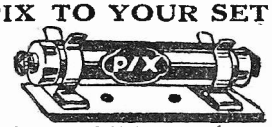
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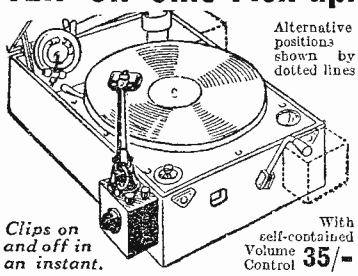
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MY OPINION! By the Editor

8-11, *Southampton Street, Strand, W.C.2.*

Correspondence

IN the course of an interesting letter a reader makes the suggestion that we should offer a prize each week for the most interesting letter published in our correspondence pages. I cannot accede to such a request, for editorial correspondence should be a natural corollary to a paper. We are always delighted to hear from our readers. We like to receive their brickbats as well as their bouquets, for it is in the clash of intellect and the admixture of diverse opinions that is generated the dynamic spark which creates the driving force of a healthy publication such as PRACTICAL WIRELESS. Any attempt to force correspondence by the inducement of a prize rather asks for flattery; for no reader would feel that in expressing his true opinion (if it were an adverse opinion) of the paper, he would stand a chance of winning it. Our correspondence pages are always open to our readers, even if their opinions may clash with mine or my contributors'. Your brickbats may be hurled at the editorial cranium without the fear that they will be ignored. Nor have we need with our vast circulation, our leading position, and the esteem in which PRACTICAL WIRELESS is held by its readers, to offer such inducement. Our prizes are limited to practical ideas from our readers, many hundreds of whom have promptly benefited financially by submitting Wrinkles.

Specifications

A READER tells me that it is refreshing to find a paper which actually tells the reader the correct parts to use in making a receiver. He is, of course, referring to our policy of specifying one make of component only for each item in the set. It is a policy which we shall continue with vigour.

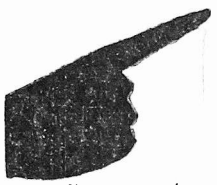
Next Week's Free Blue Print

RADIO has become a seasonal hobby largely because very few, if any, have yet produced a portable receiver which could be carried without discomfort or fatigue. I have designed what I think you will judge to be a **novel type of lightweight portable receiver, a free blueprint for which will be presented with every copy of next week's issue.** The lightest cabinet on the market, so far as I am aware, weighs about 12lbs., which in itself places it outside the genuine portable market. I therefore set to work to apply some of the weight-reducing principles adopted in the aircraft industry, with the result that the cabinet of the Featherweight Class B Portable Four, which is the subject of the blueprint alluded to, weighs only 1 lb. Additionally, you do not need the fingers of a Houdini to assemble it. The total weight of the receiver is much less than anything before attempted in the home-constructor line. Full constructional details will be given next week, and advance information appears on page 215 of this week's issue.

F. J. C.

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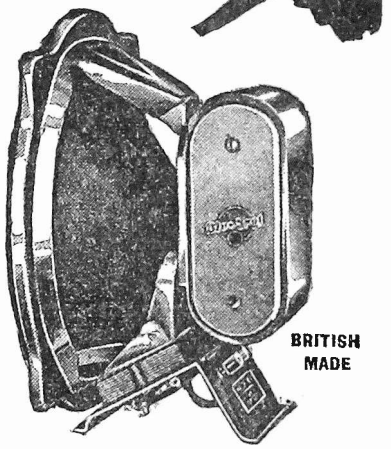


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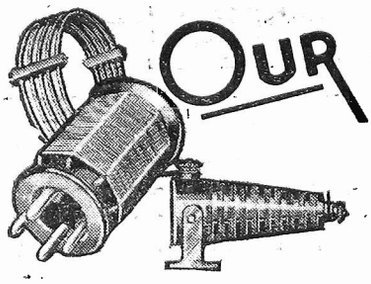
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OUR SHORT WAVE SECTION

SHORT-WAVE COIL CONSTRUCTION.

A Practical Article on Making Efficient Coils for Short-Wave Work.

By A. V. D. HORT.

TUNING coils for use on waves below about 150 metres can with advantage be of quite different design from those used on the broadcasting waves. This is not to say that compact coils of the

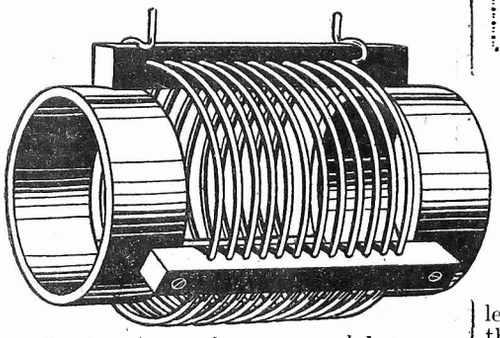


Fig. 1.—A neat short-wave coil design.

ordinary plug-in type will not function on short waves; but they cannot be expected to be very efficient. Possible losses of energy, due to the self-capacity of the coils and their high-frequency resistance, must be guarded against more and more carefully as the frequency of the currents carried increases. You might find that simple "hank" coils of a few turns of fine wire would enable you to receive signals on 100 metres, and even down to 20 metres. Signals would be comparatively weak, however, and your tuning range for one set of coils would be unnecessarily narrow. On lower wavelengths still, difficulties in persuading the detector valve to oscillate would become more and more pronounced. Substitute carefully designed coils, and, with the other components unaltered, you would at once obtain vastly improved results from the receiver, both in signal strength and in ease of handling.

The coils which are to be described do not claim to be the last word in super-

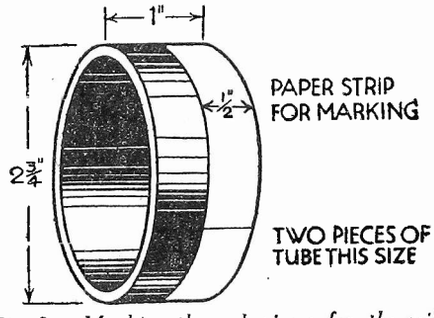
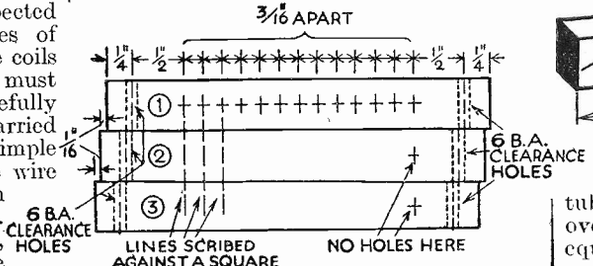


Fig. 3.—Marking the end pieces for the coil.

efficiency. They have, however, been in use in the writer's short-wave equipment for some time, and they have proved entirely satisfactory. The aim has been to make rigid coils, using bare wire with well-spaced turns, and with the smallest possible amount of supporting material. Large masses of ebonite or other insulating material are to be avoided in coils for short waves, as being potential absorbers of energy which should not be permitted to go to waste in this way.

Details of Construction

The coil illustrated in Fig. 1 is wound with bare 16 s.w.g. soft copper wire. Although wire of this gauge would stand up unsupported in a coil, the coil would not be at all rigid. The least vibration would cause variations in the wavelength to which the receiver was tuned. Hence the ebonite strips and tubes to support and space the turns.



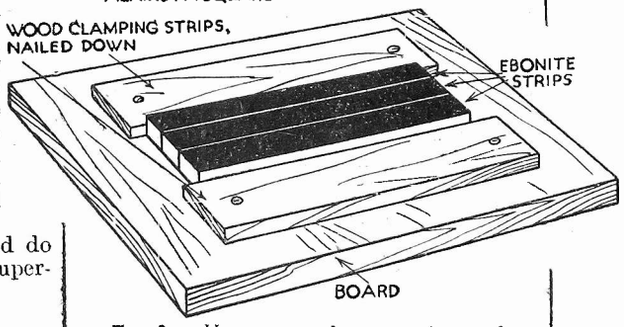


Fig. 2.—How to mark out and cut the coil supports.

You can make your coil of any length or diameter you wish, but you are advised not to make the diameter less than about 2 to 2½ inches. The illustrations show the dimensions for a 12-turn coil, about 3¾ inches in diameter, a useful size for a wide range of short waves.

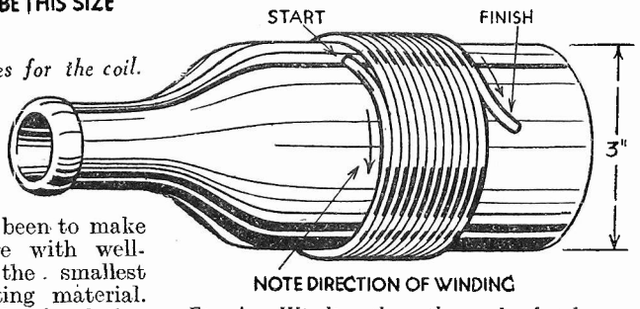


Fig. 4.—Winding the coil round a bottle.

First mark out the supporting strips. These are cut from ⅜in. ebonite sheet. Lay your strips on a flat board against a fixed wood strip, and fix another strip to hold them firmly together. Now slide them into the exact positions given in Fig. 2. Scratch the numbers 1 to 3 on them with a scriber. With dividers mark off the hole positions on strip 1 3/16 in. apart. Then with a square scribe lines right across all the strips from these marks. Punch-mark all the centres, and drill with a No. 43 drill. The holes at the ends of the strips are drilled 6 B.A. clearance and countersunk.

Next mark out the pieces of ebonite tube. The quickest way to do this is as follows. Wrap a strip of paper round the

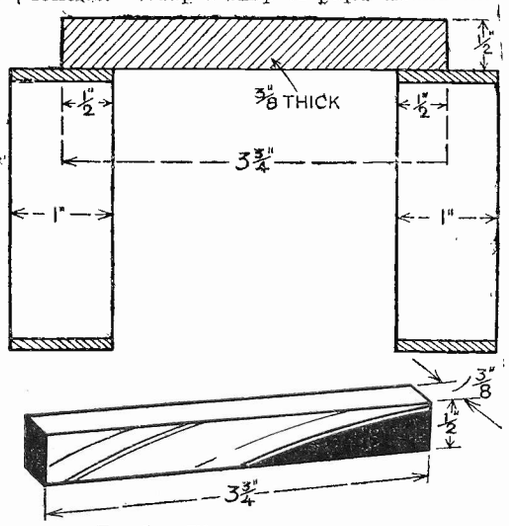


Fig. 5.—The supports, and method of fixing to the end pieces.

tube, and cut it exactly where the ends overlap. Divide the paper into three equal parts by measurement, putting a

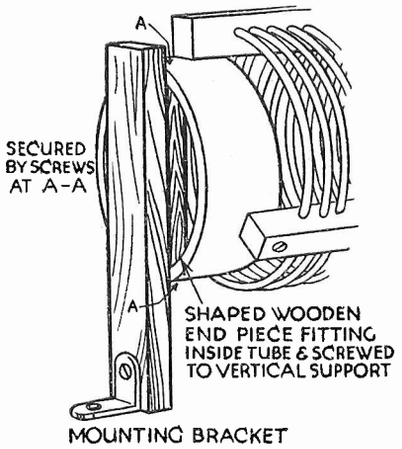
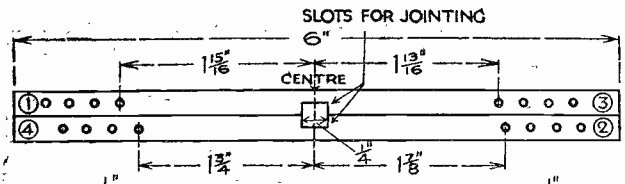


Fig. 6.—The coil supports and method of attaching the coil.



pencil mark at each point. Wrap the paper round the tube again, scribe a line round against its edge, and make a mark against each division point. This procedure gives you the positions for the strips. Place the strips in position in turn, in the order 1 to 3 round the tube, and mark on the tubes the positions

(Continued on page 243.)



(Continued from page 242.)

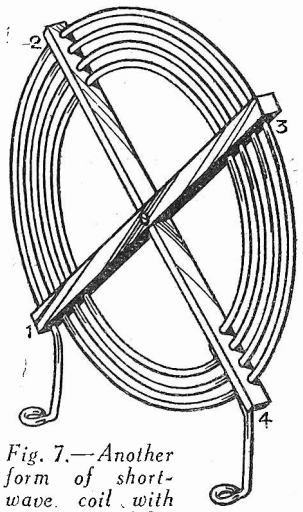


Fig. 7.—Another form of short-wave coil, with dimensions of fixing strips.

for the fixing screws. Drill and tap 6 B.A. for these. If you have no taps, drill 6 B.A. clearance holes. Now you are ready to assemble the skeleton former. Be careful to put on the strips in the right order, so that the turns of the coil will be carried forward in an even spiral from end to end of the strips.

For the coil you will need 11 feet of wire. Cut the length, put one end in the vice, and pull on the other end with pliers till the wire "gives" and comes out dead straight. You must straighten the wire before winding. Small kinks and bends in it would make it almost impossible to thread the wire into the former.

Winding the Coil

Wind the coil on a jar or bottle about

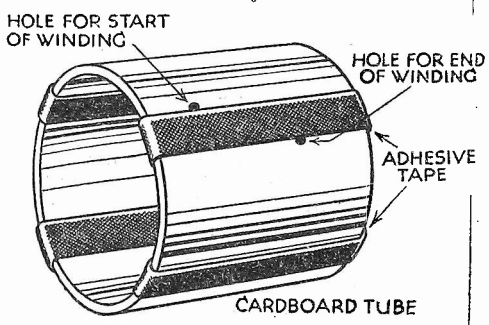


Fig. 8.—The former and adhesive strips for holding another form of coil.

2½ to 3in. in diameter, turns touching. Be sure to wind in the direction shown in Fig 4, or your coil will not go on the former. Hold the starting end all the time while you are winding, and release both ends at once. The wire will spring out a bit, and should give you a coil of even diameter of turns throughout its length. Thread one end through the end hole in strip 1, on through the end hole of strip 2, and so on. As you work along the strips, keep easing the wire through the earlier holes. Never use force, or you will break the ebonite. When you get near the end, be particularly careful to keep easing the wire through the holes near the centres of the strips. Otherwise these turns will be drawn tight as you feed in the last turns, and an ebonite strip may snap across one of the holes.

When you have finished the coil, of even diameter throughout, and without any twist in the strips, turn up each end of the wire at right angles to strip 1, and cut them off, leaving ½in. projecting.

You can mount the coil horizontally or vertically, by fitting in two or one wooden end pieces, as in Fig. 6. Make connections by soldering.

A more compact type of coil, useful where space is limited, is the helix. I have found this type of coil especially useful below 40 metres or so, as it enables one to obtain very tight coupling, if required, between aerial and grid, or grid and anode coils. The former you can make of ebonite or wood. Ebonite is harder to work and more fragile, but better electrically. If you use wood, soak the finished former in melted paraffin wax before putting on the wire, draining off all the surplus.

Now wind on a bottle a coil of 6 or 8 turns of 16 s.w.g. bare copper wire, as for the coil already described, but about 5in. diameter. Pass one end of this coil through the outside hole of No. 1 arm of the former, and thread it round and round in turns of gradually decreasing size.

The inner end is then brought down No. 4 arm and terminated in a loop. The outer end, on No. 1 arm, is similarly looped. Bend these two loops so that they lie horizontal when the coil is vertical.

The coils so far described are meant for use in any short-wave receiver intended mainly or wholly for short-wave reception. If you want to try short waves on a receiver which has ordinary plug-in coils, you will find that the following method of making coils will be of assistance.

Use as a former a short piece of cardboard tube, 2½in. diameter. Lay strips of adhesive tape on it lengthwise, sticky side upwards, as in Fig. 8. Fix them temporarily in place by turning the ends under inside the tube and sticking them together. Pierce a hole close to one adhesive strip. Using 18 s.w.g. D.C.C. copper wire, first straighten by pulling, wind tightly, with turns touching, a single-layer coil of not more than 15 turns. Push the starting end through the pierced hole, and finish at the other end in the same way, through a hole close to, but on the other side of, the same strip. Free the ends of the strips, lay them over the turns and stick them down. Draw them tight as you do so, but do not displace any of the turns. Now cut away pieces of the tube up to the ends of the coil, free the ends and slip the winding off gently. If you have any difficulty in removing the coil, crush the tube.

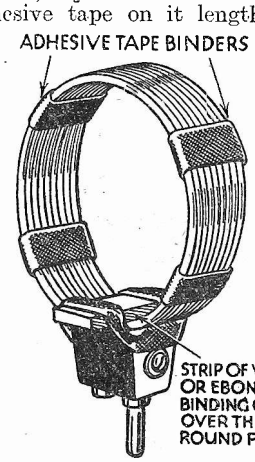


Fig. 9.—The coil wound on former shown in Fig. 8, and method of mounting.

Now mount your coil on its plug, binding it on with adhesive tape; insert a narrow slip of wood or ebonite at the bottom (Fig. 8), to project a trifle beyond each end of the coil. This will prevent the binding from distorting the coil. Make the connections to the plug contacts.



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C.H.P. (London).

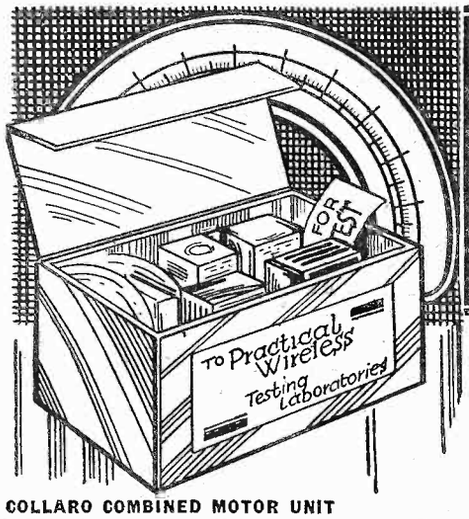
Here's a man who thought it "disastrous" that his battery gave out! Of course, the STANDARD PERMANENT H.T. BATTERY needs attention occasionally, say every year or 18 months. But the replacement is merely a matter of changing cartridges at a few pence each—and you can do it yourself quite easily. Think of the money saved before and after. The STANDARD is a special adaptation of the famous Leclanche principle which recharges itself when the set is shut down, giving Level current and Better reception for much less money. We sell direct and Guarantee your satisfaction, whether you pay cash or deferred terms. Why not write now for our interesting Free Booklet?

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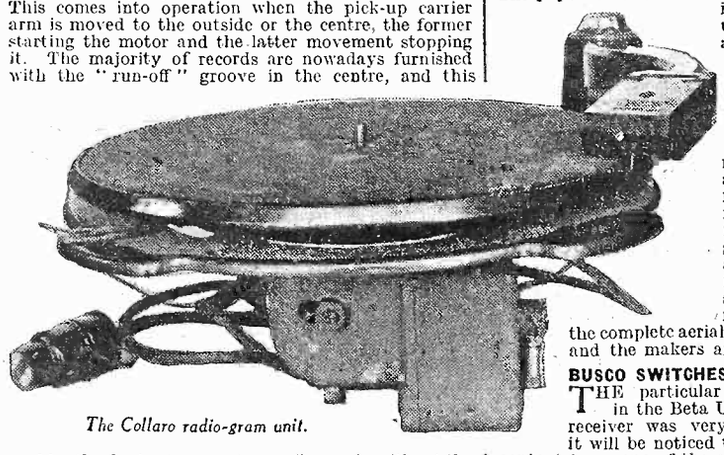
Facts and Figures

Components Tested in our Laboratory

BY THE PRACTICAL WIRELESS TECHNICAL STAFF.

COLLARO COMBINED MOTOR UNIT

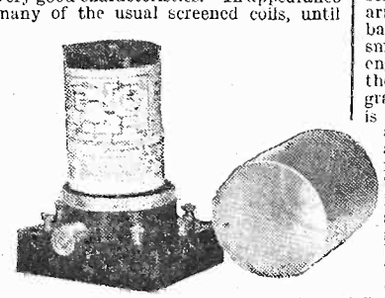
THE illustration below shows a very compact and useful radio-gramophone unit consisting of a pick-up with built-in volume control and induction motor, with fully automatic start and stop device. This is made by the Collaro Company who are, of course, very well known in the gramophone motor world. The particular instrument we have received bears evidence of very high-class workmanship and has functioned perfectly satisfactory on test. The motor is delightfully silent in operation and starts and stops very smoothly by means of the automatic device. This comes into operation when the pick-up carrier arm is moved to the outside or the centre, the former starting the motor and the latter movement stopping it. The majority of records are nowadays furnished with the "run-off" groove in the centre, and this enables the device to operate on all records without the necessity for resetting the stop according to the playing length of the record. The Pick-up has very good characteristics, the D.C. resistance being 4,000 ohms and the A.C. impedance (at 1,000 cycles) being 52,000 ohms. The average output (R.M.S.) is 1.1 volts, so that it does not require a very powerful L.F. amplifier to produce really good volume signals. The volume control is of the wire-wound type, and is quite noiseless in adjustment and provides a complete variation in output from inaudibility to maximum. The price of the complete unit is £4.



The Collaro radio-gram unit.

BULGIN DUAL-RANGE SCREENED MULTI-COIL

THE new dual-range coil which has just been perfected by Messrs. Bulgin is illustrated below It is completely different from this firm's previous coil, and the advance model which we have tested reveals very good characteristics. In appearance it resembles many of the usual screened coils, until the metal cover is removed. The first and principal difference is then apparent, for, instead of the windings being visible, they are enclosed in an ebonite cylinder, round which is pasted a paper bearing all the coil's details. This gives two circuit diagrams (in pictorial form for the non-technical user), one showing the use of the coil in the ordinary aerial circuit, and the other showing its use as an H.F. coupling coil. The connections are described, and the terminals are numbered for this purpose. One marked improvement over other coils of the dual-range type is the provision of a Q.M.B. wave-change switch. This springs into its position and definitely does change the range over which the coil tunes. It can be heard, as well as felt, when the knob is rotated, and it provides a really definite position for medium or long waves. The method of winding, and the choice of the values of the individual windings completely removes break-through, and the selectivity is of a high order. The wave ranges covered are 200 to 500, and 1,000 to 2,000 with a normal .0005 mfd. condenser. The price is 10s. 6d.



Bulgin new dual range coil.

HET INDOOR AERIAL

ANOTHER new idea in indoor aerials has just been submitted to us under the name "Het." This is a simple, but ingenious, arrangement, consisting of an inch wide adhesive *paper* strip upon one side of which is deposited a very thin metallic veneer. This is gold in colour. At one end is fixed a one-inch square of brass, fitted at the centre with a small terminal. The paper is doubled at this point and the brass plate is very firmly eyeletted. To use it, the brass plate is attached to the wall (fixing screws being provided) at a point adjacent to the receiver, and then the strip is stuck to the walls and carried where desired. Neat, right-angled bends may be made by folding, and with the gold surface it forms a very neat arrangement. It is quite effective in use, and appears to be as good as a thin wire aerial, and the large quantity which is supplied will enable a full-size aerial to be laid all round the house. The price of the complete aerial, with fixing screws, is 1s. 6d., and the makers are Univolt Electric, Ltd.

BUSCO SWITCHES

THE particular on/off switch employed in the Beta Universal Class B Four valve receiver was very interesting in design, as it will be noticed that, although of the three-contact type, one of the contacts is supplied from its terminal *via* a fuse lamp. This is one of the interesting range of switches manufactured by Messrs. Busby and Co., of Birmingham. It has a non-rotatable contact, and this is a feature of the complete range of Busco switches. The operating arm is fitted at the end with two strips arranged at right angles, and one of these strips is bent round to form the contact-maker, whilst the remaining strip is of more springy material, and is bent to form a frictional grip with the moulded bakelite side of the switch casing. The result of this right-angle assembly is that the switch rod cannot be turned, and must therefore make a direct backward and forward movement. The contact strip fits into springy contacts connected to the terminals, and makes contact in the same manner as an ordinary "knife-switch." The contact is thus very sound electrically, whilst from a mechanical point of view the whole scheme is very sound. A three-contact switch is easily arranged by joining a terminal on the side of the bakelite casing and fitting a small piece of metal to engage the spring side of the plunger. For radio-gramophones a special switch is manufactured, and this avoids the troubles usually associated with long leads from the grid terminal. The plunger on this switch is about 3in. long, and a special slotted bracket is supplied with it. This bracket may be fitted on the baseboard of the receiver in any convenient position, and the switch locked (by means of its one-hole fitting) at any height on the bracket. The operating knob then projects from the panel, and by means of ebonite junctions the rod may be extended to any desired length. The price of this switch is 2s. 6d. The on/off switch costs 1s. 3d. and the wave-change and radio-gram. switch each cost 1s. 6d.

362 VALVES

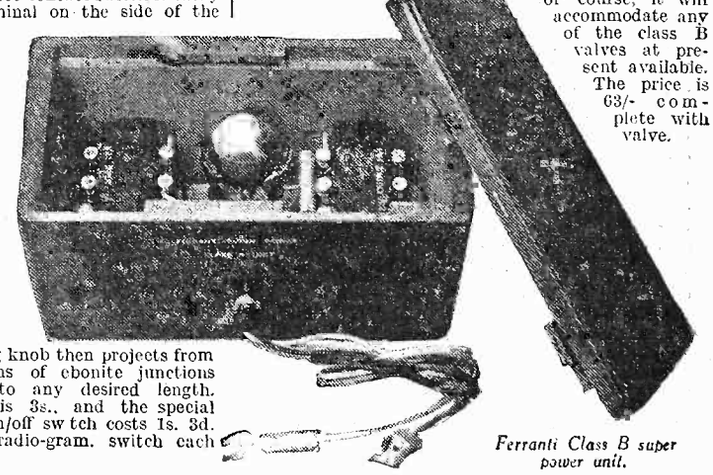
A SERIES of valves produced by the 362 Radio Valve Company has been received for test. These comprise the more usual types of 2-volt valves, including screen grid, variable-mu, H.F., L.F., Power and Pentode. In addition, we were very pleased to note a valve of the class B type, and this was, in fact the first valve of this type to be received by us. It is not of the 7-pin type, but has a five-pin base, with side terminal. We understand, however, that 7-pin bases are being fitted in future to this type of valve. Tested in the Class B Adaptor, this valve gave splendid results, and on the point of tone, volume and economy of operation gave every satisfaction. The top notes were, as is usual with this type of amplification, splendidly reproduced, and it was found desirable to fit a small fixed condenser across the output transformer to limit the response slightly. The price of this valve is only 9s., which enables everyone to try out the scheme with a minimum of outlay. The other valves all stood up very well to test and the P.2, costing 4s., was found to be the most suitable driver, with a 1/1 driver transformer. The S.G. type of valve costs only 7s. 6d., and the pentode 10s., and the valves are entirely British.



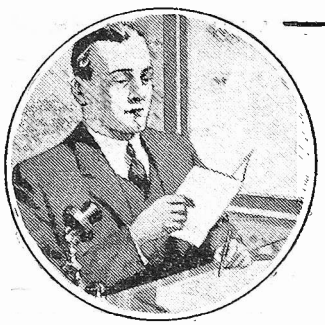
Two of the 362 valves.

FERRANTI CLASS B UNIT

TO enable users of existing receivers to add a stage of class B amplification Messrs. Ferranti have produced the neat unit shown herewith. This is finished in a very small cabinet with sliding lid and accommodates two transformers and a valve-holder. A tone compensator is fitted to the output transformer to limit the high note response, and battery cords are fed through a hole in the front of the cabinet. Holes are drilled at each end to facilitate connection to the input and output terminals, and the unit is extremely simple to connect up. On test it gave splendid results, the reproduction being very full with the top splendidly reproduced without "edge." A special class B valve is supplied by Messrs. Ferranti with this unit, although, of course, it will accommodate any of the class B valves at present available. The price is 63/- complete with valve.



Ferranti Class B super power unit.



Practical Letters from Readers.

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

Efficient Earths

SIR,—Referring to your "Queries and Enquiries" section in March 4th and the resulting further communications in "Practical Letters from Readers" in April 8th issue, may I hasten to draw the attention of your two correspondents to a fact which possibly may not have been considered seriously by them.

The object of an earth device, such as we manufacture, *i.e.* "Filt," is to provide a permanently moist area surrounding the metal contact to the set. We feel sure your readers will appreciate that common salt would not achieve this object, moreover it is extremely corrosive and we are afraid an earth tube which has received a weekly dose of two tablespoonsful of common salt would be non-existent after a month or two. Furthermore there are troubles other than corrosion to contend with, for salt rapidly washes away and is not such a good conductor as "Filt" chemical. The "Filt" chemical actually contains copper, and it is on this account that its operation is so satisfactory.

It may interest your readers to know that although upwards of half a million "Filts" have been produced, complaints to date are precisely three, and in these three instances satisfactory foundation for the complaint was not forthcoming.

In conclusion may I add that "Filt" chemical is not obtainable from any other firm, or under any other Brand name, nor are any firms licensed to manufacture this product.—p.p. GRAHAM FARISH LTD., T. GRAHAM FARISH (Bromley, Kent).

For the Veriest Novice

SIR,—I have just received my copy of the "Wireless Encyclopædia," and I must say that on perusal I find it far exceeds my expectations.

So far as I can judge at present, there is nothing that the "home constructor" of wireless sets need be afraid to tackle with such a book at his elbow, the details are given in such a plain and everyday manner that the veriest novice should find no difficulty whatever in delving into the "Innards" of Wireless in all its forms. Thanking you and wishing PRACTICAL WIRELESS every success for the future.—HAROLD S. SHAW (Huddersfield).

Why not a Handbook of Servicing Instructions

SIR,—Now that the manufacturers are preparing the designs of next season's sets it seems opportune to bring to their notice through the medium of your practical journal a very practical point which spoilt many a good set of this year. Several makes were so selective that a station is obtainable on each side of one of the lines on the tuning dial; yet there were spaces of one half-inch or more between the lines on the dial! How is one to log the numerous stations spread over this interval? Further, the difference between the readings of two such lines are often 30 or 50 metres, so that a mathematical problem has to be worked out before even an approximation could be obtained as to the actual wavelength of the station received.

Therefore, whatever the system employed, whether wavelengths, kilocycles, or names of stations, the greater the number of subdivisions on the scale the easier it is for one to log the stations. From this point of view, a semicircle divided into 180 degrees is better than one of 100 degrees because the subdivisions are finer, and therefore give a closer reading. Another practice that should be universal is to issue with each set a Handbook which includes full servicing instructions as in the case of a motor-car. The wise manufacturer realises that greater interest is taken in an instrument when one knows something of its internals. Many who would prefer to do their own servicing are handicapped through the lack of such a manual with the set. Whether it is advisable to do one's own servicing or not is surely a matter to be decided by the owner who has to bear the cost of repairs. At present, it is forced on the owner to send his set out to be repaired or adjusted however slight this might be.—A. A. (Liverpool).

CUT THIS OUT EACH WEEK.

DO YOU KNOW?

—THAT a filter circuit across the output choke of a pentode output valve is essential for gramophone reproduction.

—THAT in designing a mains unit, the total output must be the maximum required for the valves *plus* the voltage required for grid-bias.

—THAT the wattage dissipation rating of resistances must be studied when purchasing these components.

—THAT the reaction leads of a high-efficiency receiver may often advantageously be metal sheathed.

—THAT the impedance of a valve is varied as the grid-bias is varied.

—THAT Class B amplification makes the design of a portable receiver much simpler.

—THAT tone control L.F. stages are simple to build and very efficient in operation.

—THAT new types of valves will shortly appear on the English market.

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 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.

Improvements in Resistances

SIR,—As a regular reader of your valuable journal, I was deeply interested in the article by "Cynic" entitled "Some Snags and Suggestions," which appeared in the issue for March 11th, and more particularly the recommendation that resistances should be fitted with longer wire ends than is the present practice.

I have also experienced the difficulty referred to by the writer and it seems a pity that the flexible type of resistance which undoubtedly has many points to recommend it should have gone somewhat out of fashion. It is true that one serious disadvantage exists which may have lessened their popularity and that is the difficulty in joining the ends of a number of such resistances together. The usual method of accomplishing this end is by means of a nut and bolt, the junction being covered with insulating tape.

This no doubt is a very clumsy arrangement, but I have recently patented a neat connecting device which obviates all this difficulty. The latter has several other applications in the construction of wireless receivers and I shall be pleased to supply particulars with drawing to manufacturers or others interested, on application to me, c/o the Editor.—JAMES P. MCGLOIN (Rathmines).

Top Notch

SIR,—I beg to acknowledge receipt of your excellent, very clear and concise Encyclopædia, for which I thank you. I should also like to mention how much I appreciate PRACTICAL WIRELESS. Having taken most wireless periodicals at different times I find it well on top, in fact, "Top Notch." Thanking you again, and with best wishes for larger sales.—L. J. DAWES (Earlsfield).

Far Exceeds my Expectations

SIR,—Very many thanks for my copy of the "Wireless Constructor's Encyclopædia," which arrived in perfect condition. It far exceeds my expectations, and I am sure it will prove itself extremely useful in my work. I consider it a volume which every constructor should have by him for easy and precise reference.—LESLIE A. MOORE (Alexandria, Egypt).

A Reader's Thanks

SIR,—I wish to thank you and the staff for the splendid Gift Encyclopædia which I have received safely. As a regular reader of your weekly publication, PRACTICAL WIRELESS, I think it is the most interesting technical weekly on the subject. I wish your journal the greatest success in the future.—E. W. BLAKE (Southsea).

Fury Four: "Best Set I Have Handled"

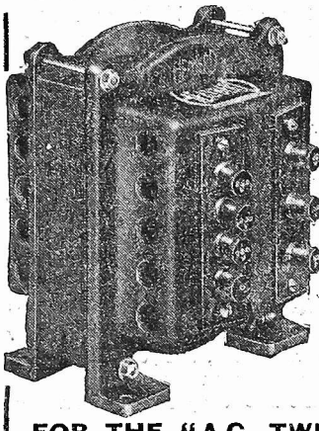
SIR,—I am very pleased to state that I have made up the Fury Four, and that it is the best set that I have handled, I am more than pleased with it, and the first time that I put it into operation I received thirty-four stations on the medium-wave, and six on the long-wave. I have very little doubt that I will be able to tune many more in. All the stations were received at good loud-speaker strength.—J. CARR (Liverpool).

The "Fury Four"

SIR,—I wrote to you some few weeks back with regard to a fault in my construction of the above receiver, and after careful tests I found that the screening

(Continued overleaf.)

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PRACTICAL LETTERS

(Continued from previous page.)

grid leg of the holder for V.2 was touching a shred of copper on the baseboard, the foil being very badly cut round the hole for the valve-holder. However, since remedying this error, I have achieved all the results that you claim, and am delighted with the performance of the set. On various evenings I have enjoyably listened to all the popular broadcasters in Europe, all of which have come over really well (subject to local conditions and fading, of course).

In conclusion, I would like to thank you for the assistance you have given, and congratulate you and your paper for keeping up its high standard.—K. H. CUDMORE (Ilford).

A Fine Book

SIR,—May I thank you for the "Wireless Encyclopædia" which I have just received? and from what I have read of it up to now I must say it is just what is wanted. The articles explain everything in terms which anyone can understand, and the diagrams are clear. It contains just what is required whether one is a beginner or a constructor. Again thanking you for this fine book.—A. HALCROW (Lerwick).

SOLVING THE PORTABLE PROBLEM

(Continued from page 215.)

comfortably be carried without any more fatigue or discomfort than with an ordinary attaché-case. Here again it scores, for the average portable set is at least 10in. from back to front, and considerably over 15in. by 12in. in height and width. To handle the output from the Cossor Class B valve a moving-coil speaker is, of course, necessary. Fortunately, an extremely light, small and efficient instrument, complete with transformer, is available in the form of the Rola, specified on page 215.

In the Featherweight Portable Class B Four I have made a genuine attempt—a successful attempt—to solve the portable problem. The quality of reproduction is really glorious, and it will receive quite a number of foreign transmissions.

An inspection of the design, which will be given next week, will bring you to the conclusion that this receiver more nearly approaches the dictionary definition of the word portable—"that may be carried about"—than anything which has been placed before the home constructor before. Look forward, then, to next week's free full-sized Blueprint.

RADIO CLUBS & 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.

PROPOSED TELEVISION SOCIETY FOR BRISTOL

The progression of radio owed its success to the efforts of amateur enthusiasts, and it is with this in mind that we intend forming a Western England Television and Scientific Society. The formation of the Society, besides benefiting local traders, will be the cause of creating and sustaining more new industries. The object of the proposed Society is to form a body of enthusiastic amateurs interested in current research in connection with television, talking films, etc., and to provide facilities for research work and the publication of reports and affairs of interest to members. Further particulars can be obtained from the Hon. Sec., H. Montague Smith, Eden House, Eden Grove, Filton, Bristol, 7.

I.S.W.C. LEICESTER CHAPTER

At the above chapter's last meeting, which was held at The Foresters' Institute, St. Nicholas St., Leicester, a 5-metre receiving set was demonstrated by C. L. Wright, 2 B.H.A., also an 80-metre receiver fitted with a directional aerial. This receiver will be used by the club's members in their forthcoming direction-finding contest. The most popular item of the evening was the "junk" sale, at which every member disposed of his unwanted parts. Anyone interested in the Leicester Chapter should write to Hon. Sec., W. Glover, "Holmstead," Stokes Drive, Groby Road, Leicester, when full particulars of membership will be forwarded.

UXBRIDGE AND DISTRICT RADIO CLUB

A new branch of the Anglo-American Radio and Television Society will shortly be formed. It will be known as the Uxbridge and District Branch. There are a number of interesting features about this branch. It is not being formed merely as a technical club but it will include a social side which will provide a large part of its activities. A club room will be obtained as soon as possible, and this will be open nightly to members. A short-wave receiver will be installed, and probably a transmitter also. The latter would be employed to communicate with members of the A.-A.R. & T.S. throughout the world. Those interested should write to Leslie W. Orton (organizer), at 11, Hawthorn Drive, Willowbank, Uxbridge.

SLADE RADIO

There was a complete diversion from wireless at the meeting last week, when two lantern lectures were given. The first was entitled "Glorious Devon" and described a holiday tour in that county, a number of excellent slides being shown. The second, "The Sunny South Coast," also covered a holiday tour, and again the slides were of great interest. Hon. Sec., 110, Hillaries Road, Gravelly Hill, Birmingham.

ANGLO-AMERICAN RADIO AND TELEVISION SOCIETY (HUDDERSFIELD BRANCH)

At a meeting of the committee on Thursday, March 30th, it was decided to give non-members, an opportunity to visit the Empire Short-Wave Station at Daventry, on Sunday, May 21st. Any member of the A.A.R.&T.S. will also be welcome, but the total number will be limited to twenty. Particulars and fares can be obtained from the District Organizer: L. Goucher, 10, West Grove Avenue, Dalton, Huddersfield.

BURTON-UPON-TRENT AMATEUR RADIO SOCIETY

Before a very good attendance at a meeting held on April 4th, Mr. F. Grekley, gave a very interesting lecture on the commercial uses of photo-electric cells. He demonstrated their use by working models, in one instance he showed how the headlights of a car would open the doors of its garage and switch on the light. Another very interesting experiment was the starting and speed regulating of an electric motor with a variable condenser by means of a photo cell used in conjunction with a gas-filled relay. The Society would welcome new members, and applications should be sent to the Hon. Sec., "Addiscombe," Branston Road, Burton-on-Trent.

THE CROYDON RADIO SOCIETY

The Croydon Radio Society held its final meeting of the session on a recent Thursday, when it met at the house of the President, H. R. Rivers-Moore, B.Sc. He had a great deal of interesting apparatus to show members. There was, for instance, a novel two-valve set having the first valve as a variable mu H.F. amplifier, and the second, an A.C. Pentode, acting as detector, amplifier and automatic volume control for the first valve. Another interesting "exhibit" was Mr. Rivers-Moore's famous receiver, now containing automatic volume control. He explained how he had effected the conversion, and it was seen that the A.V.C. valve, an A.C.H.L., was in series with a potentiometer connected to the H.F. valve's grid. When a stray signal came in the resistance of the A.V.C. valve went down, current increased and so more bias was applied to the H.F. valve. He had the secretary's assurance that the average attendance figure for the past session had not stood so high for nine years, so great things are expected of next session commencing September. Hon. Sec., E. L. Cumbers, Maycourt, Campden Road, Croydon.

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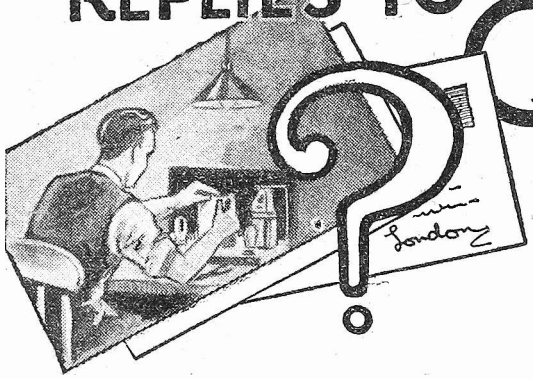
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SPECIAL NOTE

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.

INTERFERENCE

"I have just finished building my first set, the Fury Four, and must thank you for putting such a good set my way. The reproduction and everything is amazing, and there is only one point which perplexes me. Every night, almost punctually at seven o'clock, a horrible 'burring' starts in the loud-speaker and it keeps on till about ten o'clock. It is not loud enough to drown the signal, but is annoying. I do not see how it can start so regularly, especially as I do not always switch the set on at the same time. Can you tell me what it is?"—(J. R., Luton.)

The noise is not coming from the Fury Four, but from some outside source, and in view of the fact that it appears to commence just when daylight is failing and keeps on till ten o'clock points almost certainly to some form of electric sign. Take a walk round your neighbourhood (not more than a quarter of a mile radius) and see if there is a flashing sign or one of the modern neon signs which starts up about that time, and we think you will find that it is this which is causing the trouble. You can do nothing to your set to stop it, and the remedy rests with the owners of the sign.

REJECTOR CIRCUIT

"In reading through a wireless book the other day I came across the term 'rejector circuit.' Could you explain what this is, please? I presume it rejects something, but how it can do this I cannot see for the moment. I am sorry I have not got your Encyclopædia, as it is probably in that."—(P. V., Cardiff.)

Yes, the description is in the Encyclopædia. The rejector circuit is a circuit consisting of a condenser and coil so designed that it offers a high impedance to oscillations of a particular frequency, and a low impedance to oscillations of a different frequency. A very good example of the rejector circuit is a tuned anode circuit.

FAULTY SWITCH

"I find that I cannot get the short-wave stations on my two-valve set. I am using a Lissen dual-range coil and all the parts have been tested, but when I have the switch out I get Daventry and Radio-Paris, yet when I push the switch in nothing happens, and the set is dead. What can I do to find the cause of this?"—(W. G., Portsmouth).

The obvious cause is a faulty switch, although there is a remote possibility of the coil being faulty. To test the latter, short-circuit, with a piece of bare wire, terminals Nos. 2 and 3 on the actual coil base. This should enable you to hear the short-wave stations. If nothing can be heard the coil is disconnected, and it should be returned to the makers. If, however, signals are obtainable by this means, the contacts of your wave-change switch are faulty and this should be exchanged.

CLASS B STAGE

"Could I add a Class B stage to my receiver? It is a rather old pattern German set, and I am afraid I do not know the various parts, as they are not the same as English ones. The valves are English, but the condensers and resistances all look alike, and I cannot understand the marking. How could I use the new L.F. arrangement?"—(Y. B., Torquay).

The Class B stage may be added after any first L.F. stage, and you should therefore try and ascertain which is this stage in your receiver. The detector-valve will, no doubt, have a grid-leak and condenser joined to one terminal, and S.G. valves are obviously identifiable. You must, therefore, first trace out the types of valve, and add the Class B stage to the first L.F. stage, using in that socket a small power valve. If the receiver does not employ more than two L.F. stages, the Class B unit described in our issue dated April 8th could be added to the output terminals of your set, and this would save the trouble of tracing out the various stages. Read the remarks accompanying the article in question.

INDOOR EARTH

"As I am living in a flat I am rather awkwardly situated for aerial and earth. The water system comes from a tank in the roof, and I understand this is bad from the wireless point of view. I have fitted up a good indoor aerial, but would like a better earth lead. Can you suggest any way out of my difficulty. I am much too high up to run a wire down to the ground."—(L. F. S., Westminster).

A capacity earth would probably prove most useful to you. This consists of a large metal body, such as a copper gauze mat, or a number of thin copper wires running parallel, arranged under a mat or under the lino. If your receiver is a radio-gram, having a large cabinet, a very good idea would be to try the effect of a sheet of thin copper foil arranged inside the lid of the cabinet, using this as an aerial, and a similar sheet, arranged underneath the bottom of the cabinet, connecting this to the earth terminal. This may prove a much more selective arrangement than the indoor aerial and earth mat, and yet will not give an appreciable reduction in signal strength.

DATA SHEET No. 32

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

COLOUR CODE FOR FUSES.

Colour	*Rating*
Black	60 mA.
Grey	100 ,,
Red	150 ,,
Brown	250 ,,
Yellow	500 ,,
Green	750 ,,
Blue	1 amp.
Lt. Blue	1.5 amps.
Purple	2.0 ,,
White	3.0 ,,

Q.M.B. SWITCHES

"Whilst looking through the advertisements in your pages I have once or twice seen reference to Q.M.B. Switches. I have been unable to see these described in any of your articles. What do the letters stand for and what is the application of this particular type of switch?"—(G. B. V., Littlehampton).

The letters stand for Quick Make and Break, which means that the mechanism is so arranged that when the switch knob is operated the contact is made quickly or broken quickly. The arrangement usually takes the form of the ordinary electric light wall-switch, which is a Q.M.B. switch. The necessity for quick contact is to prevent arcing. When a high current is passing through a switch contact, if the contact point is brought slowly away a spark will be seen to pass from one point to the other, and this "pits" the contact point and also gives a slight corroding. The result is that the contact point becomes poor and dirty, resulting in very erratic working. The switch should always be used, therefore, where fairly large currents are dealt with.

CHOOSING A METER

"After studying your various issues I have decided to set up a small workshop, and one of the principal things I shall need will be a meter. I cannot afford much, and would therefore like to have your ruling as to the best type of general purpose meter to buy. I shall want to try and carry out all sorts of tests, as described in your articles, and would therefore like the meter chosen with this point in mind."—(A. N., Llandudno).

The most useful meter will obviously be a small reading milliammeter. It will then be possible, by means of shunts and series resistances, to arrange for this to give you practically any reading in volts, ohms, and amps. You could, of course, buy one of the all-purpose meters, but as you say you cannot afford a lot, the most accurate results will be obtained by getting a really good low-reading milliammeter, and buying the necessary shunts, etc., as funds permit. You could, in this way, build up a highly efficient instrument, and if you obtain guaranteed resistances the percentage of error will be very small indeed. A similar arrangement was recently described in our pages under the title, "The Practical Wireless Multi-Meter."

FAULTY EARTH

"My receiver has developed most annoying crackling and sizzling noises, and I have hunted all round for the cause. The only thing that will stop it is to take off the earth lead, but as this is not supposed to be good for the set I do not know what to do. Can you help me, please?"—(G. B., Edgware).

The fault obviously rests with your earth connection, which you will no doubt find has rotted away. Trace through the lead and the actual connection, and undoubtedly you will find that the lead is broken somewhere, or the actual connection to the buried plate or water-pipe (whichever type you have used), is either partially or completely broken.

STROBOSCOPE

"Can you give me the formula for working out the number of lines and spaces for a stroboscope. I want it for ordinary gramophone records, and my mains supply is 200 volts. I only want it for 78 r.p.m., and I think the formula is quite simple to work out, but I cannot find it anywhere."—(R. F., Brighton).

The voltage of your mains will not affect the design of the stroboscope, and the only figures you require are the number of revolutions per minute and the frequency of the mains supply. The latter is multiplied by 120, and the answer divided by the speed required. The formula, therefore, is

$$\frac{120 \times F}{R}$$

F being the frequency in cycles per second, and R being the speed required in revolutions per minute.

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ALL ABOUT CLASS "B"

EVERYTHING in connection with class "B" amplification and its associated equipment is fully dealt with in a twelve-page folder we have received from Radio Instruments Ltd. Diagrams, tables and technical data are given for the application of the class "B" system of amplification to battery sets, and to enable constructors to easily select the right valves and appropriate Drivermu transformers and output chokes. Prices of these components are also included in the folder. The address is Purley Way, Croydon, Surrey.

BAKER'S LOUD-SPEAKERS

SEVERAL new models of Baker's moving coil speakers are given in the latest list issued by Baker's Selhurst Radio. There is a super-power model for either battery or mains operation; a more powerful speaker for A.C. mains, and two permanent magnet-moving coil instruments. One of these is a new model having a cobalt steel magnet of the cross type and a universal output transformer. It is priced at £3 15s. The list also includes particulars of A.C. rectifier units, a variable tone control and needle-scratch filter, and various high-resistance and other coils. The address is 75 and 77, Sussex Road, Croydon, Surrey.

MULLARD LOOSE LEAF CATALOGUE

A NEW catalogue leaflet, No. VR127, is just to hand giving particulars of the new Mullard 2-volt screened-grid valve, PM 12A. A copy of this leaflet can be obtained from the Mullard Wireless Service Company, Mullard House, Charing Cross Road, London, W.C.2.

BAKELITE ACCESSORIES

PARTICULARS of a useful range of small components in moulded Bakelite are given in a folder recently issued by Ward and Goldstone, Ltd. Plug attachments, lampholders, bell pushes, connectors and switch plates are amongst the fittings illustrated in the folder, a copy of which can be had on application to the firm at Pendleton, Manchester.

DUBILIER COMPONENTS

TWO booklets of special interest to home constructors were recently issued by the Dubilier Condenser Company. One deals with condensers and resistances and gives particulars of mica condensers, paper condensers, block condensers for use with mains receivers and battery eliminators, and high voltage electrolytic condensers. Resistance capacity coupling units and anti-interference filters are amongst the other components listed. The other booklet deals with Dubilier metallized resistances, designed especially for use in mains-operated receivers for voltage dropping and decoupling purposes. Useful tables giving maximum currents and voltages, and graphs showing the voltage and current ratings at a glance, are also included in the booklet. Interested readers should write for copies of these booklets to Dubilier Condenser Co., Ltd., Ducon Works, Victoria Road, North Acton, London, W.3.

PIX—PRICE CORRECTION.

Owing to a printer's error, we wrongly gave the price of Pix on page 207 of our April 22nd issue as 2/9. The correct price with clip is 2/6. Will readers please note this.

ODDS and ENDS

Microphones for Medical Men

IN Germany, to prevent doctors being brought out of their beds unnecessarily at night, some surgeries have been specially equipped with microphones and loud-speakers. The two instruments, with the necessary amplifiers, are installed in a weatherproof casing at the front door of the house, with duplex apparatus in the practitioner's bedroom. In this manner the doctor may speak to the outside caller in comfort and ascertain the urgency of his business before admitting him to the surgery.

Radio Luxembourg

THE programmes broadcast from this new high-power station are still in the "skeleton" stage, but as a rule they will be found to consist of the following items: B.S.T., 7.0 p.m., light music (records); 7.45, news, symphony concert (records); 8.30, talk in foreign language; 8.40, records; 9.0, news bulletin (French); 9.15, light music; 9.45, news bulletin (German); 10.0, dance music (records). At intervals between items the studio transmits stock exchange quotations and sporting results.

New American Broadcasting Chain

THE Amalgamated Broadcasting System is the name of a new network which has been created in the United States to compete with the C.B.S. and N.B.C. It will mainly consist of the link-up of nine important stations in Michigan, but when completed the new organisation may number one hundred transmitters. Most of the programmes will emanate from the studios of WOL, Washington (228.9 m.), 1,310 kc/s, which will act as the key station of the network.

Replies to Broadcast Queries

L. A. MERCHANT, Midway: Apparently wavelength is wrong; too vague to trace. LENIN (Southport): G5KO, not advertised in list; write to Radio Society of Great Britain, 53, Victoria Street, S.W.1; G6OW is the call sign of James Tennant, 65, Hillhead St., Glasgow. D. ROBERTSON (Midlothian): G6YL, Miss Barbara Dunn, Aston House, Felton, Morpeth (Northumberland); cannot trace XZN2B. E. S. W. (Ilford): G5AR, E. D. Ostermeyer, 59, Gordon Rd., Woodford, London, E.13; G2XC, G2AZ, cannot trace; write to Radio Society of Great Britain, 53, Victoria Street, S.W.1; G2LZ, F. A. Mayer, "Stilemans" Wickford (Essex); G5TZ, W. G. Sherratt, 11, Bath Rd., Cowes (Isle of Wight); G6FN, S. A. French, "Valetta," Alnwickhill Rd., Liberton, Midlothian; G6FY, R. A. Fereday, 37, Wallwood Rd., Leytonstone, E.11. G6NV, J. J. A. Allnutt, M.P.S., 103, Brixton Rd., London, S.W.9.; G5NC, H. Osborne, 77, Barrett Rd., Walthamstow, London, E.17; G5GZ, G. L. Grisdale, 39, Ranelagh Gardens, Ilford, Essex; G5JZ, C. W. K. Sands, "Springfield," Heathfield (Sussex); G5SK, W. H. Maycock, 33, Camden St., Stoke, Coventry: ON4NC, C. J. Nolf, Chateau de Rameignies, Thumaide, Hainaut (Belgium); PNOBL, PNOSR, PNOKA, PNORM, cannot trace in published lists; are you sure these call signs did not begin with initial letters PA0 (Holland)?; F8JS, Maurice Philippe, Schaar, Solignac (Haute Vienne), France: F8KJ, R. Sonlie, 27, rue Toussaint Louverture, Bordeaux (France); F8MK, Georges Beck, c/o C. F. M., rue de la Republique, Rabat (Morocco). F8RM, regret, cannot trace.

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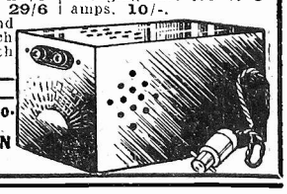
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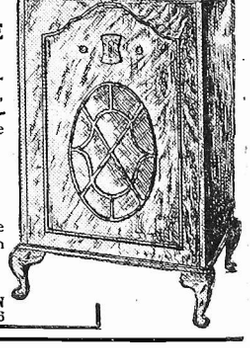
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In the May

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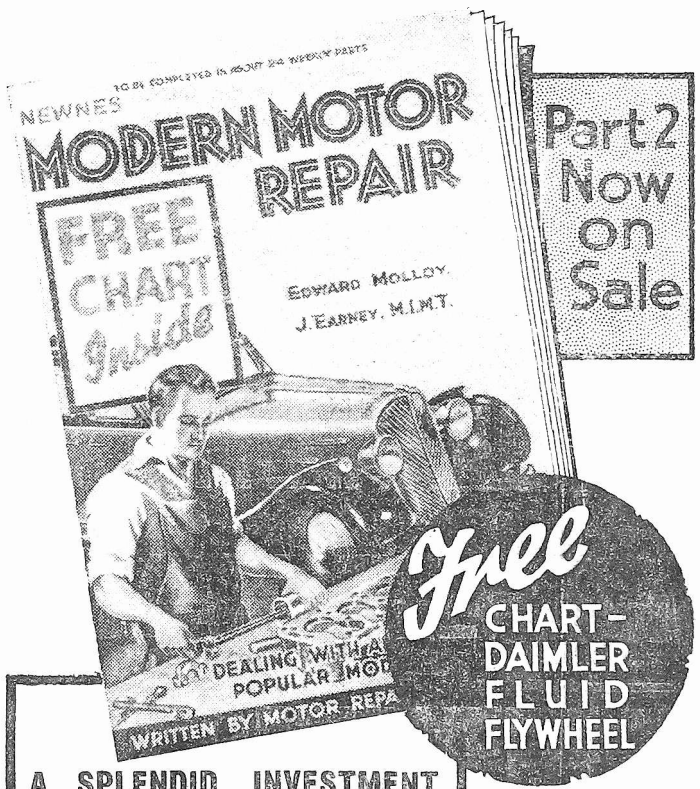
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