Practical Wireless, October 22nd, 1932

INSIDE! MAKING AN A.C. ELIMINATOR!

Practical Wireless

3D.

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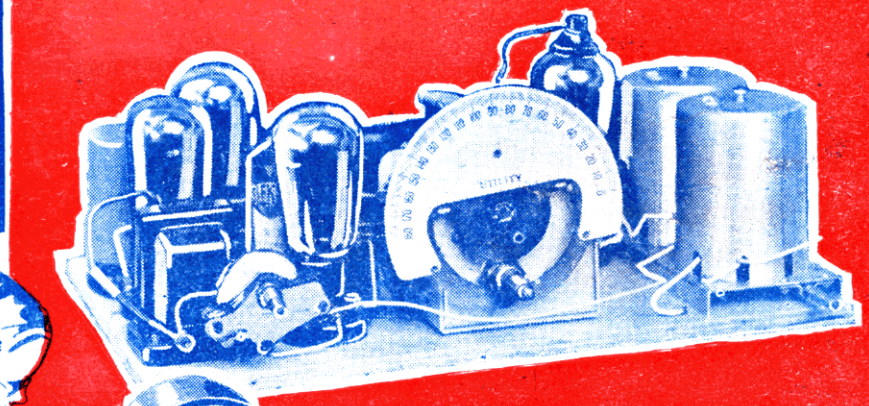

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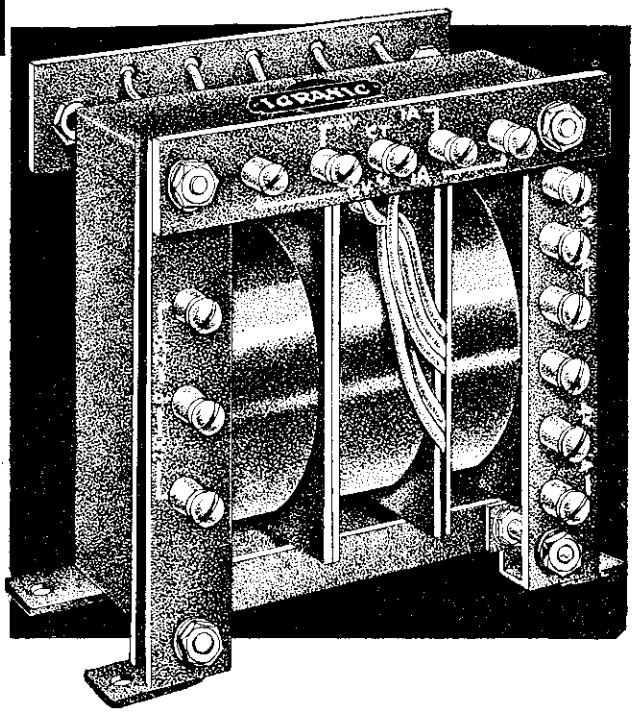
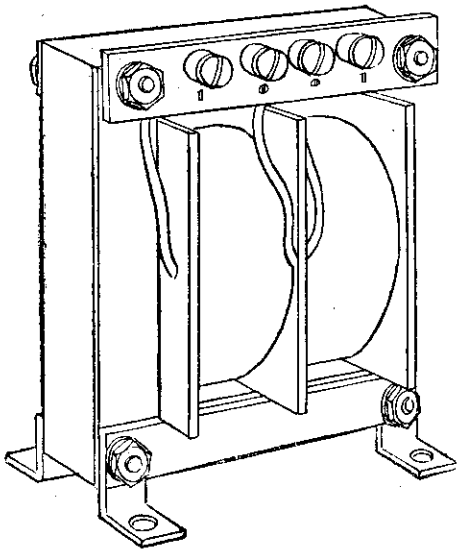
The increased popularity of all-electric radio has resulted in a demand for mains components of unquestioned reliability. Igranic answer the demand with products that are built to the highest standards of quality and efficiency. The Igranic Mains Transformer is shown on this page. The primary windings are so arranged that it can be connected to any standard 50 cycle A.C. mains supply of from 200 to 250 volts. The input terminals, mounted upon paxolin boards, are clearly marked in 10 volt steps from 200 to 250 volts. Price **27/6**



The output terminals are also mounted upon a paxolin board and marked with their respective outputs as follows:

Sec. 1	.. ..	4 volts 3 amps, centre tapped.
Sec. 2.	.. ..	6 volts or 4 volts 1 amp, centre tapped.
Sec. 3	.. ..	4 volts 2 amps, centre tapped.
Sec. 4	.. ..	250-0-250 volts.



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SONOTONE 4

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Or **12** monthly payments of **11/1.** Carriage Paid.

These are the parts the Author used

		s.	d.
1	Panel 14 x 7 ins., ready drilled	4	0
1	PETO-SCOTT Baseboard, 14½ x 9 ins.	1	8
1	LISSEN two-gang shielded coil with combined filament switch	17	6
1	UTILITY .0005 mfd. variable condenser, two-gang, type 312/Air	19	6
1	READY RADIO .0005 mfd. reaction coudenser	2	6
1	SOVEREIGN .0005 mfd. pre-set condenser	1	3
1	T.C.C. type S.P. .0002 mfd. fixed condenser	2	4
1	T.C.C. type "S" .0001 mfd. fixed condenser	1	3
3	T.C.C. type No. 50 2 mfd. fixed condensers	11	6
1	SLEKTUN standard H.F. Choke	4	0
1	BULGIN Standard Screened H.F. Choke	3	6
1	READY RADIO ratio 3—1 L.F. Transformer	8	6
1	BENJAMIN Transfeeda	11	6
4	LOTUS 4-pin Valve holders	2	0
1	R.I. output choke type DY. 25	12	6
1	LEWCOS 600 ohms Spaghetti fixed resistance		9
1	LEWCOS 10,000 ohms Spaghetti fixed resistance	1	6
1	COLVERN 25 ohms filament variable resistance Type FR.	3	6
1	SOVEREIGN 500,000 ohms volume control	4	6
1	100 m/a Microfuse	1	0
3	BELLING & LEE Terminal Blocks	2	0
6	BELLING & LEE marked Terminals	1	3
1	BELLING & LEE Five-Way Battery Cord	2	0
2	Coils Glazite	1	0
	KIT "A," CASH OR C.O.D.	£6	1 0

ANY PARTS SUPPLIED SEPARATELY.
Orders over 10/- sent. Carriage and C.O.D. charges Paid.

4	*Valves as specified*	£1	2 0
1	*CAMCO Ambassador Cabinet (Walnut)*	£1	15 0

KIT "B" As Kit A, but WITH VALVES, less cabinet CASH or C.O.D. Carriage Paid.
£8 : 3 : 6
Or **12** monthly payments of **15/-** Carriage Paid.

KIT "C" Complete Author's Kit, with valves, cabinet CASH or C.O.D. Carriage Paid.
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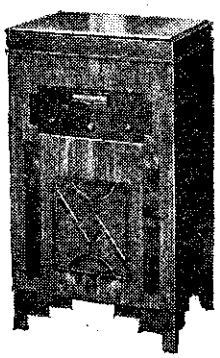
IMPORTANT *Part Kits, miscellaneous components or accessories are available Cash, C.O.D. or under our own Easy Way H.P. System. Send us list of your wants. We will quote by return without any obligation. Orders value over 10/- Carriage or C.O.D. Charges Paid.*

1933 ADAPTAGRAM

Trade Mark

Constructed in Walnut with Inlaid Walnut Veneers,



Dimensions: Height, 38½in.; width, 21½in.; depth, 15½in.; panel size: 13 x 18in.; baseboard depth, 13in.; Speaker Compartment, 17 x 19½ in.; Clearance Between motor board and underside of lid 4in. Ready fitted with back Baffle Board, 2/6 extra if required.

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Carriage and Packing 2/6 extra, England and Wales.

MODEL B with Garrard Double Spring Motor, 12in. Turntable. Automatic Stop. B.T.H. Tone-Arm with Pick-up, and Volume Control complete. Automatic Needle Cup. Cash or C.O.D. or 12 monthly payments of 12/-. **6 GNS**

MODEL C with Collaro Induction Electric Motor with Tone-Arm, Pick-up and Volume Control in one Unit. 12in. Turntable. Automatic Stop. Automatic Needle Cup. (For A.C. Mains). Cash or C.O.D. or 12 monthly payments of 13/9. **7 GNS**

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PETO-SCOTT CABINET SPEAKER, fitted with Blue Spot 100U or Peto-Scott Permanent Magnet Moving Coil Unit to choice, in beautiful walnut cabinet, with contrasting inlaid walnut veneers. Cash Price **£2/7/6.** Carriage Paid. Balance in **11** monthly payments of **4/6.** **Send 4/6 only**

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ROUND THE WORLD OF WIRELESS

A Volume You Cannot Buy!

WE have received many letters from readers (with cash enclosed) asking to be supplied with copies of the WIRELESS CONSTRUCTORS' ENCYCLOPÆDIA. In spite of the fact that our first print ran into many thousands, every copy was reserved within a few days of publication of Number 1 of PRACTICAL WIRELESS. Two reprints have since been similarly reserved by readers, and no copies of the work will, therefore, be on sale until all regular readers have been supplied. When copies are available for sale through the ordinary channels, an announcement will be made in these pages.

A New Public

THERE can now be "no possible probable shadow of doubt" (to drag Gilbert and Sullivan into it) that PRACTICAL WIRELESS is an established success. The thousands of letters of congratulation which continue to pour into these offices provide weighty evidence of our success; and the reprints of our earlier editions, and the thousands of repeat orders from the trade, coupled with the fact that the print of Nos. 4 and 5 is progressively many thousands greater even than the three preceding issues provides even weightier evidence that a vast public was waiting for a paper run on *practical* lines. We shall unceasingly continue our efforts to provide the type of matter which has quite evidently met with such universal approval.

Queries

QUERIES by the thousand have poured into our offices, and a greatly augmented staff is hard at work answering them. If *you* have a question to ask, send it along; you may rely upon a careful analysis of your difficulty.

Proposed New French Station

SOME eighteen months ago work was started at Camphin (France) on a new 20 kilowatt transmitter, destined to replace the station now operating at Lille. Lack of funds, however, put a stop to its construction, with a result that listeners appealed to the Paris authorities for further assistance. It is now reported that negotiations are proceeding with the French administration of Posts and Telegraphs, and that Lille may be endowed in 1933, not with a 20 kilowatt, but with a transmitter of much higher power.

Loud-speakers on Tramway Cars

IN Stockholm (Sweden) many electric tramway cars are equipped with a microphone, amplifier and loud-speaker. The apparatus is operated by the conductor, who announces by this means the various stops during the journey.

Italian Operatic Broadcasts

LISTENERS to Italian transmissions in the past will have heard relays from the famous Scala Opera House at Milan. As this theatre was threatened this year with a serious deficit, there was a strong possibility that it might have to close down. In order to assist, the E.I.A.R., the association responsible for broadcasting

in Italy, has agreed to grant a substantial annual subsidy on the understanding that relays are to be carried out at regular intervals of performances given during the coming winter season. These broadcasts will be taken by the North Italian group of stations, including Genoa, Milan, Trieste, Turin, Florence and Bolzano, and also on many occasions by Rome and Naples.

Wireless Picture Postcards

A NEW wireless picture-postcard service has been inaugurated by the German Posts and Telegraphs, by which passengers on liners, taking part in pleasure cruises to Scandinavian and other countries, may now transmit messages at reduced rates to their friends on shore. The radiogram is wirelessed from the steamer to the Norddeich coastal station, where a number of suitably illustrated postcards are kept for this purpose. The traveller gives the ship operator the text of a message limited to some ten words, and also stipulates the type of postcard to be used. On reception at Norddeich, a similar type of card is duly filled up and sent to the addressee by post. For such wireless greetings the charge made is roughly 2s. 6d.

French Stations and Sponsored Concerts

UP to the present the French wireless fan has never been asked to pay a listener's tax, but the law compels him to declare his receiver at the nearest post office, and to secure a registration certificate, for which the modest sum of one French franc is charged. Although the new budget does not foresee any special tax on radio receivers, it is expected that a broadcasting bill may be brought in at a later date. With the exception of the State-owned stations, to which an official subsidy is granted, the French broadcasters must defray their expenses by revenue derived from voluntary subscriptions, or subsist on an income secured from publicity transmissions and sponsored concerts.

Beginners' Turns in Spanish Programmes

IN Spain no artist engaged by the studio is allowed to broadcast unless he can show documentary proof to the effect that he owns a wireless receiver. In place of the usual private audition of singers and instrumentalists, the Barcelona (EAJ1) station incorporates a number of "beginners'" turns in its programmes. Would-be broadcasters are invited to face the microphone, and judgment of their talent is left to the unseen audience. In consequence, the studio postbag during the past few weeks has assumed unwieldly proportions.

Short-wave Broadcasts from Prangins

RADIO Nations, the 20-kilowatt station at Prangins (Switzerland), may be heard every Sunday between 10.0 and 10.45, G.M.T., on 40.3 m. and 20.64 m. For the first fifteen minutes a talk is broadcast in French, for the second in English, and the last quarter of an hour is devoted to the Spanish language. These transmissions are destined to give listeners all over the world an opportunity of hearing an account of the League's activities. In future broadcasts, a portion of the time may be devoted to the answering of questions sent in by listeners or representative journalists. At a later date a special programme for Europe will also be transmitted on Sundays, but for this broadcast another, and perhaps more suitable, wavelength may be chosen.

Round the World of Wireless (continued)

Russia and European International Concerts

IN view of the fact that Soviet representatives were invited to attend at the Madrid International Conference, it is reported from Moscow that the Russian broadcasting stations will suspend the transmission of special propaganda talks destined for foreign countries and, in future, that such talks will be limited to a mere description for living conditions under Soviet rule. Further, a network of pupinized cables is being laid down in order to link up Moscow and Leningrad with the Polish and Lithuanian frontiers, in the hope that Russia may take part in the European International concerts.

Paris Fashion Broadcast to New York

ON November 6th, when a fashion show takes place at the American Women's Club at Paris, a running commentary on the gowns displayed will be transmitted by wireless to New York. Photographs of the new creations will then follow by the first mail.

Belgian Privately-owned Transmitters

OVER and above the two high-power stations at Velthem-Louvain, which broadcast the Brussels, Flemish and French programmes, and the smaller Radio-Schaerbeek and Radio-Conference transmitters in the capital, Belgium possesses a number of miniature, privately-owned transmitters working in the provinces. Of these, five are situated in and around Liége, namely, Radio-Franchimont (207.3 m.); Seraing (203.6 m.); Liége Regional (215 m.); Liége Expérimental (241.3 m.); and Radio-Cointe in the same city, working on 271 m. Small stations also exist at Binche (231.1 m.), Antwerp (211.3 m.), and at Fontaine l'Evêque (231.3 m.). Authority has been granted to these stations to broadcast, but only on the condition that common wavelengths between 200 and 207 metres are used. A further stipulation is made to the effect that they must not resort to microphone publicity. In these circumstances it is expected that many of them will be compelled to close down.

Strasnice Again

IN order to establish a service of alternative programmes, the old Strasnice transmitter, which previously broadcast the Prague wireless entertainments, has again been resurrected on 249 m.; its power is 5 kilowatts.

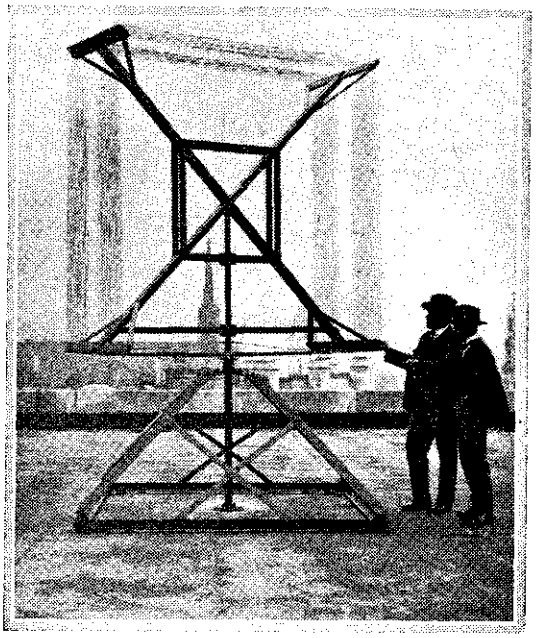
Wavelength of New Belfast Station

IT has been decided that the Belfast 50-kilowatt Regional transmitter will be built at some few miles from the city, on the summit of Divis Hill. As 242 metres would not be a suitable wavelength, something nearer to the frequency used by London Regional may be used. Work on the station is to be started without delay.

New Latvian High-power Station

AS the geographical position of Riga (Latvia) has been found unfavourable for the broadcast of wireless entertainments over the entire country, a new high-power transmitter is being erected at Aiviekste, near Madonna. Although, at the outset, it will work with a power of only 15 kilowatts, provision is being made for an increase to 50 kilowatts, if necessary. It is not expected that the wavelength of 525 metres will be retained, and it is reported that a channel in the neighbourhood of 342.8 kilocycles (875 metres) may be adopted.

INTERESTING & TOPICAL PARAGRAPHS



What is said to be one of the largest wireless frame aerials in Europe is situated on the roof of the Bush House, Aldwych, W.C. It was erected by the United States Shipping Board to conduct the business between London and the United States. It is 8ft. by 6ft., and is wound with forty-eight turns of aerial wire. Mounted on ball bearings, it can be made directional from the interior of Bush House by a wheel similar to the steering-wheel of a motor-car. Messages can be received from places 8,000 miles distant.

SOLVE THIS!

Problem No. 5.

Tompkins made up a three-valve set, using an aluminium chassis, and followed the lines of our Long Range Express Three. When completed and ready for test, he switched on, but no signals came through. All wiring was checked, and on testing with a voltmeter no voltage reading could be obtained across the filament terminals of the valve-holders. Wiring to the on-off switch was from L.T.+, but this wire was intact and making good connection, whilst the negative filament circuit was completed from the chassis, which also should be O.K. Where had he gone wrong?

Three books will be awarded for the first three correct solutions opened. Mark envelopes Problem No. 5 and send to the Editor, PRACTICAL WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2, to reach us not later than October 24th.

SOLUTION TO PROBLEM No. 4.

The L.F. valve was oscillating.

The following readers received books in connection with Problem No. 3:

Mr. F. Ball, 55, Common Lane, Washwood Heath, Birmingham; Mr. S. Brown, 106, Nicolas Road, Chorlton-cum-Hardy, Manchester; Mr. S. Frost, 67, Hawkins Lane, Burton-on-Trent.

The Cuckoo Club's Broadcast

SHORT-WAVE "fans" who tune in to W2XAD, W2XAF, Schenectady, or to the Boundbrook (N.J.) relays in the early hours of Sunday morning may have been mystified by a "KUKU" call. This is the name of a mythical station adopted in a burlesque skit broadcast by an association calling itself the Cuckoo Club. It is usually heard from the New York studio on the National Broadcasting Company of America chain of stations between 3.0 and 3.30 a.m., G.M.T.

Leipzig's Interval Signal

TO commemorate the work of its great composer, Leipzig, as an interval signal, uses four notes, B A C H, the last note in German musical terms being equivalent to our note B. The signal usually follows the ticking of a metronome. Dresden, as the relay station, proposes to use a melody associated with its own city, and may adapt a tune by Carl Maria von Weber, who for many years directed the State Opera House. By this means it hopes to identify itself to all listeners.

Weather Reports from Heston

THE Heston Airport broadcasts of the Air Ministry weather reports on behalf of the Automobile Association, on 833 m., may be heard daily every hour from 9.30 a.m. until 1.30 p.m., and again at 3.30, 5.30 and 6.30 p.m., G.M.T. On the second Tuesday of every month the 11.30 a.m. transmission is not given in view of the interference caused by the National Physical Laboratory calibration signal, on 830 m., sent out at that time.

B.B.C. and Physical Exercises Broadcast

IT is reported that the B.B.C. may broadcast early-morning physical exercises in the near future, in a similar manner to those transmitted daily from a number of Continental stations. The early broadcast would be followed, possibly, by a "spot of music" provided by gramophone records, and would be carried on, with but a short interval, until the daily service (10.15 a.m.) is put on the air.

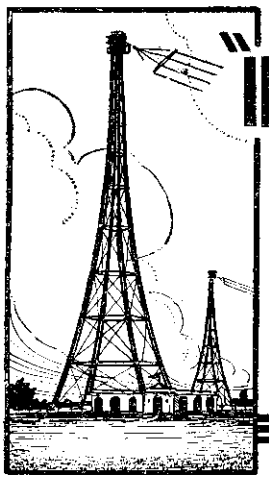
French Operatic Broadcast

A RELAY of a performance of the opera *Der Rosenkavalier* (Strauss) will be broadcast from the Paris Grand Opera House on October 30th; it will be re-transmitted throughout France by all PTT stations, including Eiffel Tower.

Wireless Retailers' Association

WHEN your new set is held up for a grid leak, a special type of coil, or some other gadget that you have on order, your local wireless dealer is apt to come in for a lot of unkind criticism. Those seventy dealers situated in the Manchester area, therefore, deserve a special pat on the back for their enterprise in each donating £3 to a £200 fund to advertise the Manchester branch of the Wireless Retailers' Association during the run of the Northern Radio Exhibition. By fostering such associations their customers—that's you and me—are protected just as much as the retailers themselves, for the association has an effective way of dealing with traders who give customers anything but a fair deal.

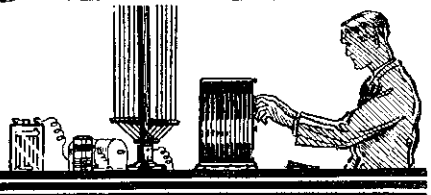
(Continued at foot of page 234)



"BREAK-THROUGH" AND HOW TO CURE IT

BY W. B. KINGSTON

In this instructive article the author explains lucidly the cause of this common form of interference, and shows how it may be overcome.



THERE is a very troublesome form of interference sometimes met with in dual-range coils known as "break-through." It is the breaking through of one or more powerful medium-wave local stations on to the long waves. In extreme cases the station or stations on the medium waves which are causing the trouble can be heard all over the dial when the set is switched on to the long waves. Usually, however, it is not quite so bad as this, the interference being most noticeable at the lower end of the tuning dial and very gradually decreasing towards the upper end.

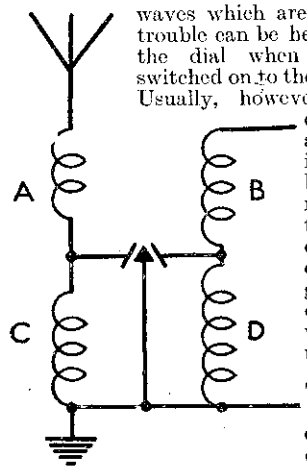


Fig. 1.—Circuit of a dual-range coil with which break-through may occur.

The Cause

Curiously enough, the cause of the trouble is usually due to an attempt on the part of the designer of the coil to obtain selectivity on the long-wave band. In order to do this it is usual to employ either a separate aerial coil of comparatively few turns coupled to the long-wave grid coil, or to tap the long-wave coil near the earthed end. This, of course, gives the desired selectivity as regards the long-wave stations themselves, but introduces break-through with it from the medium waves.

What Happens?

Now look at Fig. 1, which shows a typical dual-range circuit. In this case when the switch is in the "in" position the medium-wave circuit consists of an aerial, or primary coil A of from five to fifteen turns, and a grid, or secondary, coil B coupled to it of about sixty turns. When the switch is "out" the windings C and D are included in series with A and B respectively so as to bring the total inductance up to that required for tuning in the long-wave stations. Now C may consist of twenty or thirty turns, and this, together with A, gives an aerial coil of about forty turns. This winding is not of itself very selective, and being of about the right wavelength, brings in the powerful medium-wave local sufficiently strong to impose the signal on to the grid coil BD. In other words the medium-wave station "breaks through." In the case of the circuit shown in Fig. 2, which is another popular arrangement for a dual range coil, the effect is similar. Here the long-wave primary circuit consist of windings A and C, but C this time is not a separate coil, but a tapped portion of D. The practical difference is that the circuit of Fig. 2 is more tightly coupled on the long waves than that of Fig. 1.

How to Cure It

Any attempts at a cure must be in the direction of keeping the natural wavelength of the primary coil AC well away from the medium-wave band. Fig. 3 shows a very popular circuit much used in commercial coils where only the medium-wave winding is tapped, but here, of course, there is no attempt at selectivity on the long waves. With the circuits given in Figs. 1 and 2 there are two courses open. One is to raise the natural wavelength of A.C. *above* the medium-wave and the other is to take it well *below* it. The usual practice is to raise it. Fig. 4 shows one method. This consists of introducing a separate coil E in series with A and C. This raises the wavelength of the primary circuit sufficiently high to clear the medium band and at the same time does not decrease the selectivity. The coil E should consist of about fifty or sixty turns, and should be placed a little way from the tuning coil or with its axis at right angles to that of the tuning coil so as to prevent interaction. Screening is hardly necessary unless space is very limited. The design of the coil is not critical, and pile winding is quite suitable, especially as this method tends to limit the external field. Fig. 5 shows a very simple and effective method which can be applied to the circuit of Fig. 1. A fixed condenser of .0003 mfd. or .0005 mfd. is placed across C. This again increases the wavelength of the aerial coil without increasing the coupling. In this way the selectivity on the long waves still remains good.

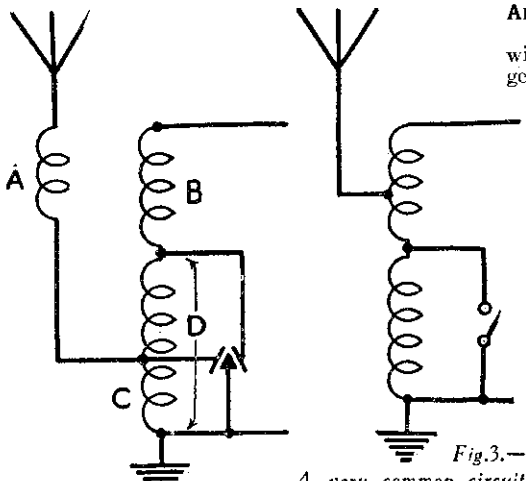


Fig. 2.—Another typical dual-range circuit.

Fig. 3.—A very common circuit employed in commercial coils. Break-through does not occur, but it is unselective on the long waves.

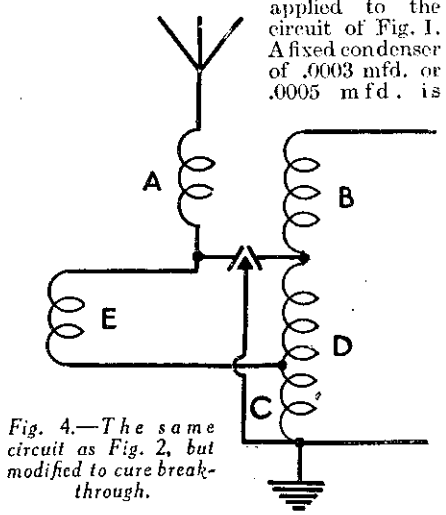


Fig. 4.—The same circuit as Fig. 2, but modified to cure break-through.

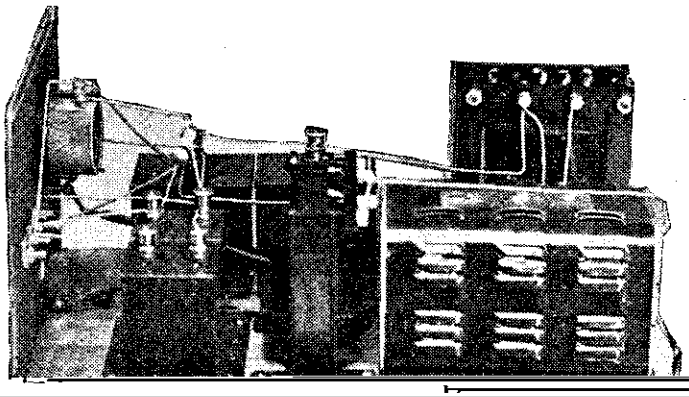
Another Method

Taking the wavelength of the aerial winding *below* the medium band is not generally considered good practice, since it can only be done by making both A and C very small, and this naturally increases the selectivity on both the medium and the long waves to a degree which is not always desirable. However, the writer has found that where great selectivity *is* necessary this method is admirable. The circuit is precisely the same as in Fig. 2, but A consists of about five turns tightly coupled to B, that is wound on top of B, and C is a tapping of about fifteen turns.

"Selectivity" Condenser and Break-through

There is one advantage in this method, and that is there is no fear of trouble arising through the use of a condenser in series with the aerial as a selectivity control. It sometimes

(Continued on page 263)



AN ALL-POWER

A Fine Home Constructor's Set for A.C. Operation

or more. One secondary winding gives 4 volts, 4 amps. A.C. current and is thus capable of heating the cathodes of up to four indirectly-heated valves. The high-tension winding supplies 200 volts at 30 milli-

voltage to the detector. An earth connection is made direct to H.T.— as an additional safety measure, and to minimize the possibility of receiving shocks when using the eliminator.

Choice of Components

In making any apparatus to work from

A.C. ELIMINATOR

Unit for Converting Any

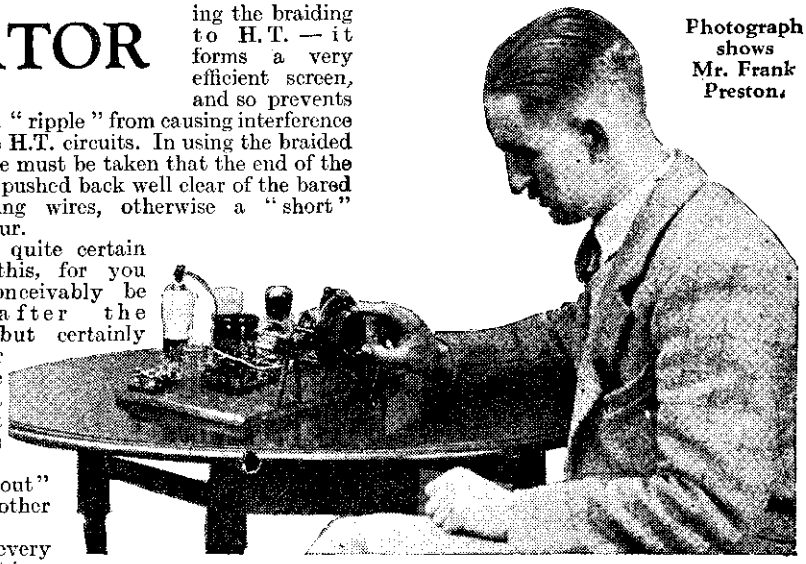
By FRANK PRESTON, F.R.A.

structor prefers to do so. Mount all components in the positions indicated in Fig. 2 and commence the wiring. When making receivers it is usually quite optional to use bare or insulated wire, but in this case it is very essential to employ well-insulated material to prevent short circuits to the metal portions of components.

Connections to the high-tension sockets are made by soldering the appropriate wires to tags provided, but the terminals are made with a slit down the shank so that the end of the wire can be put in and securely attached by screwing down the nut. The connection from the "4-volt A.C." terminals of the transformer to the panel terminals is made in Lewcos twin braided wire. This material consists of two strands of rubber-covered wire passing through a tubing made of braided metal. By connecting the braiding to H.T. — it forms a very efficient screen, and so prevents the A.C. "ripple" from causing interference with the H.T. circuits. In using the braided wire care must be taken that the end of the braid is pushed back well clear of the bared connecting wires, otherwise a "short" will occur.

Make quite certain about this, for you may conceivably be wiser after the event, but certainly poorer by the cost of a new set of valves or a "burn-out" of some other parts.

Take every precaution when experimenting with mains sets, and short circuits cannot occur.



Photograph shows Mr. Frank Preston.

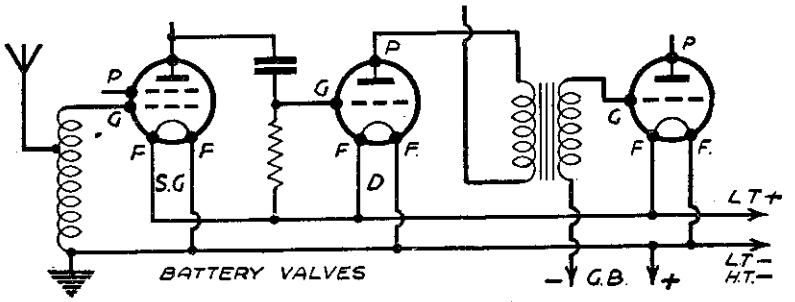
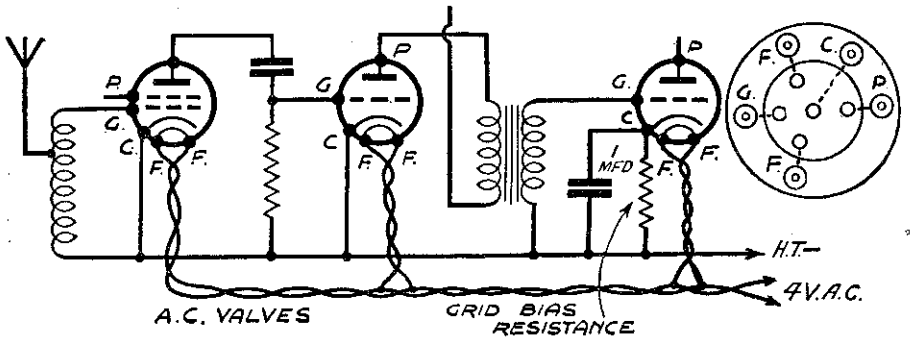


Fig. 3—Diagrams showing alterations required to a battery set when converting it for all A.C. operation.



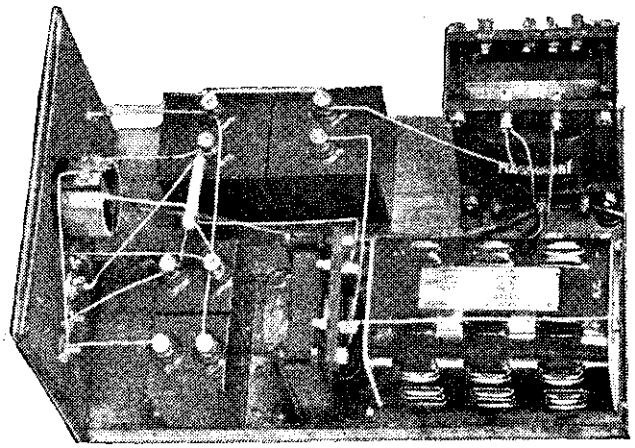


Fig. 4—A plan view of the A.C. eliminator, showing the layout of the components and the wiring.

Methods of Connection

As stated previously, the eliminator can be used with almost any type of receiver. If the latter employs battery valves, and it is desired to retain the same valves and accumulator, the high-tension portion only will be required, the connections being as mentioned before. Just one word of warning: when using the eliminator to supply high tension only, be sure to switch on the filament current to the valves *before* switching on the eliminator, and to switch it off *after* the eliminator. This prevents the liability of damaging the receiver due to the H.T. voltage rising to a high value when there is no "load" on it.

On the other hand, if one prefers to make the set entirely mains operated, new A.C. valves will be required and a few simple alterations must be made to the wiring of the set. Also, if four-pin valve holders are in use, they must be replaced by those of the five-pin type. Fig. 3 (left) is given to illustrate the few changes required in the wiring, a three-valve (S.G. — D. — L.F.) receiver being chosen as an example. With other types of set the alterations will correspond. It will be seen that the earth connection is not shown in Fig. 3; this is because it has been transferred to the earth terminal on the eliminator. Fig. 3 also shows how automatic grid bias can be

(Continued overleaf.)

AN ALL-POWER A.C. ELIMINATOR: COMPONENTS REQUIRED

- 1 Plywood Panel, 8in. by 6in.
- 1 Baseboard, 8in. by 12in. by 5/8in.
- 1 Mains Transformer supplying 200 volts at 30 milliamps and 4 volts at 4 amps (Savage).
- 1 40 Henry Smoothing Choke (Savage type C.C.38).
- 2 4 mfd. Condensers, for 400 volt working (T.C.C.).
- 2 2mfd. Condensers, for 400 volt working (T.C.C.).
- 1 Baseboard Fuse Holder with 60 m.A. Fuse (Belling-Lee).
- 1 60,000 ohm Metallized Resistance (T.C.C. 1 watt).
- 1 50,000 ohm Potentiometer (Colvern type S.T.10).
- 1 Q.M.B. Mains Switch (Bulgin).
- 3 Terminals: 2 marked "L.T.A.C." and 1 "Earth" (Belling-Lee type R).
- 3 Terminal Insulating Washers (Belling-Lee).
- 4 Plugs and Sockets, marked H.T.— H.T.1, H.T.2 and H.T.3 (Belling-Lee).
- 1 Mains Plug to suit convenient socket. (Belling-Lee)
- 1 Coil Glazite, short length Lewcos twin braided wire, length flex, screws, etc.

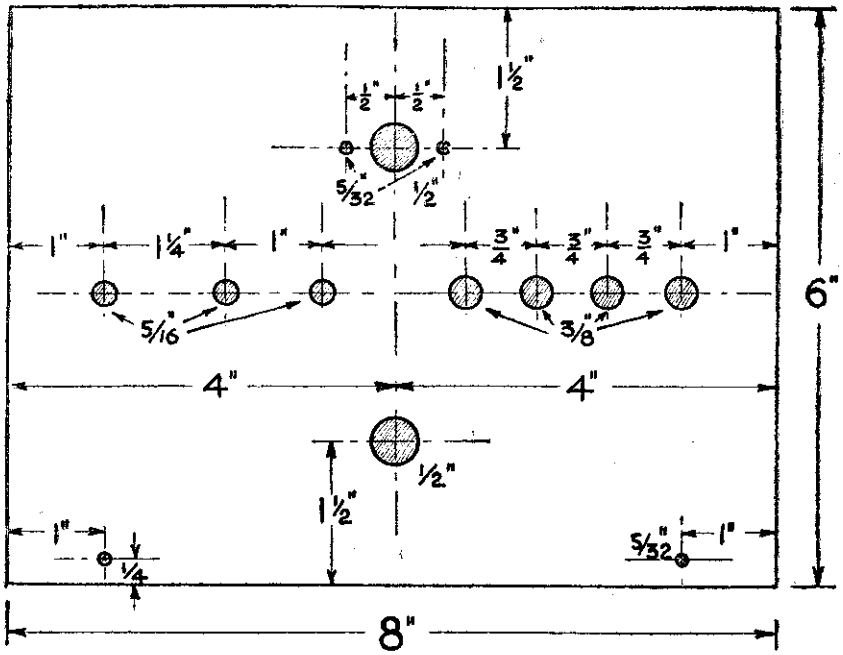


Fig. 5—Panel layout.

obtained for the power valve by inserting a suitable resistance (shunted by a 1 mfd. condenser) in the lead from the cathode to H.T.—. The actual value of the resistance will depend on the type of valve employed, but with such power valves as the Cossor 41 MP., 300 ohms will be correct. For the benefit of those of my readers who are not quite "au fait" with A.C. mains receivers, a drawing is given to show how the terminals of a five-pin valve holder are arranged. The markings of the terminals correspond to those in the circuit diagram, Fig. 3.

H.T. Voltage Available

Before this article was written, the eliminator was tested on a number of receivers, and in every case results were very satisfactory. In the case of those sets primarily intended for battery operation the volume was considerably greater even when the H.T. portion alone was in use. When the sets were converted for full mains working, results were still further improved, both range and volume being increased. In all cases mains hum was almost entirely absent. It was just audible during the silent periods of a programme, but disappeared entirely as soon as the programme was continued. The H.T. voltage available from the eliminator is the maximum for most battery valves, but is rather less than the maximum (of 200) for A.C. valves. This did not appear to be any disadvantage in the receivers available for test, because the difference in volume level at 160 and 200 volts was imperceptible. Of course, the lower voltage does slightly restrict the power handling capacity of the output valve, but this is of very little consequence in practice.

It is hoped that the brief description of the method of converting a battery set for mains working with this instrument will be sufficiently explicit, but if readers experience any difficulty, the writer will be pleased to advise for any particular circumstances.

Test Results

When tested recently on an average type of 60ft. single wire aerial situated twenty miles from a Regional transmitter, this set gave a remarkably good account of itself. It did, in fact, prove to be far superior to any receiver of similar type—and at any price—that the writer has ever had the privilege to experiment with. Using the valves specified, it was found that the reaction condenser could be set to its optimum position for either wavelength range and then left entirely alone whilst numerous stations were easily tuned in. Some twenty-odd stations on the medium waveband and eight on the long were received at good loud-speaker strength, and in each and every case the "quality" was of the kind usually obtained only on an expensive instrument. There was no interference on any stations except those very near in wavelength to the "local," the tuning of which was found to spread over about 12 degrees. The latter station could also be heard towards the bottom of the tuning range with the switch in the long-wave position, but it was easily eliminated by tightening up reaction. A number of pick-ups were tried, and in most instances reproduction was very good and of ample volume. Some pick-ups, however, require a volume control in shunt with them to reduce high-note response and are consequently unsuitable for connecting directly to the set. Types not requiring a volume control are the high-resistance ones. If a low-resistance pick-up is to be employed, it should be used in conjunction with an appropriate shunt resistance as advised by the makers.

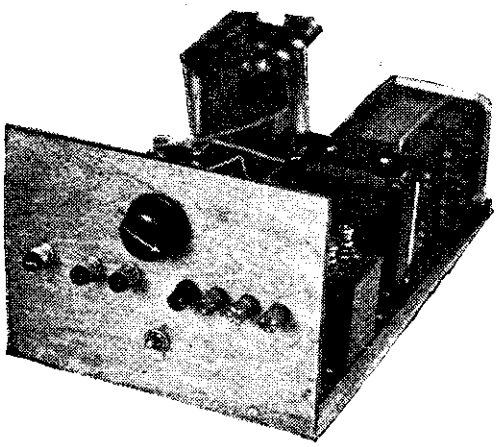


Fig. 6—Front view of the finished eliminator.

Voltage Tappings on Mains Transformers

Mains transformers are almost invariably fitted with three or four primary terminals, each of which is suitable for a particular mains voltage, but sometimes none of these is exactly the same as that of your mains. In such a case it is quite permissible to use the terminal nearest to the mains voltage. If it is known that the mains voltage frequently rises above its nominal value, or if it is suspected that the set is receiving too high a voltage, the mains lead should be connected to a higher tapping. This will reduce the output voltage from the transformer and might improve the working of the set. On the contrary, the output voltage can be increased by connecting the mains lead to a lower voltage terminal. If this is tried one should make sure that the transformer is not being unduly overloaded as would be indicated by excessive heating.

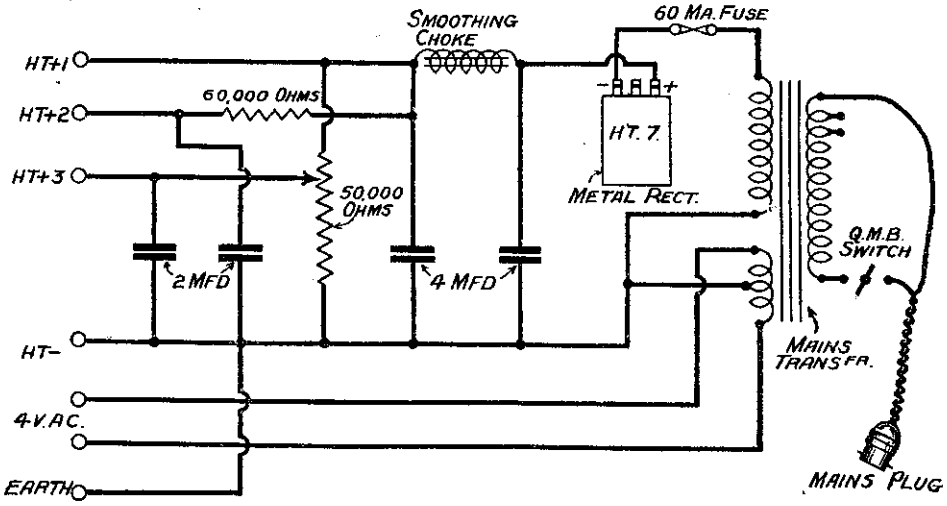


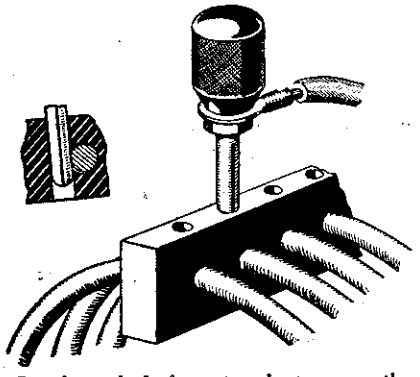
Fig. 7—The circuit diagram.

THE HALF-GUINEA PAGE

Radio Wrinkles FROM READERS

Tapping Short-wave Coils

AN unusual method of tapping short-wave coils of thick gauge bare wire, supported by ebonite spacing strips, is illustrated by the accompanying sketch. One of the spacing strips has holes of a

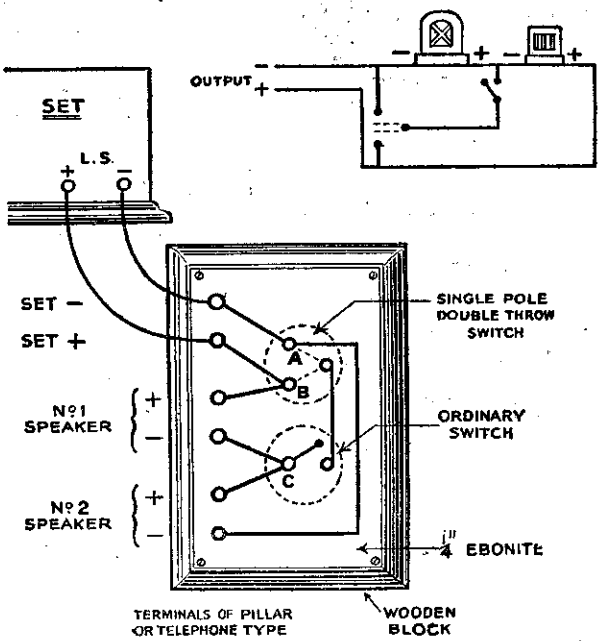


Simple method of tapping short-wave coils.

diameter in which an ordinary wander plug fits fairly tightly, drilled at right angles to the spacing holes and slightly offset, as shown in the sectional view. This allows the wire, when threaded on the strip, to partially project into the second set of holes so that the wander plug, when inserted, will make a reliable, firm contact.—B. G. R. HOLLOWAY (Woking).

Using Two Loud-speakers

MANY radio enthusiasts nowadays utilize two loud-speakers, and it is invariably discovered that the best result is obtained if they are connected in series rather than in parallel. The accompanying switch system will probably interest readers, and it will be seen that it enables either, or both, of the speakers to be used by the simple turning of a switch. The method of construction is clearly indicated in the diagram, and it will be observed that the top switch is of the single-pole double-throw type, whilst the other is of the ordinary make-and-break variety. Spare electric lighting switches of this description can, of course, be utilized, if on hand. The six terminals can be of the ordinary pillar variety, or telephone terminals can be used if desired, and should be mounted on a piece of ebonite approximately 4in. wide by 6in. deep. This can be mounted on a wooden block which can be fixed outside the set in any convenient position. To obviate indifferent connections, it is advisable to loop-in the wire at the three switch points. The wiring can be done in Glazite or other similarly insulated wire. It will be seen that if the lower switch is left open, both speakers are in circuit, whilst the closing of this switch places either of the speakers in operation by the position in which the top switch is turned. The arrangement obviates the possibility of short-circuiting the L.S. output, as no matter how the switches are handled, one or the other (or both) of the speakers is in circuit. In other words, it is impossible to cut both speakers out entirely. If the set is provided with choke or transformer output, there will, of course, be no necessity to observe the negative and positive positions for the various leads.—CAMELOT (Scarborough).



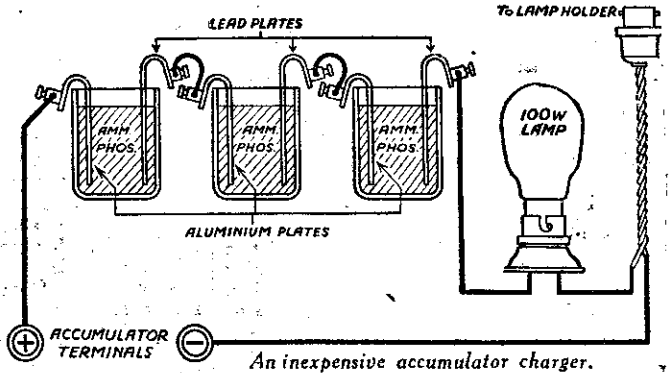
A method of switching loud-speakers. Glazite or similarly insulated wire at back of ebonite. Wiring looped in at points A, B and C.

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? For every item published on this page we will pay half a guinea. A further batch is published below. 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*.

An A.C. Accumulator Charger

A VERY inexpensive accumulator charger, suitable for A.C. mains, may be made from a one pound jam jar, some sheet lead, some aluminium sheet and half a pound of ammonium phosphate. Two plates, one of aluminium and the other of lead, are cut from the sheets, so as to easily fit the jar. A terminal is fitted at one end of each plate, and the constructional part of the rectifier is finished. The plates should now be bent as shown in the accompanying sketch and inserted in the jar. About two level tablespoons of ammonium phosphate are placed in the jar, which is then filled with water. If the supply mains are in the two hundred volt range it will be necessary to connect three of the rectifiers in series. Sufficient ammonium phosphate may be obtained at any chemist's shop for a few pence.—J. HICKMOTT (West Kensington).



An inexpensive accumulator charger.

A Useful Wiring Hint

IN the instructions given for the wiring-up of "The Long Range Express Three," it is stated that "the valve-holder legs will only comfortably take one piece of Glazite." On terminals with very little space under the holding-down nut for the wire I have found the following method very useful: Ring the wire at the end—with round-nose pliers preferably—to slightly over the required size; then place the ring on a flat metal surface and give it a few sharp taps with a hammer. The copper wire flattens out very easily in its cold state and it can be made, in a second or two, so thin that three or four connections can be made on a terminal where only one would fit before. A further advantage is that the flat surface of the wire makes better connection with, and fits more snugly against, the shoulders of the terminal and the holding-down nut. I make all my connections in this manner on account of these advantages.—A. BAXTER (Burnley).

NEXT WEEK!

SPECIAL BEGINNERS' SUPPLEMENT!

CHOOSING A MODERN VALVE

PERCY RAY Gives Some Very Interesting and Informative Notes Concerning the Valves of To-day

THE selection of a modern valve for any particular purpose has become increasingly difficult during the last two years, and to-day the multiplicity of types available has bewildered even the experienced constructor. One manufacturer lists three valves, all of which have the same impedance—namely, 4,000 ohms; quite obviously these are all small power valves, but the very fact that they are all listed clearly indicates that they are

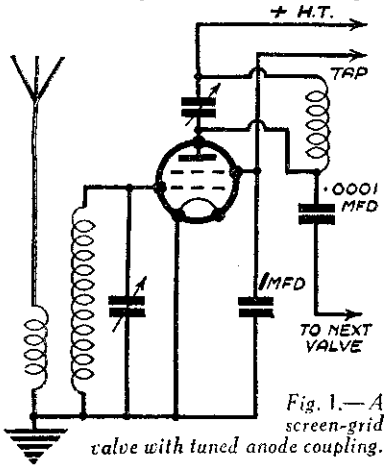


Fig. 1.—A screen-grid valve with tuned anode coupling.

different. How, then, is the would-be user to decide which valve is the one for his particular set? The answer is that to-day the choice of a valve by the old method of impedance is not enough; at least two characteristics, and in exceptional cases four, have to be taken into consideration. This review has been specially written so that the amateur may fully understand the functions of the various types and be enabled, with the knowledge of his own set, to select the valve that will at least give the same results as the one previously used. Probably the greatest mistake that listeners make is to find the nearest equivalent of impedance. This is dangerous with battery valves and fatal with mains types.

Indirectly-heated Mains and Battery Valves

For general consideration it is not necessary to consider separately indirectly-heated mains valves and battery valves, as they are much more closely allied than is popularly supposed. A battery valve filament is a core which is surfaced with some special substance, generally a mineral oxide, that has the property of emitting copious quantities of electrons at a low temperature. At the temperature to which the filament is heated by the low-tension accumulator the actual metal core will not give off any appreciable quantity of electrons; on the other hand, the coating is of considerable resistance and will not pass any appreciable current: thus the core heats the coating or surface, which in turn gives off electrons.

In an indirectly-heated mains valve the mechanical construction is different, as it is necessary to insulate the "core" from the "coating," and consequently they are made separately and are called respectively heater and cathode. The heater is a thick wire which heats the cathode in exactly the same way that a radiator is used to warm a room, and is covered with an insulating material to prevent it from coming into direct contact with the cathode. The cathode is the equivalent of the emissive surface and consists of a metal tube covered with the same substance that is used to cover some makes of battery valve filaments; the metal tube serves no other purpose than something to put the coating on to, as the latter does not possess the mechanical properties to stand alone.

The foregoing description of a filament heater and cathode shows how clearly a battery and a mains valve are allied; both arrangements are provided to throw off the necessary electrons, and it will be interesting to mention in passing that a two-volt super-power valve will give off in one thousand hours' normal use electrons totalling about one hundred and fifty times the weight of its own filament.

The Anode of a Valve

This is fundamentally a piece of metal situated at a reasonable distance from the filament, so that when made very positive by connecting it to an H.T. battery it will attract the electrons towards it at an incredible pace and in incomprehensible hordes. The key to the valve is the grid, which controls the number of electrons that can pass from filament to plate by reason of the voltage on it; for instance, the electrons in the first valve of a receiver will be controlled by the signals varying the potential (or voltage) of the grid. The requirements of, say, the first and last valve in a set are totally different: the first will be called upon to handle very, very small signals and the last relatively big ones. It is desirable that each stage should give as much amplification as possible, but unfortunately a valve that will give big amplification will handle only small inputs, and vice versa. Thus the first valve can conveniently be a valve with big amplification and small handling capacity, while the last will require a big handling capacity and will unavoidably have a small amplification factor.

High and Low Impedance

The extent of a valve to accommodate the signal passed to it from the preceding valve is called the grid swing, while the output that it will handle before distortion becomes evident is called undistorted output. A valve that will handle a heavy output has low impedance, and one that will handle only small inputs has high impedance; the former will have a low amplification factor, the latter a high amplification factor. This term denotes the number of times that the valve will multiply a signal. For example, if a signal of one volt is applied to the grid and filament, with the result that a voltage change of eleven volts is created to pass on to the next stage, the amplification factor must be eleven. In actual practice the full amplification factor is not often realised, but the foregoing explanation serves to make the meaning of this term clear. It will be as well to mention that amplification factor, magnification factor and mu all mean the same thing. (The latter is the phonetic of the Greek letter μ which is used to denote this characteristic.)

Slope is the term that combines impedance and amplification factor in such a way that the degree of efficiency of the valve can be readily seen: a high slope denotes that the amplification is high for the particular impedance, and vice versa. For example, if two valves had an impedance of 8,000 ohms and one an amplification factor of 12 and the other 16, the slope of the former would be 1.5 and the latter 2.

The Screen-grid Valve

Following the brief survey of the main characteristics, the various groups of valves call for separate attention, and the logical beginning is the screen-grid. Ten years ago plug-in coils and ordinary valves were used for high-frequency amplification, with no special precautions for stability. This was possible owing to the horribly inefficient coils and poor valves (the old R type seldom reached a slope of .2). With the appearance of the Cossor P1 and Ediswan A.R.D.E. something had to be done to hold the set down and prevent it from bursting into a violent howl, and a potentiometer was usually pressed into service to adjust the potential on the grid and make it slightly positive; this resulted in a loss of selectivity that would make the set useless to-day. The base of the trouble

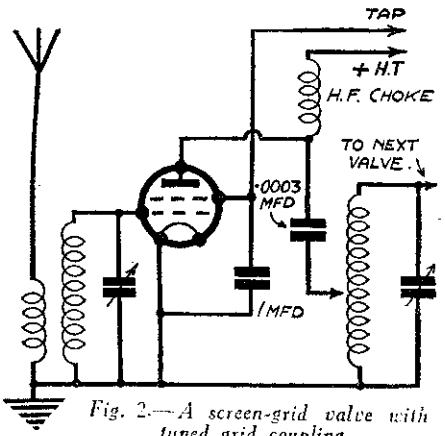


Fig. 2.—A screen-grid valve with tuned grid coupling.

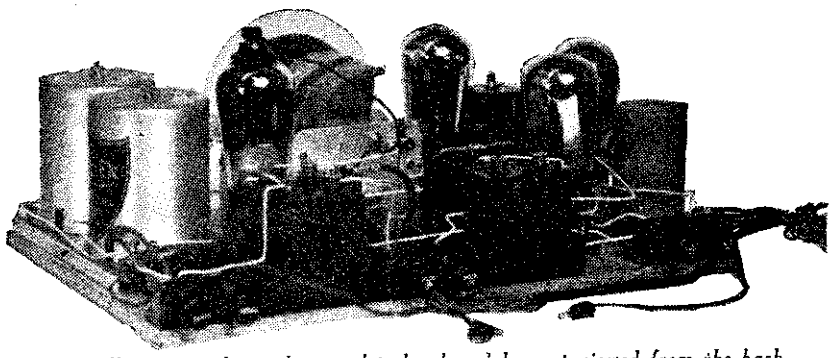
was that the grid and anode formed the plates of a condenser and coupled the anode coil and the aerial coil together. The next step was the neutrodyne, which was an arrangement wherein the coupling fed through the capacity of the grid and anode of the valve could be balanced out by reversed coupling. This system was most efficient, and the screen-grid valve in the state that was originally presented to the public was, in the writer's opinion, a definitely retrograde step; in fact, it was not until about eighteen months ago, when decent screen-grid valves were available, that it was possible to beat a neutrodyne, as the screen-grid valve is inherently unselective compared to an ordinary type, although the former has a far higher amplification factor.

(To be continued)

TUNING AND ADJUSTING THE SONOTONE

By W. J. DELANEY

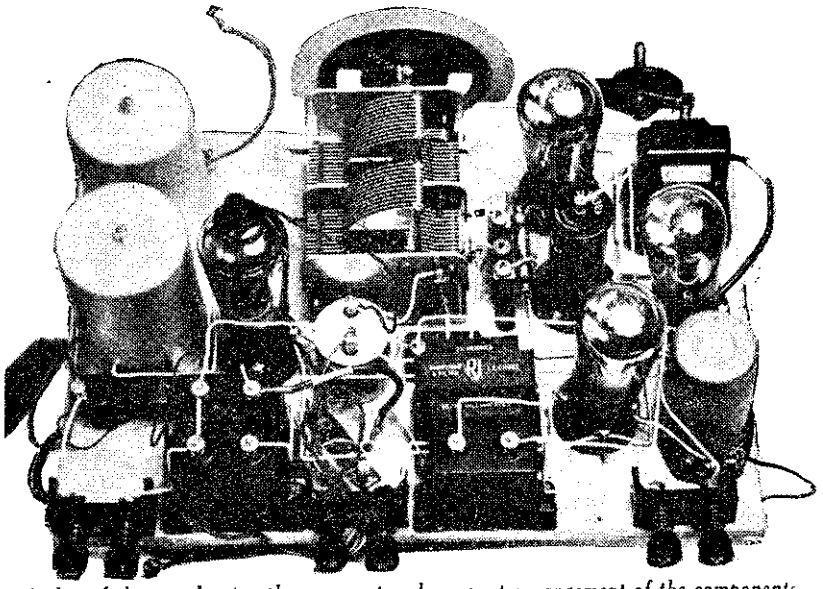
Some Notes on the Correct Adjustment of the Trimmers and Volume Controls.



This illustration shows the complete baseboard lay-out viewed from the back.

IN order to get the best out of the Sonotone it is necessary to adjust the trimming condenser, the series aerial condenser, and the volume controls in the correct manner, and if you have built the receiver as described in these pages last week, you will have found probably that the receiver when first completed at once lives up to its claims. It must be understood that the aerials used by each listener will vary, not only in length, but in height and insulation efficiency, etc., whilst in connecting up, the small trimmer on the front section of the condenser will also be moved. These factors, in view of the fact that ganged tuning circuits are employed, will have to be adjusted, and it is for that reason that these notes have been written.

We will assume that the receiver is completed, and batteries are connected up—in other words we are ready to listen-in. Before switching on set the various knobs as follows: the right-hand knob with the arm about half-way round; the top left-hand knob also about half-way round, and the lower left-hand knob with the vanes of the condenser all out, that is, with the knob turned as far as it will go to the right. Now turn the small knob at the right-hand corner of the cabinet to the left. The receiver is now in a position to tune over a wave-band from 200 to 530 metres, and there will no doubt be a fairly powerful local station in this band within a few miles of you which you can use for the preliminary adjustments. For the sake of this article we will assume that this local is the London Regional, although listeners in other parts of the country can proceed exactly in the same manner by substituting their local for the London station. Rotate the tuning-dial to the 80-degree mark and slowly rotate it over three or four degrees each side of this spot. The London station will be heard somewhere just here, and if you are lucky in the setting of the trimmers and the other factors mentioned at the beginning, this station will come in with a roar. We will, however, for the benefit of those who are some distance from a station, assume that everything is against us, and all the adjustments are right out. Well, then, the London station will, in these circumstances, be very faint indeed, perhaps barely audible. Turn the dial slowly, and find the exact position of the station, which will be somewhere about 80 degrees.



A plan of the set, showing the very neat and compact arrangement of the components.

Adjusting the Trimmer

Now, on the front section of the variable condenser (that is the section farthest from the panel) will be found a small trimming condenser. This is a small piece of springy brass over a strip of mica, with a nut at the lower end. Give this nut half a turn in each direction, trying the tuning after each adjustment to see if any improvement in signal strength is obtainable. If an improvement is noticed when it is turned in one direction, give it a further half-turn in the same direction and again try the tuning. Do this until you find a position where signal strength falls off on turning it either one way or the other. This will then indicate that the two sections of the condenser are ganged at that particular tuning position. Now turn the dial to a low reading station, such as the London National, and on tuning to the loudest position, rotate the small knob which is concentric with the tuning knob, and see if this has any effect on the tuning. If you examine the condenser you will find that this smaller knob controls a small air-dielectric trimming condenser on the rear section of the assembly, and if the wiring has been well carried out there should be no need to employ this small knob at any part of the tuning range. It is always as well however, when a station has been tuned in by means of the main tuning knob to rotate the small knob in each direction, that is, swing it about a central point, to make quite certain that the two circuits are in tune. We shall have more to say about this trimming control later on when dealing with the reaction control.

The Pre-detector Volume Control

We have balanced our tuning condensers, and tuned-in our local station, and the result is, perhaps, anything but pleasing. This is due to the tremendous amplification

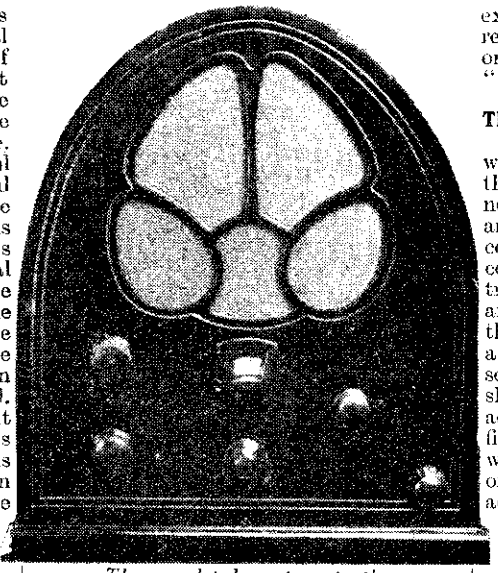
The 46 Stations received on the Sonotone.

SHORT WAVES	Madrid
Fécamp (Radio Normandie)	Belgrade
Cork	Stockholm
Bordeaux	Rome
Nürnberg	Paris (PTT)
Belfast	Beromünster
Trieste	Lyons
Gleiwitz	Langenberg
London National	North Regional
Turin	Prague
Heilsberg	Florence
North National	Milan
Bordeaux	Brussels (No. 1)
Genoa	Vienna
Göteborg	Sundsvall
Breslau	**LONG WAVES**
Brussels (No. 2)	Kalundborg
London Regional	Motala
Toulouse	Warsaw
Midland Regional	Eiffel Tower
Sottens	Daventry
Katowice	Königs Wusterhausen
Dublin	Radio-Páris
Berlin (Witzleben)	Huizen

given by the set, and the volume controls have now to be adjusted. The central knob on the right controls the filament of the H.F. valve, and by turning this so that the voltage on the filament is reduced, the strength of the signal passed on to the detector valve is also reduced. Therefore, if you are situated fairly close to a powerful station this control will have to be employed on the local to avoid overloading the detector. The upper left-hand control is the post-detector volume control, and this is used to reduce the volume of the signal passed on by the first L.F. valve so that the output valve is not overloaded. When the local is tuned-in with neither of these controls adjusted, the result will be terrible distortion, and the first thing to do is turn down the post-detector volume control. You will find, if the local is very near, that no matter how much the signal strength is reduced by means of this control, signals are still distorted. This is the indication of detector overload, and therefore the pre-detector volume control must be reduced. As soon as signals become clear you can increase the post-detector control, and you will no doubt find that louder signals are possible from the loud-speaker without distortion. These two controls have, therefore, to be balanced, and although the above description may seem to suggest rather complicated operations it will become quite a simple matter to decide when output valve or detector valve is overloaded, as you will get used to the maximum volume the output valve will deliver without distortion, and then it will be a simple matter to bring all signals to that level.

The Reaction Control

When a distant station is required, the dial should be turned to the approximate reading, and then if the signal is not loud enough, the reaction control should be used to bring up the volume. This control is the lower left-hand one, and it should only be needed when a very distant station is required. When use is made of this control it will be necessary to make slight compensation in the balancing of the two tuning circuits, and for this reason the small trimming knob on the front of the panel has to be used. Remember, therefore, that the reaction knob and trimming knob must be used together. Bear in mind always, that excessive use of the reaction control will result in distortion, and it should, therefore, only be used in what might be termed "an emergency."



The completed receiver in the Ambassador Cabinet.

The Aerial Condenser

So far we have not told you what to do with the aerial condenser, and we must therefore explain the use of this control next. As an experiment, tune in the local, and notice how many degrees this station covers. Now adjust the screw on this small condenser and, after adjusting the front trimming knob notice the difference in the amount of "spread." You will find that there is a position for this screw that gives a compromise between signal strength and selectivity, and once this has been set there should be no need to touch it again. It is advisable, however, before the receiver is finally installed in the home, to experiment with this control and make quite certain of the best position. Do not forget, any adjustment of this condenser will upset the trimming, so that use will have to be made of the trimming control, as it is adjusted, to keep the circuits in tune.

The list accompanying this article gives the principal European stations which have been received on this set, and they are in strict order of wavelength. It is only necessary, therefore, to tune in the principal stations, and enter these on a piece of ruled paper, and then the remaining stations will be found in between those tuning points.

The list on page 225 gives the stations you can expect to hear, although it must be understood that a few of these are badly heterodyned during some part of the evening, and you cannot, therefore, rely upon them for a programme of entertainment value.

A SIMPLE COIL WINDER

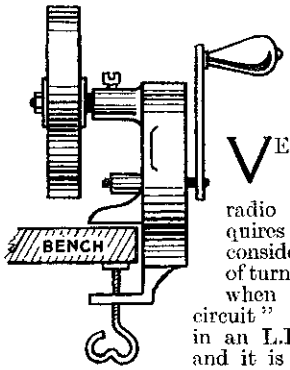


Fig. 1.—The grindstone before conversion to a coil winder.

VERY often in repair work the practical radio enthusiast requires to unwind a considerable number of turns; for instance, when an "open-circuit" has occurred in an L.F. choke, etc., and it is a tedious job unless some form of machine is available. The following description of an inexpensive coil-winder, which I have found extremely handy in my own workshop, may perhaps be useful to other readers of PRACTICAL WIRELESS.

Fig. 3 of the accompanying diagrams shows the finished winder. It consists of a small hand-grinding machine (obtainable for about one shilling); an empty tin about 2in. diameter by 4in. long; a wood screw telephone terminal; a 1in. round nail; a small block of wood approximately 4in. by 1¾in. by 1in., and sundry screws. Fig. 1 illustrates the grinder with the tool-rest removed, but before doing this take the one-inch nail, grind a concentric point at the end and lay aside for future use as the "centre." Then remove the tool-rest, grinding wheel and the two clamping washers, leaving the spindle, which is held in position by the grub-screw A, Fig. 3.

Details of Construction

The next step is to take the tin, which must have a tight-fitting lid, and pierce the bottom exactly in the centre with an old pair of compasses to allow just the point of the sharpened nail to enter. This should be done carefully, as once the tin is pierced it is easily made too large. A half-pound size carbide tin, with a tight-fitting lid answers the purpose admirably.

Next, take the lid, lay it on a piece of wood and drill it to make a sliding fit on the spindle. It will be noticed that the spindle has a shoulder on it (see B, Fig. 3) against which the grinding wheel was clamped, and it is advisable to put on a small sleeve to keep the tin clear of the driving-wheel spindle (see C, Fig. 3). Now put the lid on the spindle, with a washer on either side, tighten up the nut, and force the tin on, taking care not to bend the lid. Screw the telephone terminal on the block of wood, insert the nail through the hole and bring it up to the centre of the bottom of the tin. It is now a simple matter to adjust the height of the "centre" to level up the tin. Put a drop of oil on the "centre" point and the machine is ready for use, after screwing down the block.

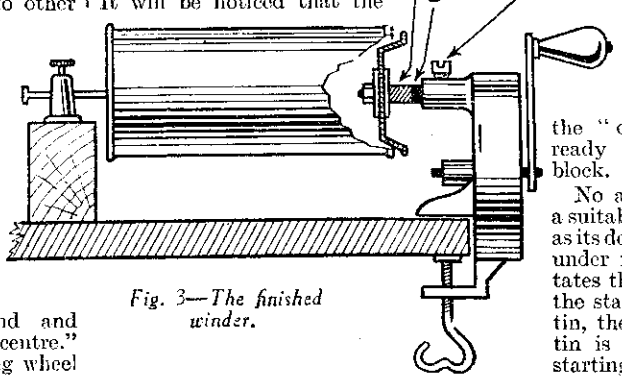


Fig. 3—The finished winder.

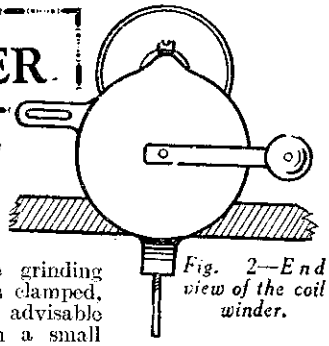


Fig. 2—End view of the coil winder.

No attempt has been made to describe a suitable holder for the coil being unwound, as its design will depend upon the component under repair. A useful hint which facilitates the testing for continuity is to solder the start of the winding to the rim of the tin, then a touch of the test leads on the tin is much easier than looking for the starting end each time.

NOISES: THEIR CAUSE AND CURE (Part 2)

By W. B. RICHARDSON

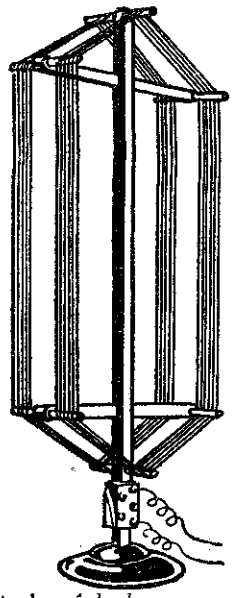


Fig. 1.—A dual range frame aerial

NOISES which occur from causes outside the set are usually far more difficult to eliminate than those which are caused through some defect in the receiver itself, since it is very rarely that they can be tackled at their source. That the source may be well known to you is not usually of much help for that reason.

The usual noises experienced are crackling and similar noises due to electrical machinery, mains hum, atmospherics, and heterodyne whistles.

Interference Due to Electrical Machinery

The problem of disturbances due to electrical machinery in the neighbourhood of the receiver is one of the hardest to solve. Amongst the more usual sources are trams, trains, electric signs, automatic traffic signals, charging plants, generators, etc. The radiations are apparently caused by sparking at commutators and switches, etc. These act in much the same way as a spark station, the transmitting aerial being represented by the supply mains which feed the machinery. In the case of trams, the overhead trolley which collects current from the conductor is often a prolific source of crackles and crashes, and even the ordinary tumbler switches of the house lighting system cause a click in the loud-speaker every time they are operated.

In some of the worst cases a complete cure is often impossible unless the cause is removed. The B.B.C. are, of course, doing much good work in this connection, but you can often supplement their efforts by yourself approaching owners of noisy plant, such as electric charging systems, sausage machines, etc. Often the fitting of such an inexpensive addition as a good earth connection or a pair of 4 mfd. condensers across the brushes, with the centre point earthed, will make all the difference.

Frame Aerial as a Cure

As regards the receiver itself, there are various dodges which may be tried, but probably the most successful of all is the centre-tapped frame aerial. An ordinary frame will generally effect some improvement, but not to the extent that a properly balanced frame will. The merit of the frame is not due to the fact that it is less efficient than an outdoor aerial, and that therefore it picks up less of the disturbance. If that were so, there would be no advantage

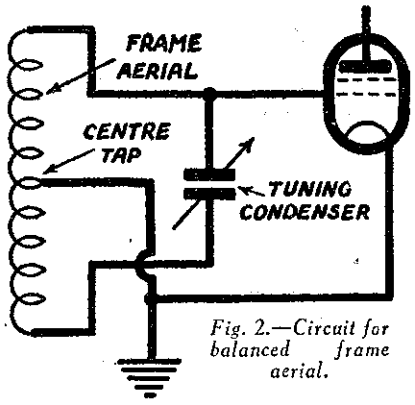


Fig. 2.—Circuit for balanced frame aerial.

since signals would also be reduced in proportion, and any attempt to increase the signal strength would increase the disturbance again. Actually, however, the frame appears to be much more sensitive, at any rate, to the distant broadcast than to the local disturbance.

The circuit for the balanced frame is shown in Fig. 2. It is similar to that of an ordinary frame, except that the centre point of the winding is earthed. One end of the frame goes to the grid of the first valve in the usual way. The centre tap goes to earth, while the other end is joined to one side of the tuning condenser only. Points to remember in the fitting up of such a frame are: that each half of the frame should be as nearly identical as possible, electrically as well as mechanically. Both the outside leads should be the same length and equi-distant from the centre or earthed lead. Naturally, you will need a sensitive receiver with a frame aerial if you wish to get foreign stations with any degree of volume. A super-het. is ideal, but a straight four-valver, with a screen-grid stage, will usually meet all average needs. The placing of the receiver in a metal box or in some way screening it, will be an advantage when used in conjunction with the frame, although it is unlikely to be of much help with an ordinary aerial.

Try a Counterpoise

The use of band-pass tuning and variable-mu valves is sometimes very helpful in reducing electrical disturbances, as both tend to give a silent background. Another scheme is the use of a counterpoise earth. This has somewhat the same action as the frame aerial, although it is not so effective. In its simplest form it consists of an insulated wire similar to the aerial and placed directly underneath it. Naturally this is not always a practical arrangement, but for those who wish to try it, it is illustrated in Fig. 3. The earth terminal of the set is joined to the counterpoise instead of to earth.

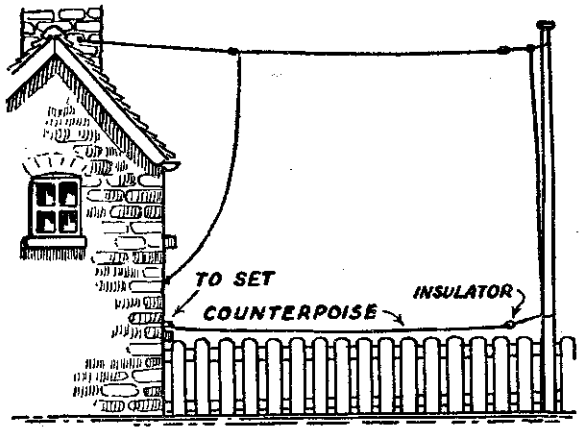


Fig. 3.—A counterpoise earth.

H.F. Interference *via* the Mains

It sometimes happens that most of the noise arrives *via* the mains, and not down the aerial. This can be tested by disconnecting the aerial. If the noise continues then, you can be fairly certain that the mains are picking up most of the unwanted impulses. Try a good H.F. choke in each lead with a fixed condenser across them, as in Fig. 4. An .01 mfd. condenser (or larger in the case of D.C. mains) will be suitable.

Mains Hum

This most troublesome form of noise can usually be dealt with quite successfully in the set itself. I might for that reason have included it under the heading of noises due to defects in the receiver, but although careful design of the receiver will eliminate it, it cannot, strictly speaking, be said to emanate from the set. In the ordinary way the average set does not give

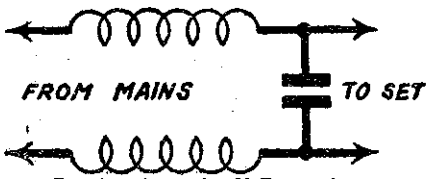


Fig. 4.—A cure for H.F. interference via the mains.

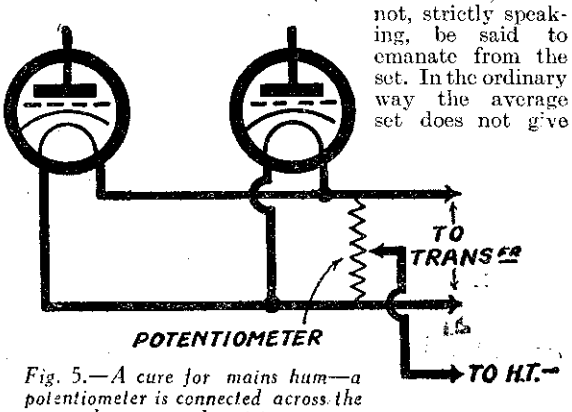


Fig. 5.—A cure for mains hum—a potentiometer is connected across the heater supply wiring.

trouble. It is when the mains are exceptionally noisy that they show up little defects in the wiring of heaters, transformers, etc., and a hum is produced in the speaker. Sometimes, for instance, the set will be perfectly silent during most of the day, but at certain times, usually in the evening when the generators are working at full load, it suddenly becomes noisy.

A device that is worth trying is the fitting of a 30 or 40 ohm potentiometer across the heater supply wiring. Of course, the usual practice is to connect the centre tapping of the heater wiring of the mains transformer to H.T. negative. The use of a potentiometer, however, allows the dead-true electrical centre to be obtained. You see the *mechanical* centre of the transformer is not always the same as the *electrical* centre! By moving the knob of the potentiometer one way or the other the hum can be exactly balanced out. In making the change, disconnect the wire going to the centre tap of the heater winding of the transformer and join it, instead, to the slider of the potentiometer as in Fig. 5. The tapping on the transformer is left free. A point to remember is to place the potentiometer as near the valves as possible and not actually across the transformer terminals.

Smoothing the H.T. Supply

A potentiometer may also be included with advantage across the filament of the usual full-wave rectifier valve, the H.T. positive lead being taken from the slider instead of from the centre tap of the transformer. This will balance out any hum that would otherwise enter the filter circuit. The connections are shown in Fig. 6. There are several potentiometers on the market suitable as hum eliminators. The type shown in Fig. 7 is specially made for the purpose. It is the Clarostat "Humdinger."

The shielding of all heater wiring in earthed sleeving and the use of earthed lead-covered wire from the mains to the set are other well-known dodges for eliminating hum. Take care also that your aerial, earth and speaker wires do not run close to or parallel with the supply mains.

Tunable Hum

A hum may sometimes be experienced when tuned into a strong transmission like the local station. This must not be confused with the microphonic noise due to vibrating condenser vanes described in my first article. Tunable hum is usually accentuated, if not caused, by a poor earth connection. Failing a cure when this has been attended to, try the following: connect a .01 mfd. condenser (1,000 volts D.C. list) between one mains terminal of the transformer in your power unit and the earth terminal of your set.

Atmospherics

These do not trouble us much in this country except during the few periods of thundery weather we experience each summer. In fact, what is often put down to atmospherics is nothing more than crackles caused by a worn-out H.T. battery or some faulty or dirty connection in the set. If you have any doubts as to the cause, disconnect the aerial temporarily. If the crackles cease they are due to atmospherics. A cure is practically out of the question at the present time, but those means I have described for the elimination of electrical disturbances may be found helpful in reducing their effects. One thing to remember is that volume control should never be effected by detuning, since by this method the atmospherics, being untunable, remain at full strength, while the signal is reduced. The best way is to tune in the required station accurately and then reduce it to a workable volume with the reaction or the volume control. This will at the same time reduce the atmospherics. It is perhaps not quite correct to say atmospherics are untuned, as they will often be found to be less troublesome on the medium waves than on the long. In this case, if you have a choice of using either band for your local programme, as for instance when Daventry National and London National are giving the same programme, you will naturally tune in to the one which has the least interference.

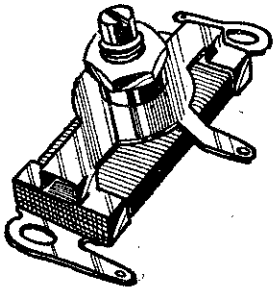


Fig. 7—Suitable potentiometer for eliminating hum.

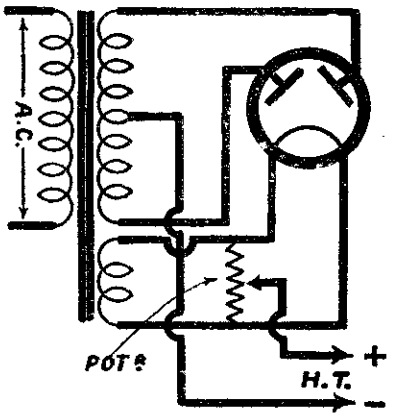


Fig. 6—Another cure for mains hum.

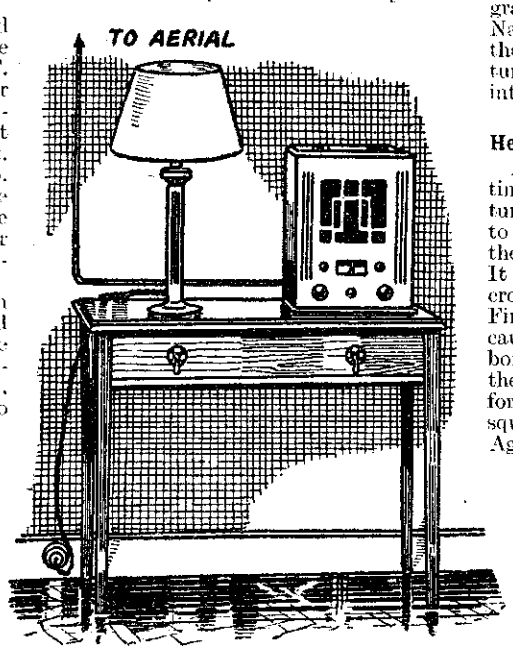


Fig. 8—One cause of hum is the aerial, earth or speaker leads, running parallel to the supply mains.

Heterodyne Whistles

A very shrill whistling sound is sometimes heard above the legitimate signal when tuned to a particular station. This is due to jamming by another station working on the same, or nearly the same, wavelength. It is not uncommon in these days of overcrowding on the broadcast wavebands. First of all make quite certain that it is not caused by your own receiver being on the border of oscillation and itself heterodyning the incoming carrier. It is quite possible for this to happen if you are trying to squeeze the last ounce out of your reaction. Again, the trouble may be due to a neighbour's receiver oscillating. Your redress here lies with the Post Office. Assuming, however, that the trouble is due to jamming, and if the station affected is one of your favourites, you may care to fit up a high-note filter. This is shown in Fig. 10, and consists of a .01 mfd. condenser and a 50,000-ohm variable resistance fitted across the speaker terminals. By varying the resistance the degree of cut-off is controlled.

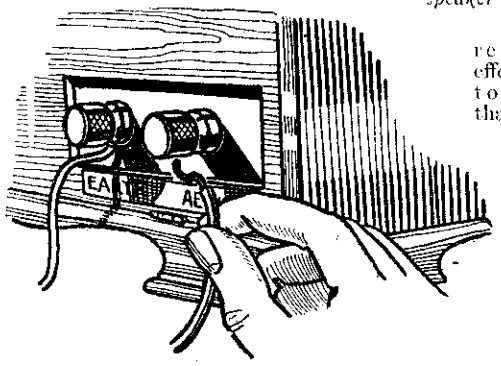


Fig. 9—If crackling noises cease when the aerial is disconnected this is certain proof that they are caused by atmospherics.

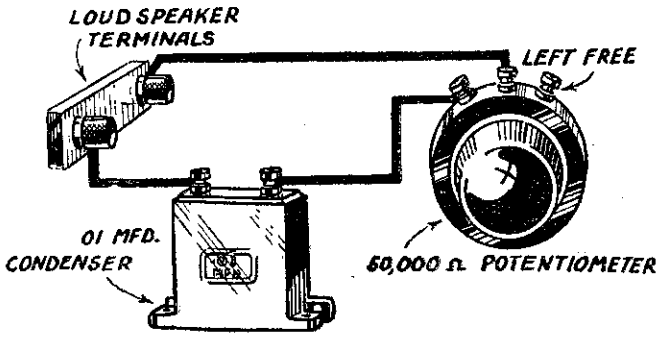


Fig. 10—A high-note filter—a cure for whistle, caused by heterodyning.

MAKING A MAINS TRANSFORMER

This Article Explains How to Make Mains Transformers and Smoothing Chokes at Home

By FRANK PRESTON, F.R.A.

ALL-MAINS receivers and mains eliminators are rapidly increasing in favour and their construction has been simplified to such an extent that amateur set-builders can make them with every confidence. But most amateurs are in the habit of buying all the necessary components ready-made and merely assembling them. This is perhaps the wisest plan in regard to many components, but there are some which could be made at home at a fraction of the cost of the ready-made articles. And, what is more, the work of making them would prove of great interest to all amateur mechanics and electrical enthusiasts. Among these latter, mains transformers and smoothing chokes first come to mind. These are probably the most expensive items whilst being the easiest and safest to construct.

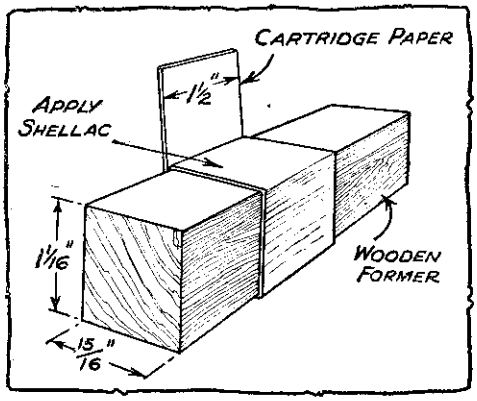


Fig. 1A.—Details of the former

No doubt they would be made at home far more extensively if constructional information were available regarding them. Peculiarly enough, very few technical writers have devoted their attention to this interesting subject and therefore the writer does not consider any apology necessary in presenting the practical data to be given in this article. Although one specific transformer will be described, it is hoped that the information supplied will be sufficient to enable any reader to modify the component, if necessary, to meet his own requirements.

The instrument to be described is suitable for operation from any A.C. mains having a voltage of from 200 to 240 volts and a frequency of 40 to 100 cycles. It supplies both H.T. and L.T., the high tension being at 135 volts 100 milliamps and the low tension 4 volts 4 amps. The higher voltage is correct for feeding a Westinghouse H.T.7 metal rectifier on the "voltage doubler" principle, and the output from the rectifier is approximately 220 volts at 28 milliamps. After smoothing the current, by passing it through the usual choke, the voltage is reduced to just about 200, which is the maximum required by nearly all indirectly-heated valves. The 4-volt winding will heat the cathodes of from one to four A.C. valves. Both core and windings are designed on very generous lines, so that the transformer will safely stand an overload up to 25 per cent. without damage.

Materials Required

The list below assumes that every item is home-made, but mention will later be made of alternative ones that can be bought complete if desired :—

6 doz. pairs No. 4A Stalloy stampings.
1 length ½in. by ⅛in. mild steel.
4 3/16in. bolts, 1¾in. long, with nuts.
2 strips Paxolin, or Ebonite, 3 9/16in. by ⅝in. by ¼in.
9 6 B.A. Terminals with soldering tags.
2 pieces ⅛in. Fibre, 2¾in. by 2⅝in.
2 pieces 1/16in. Fibre, 2¾in. by 2⅝in.
1 sheet Cartridge Drawing Paper about 30in. by 1½in.
6½ ounces 36 s.w.g. Enamelled Wire.
2½ ounces 18 s.w.g. d.c.c. Wire.

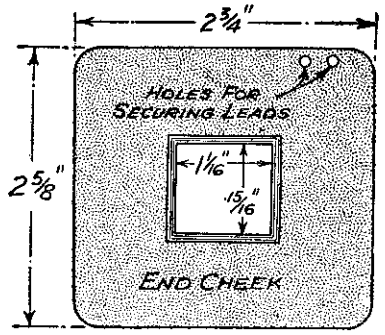


Fig. 1B.—Dimensions of the end cheeks.

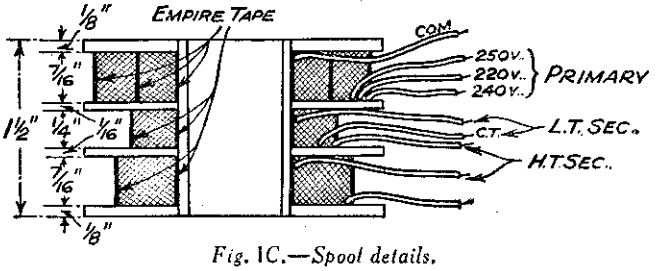


Fig. 1C.—Spool details.

The Winding Spool

This is the first and most important part, and is made as illustrated in Fig. 1A.

A wooden former having the same cross section as the core (1 1/16in. by 15/16 in.) is required and a 1½in. wide strip of cartridge paper is tightly wound round it. Thick shellac varnish is applied liberally to the paper as it is being put on, to stick it and to stiffen the tube. When the tube has been built up to a thickness of about 1/16in. it should be removed from the former and thoroughly dried—preferably by baking in a warm oven.

Next make four end cheeks to the dimensions shown; two are ⅛in. thick and two 1/16in. The cheeks are made of fibre, although cardboard, if treated with shellac and then baked well, would act almost equally well. The square holes in the centre should be cut (with a sharp knife or chisel) to make the cheeks fit tightly on the square tube. First put a thick cheek on one end, wrap round a few layers of empire tape, 7/16in. wide, and then put on one of the thinner cheeks. Again, wrap a few layers of empire tape (this time ¼in. wide) round the tube before putting on the third cheek. Finally, apply more 7/16in. tape before putting on the last cheek. The tape is used, of course, to space the cheeks evenly, and it helps to strengthen the spool. If the spool does not appear to be quite rigid by this time it should be given two coats of shellac and allowed to dry thoroughly.

Putting on the Wire

When the spool is ready the windings can be put on. This may be done by replacing the spool on the wooden former and gripping the latter in a lathe or holding it in the hand. The number of turns required for any winding depends upon the voltage, frequency, core cross section and material used for the core. Without entering into the necessary calculations it will be sufficient to state that in the present instance, with a core of approximately one square inch and a mains frequency between 40 and 100 cycles, a suitable number of turns-per-volt is 8.

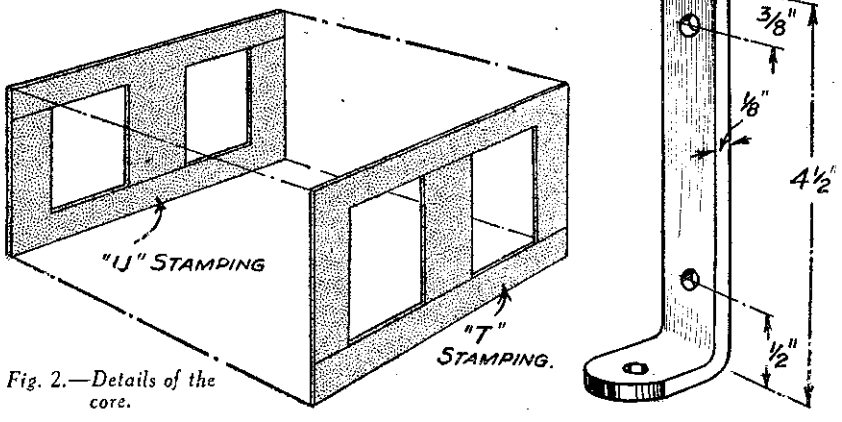


Fig. 2.—Details of the core.

Thus the H.T. secondary requires 8 by 135, or 1,080 turns; the L.T. secondary 8 by 4, or 32 turns (with a centre tapping); the primary, a total of 8 by 240, or 1,920 turns, with tappings after 1,640 and 1,760 turns. The H.T. secondary should be capable of carrying up to about 100 milliamps and therefore 38 s.w.g. wire would do. As, however, there is sufficient space for 36 gauge enamelled wire which is much easier to handle, the thicker wire is specified. The L.T. secondary must carry over 4 amps. to ensure an ample margin of safety, and we therefore use 18 s.w.g. double cotton covered wire which has a safe current capacity of 7 amps. The primary has to deal with the total of the power in both secondary windings plus a certain loss in the core, etc., which amounts to about 30 watts. This is equivalent to a current in the region of .15 amp. and we therefore employ 36 gauge wire which has a safe current rating of .18 amp.

Before commencing any winding, solder a 12in. length of rubber-covered flex to the finer wire to act as a terminal lead. It is advisable to use resin as a flux so as to obviate subsequent corrosion of the joint. Take the flex once round the spool and continue to wind on the finer wire. If a lathe is used it must be run at a slow speed or else there will be a danger of breaking the wire. Keep a fair and even tension on the wire and run it on as evenly as possible. A layer of insulation (empire tape, oiled silk or thin waxed paper) is used half-way through the primary winding to prevent any turns at widely different potentials coming in contact. No insulation is necessary in the other windings which provide a lower voltage. After putting on the insulation be careful that no later turns are allowed to slip past it or it will have no effect.

Tappings are made by baring the wire for a short distance, twisting the end of a piece of flex round the bared portion and applying a spot of solder. Here, again, it is well to wind the flex once round the spool before bringing out the lead, so as to reduce the tension on the fine wire. It is also a good thing to cover the soldered joint with a small piece of gummed paper to prevent any sharp ends scratching against other wires and so causing a short circuit of some of the turns. At the end of each winding solder another length of flex as at the beginning, and cover the winding with a few layers of empire tape. The flex can most easily be secured by passing it through two holes made in an adjacent cheek, as shown in Fig. 1B.

Assembling the Core Stampings

The core stampings, which are supplied in pairs, consisting of a "T" and a "U" piece, should next be fitted into the spool. The method of fitting these is shown in Fig. 2, where it will be seen that they are inserted from alternate sides. A "T" piece and then a "U" piece are put in from one side, a "T" and "U" from the opposite side, and so on until the spool is quite full; the stampings should be packed as tightly as possible without applying undue force. It will be noticed that one side of each stamping is white, being covered with insulating material; the insulated sides of all stampings must face in the same direction, so that every stamping is insulated from the next.

Final Operations

Theoretically, the transformer is now complete, but for practical reasons the core stampings should be tightly clamped together to prevent vibration and suitable terminal strips should be fitted. A pair of core clamps can be made from two strips of mild steel hoop as shown in Fig. 2, or alternatively they may be bought ready-made in the form of strong castings from the firms mentioned below. The drawing will need no explanation, whilst the method of fitting the clamps is clearly shown in Fig. 3. This latter drawing also shows the paxolin (or ebonite) terminal strips. These are fitted under the heads of the clamp bolts, and the leads from the spool are brought up to, and soldered to, the terminals.

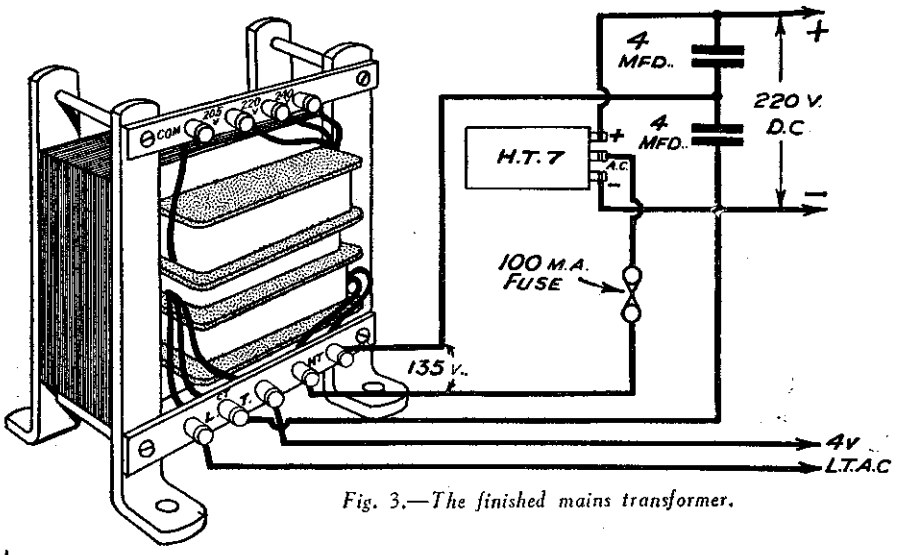


Fig. 3.—The finished mains transformer.

Connections

Figure 3 shows the finished transformer and gives diagrammatic details of the connections to a Westinghouse style H.T.7 metal rectifier. As mentioned previously, the rectifier is connected on the "voltage doubler" principle, two 4 mfd. condensers (of no less than "250 volts working" specification) being employed for voltage doubling. The 220 volt D.C. output will, of course, require to be smoothed in the usual manner before it is applied to the receiver.

A Smoothing Choke

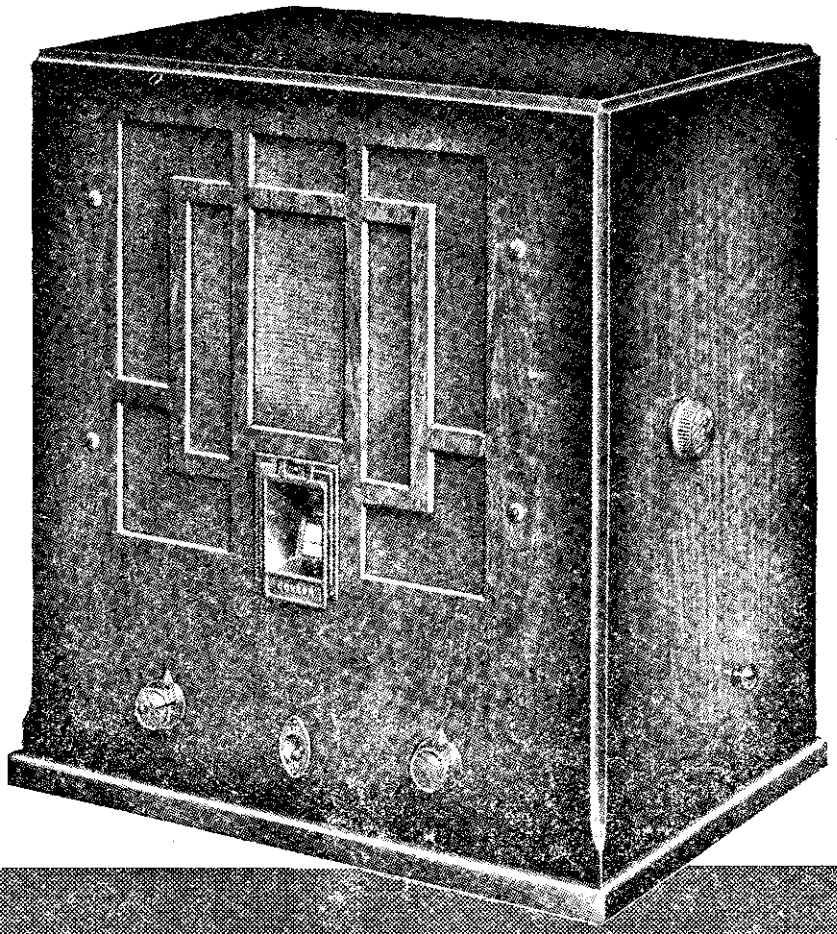
A really good smoothing choke, having an inductance of about 30 henries at 30 milliamps, can be made in a similar manner to the transformer by using six dozen No. 30A Stalloy stampings, with a spool ¾in. long, and having two end cheeks of the same size as those shown in Fig. 1B. No intermediate cheeks are required, and the single winding should consist of four ounces of 38's gauge enamelled wire.

Obtaining the Materials

There are now two or three firms who specialise in the supply of transformer components, and among these might be mentioned Messrs. W. Brian Savage, 292, Bishopsgate, London, E.C.2; Messrs. Sound Sales, Tremlett Grove, Highgate, N.19; Messrs. Lumen Electric Co., 19, Scarisbrick Avenue, Litherland, Seaforth, Lancs. These firms will supply everything required, including cast core clamps, fibre end cheeks and ready-cut terminal strips. The prices in all cases are distinctly moderate, and it is possible in many cases to purchase complete sets of parts of chokes and transformers, which include all the necessary fittings, such as bolts, wire, etc., enabling the complete component to be home-made. Apart from the interest of this home-manufacture, one also obtains valuable information on the design of mains apparatus.

The Trans-Atlantic Telephone

THE recent excitement in the daily press regarding the "eavesdropping" on the trans-Atlantic phone service has been of interest to me and has afforded not a little amusement. I have not tried to receive Rugby or its American counterpart recently, but I remember that soon after the service was inaugurated I often listened to the transmissions from both sides of the Atlantic. So far as I can recollect, the transmissions were on about 4,000 metres and could be brought in at good strength on a three-valve set. There was certainly no secrecy about the transmissions beyond the fact that they were on a longer wave-length than most receivers could be tuned to. I know that some alterations have been made, but I fail to see how the transmissions could be made absolutely private, and it seems to me that people using them should be made to realize this fact, especially when transmitting information of National importance. When conditions are favourable I believe the transmissions consist of a modulated carrier of which some of the sidebands are "chopped off" at the transmitter and added again at the receiving end. Thus, if the transmission were tuned in on an ordinary set speech would be quite unintelligible. But there should be little difficulty in devising a corrector circuit if any one were so anxious to overhear the transmissions. According to a Post Office statement, however, it is sometimes necessary to revert to a more or less normal method of transmission when reception conditions are poor. In that case, it is assumed that communications could be heard with any long-wave receiver.



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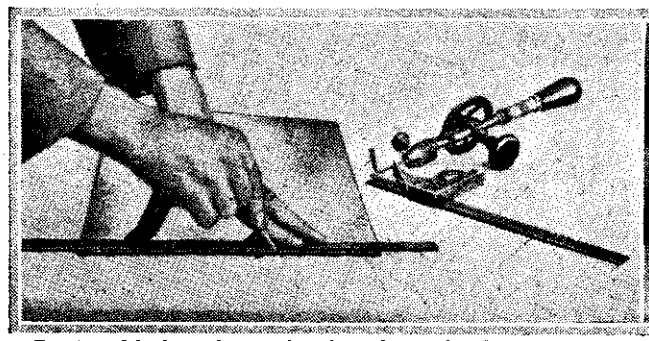

Fig. 7.—Marking the metal with steel straight edge and scriber.

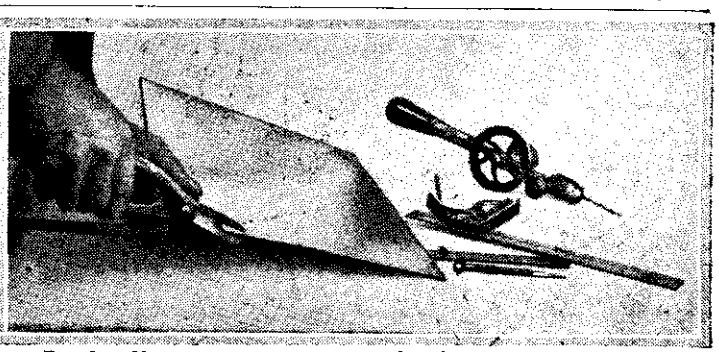

Fig. 8.—How to cut away waste metal without distorting the chassis.

SIMPLE CHASSIS CONSTRUCTION

How to Make Up the All-metal Type of Chassis, Simply Explained by W. H. DELLER

IN its simplest form a chassis is that which is built of wood and covered with metal foil, and is seen in Fig. 1, and while these are all very well in their way, an all-metal chassis makes a wireless set into a real engineering job.

An all-metal chassis can be built up in a variety of ways, and aluminium has the advantage of being easily workable. Fig. 2 shows one method of constructing a chassis. It will be noticed in this arrangement that no sheet metal bending is required. The metal panel is attached to the platform with a convenient length of angle aluminium, and the same material is used for the returned portion or terminal panel. Thus the chassis comprises three flat pieces of sheet aluminium and a couple of lengths of angle. This material, by the way, is obtainable in various gauges and with equal and unequal width of sides. For the present purpose, however, ¼in. to ¾in. width by 16 to 18 s.w.g. thickness is most suitable. The sheet aluminium and angles are joined together by drilling holes through both pieces and fixing with small brass screws and nuts. In another adaptation of this arrangement an ebonite terminal strip may easily be incorporated as shown in Fig. 3. One further advantage to be obtained from the adoption of this or a similar form of construction is that, after marking out the positions of holes required to accommodate fixing bolts for the components or for the passage of wires, the chassis members may be taken apart, thus leaving the essential portions in the flat, thereby greatly facilitating drilling, and more especially will this convenience be appreciated where an irregular-shaped hole or two has to be pierced with a fret-saw.

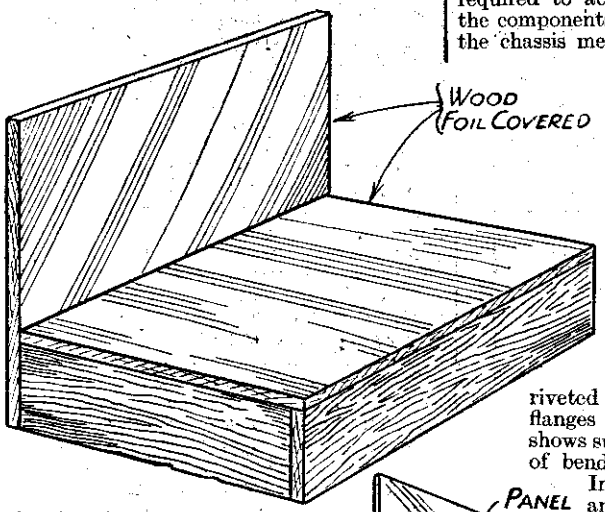

Fig. 1.—A simple way of making a "metal" chassis. A wooden framework covered with metal foil.

Various Formations

The more usual form of chassis now employed is made by bending sheet metal into a fairly wide channel section formation, the panel being either riveted or bolted on to one of the flanges or narrow edges. Fig. 4 shows such a chassis. Another form of bending is illustrated in Fig. 5. In this the panel platform and terminal panel are in one piece, and the remaining portion of the front panel below the platform is completed by the addition of an angle piece running the whole length. The fitting of side pieces in wood or metal as in Fig. 6 would make this unnecessary.

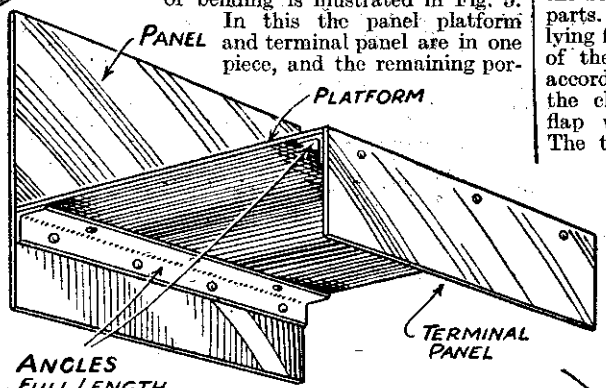

Fig 2.—A metal chassis using angle-irons instead of bending the aluminium.

Now unfortunately these long right-angled or modified forms of bends are not easy to make with the means at the disposal of home constructors generally, and while beating the metal over an object with a square edge with a hammer or mallet might produce a very nice antique effect, the resulting chassis would not please the discriminating wireless enthusiast.

Method of Bending

The only reliable way of making bends of this description is to employ some mechanical means, and the following is a short description of a simple appliance for this purpose. Reference to the photograph, Fig. 9, in which the bender is seen in operation, shows it to be a contrivance which anyone with a very elementary knowledge of woodwork could quickly make. The essential parts are a baseboard with clamping bar fitted to it with a bolt and wing nut at each end. The bending flap is hinged to the baseboard, and is provided with a short handle for extra leverage. Just a word of warning: do not use timber that is too light for the job, it should be 1in. to 1¼in. thick, the latter for preference; use a good pair of steel hinges, either back flap or butt pattern will do, secured with good stout screws. Arrange the position of the hinges so that the unsupported part of the bending flap is divided into three equal parts. The bending face of this flap, when lying flat, should coincide with the top face of the baseboard, so arrange the hinges accordingly. See that the front edge of the clamping bar lays parallel with the flap when it is in a vertical position. The two clamping screws are ¾in. Whit. countersunk-headed ones; tight-fitting holes, afterwards countersunk on the underside, are drilled in the baseboard to receive them, and the matching holes in the bar are drilled to give a slight clearance. Provide two large diameter washers for the wing nuts to butt against.

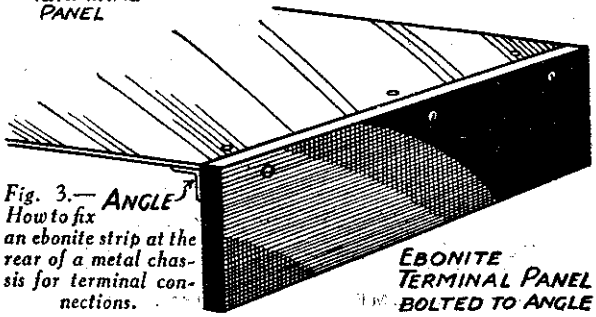

Fig. 3.—How to fix an ebonite strip at the rear of a metal chassis for terminal connections.

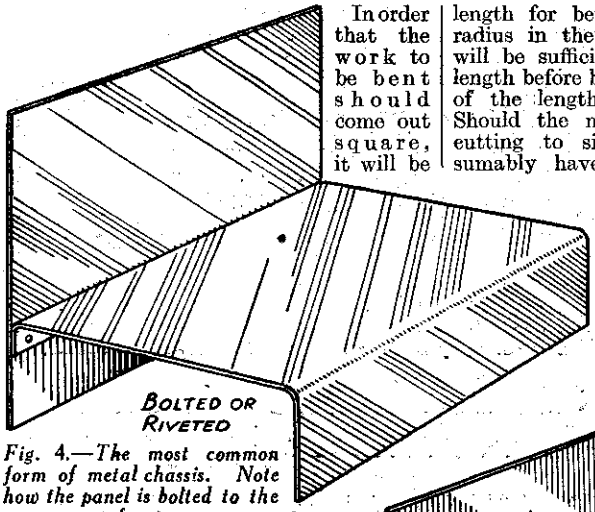

Fig. 4.—The most common form of metal chassis. Note how the panel is bolted to the front.

In order that the work to be bent should come out square, it will be necessary to pull the flap through an angle of a little more than 90 degrees, so make an allowance for this by planing the front edge of the clamping bar one or two degrees out of square, at the same time making sure that there will be room for a thickness of metal of the gauge to be used between the bending faces. A small radius should be worked along the bottom front-edge of the clamping bar; this will leave a similar radius in the corner of the work being bent.

Marking Out and Cutting

Having decided on the sizes of the chassis to be made, the making-up should be proceeded with as follows. If possible, buy the aluminium already cut to required sizes with the edges, of course, clean cut and square with one another. Make allowances in the length for bends, but provided that the radius in the corners is not too small, it will be sufficiently accurate to make the length before bending the total of the lengths of the sides. Should the material require cutting to size, it will presumably have at least one clean-cut edge; if so, this is the one to work from. Make a mark at each end on the opposite side of the metal, and with a steel rule placed against these marks, strike a well-defined line with a sharp-pointed scriber as shown in the photograph. The remaining edges are scribed off square with the ready-finished edge. To make a good job of the chassis the metal must be kept free from buckles, so great care must be taken to maintain the flat surface during cutting operations. So for this reason work outside the wanted portion, bending the scrap part as it is cut to provide an easy path for the snips. Any roughness or irregularity caused by a slight deviation from the line in any place is easily removable by draw-filing with a fine file. The bending may now be commenced. Make a pencil line where each bend is required, keeping these lines, of course, parallel with the respective edges. Undo the wing nuts and slide the metal under the clamping bar until bending line coincides absolutely with the front edge of the bar, afterwards tightening the nuts well down. Raise the lever until it is in a vertical position, when bend may be examined for squareness. Owing to the slight spring-back on the metal a little extra bending may be necessary. Having attained the desired result, the remaining bend or bends may be completed in like manner.

The remaining work consists of drilling and needs no comment, but the photograph shows a method of cutting large circular holes such as are required in screens. A small hole is drilled in the centre of the required hole and the metal is cut through from either side with a pair of dividers. These dividers must be of the type provided with a quadrant and positive locking device, the end of one leg being sharpened to a keen point. Hold the aluminium on a hard surface to prevent the leg in the centre hole from pushing through and enlarging it.

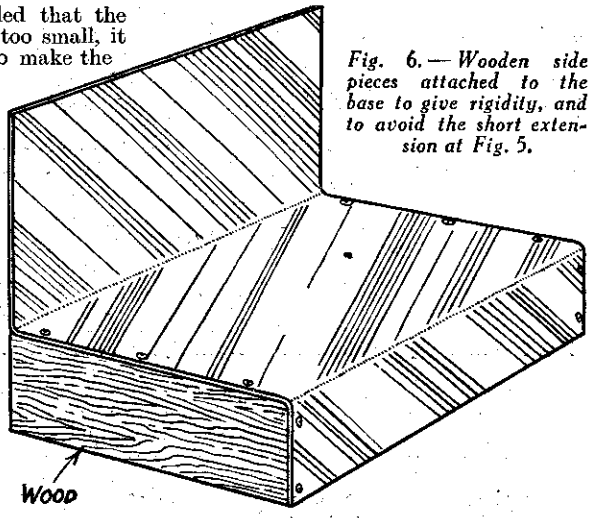

Fig. 6.—Wooden side pieces attached to the base to give rigidity, and to avoid the short extension at Fig. 5.

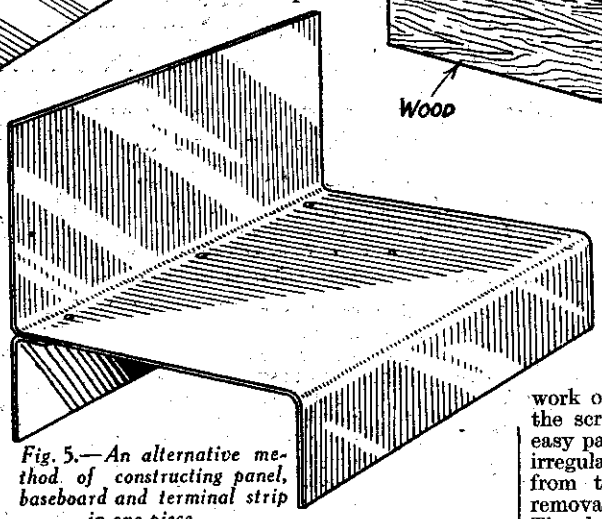

Fig. 5.—An alternative method of constructing panel, baseboard and terminal strip in one piece.

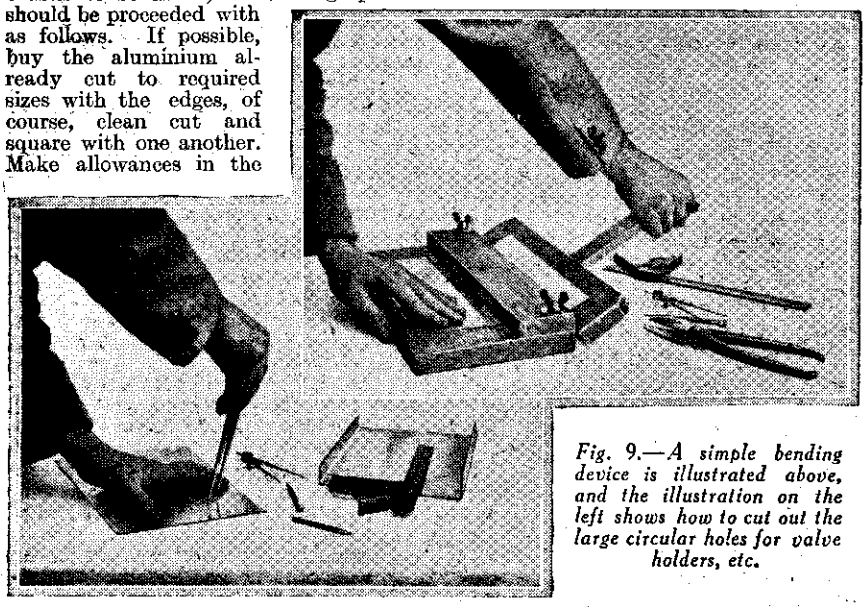

Fig. 9.—A simple bending device is illustrated above, and the illustration on the left shows how to cut out the large circular holes for valve holders, etc.

French Announcers

IN many Paris broadcasting studios announcers are not paid a fixed salary but are remunerated on the piece-work system, namely, according to the hours of duty undertaken by them in the course of a week.

Dutch Mystery Station

A MYSTERY pirate station calling itself "T.730" and broadcasting on 230 metres when the Dutch transmitters have closed down, is arousing considerable interest in Gouda (Holland). Its location has completely baffled the local police authorities. The owner in his announcements usually sends greetings to these officials and much to the delight of the listening public, dedicates various items of his repertoire to the police officials who are endeavouring to discover his whereabouts.

ROUND THE WORLD OF WIRELESS

(Continued from page 218)

Russian Interval Signal

MOST of the Russian studios, including Moscow and Leningrad, as an interval signal, have adopted the striking of a hammer on an anvil. This sound may be heard nightly through Moscow (Trades Unions) on 1,304 metres or through the short-wave station on 50 metres.

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THE HEART OF YOUR SET

Part 3.—OUTPUT VALVES

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

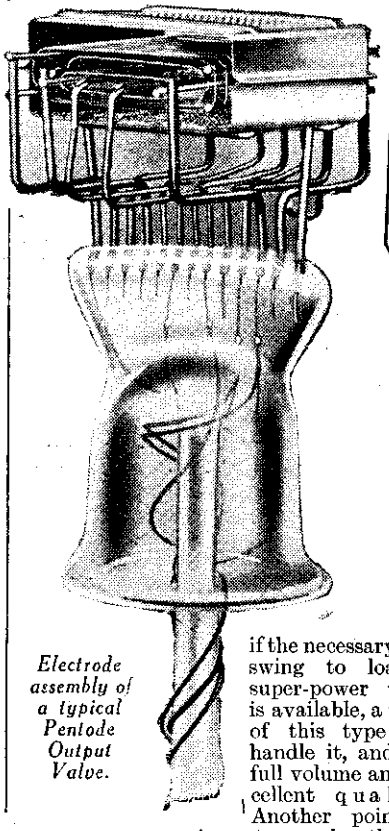
THE earlier stages of a receiver are only required to provide voltage amplification, but to the power or output stage is given the task of providing a substantial amount of energy to operate the loud-speaker. Something over 100 milliwatts of audio-frequency power is required for reasonable volume and quality with the smallest type of speaker, while anything up to 2,000 milliwatts is necessary to operate the larger types of domestic speaker. The output valve, therefore, must be capable of delivering ample power for the speaker to be used. Provided the impedance of the speaker is of suitable value for the valve which will drive it, the output of a power valve depends upon three factors—the signal voltage input to the grid, the impedance of the valve and the amplification factor.

Unfortunately, in the case of three-electrode output valves, these factors are strangely conflicting. For instance, it is not easy to design a triode which will have the high amplification factor required for high sensitivity, and also the low impedance required for big output. This at once limits the output obtainable if only small signal voltages are provided by the earlier stages of a receiver. For big outputs with a three-electrode valve, therefore, a low impedance valve having a comparatively low amplification factor must be employed, and the set must have sufficient earlier amplifying stages to provide a big grid input to the output valve.

Power Valves

A natural process of competition and selection has resulted in the survival of two main classes of three-electrode output valve. The so-called "power" valve has a fairly high amplification factor, of the order of 12, and a medium low impedance of from 3,000 to 4,000 ohms. It will handle without distortion signals up to about 6 or 7 volts amplitude, and is thus suitable for providing moderate output and good quality reproduction in such sets as portables or 2-valve domestic receivers where it is necessary to make the most of comparatively weak inputs. Where previous amplifying stages are employed, the signals will be sufficient to load a "super-power" valve. Valves of this class have very low impedance, of the order of 2,000 ohms or even less, but as already pointed out, this is only achieved by a reduction of the amplification factor, so that greater amplification must be supplied in earlier stages. On the other hand, the super-power valve has a longer "grid base" than the power valve, and thus can handle the stronger signals without distortion.

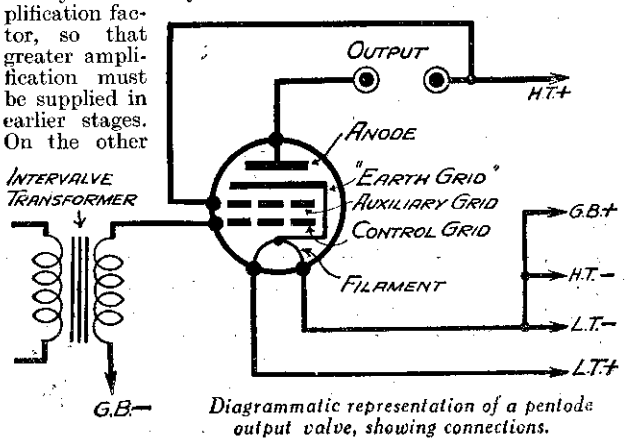
It must be clearly understood that the mere substitution of a power valve by a super-power valve will not produce greater volume—on the contrary, the lower amplification factor of the super-power valve results in a diminution of volume. But if the necessary grid swing to load a super-power valve is available, a valve of this type will handle it, and give full volume and excellent quality.



Electrode assembly of a typical Pentode Output Valve.

Another point of importance is that a super-power valve naturally makes bigger demands upon the high tension battery than a small power valve, and it is hopeless to expect good quality reproduction and reasonable life of the high tension battery when using a super-power valve unless a large capacity battery is fitted.

Were three-electrode valves the only type available for use in the output stage, the owner of a small set would be limited to the moderate volume obtainable from a small power valve. But the development of yet another class of valve, the "pentode," makes possible a combination of high amplification and big output in one valve.



Diagrammatic representation of a pentode output valve, showing connections.

The Pentode

The pentode is so called because it has five electrodes—filament and anode, control grid, and two further grids. The second grid, termed the auxiliary grid, is connected to the high tension supply—usually to the maximum voltage tapping. The third grid, located between the auxiliary grid and anode is connected inside the valve to the filament. The operation of a pentode is somewhat complex, but the effect of the auxiliary grid is to give the valve a very high amplification factor, while the third or "earth" grid avoids the secondary emission of electrons from the anode to the auxiliary grid which would otherwise occur and upset the proportionate amplification produced by the control exercised through the normal control grid.

The average battery-operated pentode requires a grid excitation of the same order as a "power" type triode; while its power output is comparable with that of a super-power valve. There are, in addition, two further classes of pentode. One is an "economy" pentode, requiring a grid swing of only from about 3 to 4½ volts peak value and operating at a very low anode current, and the other comprises pentodes with grid acceptances comparable with those of super-power types, but giving still greater output. Pentodes, therefore, may be considered as a special class of output valve, having a higher sensitivity or higher electrical efficiency than triodes.

(Continued on page 260.)

LITTLE MISTAKE

An Interesting Article Pointing C Construction and How to Av

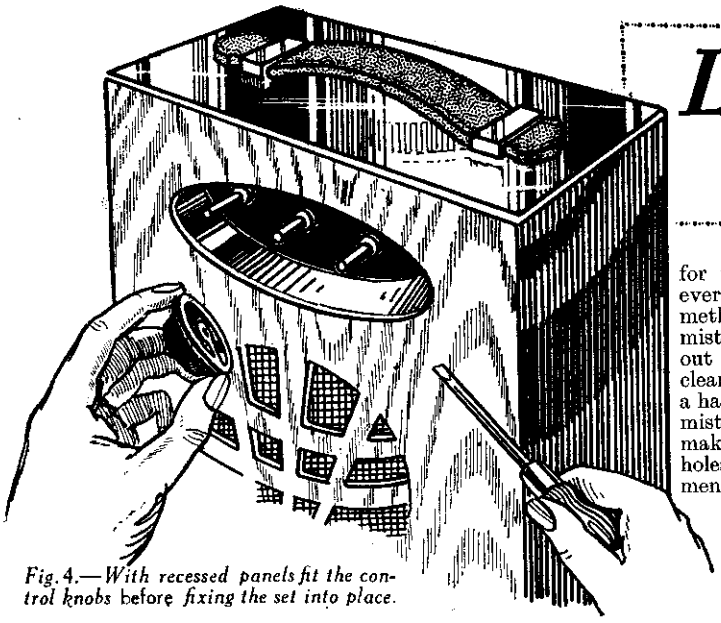


Fig. 4.—With recessed panels fit the control knobs before fixing the set into place.

"HE who never makes mistakes never makes anything." So it has been said, and, of course, in this constructional age it follows that we all make mistakes. Radio folk, whether they be manufacturers, constructors or designers, are no exception to the rule. I would be the last person to claim immunity from an occasional stumble into one of the many pitfalls open to the unwary. In fact, it is just this reason which prompts me to give here some of the errors and "snags" which I have come across from time to time in my own and other people's work, with the idea that a knowledge of them may possibly save *you* from much "gnashing of teeth and vexation of spirit." After all, to be forewarned is to be fore-armed!

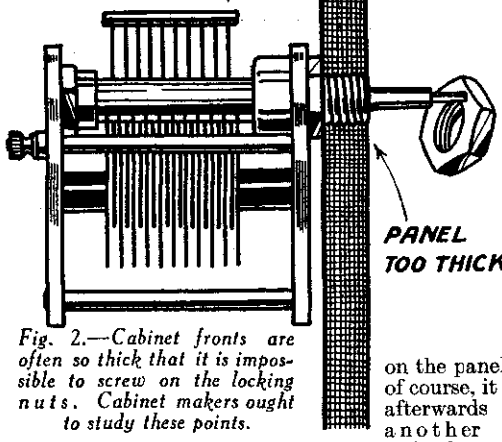


Fig. 2.—Cabinet fronts are often so thick that it is impossible to screw on the locking nuts. Cabinet makers ought to study these points.

Drilling Panels

I shall deal chiefly with errors in the practical work first of building, then of testing a receiver. One of the first little mistakes the amateur constructor must beware is in drilling ebonite or wood panels. Do not drill straight through from one side to the other. If you do the drill will burst through just at the finish and leave a nasty ragged edge to the hole. The proper way is to drill until just the point of the bit comes through and then to reverse the panel and start drilling from the other side. This will give a clean edge to the hole on both sides. Fig. 1 shows the process in detail. Even an aluminium screen may be drilled for the screen-grid valve quite successfully with a sharp centre bit by this method. Make a small hole to start the bit and support the screen on a block of wood. Naturally care should be taken as these centre bits are not really intended for use on metal; however, this is a much better method than making the mistake of trying to chisel out the hole and then cleaning up the edges with a half-round file. Another mistake one is liable to make is to drill the panel holes from the measurements on a blue print, quite forgetting that one intends using some component one happens to have on hand in place of one of those specified. If this happens to be of a different shape or size, it may mean it will foul some other part when in operation, unless we alter its position by drilling the hole for the spindle in a slightly different position on the panel. Sometimes, of course, it can be altered afterwards by drilling another hole by the side of the first one and relying on the dial or knob to cover up the error from the front. But it may be that the new hole has to be only a fraction of an inch to one side, in which case the two holes would run into one another and the panel would have to be scrapped.

Fig. 3.—A cure for the trouble illustrated in Fig. 2.

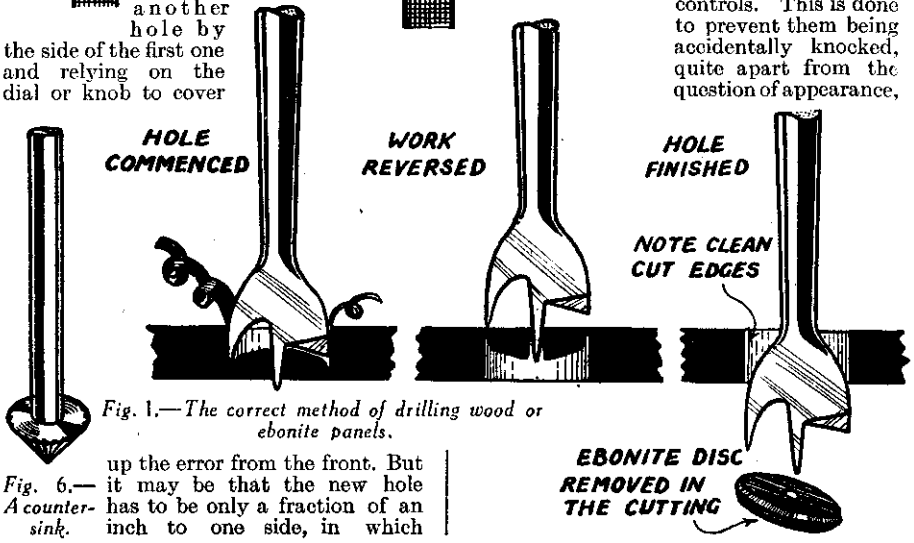


Fig. 1.—The correct method of drilling wood or ebonite panels.

Fig. 6.—A countersink.

Mistakes in Cabinet Design

While on the subject of panel drilling I might mention a mistake which I have come across several times recently in the products of professional cabinet makers. I refer to the thickness of the wooden panels on which the controls are supposed to be mounted. These are often so thick that it is impossible to screw the locking nuts on to the spindles of the various controls (see Figs. 2 and 3). Even if you drill away the wood round the hole so as to countersink the locking nut, then often the dial will not go on, since there is insufficient of the spindle protruding for the set-screw to grip. Clearly these manufacturers have not tried fitting a set into one of their own cabinets! Another point: Why is not the panel made detachable so that it can be used in the construction of the receiver? As it is a separate panel is always necessary in order to build the receiver as a unit. This panel, unless it is of very thin metal, will again add to the total thickness of material through which the spindles have to pass.

Recessed Panels

Here is a little point to remember if you are building a portable in which a sunken panel is used for the controls. This is done to prevent them being accidentally knocked, quite apart from the question of appearance,

ES WE ALL MAKE!

Out Some of the Minor Errors of Radio oid Them—By W. B. RICHARDSON

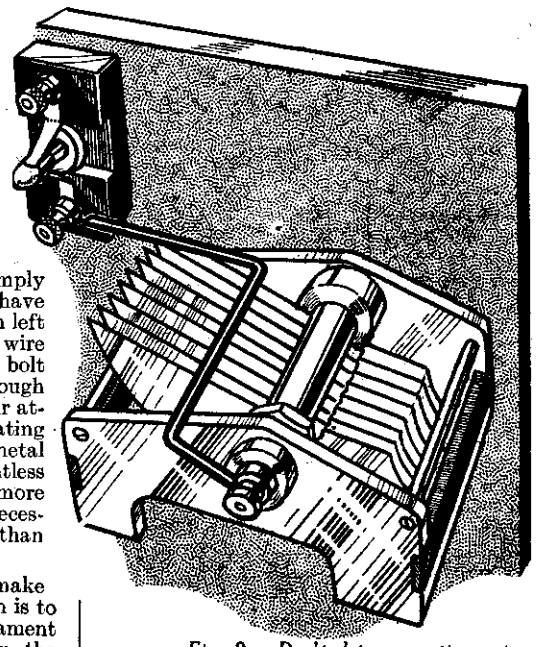


Fig. 9.—Don't let connecting wires foul the condenser vanes.

but don't forget when assembling to fix the knobs in position *before* screwing the set in the case, otherwise you may not be able to get at the grub screws which hold them in place. The edge of the case will prevent you holding the screwdriver at the right angle. (See Fig. 4.)

Fixing of Screws

Next to drilling the panel comes the mounting of the components. Here the use of round-headed screws is usually necessary since the holes in the fixing flanges of most parts are not countersunk. If you use screws with flush fitting heads you are liable to split off the fixing flange, as in Fig. 5. Naturally if you possess a countersinking bit you can countersink the holes first, and this will then make an even neater job than using round-headed screws. Such a bit can be obtained for a few pence. One type is illustrated in Fig. 6.

Some sets mounted on wooden baseboards have a sheet of metal fixed underneath part or whole of the baseboard to act as a screen. Usually a wire is taken from this to some earthed point. In constructing such a set be very careful that the screws used to hold the parts in position are not so long that they go right through the wood and into the metal plate. Obviously no harm will result if all the components have bakelite flanges, but in the case of some strip resistances and similar components, the metal connecting tags also act as holding down lugs, in which case if the fixing screws pass right through and touch the metal plate a direct short circuit will result. Fig. 7 shows what I mean.

Earthing the Screen

Sometimes a set refuses to work when everything is apparently in order simply because some point which should have been earthed to the screen has been left unconnected. It may be just a short wire from a terminal to a holding down bolt passing through the screen which, through its very insignificance, has escaped our attention. The leaving out of the insulating washers under a terminal fixed to a metal chassis is a similar kind of thoughtless mistake. This, however, may lead to more disastrous results. To make an unnecessary connection is always more risky than leaving one out.

A mistake which is quite easy to make if you are getting out your own design is to make a wrong connection to the filament of a metallised valve. As you know, the metal covering is always connected to one particular filament pin. This is usually marked and must of course be joined to the filament wire which is at earth potential. This is usually the negative one. Often when planning out a neat wiring layout one is apt to forget that the negative wire must go to, say, the right-hand filament terminal, when it would be much simpler to take it to the left-hand one.

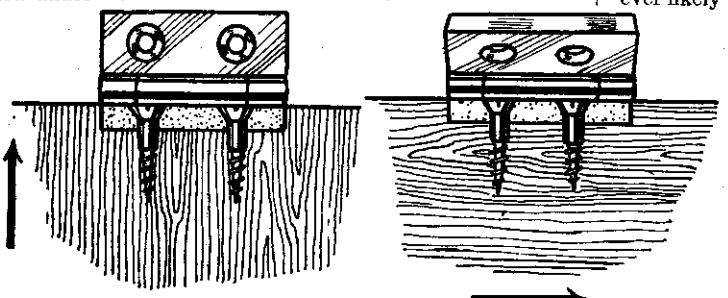


Fig. 8.—Incorrect and correct methods of fixing hinges.

Mistakes of Amateur Designers

While on the subject of home-made designs, here are one or two points which come to mind. Firstly, in designing your cabinet always have sufficient height above the baseboard to accommodate the tallest valve you are ever likely to use. I myself have experienced trouble here and have had to take the terminal cap off a screen grid valve because the roof of the cabinet was a fraction of an inch too low. Always, if possible, arrange for the grain of the wood of the cabinet or baseboard to be across the axis of the fixing screws. Fig. 8 shows the fixing of a hinge. On the left the grain is vertical and the screws will easily pull out. On the right the grain is horizontal as it should be. There is no chance here of the screws going "round and round" when you go to tighten them as sometimes happens if they are driven into the end of the grain.

With amateur coil-making a common mistake is to wind the reaction coil the wrong way round. The symptoms are that signals are not very strong and when the reaction is advanced they get weaker instead of louder. This is easily remedied by reversing the leads, but it is just as well to know what is the cause if a set displays trouble of this sort. The passing of a connecting wire close over the top of a variable condenser (as in Fig. 9) is another silly mistake which could be easily avoided by having the vanes open during the wiring.

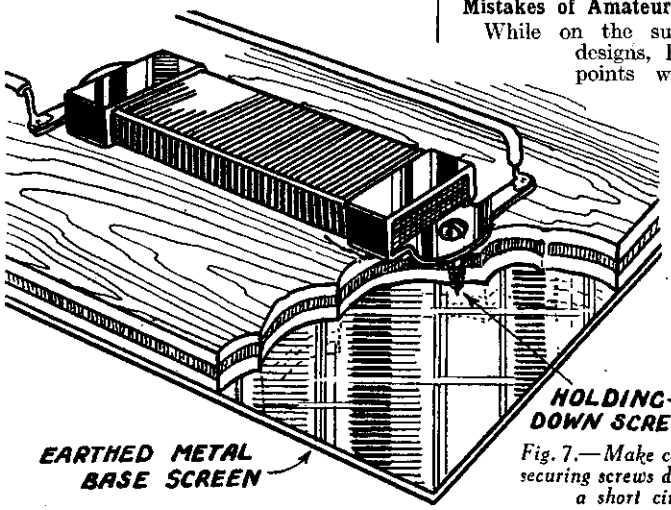


Fig. 7.—Make certain that securing screws do not cause a short circuit.

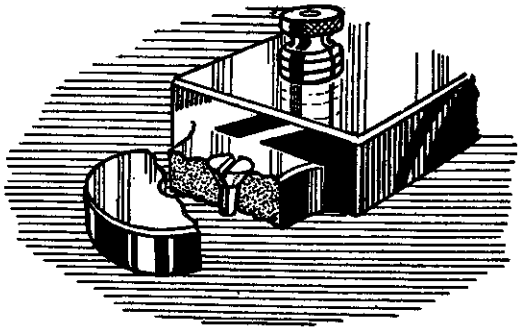


Fig. 5.—Use of the wrong screw will cause this! Don't use countersunk screws unless the lug hole is countersunk.

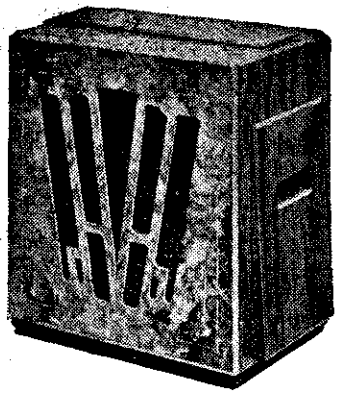
Receivers and their Records

We shall be glad to advise readers regarding purchase of complete sets.

A SELF-CONTAINED battery-operated suitcase portable receiver must always make a popular appeal, for it can be used anywhere without being dependent, as is the case with other types of sets, on an aerial and earth.

Although its size and weight is such that it can be moved from room to room as desired, this does not necessarily imply that the range of the receiver has been sacrificed to its portability; on the contrary, in many instances the set of a portable type, with its enclosed frame aerial, may prove more selective, and more generally useful, than its more bulky competitors.

In their "Atlantic" suitcase model the makers have embodied a straight circuit comprising one H.F. stage tuned-grid



Another Portadyne. The Transportable Cabinet Model. The Portadyne Suitcase "Atlantic" Model reviewed in this article is illustrated below.

coupling, grid detector and two transformer-coupled L.F. amplifiers, with, in the last stage, a power output valve. A point of outstanding interest is the use in this circuit of a swinging coil to secure reaction, and two stages of transformer coupling to obtain sufficiently magnified signals through the Celestion loud-speaker fitted in the lid of the case. The receiver contains a high-tension battery of the standard capacity size, a 2-volt accumulator using jellied electrolyte—the unspillable type—and the necessary 4½ volts grid-bias battery.

Few Controls

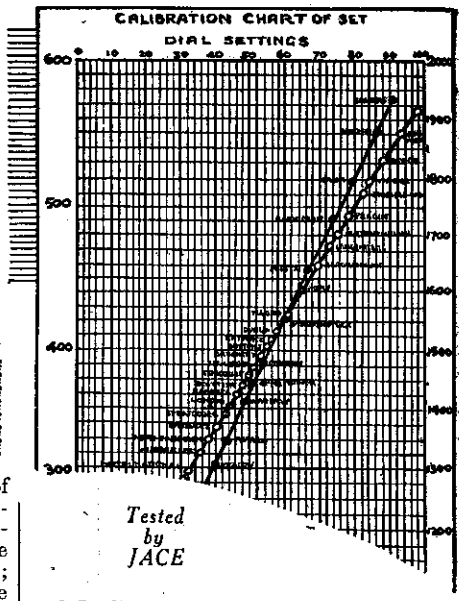
Although I have handled a number of wireless sets, I have not come across many with so few controls. On the panel of the Portadyne "Atlantic" you will only find *two* knobs and two thumb-operated drum dials. The left-hand knob acts as an "on-and-off" switch, and at the same time effects the change over from medium (200-800 m.) to long (1,000–2,000 m.) waves. On the right of the panel is the reaction and volume control. The method of tuning is an original one, and is one of

The Portadyne "Atlantic" Portable S.G.4.

the most interesting I have seen. In view of its novelty, it deserves a few words of explanation—and praise. The two milled-edge thumb controls are on each side of a scale clearly marked in wavelengths; in some instances, to facilitate matters, the names of the better-known stations have been indicated. A diagonal line runs throughout the main scale, and a similar but movable one is seen on the celluloid band attached to the left-hand condenser which tunes the frame aerial. All that is needed, therefore, to keep the two circuits in tune is to see that the movable diagonal line is imposed over the other one. The tuning is of knife-edge selectivity, which, combined with the directional property of the frame aerial, enables you to separate stations working on almost neighbouring wavelengths. This is not a hit-or-miss method; there is no need to twiddle the dials. It is a mere question of getting the two diagonal lines to correspond on the dial with the wavelength of the transmitter. A slight adjustment of the volume and reaction control knob will bring the broadcast up to the desired strength.

Reaction and Calibration

With the method employed, reaction is exceedingly smooth, a valuable asset when searching for the weaker or more distant transmissions. Moreover, I specially noticed that the wavelength calibration of the dial is remarkably accurate; it might possibly have proved an advantage had they been spread over a longer scale, but the thumb control is so easy that this did not prevent the capture of the more elusive broadcasts. Tested at a spot some thirteen miles from the Brookmans Park transmitters, there was no difficulty, whilst these two stations were working, in securing broadcasts from Hamburg, Breslau, or Poste Parisien. Mühlacker could not be separated from London Regional, but when the latter station was resting the Stuttgart concert was received at full loud-speaker strength. During daylight hours, Huizen (1,875 m.), Radio-Paris, Eiffel Tower and Brussels were tuned in; from 8.0 p.m. onwards some thirty Continental stations were logged whilst the two London programmes were on the air. They include such stations as Radio Normandie (Fécamp), Trieste, Turin, Breslau, Radio Toulouse, Frankfurt-am-Main, Sottens, Rome, PTT Paris, Beromünster, Prague, Brussels, Vienna and Budapest on the medium waves, with the addition of Leningrad, Oslo, Kalundborg, Motala, Warsaw and Hilversum on the longer waveband. Königs Wusterhausen was clear of both Daventry

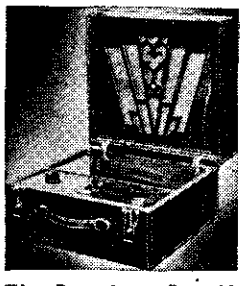


Tested by JACE

and Radio-Paris, and Motala free of interference from Warsaw, thus demonstrating the excellent sensitivity and selectivity of the receiver. Generally speaking, the tone of the loud-speaker was very pleasing, provided the volume was kept at a reasonable strength. The power emitted by the loud-speaker was amply sufficient to fill an average-sized drawing-room, and when speech was heard it was crisp, clear and of a natural quality.

For an efficient four-valve receiver of a suitcase model, the price of £12 12s. complete is distinctly advantageous, as the Portadyne "Atlantic" S.G.4, although of the portable type, is peculiarly efficient: its all-round performance is so good that it can be highly recommended as a "household" set.

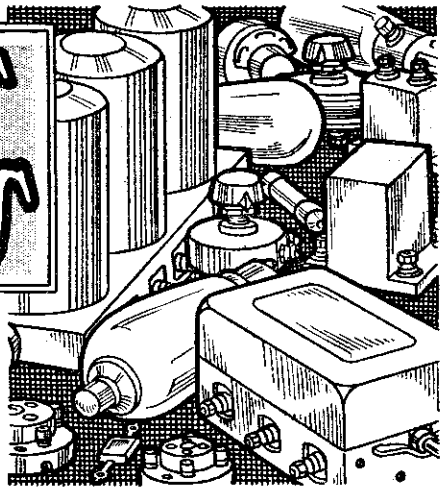
It is my opinion that every listener should own a portable set, even though he may also own an ordinary set operating from an outdoor aerial, for there are dozens of occasions when it is desired to listen to the wireless programmes in some part of the house remote from that in which the ordinary set is installed. Also, it may be that some member of the household is ill in bed; under such circumstances a portable is a great boon, for the two sets can be in operation at once. It is worth while reminding those who have not taken the trouble to read their wireless licences that the 10s. wireless licence enables a listener also to use one portable receiver.



The Portadyne Portable as reviewed in this article.

There is also the case of a listener who wishes, for example, to listen-in to, say, Radio-Paris, whereas the remainder of the family are keen on listening to an English programme. Here again the portable comes to the rescue. It is a useful stand-by when the ordinary receiver is out of action for some reason or another. In many other ways the portable comes to the rescue, and the great improvements in modern receivers rid portables of most of the bugbears to which they were heir five years ago.

REVIEWS of LATEST KITS



THE Radio Exhibition of 1928 marked the first nation-wide appearance of a kit of parts intended to be made into a complete receiver. This kit was known as the Cossor Melody Maker, and was introduced by A. C. Cossor, Ltd. Each year this enterprising firm has introduced a new and up-to-the-minute kit which has gained such popularity that to-day it is a case of—"think of a kit and you think of Cossor." Each successive year has marked the advent of a new kit containing notable improvements, up to the appearance of the present model, which is distinguished by the presence of a variable-mu valve. This year's range includes four separate kits, each based upon the same fundamental principles and employing a variable-mu valve, but differing inasmuch that two are for battery working and two are intended for use on A.C. mains; each pair consists of substantially the same kit, but one is with loud-speaker and one without.

The kit illustrated at Fig. 1 is the Model 337, which is the all-mains model with incorporated loud-speaker which is designed for use on A.C. mains only, 200-250 volts, 40-100 cycles. The circuit is shown at Fig. 5 and presents many interesting points. Let us commence the survey with the aerial coil, which, it will be noticed, has winding so arranged that the aerial is tapped in at predetermined points, which can be at any position on the coil that the designer wishes: this in itself is refreshing after the slavish centre-tapping that follows the use of the conventional three-point switching. A feature of great interest is the coil, which is in series with the aerial when switched for long waves, but is out of circuit when the set is switched for short waves. Presumably the purpose of this coil is to act as a choke to short-wave lengths when working on the long waves, to stop the former from butting in on the preserves of the latter. This refinement is a boon to listeners situated in the vicinity of a powerful regional transmitter as otherwise they would experience the annoyance of having half the long-wave scale covered with a mixture of the alternative transmissions.

COSSOR MELODY MAKER KIT MODEL 337

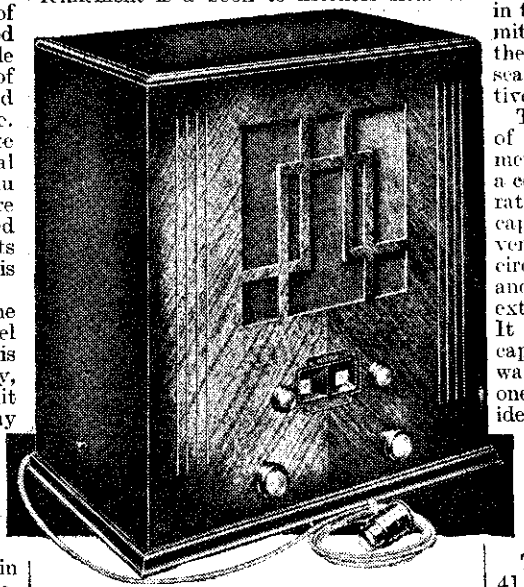


Fig. 1.—The Cossor Melody Maker All-mains Model No. 337.

KIT:
Cossor Melody Maker, All-Mains Model No. 337.

MAKERS:
A. C. Cossor, Ltd., Highbury Grove, London, N.5.

SPECIFICATION:
A.C. mains only, 200-250 volts, 40-100 cycles, Cossor variable mu MVSG, 41 MH and 41 MP valves, bi-phase rectifier, mains transformer tapped at 200, 220 and 240 volts, fuses in leads of rectifier anodes, metal chassis, built-in permanent magnet moving coil loud-speaker, capacity-controlled reaction.

PRICE:
£11 . 19 . 0, or without loud-speaker, £9 . 15 . 0

This coil is shunted across the grid cathode of the variable-mu valve, Cossor MVSG metallized, which is in turn provided with a centre-tapped anode coil, giving a step-up ratio of 2 : 1. This coil is provided with capacity-controlled reaction in the conventional manner. In connection with this circuit it is interesting to note that the anode to grid coupling condenser has an extremely low value—namely, .000025 mfd. It would seem that such a very small capacity would lower the volume on long waves, but the substitution of a larger one experimentally entirely discredited this idea. The advantage of such a low capacity is that the tendeney for mains hum to be introduced in the screen-grid stage is minimized. The detector stage makes use of a Cossor 41 MH metallized mains valve, and is designed on conventional lines.

The output stage employs a Cossor 41 MP, which is an indirectly-heated power valve capable of an output that is more than adequate for domestic purposes. It is interesting to note that this valve gives more volume than any indirectly-heated pentode would do, as it has the distinction of having the highest sensitivity factor of any valve, which is largely accounted for by the phenomenal value of mutual conductance, which is no less than 7.5 m.A./v. The mains pack is designed around the Cossor 442 BU, which is a bi-phase rectifier of very robust construction having a flat

(Continued on page 244.)

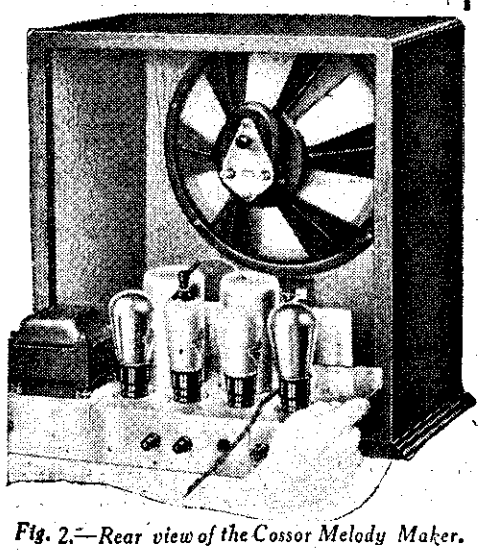


Fig. 2.—Rear view of the Cossor Melody Maker.

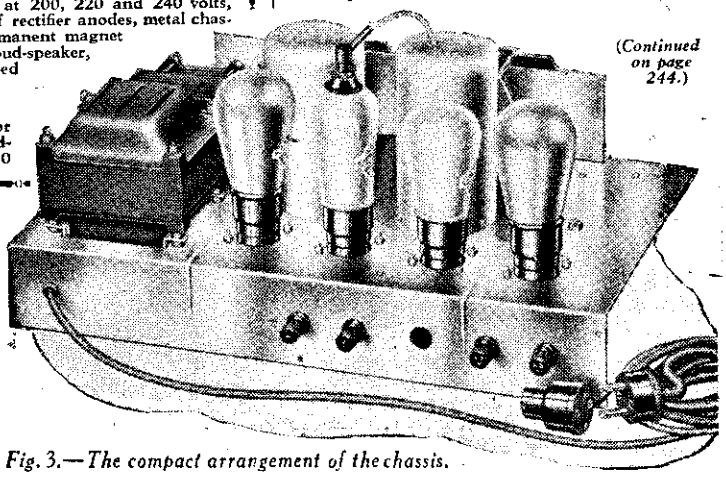


Fig. 3.—The compact arrangement of the chassis.

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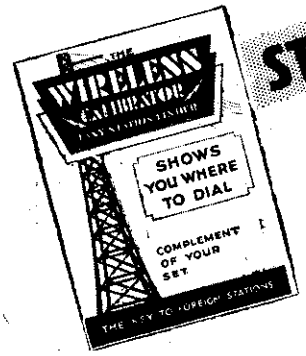

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1 T.C.C. .0001-mfd. fixed condenser type "S"		1	3
3 T.C.C. 2-mfd. fixed condensers		11	6
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1 Ready Radio L.F. Transformer ratio 3-1		8	6
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1 Lewcos 10,000 ohms spaghetti fixed resistance		1	0
1 Colvern 25-ohms filament resistance FR		3	6
1 Sovereign 500,000 ohms volumecontrol		4	6
1 100 m.a. fuse and holder		1	0
3 Belling Lee terminal blocks		2	0
6 Belling Lee terminals (aerial, earth, L.S.-L.S.+, and 2 pickups)		1	3
1 Belling Lee 5-way battery cord		2	0
2 Coils Glazite			8
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1 Oldham 0.50 Accumulator		9	0
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or in Epoch Oak Cabinet		2	7	6
1 Filt. Earth		2	6

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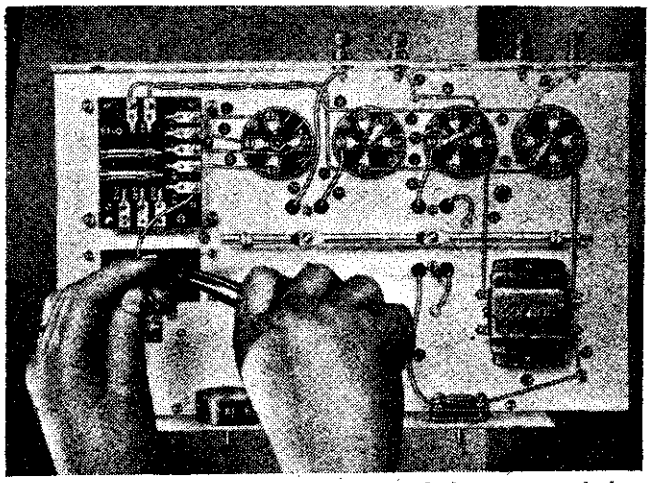


Fig. 4—One of the easy-wiring diagrams which accompany the kit.

(Continued from page 242.)

tape filament. This valve is fed by a specially-designed mains transformer which is tapped for working on 200, 220, or 240 volts; fuses are provided in each of the leads to the rectifier anodes. Smoothing is taken care of by a 30 henry constant inductance choke in conjunction with a 2 and 4 mfd. condenser. Further reference to Fig. 5 will show that the possibility of modulation hum is stamped out by an earth shield between the primary and secondary winding of the mains transformer.

A large and exceedingly well-printed chart is included with the kit which shows in a concise and definite manner the correct procedure of assembly. This chart is a mass of careful forethought that shows that every possible mistake that the constructor could make has been realized and guarded against. The various components are all boxed, while small parts are enclosed in envelopes bearing their description. The all-metal chassis is in two pieces, on which the components are mounted before the two sections are united by means of four bolts and nuts. These are, perhaps, a trifle inaccessible, but the fixing is easily accomplished if it is approached calmly; altogether, assembly is extremely simple and would not take the most cautious constructor more than about three hours. After the chassis has been duly assembled and wired it is slipped into the cabinet, as shown at Fig. 4, when the suggestion of a kit is entirely lost and a complete receiver is created, equal in every way to a factory-built job which would be far more expensive. Incidentally the kit illustrated is £11 15s., and is available without loud-speaker at £9 15s.

The test was carried out at 21 miles from Brookmans Park on an aerial 45ft. long, made up of 25ft. down lead and 20ft. horizontal in an area which is entirely normal and quite free from reception freaks. There are four controls (excluding wave-change switch), two tuning condensers, volume and reaction. The high degree of selectivity obtainable is dependent upon the correct use of the volume and reaction control; for maximum selectivity it is necessary to turn down the volume control until the the station is lost and bring it back by means of reaction; in other words, the volume control should be turned down as far as possible and reaction advanced as far as practicable without loss of quality. Too much stress cannot be laid on the advantages of the variable-mu valve, which, in addition to many other advantages, permits perfect volume control that will allow the local to be tuned down to a whisper without adversely affecting quality to the slightest extent. The use of separate tuning controls for each condenser has many advantages when the receiver is used under adverse circumstances, such as when using an indoor aerial, as that little bit of extra punch that makes all the difference between bad and good reception is not lost. This is not the case with a ganged receiver unless great care is used in trimming, which is, generally speaking, impossible with a kit. As was expected, the completed kit was highly selective and possessed excellent range. Station after station can be tuned in without interference upon a silent background which is delightfully free from any trace of mains hum. After listening for a considerable period, it must be admitted that the reproduction of both speech and music reaches a high standard well in keeping with the other qualities of this excellent all-mains receiver.

Viewed from the "home" standpoint the receiver leaves nothing to be desired It is selective, powerful, gives really excellent reproduction of both speech and music, has the appearance of a factory-built receiver when fitted into its walnut-finished cabinet, and consumes from the mains only one unit of electricity for every twenty-six hours that it is working.

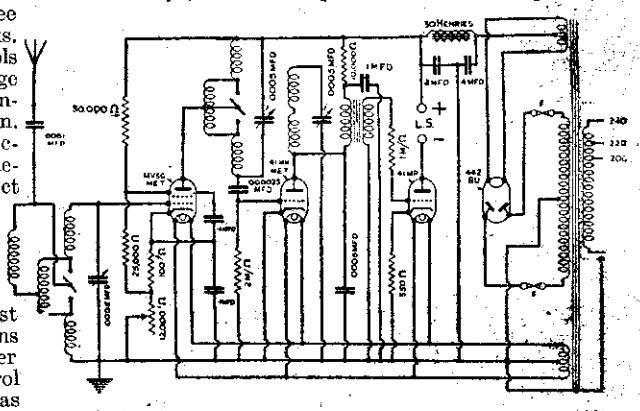
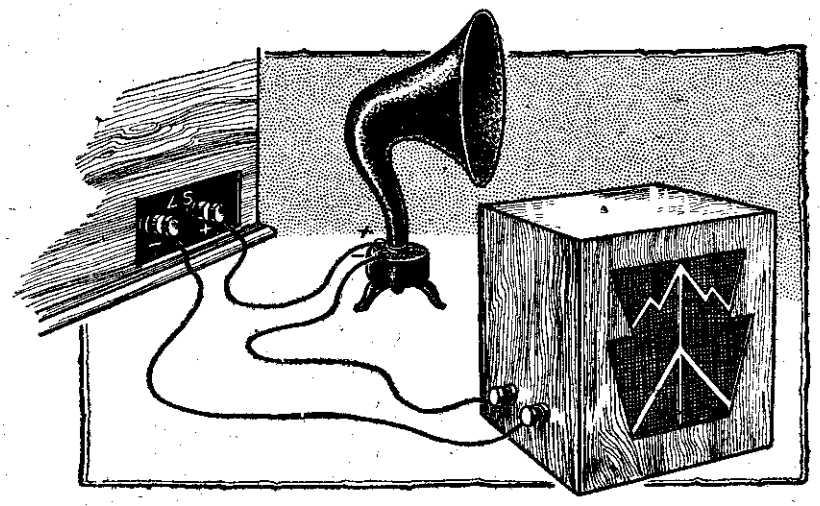


Fig. 5—Circuit diagram of the Cossor Melody Maker All-mains Model No. 337.



Balancing reproduction by means of two loud-speakers connected in series.

A USE FOR THE OLD SPEAKER

IF you have invested in a moving coil to replace the old horn or cone speaker the old one will probably have been relegated to the junk box. But have you tried using the two together? By connecting them in series it is often possible to get more pleasing reproduction than by using either of them separately. The reason is that most moving coils give emphasis (sometimes over-emphasis) to the low notes whilst the old moving iron speakers favour the upper register. By suitably combining the two, both ends of the scale are brought out in better proportion. Both speakers should be tried in different positions in the room until most pleasing results are obtained.

SIMPLE TESTS WITHOUT INSTRUMENTS

The first article on this subject appeared on page 97 of our issue dated Oct. 1, 1932

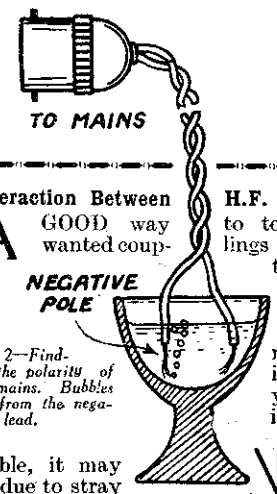


Fig. 2—Finding the polarity of the mains. Bubbles rise from the negative lead.

Interaction Between H.F. Circuits

A GOOD way to test for unwanted couplings between two tuned circuits in a set is by the absorption method. For instance, if your receiver is not very stable, it may be due to stray coupling between the aerial circuit and the intervalve circuit. To test if there is any interaction, remove the H.F. valve and join the aerial to the top end of the intervalve coil through a very small condenser, as in Fig. 1. Tune in a fairly weak station on the intervalve coil, and then tune in the aerial coil to the same wavelength. If there is an obvious reduction in signal strength as soon as this point is reached, it is evidence of an undesirable degree of interaction between the two circuits. On the other hand, no reduction in signal strength indicates minimum interaction. This test is not, of course, applicable where ganged condensers are used, since the two circuits cannot be independently tuned.

A Polarity Test

A simple way of testing the polarity of the mains is to dip the ends of the two wires in an eggcupful of water. Bubbles will rise from one wire. This is the negative pole. Naturally, you must be very careful not to allow the wires to touch one another or you will short-circuit the mains. For lower voltages, it may be necessary to add a pinch of salt to the water to increase its conductivity, but do not do this when testing the mains or too much current will pass and you may blow the fuse. Plain tap water is quite sufficient. The same test will distinguish A.C. from D.C. If the supply is A.C., there will be no difference between the behaviour of the two wires in the water.

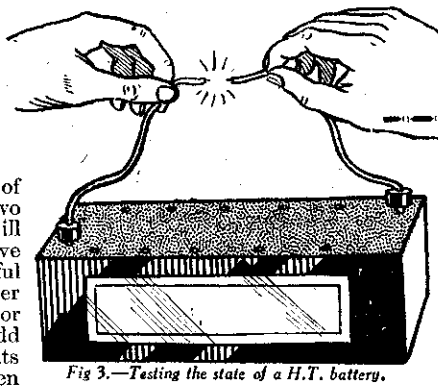


Fig 3.—Testing the state of a H.T. battery.

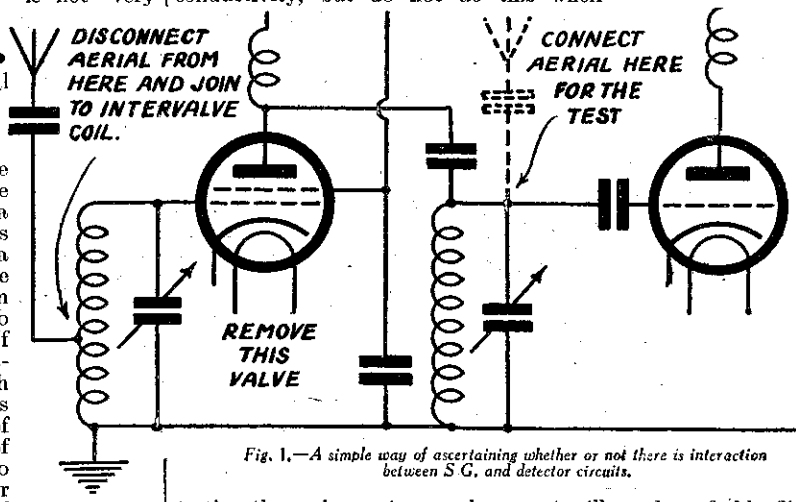


Fig. 1.—A simple way of ascertaining whether or not there is interaction between S.G. and detector circuits.

Testing the State of the H.T. Battery

Here is a test which will give you a rough guide to the state of your H.T. battery in the absence of a voltmeter. Disconnect the battery from the set and join a wire to each end, as in Fig. 3. Momentarily "short" these wires by quickly flicking the end of one past that of the other. The actual contact must be very brief, or you will harm the battery. If a bright, fat spark occurs when the wires touch, the battery is O.K., but if there is only a feeble flicker, then the battery is running down. Needless to say, you should not repeat this test more often than necessary, as some current is taken from the battery even with the briefest contact.

Parallel Wires

At one time, and only a few years ago, we used to take elaborate pains in wiring up a set to make all bends right-angular, to ensure that no adjacent wires ran parallel to each other, and so on. Since then the pendulum seems to have swung pretty well in the opposite direction so that really neat wiring is seldom seen. But although the appearance of the wiring is not of great consequence, it is as important as ever to make sure that wires in grid and plate circuits, if near together, should not run parallel to each other. The capacity formed between such wires can be quite sufficient to cause instability, especially in a set giving a large amount of high-frequency amplification.

When Testing

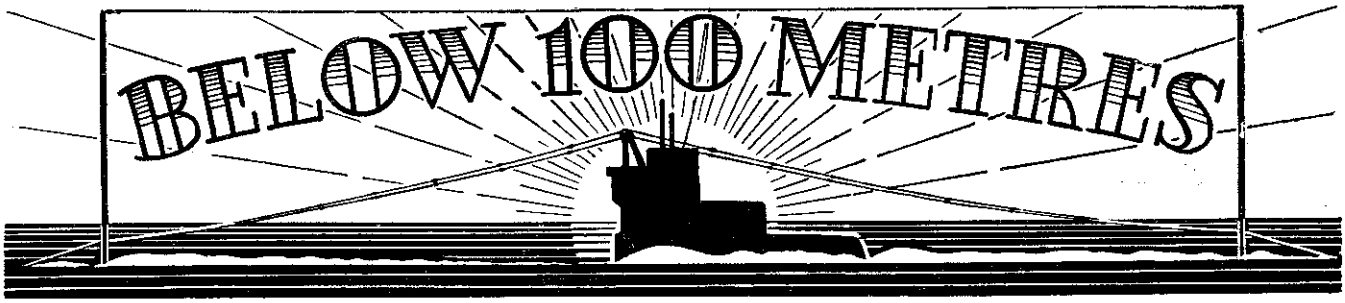
When you have assembled a receiver and are carrying out the preliminary tests, there are one or two little mistakes which are likely to occur if you are not careful. Do not, for instance, pull out the grid-bias plugs while the set is working so as to try a different value. This puts a great strain on the valves. The correct way is to switch off each time a change is made. Be sure not to touch the metal covering of a metallized valve with any bare wire, or with a metal screwdriver with which you may be adjusting some other part of the set, for you may cause a "short." Do not take off or move the covers of band-pass coils after the set is fixed in the case. You will most certainly upset the trimming unless you replace them in *exactly* the same position. Actually, of course, they should be pushed home firmly before carrying out the trimming and then left severely alone.

ODDS AND ENDS

Anode Bend Detection

In the case of anode bend detection, first consideration must be given to the suitability of the valve for this form of detection. This can be judged by the shape of the grid volts / anode current curve supplied by the makers. The curve should, of course, have a sharp and pronounced bend at its lower end, and a long straight characteristic above. In operation, the valve should be worked at about the medium anode voltage recommended by the maker, and should be biased to well down on the bottom bend.

As a general rule the valve maker's recommendation as to the value of coupling condenser and grid-leak can be followed in the case of a leaky grid or power grid detector. For normal grid rectification, the valve should be operated usually at the lowest anode voltage which gives sufficient modulation output to load the following stage and at the same time renders reaction control effective, while for power grid detection the valve should be operated at its maximum rated anode voltage.



IN short-wave reception, it is often the small and seemingly insignificant details that make all the difference between a set that is a pleasure to use and one that is a perpetual source of exasperation to its owner! Easy tuning, an entire absence of hand-capacity effects, velvety-smooth reaction, and freedom from grating or crackling noises due to faulty rubbing contacts, etc., are among the desirable features that make a really good short-waver pleasant and easy to handle.

These ideals can be attained without difficulty by paying careful attention to certain important details when designing, constructing, or adapting a set for short-wave work; and similarly, of course, one should look out for these points when buying short-wave apparatus ready-made. The case or otherwise with which tuning adjustments may be made depends very largely on the capacity of the variable condenser or condensers in the set.

Condenser Capacities

With a .0005 mfd. condenser, for instance, such as is used in the majority of ordinary broadcast receivers, tuning on the short waves is exceedingly sharp and critical, so that very delicate and skilful adjustment is necessary when tuning-in stations. That is why, in sets, adaptors, or converters expressly intended for short-wave work, the variable condensers used have quite a low maximum capacity—say .00025, .00016, or even .0001 mfd. The smaller the maximum capacity of the condenser, the broader the tuning, and therefore the easier it is to tune in stations quickly and accurately without undue "fiddling."

In the case of any circuit intended exclusively for short wavelengths, therefore, it is strongly advisable to use variable condensers with a relatively small maximum capacity so as to facilitate adjustment. But what of sets that are only used occasionally for short-wave reception, being adapted for the purpose by plugging in short-wave coils in place of the ordinary broadcast coils?

A small-capacity variable condenser is inconvenient for use on the ordinary broadcast wavebands, as the range of wavelengths covered by it, in conjunction with any given coil, is too restricted. One way out of the difficulty is to compromise between the .0005 mfd. condenser that is customary for ordinary purposes, and, say, the .00016 mfd. used for short-wave work, by adopting some intermediate value, such as .0003 mfd., which does fairly well for both purposes.

Another plan that is sometimes resorted to is that of switching a fixed condenser into series with a .0005 mfd. variable one when working on short waves. This, of course, reduces the total effective capacity. Thus, for example, a .0005 mfd. fixed condenser in series with a .0005 mfd. variable one reduces the total effective capacity to .00025 mfd.

PRACTICAL HINTS ON SHORT-WAVE WORK.

By "RADIOMAN"

Trimmer Condenser

A simple expedient which may well be adopted is to connect a small independent trimmer or vernier condenser (having, say, one fixed plate and one moving plate) in parallel with the .0005 mfd. variable condenser. For short-wave work, the final adjustments can be made with great precision by means of the vernier condenser. Hand-capacity effects are seldom troublesome above about 25 metres with a well-designed modern short-wave set; but on shorter wavelengths—say around 16 or 19 metres—they may become a nuisance, unless special precautions are taken to avoid them.

Metal screening *may* help to eliminate hand-capacity effects—or it may make them a thousand times worse! A good deal depends on the earth connection used. With a poor earth, one sometimes finds that appalling hand-capacity effects occur whenever the operator's hands come anywhere near any part of the metal chassis or screening. That sort of thing, of course, renders satisfactory reception almost impossible.

Avoiding Hand Capacity

One of the most widely-used methods of avoiding hand-capacity consists of joining extension rods to the spindles of the variable condensers, so that the latter can be mounted several inches behind the control panel.

The type of extension-piece usually sold for this purpose consists of an ebonite tube with set-screws near each end. One end of the tube is secured to the spindle of the variable condenser, while a short metal spindle secured in the other end of the tube connects it to the slow-motion dial on the control panel. I have come across instances in which hand-capacity effects persisted in spite of the use of these extension rods; the signals would fade out whenever the dials (which contained a good deal of metal in their construction) were touched with the hands. In each case this trouble has disappeared completely on substituting a short spindle of solid ebonite rod in place of the metal spindle connecting the extension-piece to the slow-motion dial. Apparently there was an unexpected capacity effect between the ends of the two metal spindles which faced one another inside the tube.

Sometimes pronounced body-capacity effects occur through unwanted high-frequency currents finding their way into the low-frequency part of the set. When this is happening, one often finds that the tuning is upset and signals fade out whenever the headphone or loud-speaker leads are touched. The remedy is to improve the H.F. choking, by-passing and decoupling arrangements inside the set, and (the simplest and usually the most effective remedy) to connect a *high*-frequency short-wave choke in either or both of the output leads which go to headphones or loud-speaker. It may be necessary to connect a small-capacity fixed condenser between the anode of the output valve and earth, in order to get rid of the high-frequency currents that are blocked by the H.F choke or chokes.

Smooth Reaction

Smooth reaction depends on a number of factors, such as the resistance value of the grid-leak, the anode potential on the detector valve, the tightness or otherwise of the aerial coupling, etc. Connecting the return end of the grid-leak to the moving contact-arm of a suitable potentiometer (more correctly termed a potential divider), shunted across the L.T. or filament circuit, helps greatly to ensure smooth, efficient reaction control.

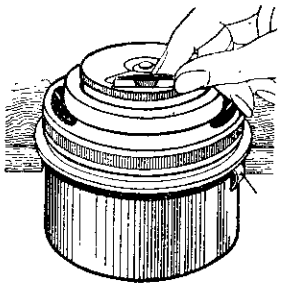
As an alternative to an ordinary potentiometer of the variable type, one can use a fixed potentiometer, having a single tapping at a suitable point on the winding. The ends of the resistance winding are connected to the filament circuit, and the return lead from the grid-leak is joined to the tapping. This is, of course, a slightly simpler arrangement than the variable potentiometer, but the latter, being adjustable, naturally gives finer control of the degree of positive bias applied to the grid of the detector valve. If the grid is made too positive, reaction is apt to be "ploppy," while if it is too negative, smoothness of reaction is obtained at the expense of signal-strength, to some extent. A happy medium must therefore be found in order to get the best results.

When a short-wave receiver is operating on or near the point of oscillation, it is so sensitive that, unless the connections to the moving vanes of the tuning and reaction condensers are well-nigh perfect, loud grating noises may be heard in the headphones or loud-speaker whenever transmissions are being tuned in. Variable condensers that are quite satisfactory and silent in operation on the ordinary broadcast wavebands often set up intolerable scratching or grating noises when used on the short waves. It is strongly advisable, therefore, when building short-wave receiving apparatus, to use condensers of a type expressly designed for short-wave work.

A CHAT ABOUT THE LATEST COMPONENTS

AUTOMATIC NEEDLE CUPS FOR GRAMOPHONES

THE illustration shows one of the new automatic needle cups for gramophones. One simply has to press the top of the device to obtain one needle. Each container holds about 200 needles of any design which may be poured in. It can easily be attached to any gramophone or radiogram, and is made for use as a separate unit. It automatically prevents the use of old needles, and is neater, tidier, and more dustproof than the open bowls usually supplied.



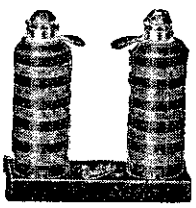
Automatic needle cups for radio-gramophones.

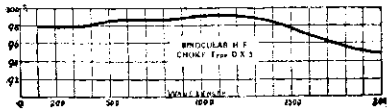
WATMEL H.F. CHOKE

The function of a choke demands that the inductance shall be high and the self-capacity low. The Binocular Choke, Type D.X.3, manufactured by the Watmel Wireless Co., Ltd., has an inductance of 200,000 mh, and a self-capacity of only 1.6 m. mfd. In addition to these admirable characteristics, the choke is wound in binocular form, which reduces the risk of interaction. This choke will be found to be useful wherever an H.F. choke is required, and costs 4s.

SHORT-WAVE CONVERTER

To enable users of ordinary broadcast receivers to tune in the short waves quite a number of adapters have been placed on the market. In practically every case these are simply one-valve detector circuits with a plug to enable it to be plugged into the L.F. side of the ordinary set. In a different category, however, is the Eclex Short-wave Converter manufactured by J. J. Eastick and Sons. This is an ingenious circuit arrangement, which can



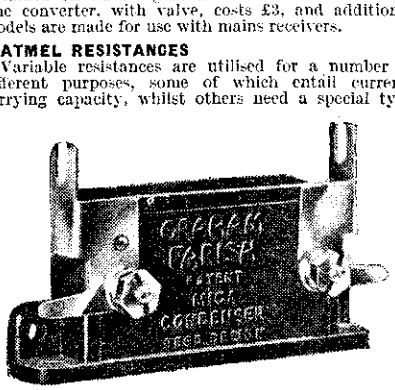


The Watmel Binocular choke.

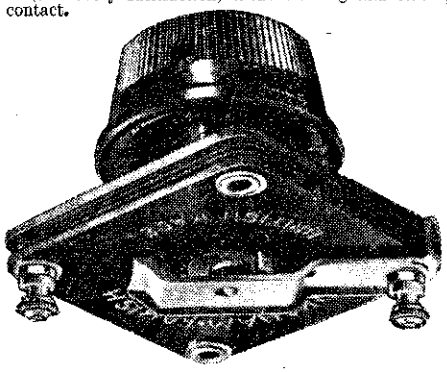
only be used with a set employing H.F. stages. The combination then makes an efficient super-Heterodyne receiver, enabling good loud-speaker results to be obtained on wavelengths of 16-60 or 60-120 metres. The converter, with valve, costs £3, and additional models are made for use with mains receivers.

WATMEL RESISTANCES

Variable resistances are utilised for a number of different purposes, some of which entail current-carrying capacity, whilst others need a special type of winding to give a straight line variation of volume. The Watmel Wireless Co., Ltd., make resistances and potentiometers which will suit all purposes, and amongst these we would mention Type 1, which is a wire-wound resistance or potentiometer having a protected winding wound on a non-shrinkable former. A direct wiping contact is used in this model, which is made in various ratings from 1,000 to 50,000 ohms to carry 50 m/A to 15 m/A. The price of this type is 5s. 6d. Type 3 is of the non-inductive element type, with a wire contact. This is a smaller component than Type 1, but naturally will not carry the current, and is therefore made in much higher values, namely, from 50,000 ohms to 5 megohms. The price of this type is 4s. 6d. Both types will be found to give every satisfaction, silent working and clean contact.



The Graham Farish fixed condenser. These are tested on 750 volts D.C. and are guaranteed accurate to within fine limits.



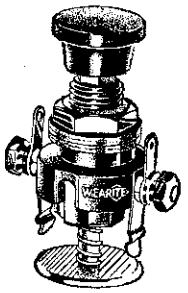
The Graham Farish "Litlos" variable condenser.

LITLOS VARIABLE CONDENSER

The bakelite type of condenser can be the source of rather large losses unless very carefully designed. Messrs. Graham Farish have spent considerable thought on the efficient design of this type of condenser, and the result is embodied in the Litlos variable reproduced on this page. The bakelite dielectric is very accurately ganged, and a solid brass pigtail is used to make connection to the moving vanes. Three types of this condenser are available, Log line, straight line capacity and differential, and various values up to .0005. The price, 2s.

WAVEMASTER CONDENSERS

The Webb Condenser Co., Ltd., of Hatton Garden, E.C.1, have sent us their latest catalogue of condensers. Variables with bakelite or metal end-plates; slow-motion drive variables; differential and ordinary types of reaction condenser, and two and three-gang condensers are well represented in this catalogue. The prices of these components are quite standard, and workmanship and finish are all that can be desired.



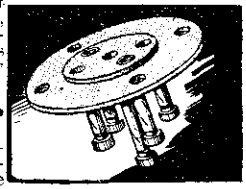
The New Wearite On-off Switch.

A NEW ON-OFF SWITCH

The ordinary type of push-pull switch has the disadvantage that it is not self-cleaning, and as a result the contacts oxidize and, by causing a voltage drop, reduce volume. Another disadvantage is that they are often out of round so that by rotating the switch one can often reduce or increase volume. The merit of the new Wearite on-off switch illustrated on this page is immediately apparent, for in place of the usual cylinder type contact, a disc is provided which makes very positive contact with the spring arms. The movement is definite, and by reason of its quick breaking and robust construction is a safe type to be used for both battery and mains receivers. The spiral spring behind the disc and around the spindle assures contact being cleanly made or broken. It costs 1s., and a push-pull wave-change switch, 1s. 3d. A change-over switch costs 1s. 6d.—all of them from Wright and Weaire.

CHASSIS-MOUNTING VALVE-HOLDER

The use of all-metal chassis for wireless sets, enables a lot of the wiring to be carried out below the base. The Clix valve-holder, illustrated, is intended for attachment to this type of receiver, and a large hole in the chassis enables the holder to be mounted flush with the top surface of the metal, and the filament wiring, etc., can be conveniently carried out below. Apart, therefore, from lightness and rigidity, these components will be found to greatly simplify construction.



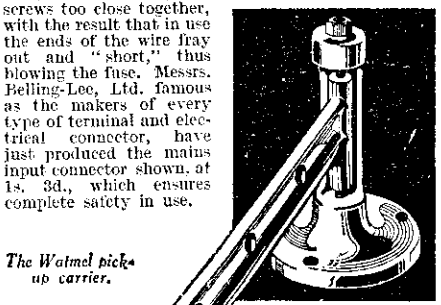
A new Clix chassis-mounting type valve-holder.

WATMEL PICK-UP CARRIER

One of the most important points in mounting a pick-up is the tracking angle, and the Watmel Pick-up Carrier is built so that not only is correct alignment assured, but weight is reduced, and by reason of the accuracy of the workmanship, vibration is reduced to a minimum. The price of this component is 7s. 6d., and a template is supplied to ensure that the carrier is mounted in the correct position.

MAINS INPUT CONNECTOR

No matter what device you use which works from the mains, it is important to ensure that the connection is safe. Many cheap mains connectors (usually those of foreign manufacture) have their internal connecting screws too close together, with the result that in use the ends of the wire fray out and "short," thus blowing the fuse. Messrs. Belling-Lee, Ltd. famous as the makers of every type of terminal and electrical connector, have just produced the mains input connector shown, at 1s. 3d., which ensures complete safety in use.

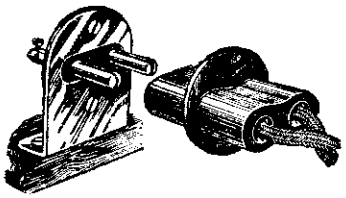


The Watmel pick-up carrier.

WEARITE DECOUPLING RESISTANCES

Two types of very accurate decoupling resistances have just been submitted to us by the famous firm of Wright and Weaire. A particular feature of these resistances is the ease with which they can be used in the construction and wiring of a receiver. The usual disadvantages of the Spaghetti type are non-existent and firm contact can be made at both points. The 400 to 2,000 ohms cost 1s., from 2,500 to 10,000 ohms 1s. 6d., from 20,000 to 50,000 ohms 2s., and 60,000 to 100,000 ohms 2s. 6d. The plug-in types are similar in every way to those described, but have been designed to facilitate rapid changing of resistance when change of other components calls for a change in resistance values. The base for the resistances costs 3d. each.

(Continued on page 250.)



A cheap mains connector—The Belling-Lee.

A Chat about the Latest Components

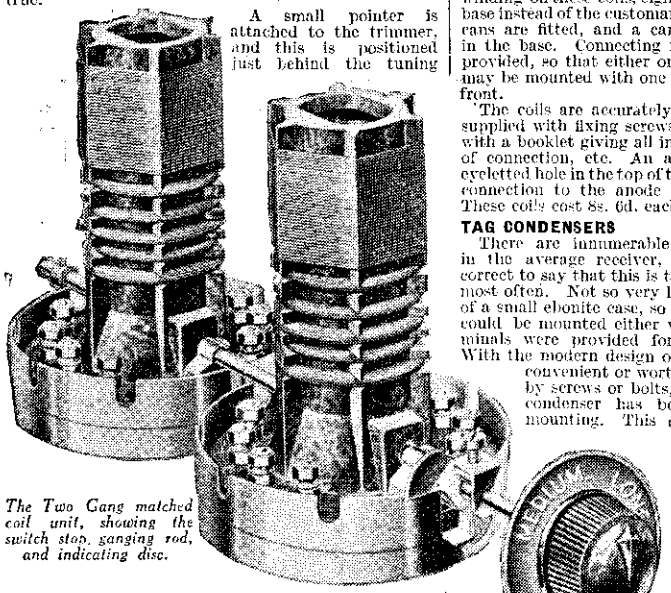
(Continued from page 248.)

New Telsen Components

We have recently been given the opportunity of testing a number of the new components manufactured by the Telsen Company. As the majority of our readers are aware, this firm manufactures, on an extensive scale, practically every type of component used in a wireless receiver, and these cover such items as valve-holders, fixed condensers, tuning coils, variable condensers, switches, slow-motion dials, etc. We give below a short report of some of these parts, which we have no hesitation in saying are of first-class workmanship and finish, and which show the result of careful thought and experiment.

GANG CONDENSER ASSEMBLY

The twin gang condenser assembly is a very ingenious piece of mechanism, comprising a drum dial and two log. variable condensers. The control knob is in two sections, the larger one rotating the moving vanes at both condensers, and at the same time an ivorine scale, which is illuminated from the rear. The smaller knob moves the fixed section of the left-hand condenser through a few degrees, to enable compensation to be made for slight inaccuracies in the two circuits with which the coils are used. The two tuning condensers are provided with compensators enabling preliminary balancing to be carried out. The most novel and interesting points of this assembly are the scale and "trimmer indicator." Unlike other makes of tuning dial, Messrs. Telsen supply two ivorine scales. One of these has a plain scale—0 to 100—whilst the other is calibrated direct in wave lengths, the short-wave band on the left of the scale, and long waves on the right. If used with the Telsen log. condensers, this enables direct reading of stations to be obtained. The scale is slotted so that it may be adjusted to give a true reading on one station, and then all other wavelengths will automatically fall true.



The Two Gang matched coil unit, showing the switch stop, ganging rod, and indicating disc.

A small pointer is attached to the trimmer, and this is positioned just behind the tuning scale. It therefore throws a shadow on the scale, so that the position of the trimmer is easily seen, and tuning made much simpler. The movement of the whole assembly is delightfully smooth, and this is a really first-class component, which we hope to include in one of our sets at an early date. Price 17s. 6d.

INTERVALVE COUPLING UNIT

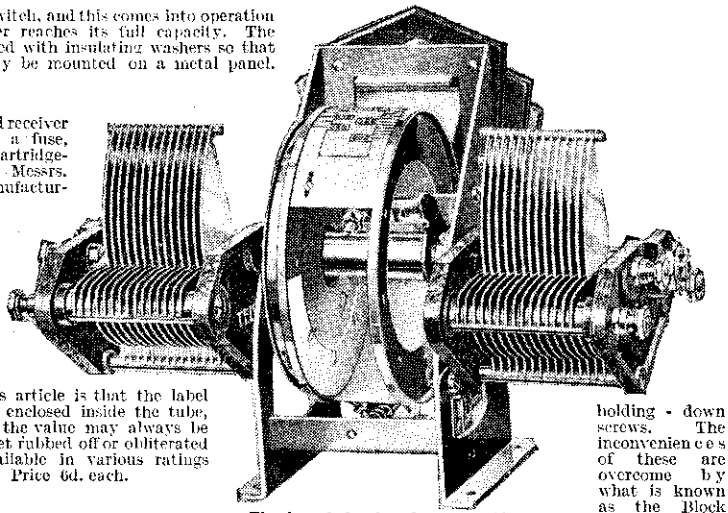
The new method of arranging a parallel-fed L.F. transformer has been incorporated in this unit with marked improvements over the usual type of coupler. The anode resistance has a value of 25,000 ohms, and the coupling condenser is .5 mfd. The transformer is of the high permeability nickel alloy core type, with an inductance of 40 henries. Owing to the efficiency of the design in this component, the step-up ratio is 10-1, and the response curve has a rising characteristic at the lower end of the musical scale, with a slight falling off at the upper end to reduce interference from heterodyne whistles, needle scratch, etc. This interesting component is so wired that, by connecting a choke with a value of 100 henries in place of the feed resistance, the amazing amplification of 225 is obtainable. Price 12s. 6d.

AERIAL SERIES CONDENSER

This is a further improvement on aerial condensers. Although having a maximum capacity of .0003 mfds., the design has been so arranged that it has the low minimum of .000006 mfds. A further useful point in a condenser of this type, which is used in the aerial lead, is a shorting switch, and this comes into operation when the condenser reaches its full capacity. The condenser is supplied with insulating washers so that the component may be mounted on a metal panel. Price 2s. 3d.

POWER FUSES

No mains-operated receiver should be without a fuse, and the small cartridge-type fuses which Messrs. Telsen are now manufacturing will be found very convenient to use. The fuses consist of a small glass tube 3/16 in. by 1¼ in. with metal caps. Inside the tube is a thin wire, accurately measured off to a definite current rating. A good feature of this article is that the label giving the rating is enclosed inside the tube, with the result that the value may always be seen, and will not get rubbed off or obliterated whilst in use. Available in various ratings from .5 to 3 amps. Price 6d. each.



The drum dial and condenser assembly, showing the rigid framework upon which it is assembled. The indicating pointer of the trimmer can be seen just inside the drum above the central shaft.

TUNING COILS

The new Matched Screened Coil is one of the best coils we have yet tested, and has been designed after long and careful investigation. Unlike the majority of screened coils on the market, these coils have an aperiodic aerial winding for both short and long waves, instead of a tapping into the long-wave section. This, of course, will tend to prevent "break-through." The coils are wound on a ribbed former having an overall diameter of 1¼in. and the short-wave winding is in solenoid form, with sectionalized windings for the long waves. A common reaction winding is provided. In view of the extra aperiodic winding on these coils, eight terminals are found on the base instead of the customary six. Aluminium screening cans are fitted, and a cam-operated switch is fitted in the base. Connecting rods for these switches are provided, so that either one or a number of the coils may be mounted with one switch control on the panel front.

The coils are accurately matched, and each coil is supplied with fixing screws, escutcheon, etc., together with a booklet giving all information, circuits, method of connection, etc. An additional refinement is an eyeletted hole in the top of the screening can to facilitate connection to the anode terminal of a S.G. valve. These coils cost 8s. 6d. each.

TAG CONDENSERS

There are innumerable uses for fixed condensers in the average receiver, and it would not be incorrect to say that this is the component which is used most often. Not so very long ago, this took the form of a small ebonite case, so designed and drilled that it could be mounted either vertical or horizontal. Terminals were provided for making the connections. With the modern design of receivers, it is not always convenient or worth while to fix the condenser by screws or bolts, and, therefore, the "tag" condenser has been produced for modern mounting. This consists of a thin bakelite casing, less than a quarter of an inch thick, inside which the plates and dielectric are fixed. Moulded into the ends are thin metal strips, provided at the end with rings. These ring ends are quite thin and, therefore, lend themselves admirably to mounting beneath terminal heads, etc. By arranging the distance between, for instance, the tuning coil base and the detector valve, the condenser may be used to bridge these two components, thus saving two wires, and only giving two connections to be made instead of four. Many other uses will be found for this component, which is made in all values from .0001 to .002 mfds. For those who for any reason prefer the old method of mounting, two holes are provided at the sides of this condenser. The price is 6d. each.

MANSBRIDGE BLOCK CONDENSERS

For the construction of a mains set, a number of large fixed condensers are essential. These take up a considerable space, besides requiring a number of holding-down screws. The inconveniences of these are overcome by what is known as the Block Condenser, which consists of a large metal case housing a number of condensers of the Mansbridge type. Three patterns of this block are available, having totals of 4, 6 and 8 mfds., each type being divided up into 2 mfd. sections. The connections are all brought out to the top, so that practically any desired value may be obtained by suitably connecting the lugs. The blocks are made in two types, 500 volt test and 1,000 volt test (this latter is not, however, made in the 8 mfd. pattern). Prices of these condensers will be found in the advertisement pages.

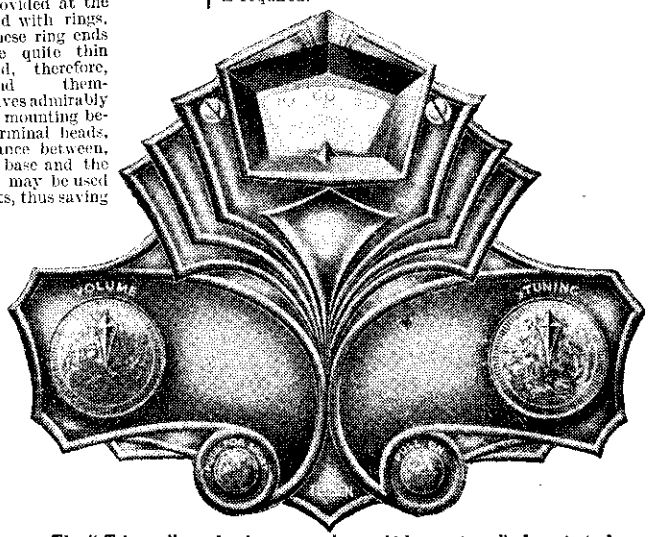
PRE-SET CONDENSERS

Pre-set condensers—sometimes known as "semi-variables," are found very useful for the experimenter. Provided the insulation is good, and the action smooth, they prove a boon in experimental "hook-ups." The Telsen Pre-set is provided with a locking ring, so that when adjusted to a suitable position, the adjusting screw may be fixed. Made in maximum capacities of .0001 to .002, these interesting components cost 1s. 6d., and are guaranteed low-loss.

H.F. CHOKES

There are two main uses for an H.F. choke in a receiver—to choke back H.F. currents for reaction purposes, and to provide a coupling impedance. For the former purpose the requirements are not, obviously, so important, and the Standard Telsen H.F. Choke will be found admirable for this purpose. An inductance of 150,000 microhenries, a D.C. resistance of 400 ohms, and a very low self-capacity, are indications of the efficiency of this choke. With a neat case enabling it to be mounted in the minimum of space, this item costs 2s., and will be found ideal for reaction purposes.

For a coupling impedance, a much higher inductance is necessary, and the Binocular Choke, with a value of 250,000 microhenries, certainly has a claim here. In addition, it is wound in binocular form, which reduces the external field and so prevents instability due to interaction. This component is obviously dearer, but is well worth the 5s. where a choke for coupling purposes is required.



The "Telornor"—a handsome escutcheon which contains all the principal controls of the usual receiver.

Hyper-sensitive!! Ultra-modern!!!

JUPITER S.G.3.

Dial marked in wavelengths! Special Separator Control!

Full size 1/- Blueprint given FREE with the TELSEN RADIOMAG No. 3.

Never before has it been possible for the ordinary home constructor to build so powerful a 3-valve receiver as the Telsen JUPITER S.G. 3! For never before has such amazing power, such tremendous range and such superlative selectivity been attained with the use of only standard components! Child's play to build, child's play to operate, it is beyond question the most *sensational home constructor set ever produced.* Yet it is not a "Kit" set, but purely a circuit design using specified components—some of which you may already have and will not therefore need to buy!

3 full size 1/- Blueprints given FREE with the new TELSEN RADIOMAG

The Telsen Radiomag No. 3 tells you how to build the very latest types of receivers—how to modernise and improve your existing set—how to rectify little faults—how to get the best out of radio in every way. Get your copy now—price 6d. of all radio dealers and newsagents.

In keeping with the highest modern practice, the Telsen JUPITER S.G.3. incorporates Ganged Condensers, Ganged Coils, a Tuning Dial calibrated in wavelengths, and Matched Output, the brilliant circuit arrangement providing for absolute control of selectivity, with entire prevention of L.F. oscillation. The revolutionary 10-1 Coupling Unit specified gives an L.F. stage gain equal to that of a *two-stage* amplifier, ensuring (in conjunction with the special low loss coils) an overall amplification never hitherto approached in any receiver of its type.

Yet you can build it yourself—in an evening—with the aid of the full size 1/- Blueprint and complete constructional details contained in the Telsen Radiomag No. 3. PRICE 6d. Get your copy NOW!

TELSEN
RADIO COMPONENTS

TELSEN RADIOMAG No. 3

ANNOUNCEMENT OF THE TELSEN ELECTRIC CO. LTD., ASTON, BIRMINGHAM

Practical Letters FROM OUR READERS

All letters intended for publication must bear the name and address of the sender, not necessarily for publication.

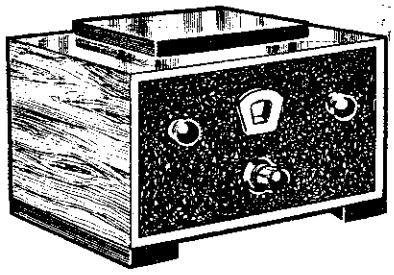
The Editor does not necessarily agree with opinions expressed by his Correspondents

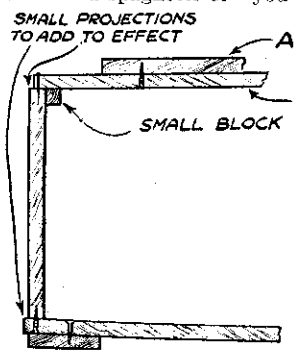
Burton-on-Trent Radio Society

SIR,—The Burton-on-Trent Amateur Radio Society, which has been formed to further the interest in radio reception in the district, hopes to cater for everyone, from the veriest beginner to the old hand. New members will be welcomed. All applications should be sent to the Hon. Secretary, W. A. Mead, G5YY, "Addiscombe," Branstone Road, Burton-on-Trent, or ring up Burton 835. The Society would also welcome lecturers from manufacturing firms. —W. A. MEAD, G5YY., Mem. R.S.G.B., Hon. Sec. (Burton-on-Trent).

An Appreciation from Camco

SIR,—If the first two issues of PRACTICAL WIRELESS are examples of forthcoming issues, then the success of this paper is undoubtedly assured. There is still a very large number of constructors who must welcome a publication such as yours, which is crammed full of good ideas, suggestions and advice, and we take this opportunity of wishing your journal every possible success.—W. J. SALAMAN, Sales Director (Carrington Manufacturing Co., Ltd.).





Diagrams illustrating letter from "Vic" (Barnstaple).

Instruction—not Sarcasm

SIR,—Please permit me to add my congratulations upon the excellence of PRACTICAL WIRELESS, and count on my being a regular subscriber.

I like your articles, which are free from sarcasm: your advice bureau is a boom; and, above all, I like the fact that your paper adheres to wireless instruction, and does not attempt to fill space with stuff which the wireless fan doesn't want.

Your chats are great, and do not give us a new circuit every week, rather tell us how to make the most of the set which took all our pocket-money to construct.—A. J. LAWRENCE (Newcastle).

The Neglected North

SIR,—I have read the current issue of PRACTICAL WIRELESS and must congratulate you on the articles contained therein.

However, to my mind, in all radio journals there appears to be neglect of the North of England and its problems, reception conditions, etc.

A "Northern Radio News" would, I am sure, be of interest.—R. BILLHAM (Dunston-on-Tyne).

Using Pentodes

SIR,—May I congratulate you on a fine effort. You have, to my idea, struck the right style: not too dull, and not too learned for the average radio enthusiast. While not exactly a novice, having been in radio since we had accumulators weighing (it seemed) a ton, I find it most refreshing in its style and have placed my regular order.

In regard to all the articles on pentode valves, perhaps my experience may interest you, if not your readers.

I have never yet seen a pentode advised in a set with two L.F. stages, as it causes overloading and instability.

Now (prepare for shocks), I have a well-known home-made set, det. and two L.F. transformer coupled stages, with a pentode in the final stage, and pick-up in the detector valve.

Granted, the volume control has to be tuned down a bit on the local, but on distant stations it is a revelation to my old power valve.

Furthermore (more shocks), I use no tapped output choke: merely an ordinary filter that I used for my power valve and a tone control of .01 fixed and spaghetti of 20,000 ohms across L.S. terminals, with a Harlie tone selector.

With 130-volts Standard No. 3 H.T. battery and a 66 R. Blue Spot, tone is nearly as pure as a moving coil, and nobody would say I was using this much-abused type of valve.

I don't say all makes of pentodes would act as satisfactorily as the make I have, but my valves (all three of them), are built different to others, I believe, and on the 'gram. I can make the ornaments rattle without any distortion.

Trusting this may interest you.—R. G. HARRISON (Newcastle).

CUT THIS OUT EACH WEEK

DO YOU KNOW?

—That an H.F. valve under-biased will result in flattened tuning.

—That long leads on the output side of a receiver can result in high-note loss.

—That ordinary vaseline applied to the terminals of an accumulator will prevent "creeping" and corrosion.

—That a tone control of modern design will enable that annoying heterodyne whistle to be suppressed.

—That if by touching a grid terminal with a moist finger a "plop" is heard, that valve is oscillating.

—That a full-size P.M.G. 100-ft. aerial has a natural wavelength of about 120 metres.

—That the reproduction from a cone loudspeaker may often by improved by painting the cone with a collodion (or cellulose) paint.

Mr. Richardson Bows!

SIR,—May I tender to you my best wishes, and thanks, for producing such a helpful weekly journal.

It is the best threepennyworth I have bought, with a free advice service, too. I wish you and staff every success in this new departure. W. B. C. Richardson's article was very good.—F. WEBSTER (Bristol).

Prison for the Editor and Staff?

SIR,—I have just finished giving No. 3 of PRACTICAL WIRELESS a preliminary "once-over," and have arrived at the following conclusions: (1) That you and your entire staff should be sent to prison for ten years, representing one year for each one of those you have withheld PRACTICAL WIRELESS from the radio-minded public. We have been waiting for such a publication for that length of time; (2) That it is the finest radio journal offered, or ever has been offered, to the public; (3) That it is worth 3s.; (4) That if the present standard of the contents is maintained, your circulation will be determinedly maintained and go on increasing and increasing. In fact, it's a stunner, and I honestly wish to congratulate you and your staff on its fine achievement.

What a wealth of information you are giving us! Hardly believable at the price! The details, the diagrams, the whys and the wherefores; do please keep it up, especially the diagrams. In short, please maintain the present standard. I won't ask you to do the impossible, and improve on it. I may add that this is the first letter I have ever sent to a paper. Again thanking you for "the goods" and such splendid reading—and diagrams.—A. G. K. SEIRER (Newport, Mon.).

A Constructor's Thanks

SIR,—Many thanks for putting a book like PRACTICAL WIRELESS on the market; it fulfils the need of every amateur like myself. With only the second number published, I, who before its advent was afraid to interfere with my set in case of causing damage, have been able with its help and diagrams to take it to pieces for cleaning and reassemble it successfully.

Wishing you every success.—G. BENNETT (Swansea, Glam.).

Radio Cabinets

SIR,—As a designer of radio cabinets, I was very interested in your article on Cabinets. Radio cabinet-making has become a special branch of the woodworking trade, and I should like to offer a few suggestions, if I may.

Enclosed is a sketch of your Fig. 8 as I should carry it out, with the "reasons why" indicated. No reflection on Mr. Richardson is intended, as his is a difficult job. It is worth noting that in Messrs. Telsen's recent competition, out of 200

(Continued on page 256)

Practical Letters from Readers

(Continued from page 255.)

designs only fifteen were considered "passable." All kinds of designers entered—an architect gained second prize, another commercial cabinet designer and myself first and third respectively. The sample cabinets even had a "bumping" test, so it is evident that radio cabinet design and construction is no "picnic" nowadays. With every good wish that your paper may successfully live up to name.—"VIC" (Barnstaple).

Congratulations and a Suggestion

SIR,—Allow me to thank you for producing an instructive weekly at a moderate price. I thank you, too, for five very useful hints which I have already put to the test. Let me here say I mostly regret that, owing to illness caused through the late war, I shall not be able to have the pleasure of constructing your sets as much as I would like to. Of the two already published I like the Long Range Express Three, and I think two of my friends will take my advice and get the kits for me to construct for them. Now for the true reason for writing you. I'm a man whose sole interest in wireless is to build sets, find their faults and rectify them. I am called out to all kinds of sets and to me it is a great pleasure when I have a stiff problem. On many occasions I have sat up all night with them.

Well, here is a hint which I hope you will not resent me giving you. My experience is this, that there are thousands of people who have not got sets, but would like to own one. They are beaten by the *technical terms* and *technical circuit diagrams*. What they want is plain English and actual drawings of components with point-to-point connections. These are the thousands who are waiting to be educated as regards the ins-and-outs of wireless. I hope you will take them under your wing, as the editor of a new wireless paper, and become their wireless father, giving them plain advice and instructions. You will be helping these people twofold: first, you will be educating them, and, secondly, by giving them something they can understand, you will be keeping them clear of the few wireless sharks who make money out of the people's lack of knowledge.

Here's your chance. Keep to simple instructions in plain English, and I can see your paper having a huge circulation.—JOHN E. DEWS (Wakefield).

Radio Fads and Fallacies

SIR,—Most of the wireless set designers of to-day take it for granted that their readers are possessed of unlimited pocket-money, and can go on spending it on the newest gadgets that are put on the market. I have written on several occasions to these people protesting, and when I bought your first number, I hoped that perhaps a new paper would recognize this fallacy, and would at least reserve a page or two for those—the enormous majority of possible readers—who can *not* afford to spend money on the latest thing in coils or tuning units, etc. But here is your contributor, Mr. W. B. C. Richardson, with the air of a millionaire, gaily writing: "Another silly fad is that of saving obsolete apparatus—with the idea that they might come in useful. Throw them away—it is only a sign of meanness." For my part, I suggest to your readers that the silliness consists in throwing such "junk" away, and that it is quite possible to utilize even broken transformers and faulty variable condensers, and those old coils that were wound so carefully years ago; and I would urge that some of your experts would be adding enormously to your readers' interest if they would tell us how to make use of this accumulation of odds and ends, the debris of many years' experiments. It is absurd to suppose that no use can be made of this material. I have, for example, a little model "water-mill," the inside of which consists only of junk, which serves an invalid as a one-valve set. I know of a "birdcage" set, which hangs in the window, and looks like a birdcage—canaries and all. It works a loud-speaker on high or low wavelengths, and, again, its parts are only discarded "junk." I have seen, also, an "occasional" table in a lady's drawing-room (that is all that it appears to be on the surface); but it is really a three-valve loud-speaker set—again made of very ancient components. I believe that if you were to publish a series of articles on "What to do with your Junk," you would be filling a gap, and responding to a very real question which looms large in the minds of many of the amateur experimenters of the present day.—S. N. SEDGWICK (Liss, Hants).

A Few More Suggestions

SIR,—I would like to thank you very much for the first two copies of PRACTICAL WIRELESS. As a wireless enthusiast of several years standing, I would like to make one or two suggestions which I hope will be useful to you:

1. When reviewing new apparatus, do not forget to give figures. Adverts. tell us that everything is the best, but very few give figures to prove this.

2. May I suggest that a page weekly be used for "How to Make" chokes, transformers, home accumulator chargers, and, above all, a variable cut-off, heterodyne whistle filter.

3. Do not forget that a home constructor hasn't two or three pounds to spend on band-pass tuning, so let us have something different sometimes.

4. I think lots of people would welcome an article on the following: The exact performance of a set and speaker built in the same small cabinet one sees to-day, and the same set and speaker built into separate cabinets of respectable size. The thickness of material used to be taken into account for speaker.—C. P. HOPKIN (Peterborough).

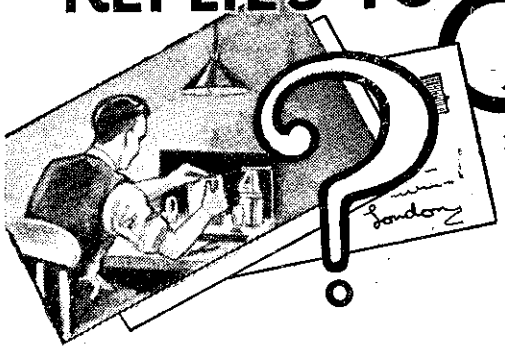
A Cure for Feed-back

SIR,—I am a wireless amateur of about ten years standing and must congratulate you on your new paper, PRACTICAL WIRELESS; not only are there plenty of articles and advice, but they are really useful and helpful. I shall certainly continue to take your paper.

Here is a hint for your readers: Sometimes when fitting a new coil, or especially a new detector valve, the set oscillates with the reaction condenser only in a few degrees. Thus, with the vanes all out, the feed-back is too much on loud signals. The cure is a small fixed condenser, about .0001, in series with the moving vanes of the reaction condenser and the plate of the valve. This lowers the condenser short circuit if the condenser vanes should happen to touch.—ERIC BASILIO (West Hove).

LET OUR TECHNICAL STAFF SOLVE YOUR PROBLEMS

REPLIES TO QUERIES and ENQUIRIES by Our Technical Staff



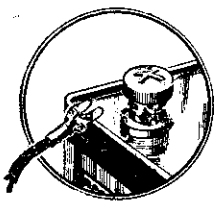
The coupon on page 260 must be attached to every query.

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

SIZE OF FILAMENT FUSE

"I wish to fit a fuse in my battery-driven receiver to safeguard the valves from being burnt-out in the event of a short from the H.T. What size must this fuse be?"—(H. K. B. C., Bristol).

In the majority of receivers the filaments are wired in parallel, and you must therefore add together the filament current of each valve. You should then choose a fuse with a rating just lower than this figure—remembering that 100 m/A is the same as .1 amps.



Faulty or corroded battery connections will have a considerable effect on the reception of the set.

CORRODED CONNECTIONS

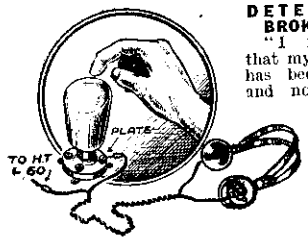
"I have noticed that the spade terminal attached to my accumulator gets covered with a green crystal deposit. Is there anything wrong with my accumulator, or is this the normal effect of working?"—(R. S. T., Heston).

The corrosion is a natural outcome of the effect of the accumulator acid on copper. It is, however, a thing which should be avoided, as it results in weakened reception. Thoroughly clean your spade-end, and the terminal, and then, after tightening the terminal on the spade, smear it all over with vaseline. A lead connection, in place of the copper, will avoid this corrosion difficulty.

PORTABLE LICENCE

"I have just purchased a portable receiver. Do I have to buy a licence for this set? I might mention that I already have a five-valve set for which I have a licence."

The Licensee, L. V. (Tynemouth), is permitted to use any number of receivers at the address mentioned on the licence, but not elsewhere. As a concession, one portable set may also be used under that licence, at an address other than that given on the licence, but this concession is for the convenience of the licensee on holidays, week-end car trips, etc.



To test the detector valve, disconnect the wire from the valveholder terminal lettered A or P, and connect one lead from a pair of headphones to the terminal, and the other lead to H.T. positive 60. Tap the valve with your finger and you should hear a ringing noise in the phones.

DETECTOR-VALVE BROKEN

"I rather fancy that my detector valve has become damaged, and not being lucky enough to have any test meters I wonder if you could tell me any easy way of testing whether it is broken?"—(P. M., Kneller-Hall).

The simplest test is illustrated here. Join a pair of 'phones in the Plate circuit, and tap the glass bulb gently with your finger-tip. A ringing noise will be indicative of the fact that the valve filament is unbroken.

S.G. VALVES

"I have noticed that the two sets you have so far published employing screen-grid valves, do not employ the usual vertical screen with the valve pushed through it. Is this method not necessary nowadays?"—(A. R. T., Peckham).

The valves employed in our two sets were metallized, and this metal coating acts as quite a good screen *when it is earthed*. Certain types of S.G. valve are so efficient that complete separation of the anode and grid circuits is essential if stability is to be maintained. Careful design and choice of components will, however, enable a stable receiver to be constructed without the vertical screen arrangement.

H.T. CONDENSERS

"I have just had a set built up for me, and am rather puzzled by a peculiar effect. When I have finished listening-in, I switch the set off and can hear the switch click, but the signals keep on for a second or so and then fade out. Does this mean that there's a leak somewhere?"—(W. J., Hoxton).

The phenomenon you refer to indicates that your set is probably well constructed. Across the H.T. tappings you will no doubt find large capacity fixed condensers, and when these are of good quality they store up the current, and then when you switch off they discharge this "store," giving rise to the effect you refer to.

LONG-WAVE WINDING

"Why is it that the long-wave section of a coil is invariably wound in sections instead of in a single bank? I appreciate the fact that it could not be wound in solenoid fashion, but is there any reason why one good pile winding would not do?"—(F. T. P., Balham).

The reason is that a coil has to possess inductance and capacity in certain proportions if it is to be efficient. The inductance is decided by the amount of wire, and the capacity results from the effect between adjacent turns of wire. By splitting the coil up into a number of small sections we reduce the over-all capacity, and therefore, preserve the efficiency.

PRACTICAL WIRELESS DATA SHEET No. 5

TUNING COIL DATA

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

Outside diameter of former.	Wire gauge.	No. of Turns.	Length of Winding.	Inductance value (microhenries).
1.5"	28 D.C.C.	94	2.25	175
1.5"	30 D.S.C.	82	1.25	200
2.0"	28 D.S.C.	58	1.01	175
2.0"	28 D.S.C.	64	1.15	200
2.5"	24 D.S.C.	58	1.85	175
2.5"	24 D.S.C.	64	2.05	200
3.0"	22 D.C.C.	50	1.9	175
3.0"	22 D.C.C.	55	2.09	200

With a .0005 mfd. Tuning Condenser the 175 microhenry coil will cover a band of approx. 200 to 555 metres, and the 200 microhenry coil a range of 250 to 600 metres.

INTERFERING HUM

"I am troubled by bad hum from my mains set, which can be cured by disconnecting the aerial. A small indoor aerial works O.K., but does not give any range. Can the aerial pick up hum, and, if so, how can I remedy it?"—(A. P. P., Blackpool).

As the aerial certainly seems to help in picking up the hum it would seem that some outside source is responsible for this trouble. Therefore, make sure that your aerial does not run parallel with any conductor of A.C.; house lighting wires, tramway overhead wires, etc. You should also enquire whether any machinery is in use near you which would cause the interference. In the latter case you should get into touch with the owners of the apparatus, and if they are unwilling or unable to reduce the interference, write to the B.B.C.

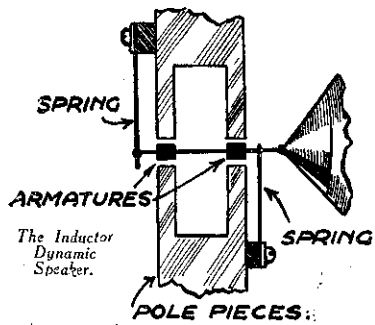
SPEAKER FOR SMOOTHING

"I have been given to understand that a moving coil type of loud-speaker may be used in an eliminator instead of the ordinary smoothing choke. As I am building an eliminator, and at the same time wish to purchase a moving coil speaker, I should like some information on this arrangement."—(F. J. P., Windermere).

To enable you to use the field winding of a loud-speaker for smoothing purposes, you must first of all choose a mains transformer and rectifying valve which will deliver a voltage much in excess of that required for your valves. The speaker must then be of the D.C. type, designed for this special purpose, which means that the resistance must be very high. The voltage dropped across the field will, of course, leave you with the normal mains output voltage. Suitable values are—mains transformer and valve to deliver 350 volts—speaker field resistance, 2,000 ohms.

INDUCTOR LOUD-SPEAKER

"I have seen a number of advertisements lately referring to a loud-speaker called an 'Inductor Dynamic.' I know how the ordinary reed and balanced armature speakers are constructed, but I am afraid I am not aware of the features of this arrangement. Could you explain the idea to me?"—(R. S., Brighton).



The Inductor Dynamic Speaker.

The illustration above should explain the principal points of the Inductor type of speaker. As will be seen, the reed supporting the cone is attached to two thin springs, held at opposite ends, and supported between two pole pieces. As the springs are held at opposite ends they may be very thin, and furthermore, the movement of the rod will be strictly horizontal. This results in a real "piston" movement, and it is claimed that the overall response is improved.

DEFECTIVE VALVE-HOLDER

"I recently took out the grid leak from my detector stage, with a view to substituting one of a different value. Imagine my surprise to find that it made no difference to reception, as signals came through all the time with no difference. Does this mean that there is anything wrong with the valve, or some other component?"—(S. A. V., Belsize Park).

Theoretically, the valve should not work without a grid leak, but actually this state of affairs does not exist. The most likely trouble is an inferior valve holder, which permits of a leak between the grid and positive filament socket. This of course, acts in the same manner as an orthodox grid leak, and permits the valve to function.

GRAMOPHONE SWITCHING

"I have seen several notes and circuits in your issues, but cannot understand the theoretical diagrams.

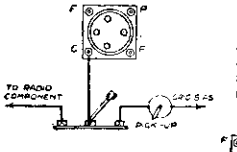
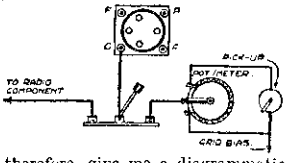


Diagram showing switching arrangement for pick-up without volume control.

Switching arrangement for pick-up with volume control.



Could you please, therefore, give me a diagrammatic drawing of the switching arrangement for a gramophone pick-up?"—(S. V. T., Hastings).

The two sketches above show the method of arranging a switch to connect a pick-up to the grid of a valve.

(Continued on page 260.)

Queries and Enquiries

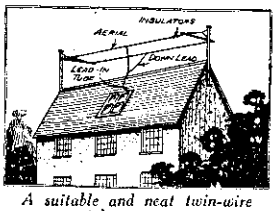
(Continued from page 258.)

One illustration shows the connection for a pick-up without volume control, and the other with such control. The radio component referred to in the sketches is the grid condenser, or the L.F. transformer. This will depend, of course, upon whether it is the detector-grid circuit or L.F. circuit.

AERIAL ARRANGEMENTS

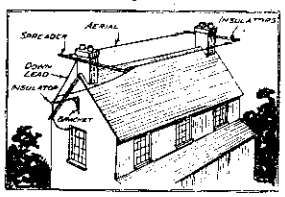
"I am unfortunate in not having any garden in which to erect an aerial. Could you suggest any other outdoor arrangement which I could build up so as to get results which would be better than an indoor aerial?"—(F. S., Barking).

There are two good methods which you could employ, and they are both illustrated (right). Where a chimney-stack is available at each end of the roof, poles may be fixed across to support two horizontal wires, spaced 4 or 5ft. apart. The wires at one end are joined together and taken down to the receiver. Vertical poles may be used in place of the chimney-stacks, and leads may be taken from the centre of the aerial if that course is more convenient.



A suitable and neat twin-wire aerial arrangement.

Another twin-wire aerial arrangement.



SAFETY FUSE

"I have fitted a safety fuse to my battery receiver, as shown on the attached sketch. I can, however, get no signals. Have I put the fuse in the right place?"—S. T. P., Leeds).

You have inserted the fuse in series with a filament wire, and this is not the correct position. The fuse should be inserted in the short lead which connects H.T. and L.T., and the wire to the filaments should be taken from the side of the fuse which is joined to the L.T. terminal.

SHORT-WAVE DIFFICULTY

"I have made up a short-wave set, using home-made plug-in coils with a slow-motion .0005 tuning condenser and a .0003 reaction condenser. So far I have not been able to get a single station, so I send you the circuit herewith and should be glad to receive any hints."—(B. P., Hythe).

A tuning condenser of the size you are using is much too large, even with a slow-motion dial. The largest condenser you should attempt to use is .0002, while best results will be obtained with a maximum value of .0001.

DUAL RANGE COIL

"Is it possible to make up a dual range coil at home? If so, could you give me details such as gauge of wire, number of turns, etc.?"—(G. M., Harrow).

An efficient dual range coil may easily be constructed at home, and full details of such a coil were given on page 13 of the Free Gift Book given away with No. 2 of PRACTICAL WIRELESS.

LONG RANGE EXPRESS

"In the blue print of the Long Range Express you show a lead marked 'To Fixed Plates of Aerial Tuning Condr.' with a note that this is braided flex earthed to chassis. I cannot understand either how you can earth braid, or if this is not what you mean, why you should earth the flex from the grid. Perhaps you can explain all this."—(M. D., Prestwych).

The braided flex is a length of ordinary flex covered with a metallic braid. The two ends of a length of this lead are bared, one end joined to the grid terminal of V1, and the other end to the fixed plates of the first condenser. The *covering* is then earthed by means of a clip attached to the metal chassis.

THERMAL SWITCH

"What is meant by a Thermo Delaying Switch, which I have seen advertised recently?"

You have got the term rather mixed. The switch is a delay-action switch working on a thermal action. It consists of a thin wire wound round, or in close proximity to, a bi-metal strip. When a current of a certain value passes through this small winding it heats up. At a certain determined temperature the bi-metal strip distorts or bends, and this is arranged so that this makes a contact and so completes a circuit. The switch is employed in mains operated sets to complete the H.T. circuit, only after the heaters have reached maximum temperature.

FREE ADVICE BUREAU
COUPON

This coupon is available until Oct. 29th, 1932, and must be attached to all letters containing queries.

PRACTICAL WIRELESS, 22/10/32.

The Heart of Your Set

(Continued from page 236.)

How to Select the Valve for the Output Stage

The choice of an output valve must be considered with reference to two main points—the volume of sound required (always assuming that the speaker is capable of giving that volume when correctly driven) and the design of the previous stages of the receiver. For moderate volume in a receiver where, owing to small input or restricted amplification, only a small grid swing is available for the output valve, a "power" type valve must be chosen. If greater volume is required a pentode must be used. In all receivers having one or more previous stages of amplification, a super-power triode capable of handling without distortion the big grid swings available should be selected, or a pentode can be employed providing the receiver incorporates some form of volume control so that overloading of the pentode can be avoided by reducing the grid input when necessary.

Of several triode output valves, all of which are capable of handling the signals with which they will be called upon to deal, those having the lowest impedance and the highest amplification factor will give the greatest output, the value of the mutual conductance or factor of goodness being the final deciding factor.

Decision in the case of a pentode again, must be made on a comparison of the mutual conductances of the available alternatives. In some cases, however, it may be necessary to take into consideration the battery consumption of the valve, and in the interests of economy in battery power, a valve taking a smaller anode current may have to be employed in preference to a more efficient valve requiring a somewhat larger H.T. consumption.

Detector Valves

There is a much smaller range of choice of detector valves than of valves for amplification and power output. In the first place, for all ordinary purposes, the only class of valve that can be used for detection is the triode. It is possible to employ both screened grid and pentode valves as detectors, but the circuits are not well known at the moment, and are seldom met with in commercially built sets. Moreover, British valve makers appear to be standardising on fewer types of detector valve—in fact, the special detector seems to be disappearing from the catalogues of many makers, and the so-called "general purpose" triode, suitable for both detection and low frequency amplification, is coming into its own again. For use as a normal leaky-grid detector, the "H.L." type has proved most satisfactory when followed by transformer coupling, or for an R.C. coupled detector when the anode resistance is of medium value, say, below 100,000 ohms. A valve of this type should, therefore, be chosen in sets employing no high frequency amplifier before the detector stage, unless a very high resistance R.C. coupling is used, when an "H" type, high amplification, high impedance valve will probably give better results.

AMAZING DISCOVERY

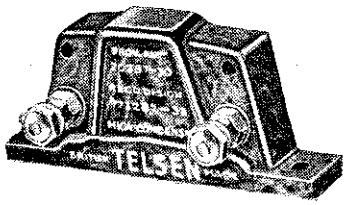
98% RADIO SETS "DOWN" IN EFFICIENCY THROUGH FAULTY GRID LEAKS OR MICA CONDENSERS!

A RECENT analysis of Kit sets and Home Constructor Receivers reveals the astounding fact that 98% were considerably 'down' in efficiency through faulty Grid Leaks or Mica Condensers. These tests were carried out by one of the foremost Radio Engineers in the Country on sets which the owners thought were working satisfactorily.

The above facts were brought to the notice of TELSEN Engineers who immediately commenced intensive research and experimental work to discover the causes. Every known make of Grid Leak and Mica Condenser was tested and examined in conjunction with all types of Receivers.

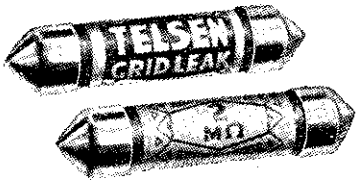
Invaluable information and new data were obtained from these investigations among which were startling revelations concerning the rapid deterioration and consequent loss of efficiency in these components.

The new TELSEN Grid Leaks and Mica Condensers are the direct outcome of this amazing discovery. They have been designed on entirely new lines and embody the new



TELSEN FIXED MICA CONDENSER
(Shown with Grid Leak Clips removed).

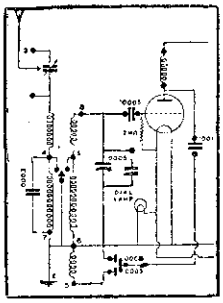
principles formulated by the Telsen Radio Engineers to overcome the numerous faults



Two views of the TELSEN GRID LEAK.

disclosed and to attain permanent efficiency.

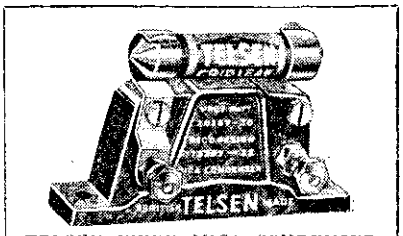
TRY THIS SIMPLE TEST



Tune in a station at the top of the medium wavelength band—say the Northern Regional. Note the signal level. Now connect a Telsen Mica Condenser (up to .0005 mfd. in value) across the aerial tuning condenser. Decrease the value of the tuning condenser until the same station is heard, and it will be found that the signal strength is equal to that previously obtained, proving that the Telsen Mica Condenser has an efficiency comparable with that of the variable air condenser, the most efficient type of condenser used in radio broadcast reception.

The new TELSEN Grid Leaks and Mica Condensers set a world's standard in lasting efficiency.

IT'S THE 'LASTING EFFICIENCY' THAT COUNTS



TELSEN FIXED MICA CONDENSER.
(Complete with Grid Leak Clips & Grid Leak)

WE HEAR

That well over a quarter of a million radio components are produced *every day* in the new Telsen Works (the largest and best equipped radio organisation in the world, employing in the neighbourhood of 8,000 workpeople)—and that even this record output is only barely sufficient to meet the enormous and still rapidly increasing demand for these popularly priced quality components.

★ ★ ★

That enormous numbers of home constructors are fitting the new Telsen Drum Drive and Ganged Condenser Assembly, whose single knob operated tuning scale, calibrated in actual wavelengths, makes station logging literally as easy as A.B.C.

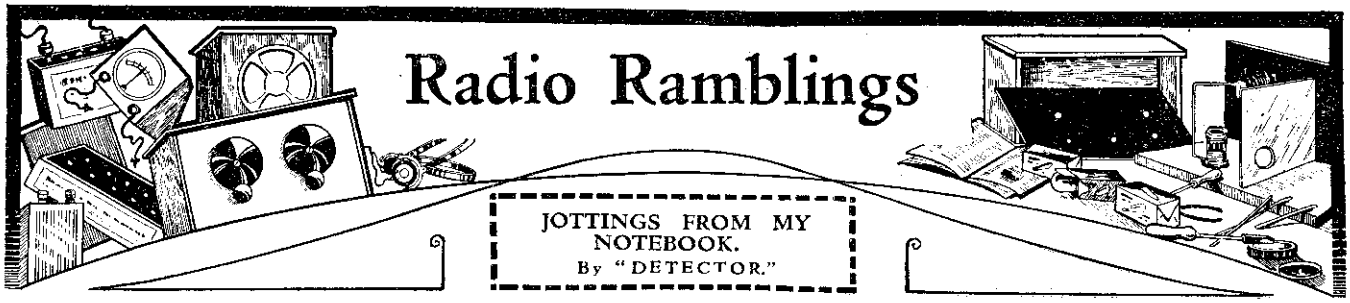
★ ★ ★

That the new Telsen Telornor (illuminated variable ratio slow-motion Disc Drive, whose handsome silver oxidised escutcheon plate permits of the very effective grouping of all controls) gives home-built sets the dignity and beauty of line of expensive commercial radio receivers.

★ ★ ★

That home constructors everywhere are thrilled with the performance of the sensational new Telsen JUPITER S.G.3 and AJAX 3 receivers, and that free 1/- blueprints and constructional details of these amazing sets are given with the Telsen Radiomag No. 3, price 6d.

Announcement of The Telsen Electric Co., Ltd.



Radio Ramblings

JOTTINGS FROM MY NOTEBOOK.
By "DETECTOR."

The Earth Connection

I HAVE recently run up against what appears to be almost an epidemic—of inefficient earth leads. In most cases the earth has looked O.K., but the set has given trouble due to low-frequency oscillation or some similar fault suggestive of an unsatisfactory earth connection. (The way to test an earth, by the way, is to touch the earth terminal of the set with a moistened finger; if this affects reception in any way the earth lead is failing to do its proper job.) In nearly every instance of a faulty earth the trouble can be traced to a corroded contact between the wire and buried plate, or water pipe, as the case may be. The cure is thoroughly to clean, and re-make the contact either by soldering or by tightly binding round the wire and then to *cover the joint* with a good coat of paint or varnish. This covering will protect the joint from further corrosion for two or three years at least.

Loud-speaker Demonstrations

I WONDER why so many radio dealers will persist in giving perpetual loud-speaker demonstrations (?) in their shops. I went into a shop recently and the noise was so great that I was obliged to shout at the top of my voice to make known my requirements. Hoping to take a rise out of the manager, I mentioned the fact that it was now contrary to regulations to use broadcast transmissions for public demonstration purposes, but he quickly reassured me that he was using gramophone records and was consequently well within the law. It is a pity that something cannot be done to stop this nuisance, for it is bound to have a bad influence on the radio trade. The trouble is that most dealers endeavour to obtain the greatest possible volume from an ordinary three- or four-valve set and a small moving-coil speaker. As a result, both set and speaker are grossly overloaded, so that good reproduction is absolutely impossible. If dealers really must give these demonstrations and "shout down" all competitors, why don't they buy or make a proper amplifier and speaker capable of giving a decent output? This would at least ensure that reproduction bore some resemblance to the original, even though it were sufficient to deafen customers—"and the dealers themselves," I almost added—but they seem to be quite immune from aural troubles. They must be, or they could never live through the continual din.

Metallized Resistances

I AM very fond of those little metallized resistances which were first brought on to the market last autumn. They are compact, non-inductive, and obtainable in a variety of power-ratings. If you ever manage to break one you will find that the resistance element resembles the lead of an ordinary pencil and passes through the centre of the otherwise solid porcelain rod. The ends of the resistance element are connected to metal end caps like those of the usual grid-leak. These resistances can thus be used by fitting them in an ordinary grid-leak holder, but they possess the added advantage of having a short connecting wire projecting from each cap. In most cases it is possible to attach them directly to the set by means of the connecting wires, but it is sometimes found that the wires are not long enough to reach the appropriate terminals. It then becomes necessary to extend the wires by some means or other. The most obvious is to solder longer pieces of wire to them; but I prefer another method. I fit a small terminal to the wire and connect up to this in the usual way. This method simplifies the changing of one resistance for another of different value when experimenting. (See Fig. 1).

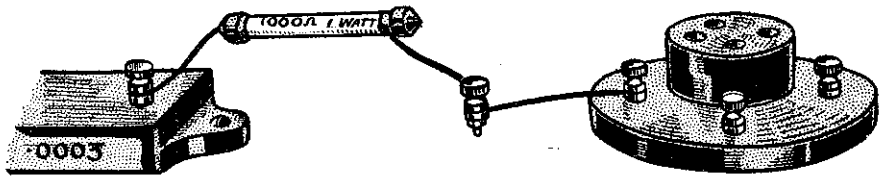


Fig. 1.—Using an extension lead to facilitate the connection of wire-end resistances.

Power Rating of Resistances

YOU have noticed that most of the resistances used for wireless purposes are now sold in a variety of power ratings from 1 to 10 watts, and have perhaps wondered exactly what these figures are intended to convey. As the resistances of lower rating are cheaper, it is customary to use the lowest which is sufficient for the required purpose. The power consumption (in watts) can always be obtained from the formula:—

$W = C^2R$

where C is the current in *amperes* and R the resistance in ohms. When choosing a resistance, though, it is wise to allow a safety factor of 20 per cent. or so.

By way of example, let us suppose that a 500 ohm bias resistance is required for an A.C. power valve having an anode current consumption of 50 milliamps (.05 amp.). The power taken by the resistance will be $.05^2$ multiplied by 500, or .0025 times 500, which is 1.25 watts. Adding to this a 20 per cent. safety factor we find that a suitable resistance should have a power rating of not less than 1.5 watts. As another example, we will suppose that a 50,000 ohm resistance is required for decoupling the anode circuit of a detector valve taking 1 milliamp (.001 amp.). The power dissipation of the resistance will now be $.001^2$ times 50,000, or .05 watt, so a 1 watt component (the lowest rating generally made) would be more than sufficient.

Another Cause of Mains Hum

IT would be impossible to give a list of all the things which might cause hum in a mains set, for one is continually running up against new ones. The method of treatment also varies in almost every case. Whilst testing a well-known make of commercial four-valve A.C. set recently, I was amazed to find that the hum was so bad as to make reception of even strong stations most unpleasant. I had recently used a similar set with every satisfaction, and knew that the mains supply was not unduly "rough." Valves, speaker, and sundry other things were suspected, but no fault could be found. Eventually the back of the cabinet was removed to gain access to the "works," and the cause of trouble was at once apparent. This particular set was fitted with a very long length of flex to connect up with a distant wall plug, but the owner had recently moved the set on to a table nearer to the plug. To avoid cutting off a length of the connecting flex, the latter had been coiled up and tucked away inside the set. It so happened that the coil was quite near to an L.F. transformer and induction was responsible for the hum finding its way into the transformer windings. (See Fig. 2.)

(*Continued on page 263.*)

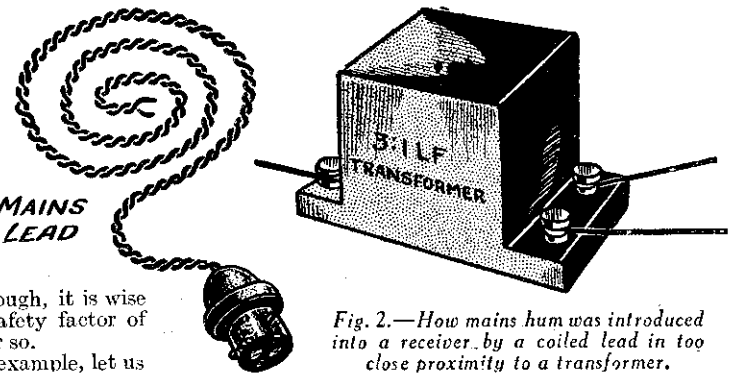


Fig. 2.—How mains hum was introduced into a receiver by a coiled lead in too close proximity to a transformer.

Radio Ramblings

(*Continued from page 262.*)

Safety Fuses

I HAVE often been rather surprised to find that apparently experienced amateurs did not know where to fit a safety fuse in a set. Now, the object of the fuse is to allow sufficient anode current to flow to the valves, but to prevent the flow of any current high enough to burn out the valve filaments in case of an accidental short circuit or wrong connection. It is fairly obvious then that the fuse should be fitted between the high-tension battery and the low-tension supply. Actually it could be fitted in either the positive or negative high-tension lead, but it is generally inserted between H.T. and L.T. The simplest way to fit a fuse to a set not so equipped is to employ one of those combined with a battery wander plug. It is then only necessary to replace the negative H.T. wander plug by the combined plug and fuse. This type of fuse has the further advantage of being readily accessible. (See Fig. 3.)

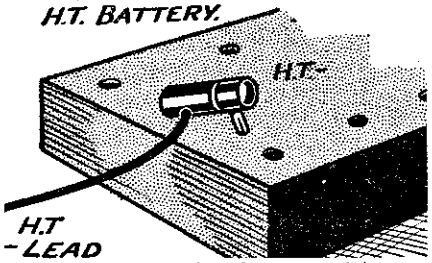


Fig. 3.—The Belling-Lee type of fuse.

Break Through and How to Cure It

(*Continued from page 219.*)

happens that when reducing the setting of such a condenser a point is reached where break-through occurs. This is because the natural wavelength of the primary circuit, which in the particular coil used would normally be well above the break-through range, is lowered sufficiently to bring it into the danger zone. Obviously, this cannot occur with the second method since the natural wavelength of the primary circuit is already below the medium-wave band, and the reducing of the condenser setting would only tend to lower it still further. Where, however, trouble of this sort does arise the only cure is to increase the setting of the series aerial condenser and make up for the reduced selectivity by decreasing the coupling between the primary and secondary circuits. If the coil is a home-made one, this can easily be arranged, either by reducing the number of turns in the tapped portion C, in the case of Fig. 4, or by placing the windings C and D farther apart, in the case of Fig. 5.

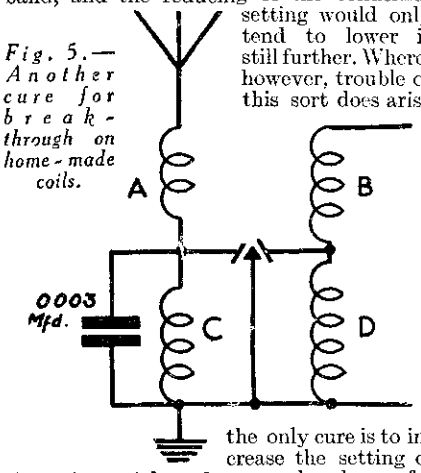


Fig. 5.—Another cure for break-through on home-made coils.

CATALOGUES RECEIVED

To save readers trouble, we undertake to send on catalogues of any of our advertisers. Merely state the names of the firms from whom you require catalogues, and address it to "Catalogue," PRACTICAL WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton St., Strand, London, W.C.2. Where advertisers make a charge, or require postage, this must be enclosed.

B AND-PASS COILS

CONSTRUCTORS using band-pass tuning will find the latest British General list of particular interest. A new device listed consists of brackets which enable a pair of ordinary condensers to be coupled up efficiently. A new range of B.G. filter coils are in three types, the first being a band-pass aerial coil, the second, a band-pass H.F. coil, and the third a screened H.F. coil designed to match with either of the other two. The aerial band-pass filter is a mixed-coupled filter in which great attention has been paid to compactness without sacrificing efficiency. Other components included in this list are dual-wave coils suitable for ganging, transformers and H.F. chokes.

LOEWE RADIO COMPONENTS

ALTHOUGH noted principally for their vacuum type resistances, the Loewe Radio Company also manufacture a number of other lines, and their new catalogue, just received, gives a number of interesting examples. Paper condensers—with details of the various tests to which they are subjected; valves, both of the multiple type, and rectifying valves; receiver chassis; gramophone pick-up; volume control; loud-speaker and loud-speaker chassis, are well illustrated, and copious details are given. It is explained that the majority of the components are protected by Letters Patent.

"UTILITY" COMPONENTS

PARTICULARS of a fine range of "Utility" steel-ganged condensers is given in the new season's catalogue of Wilkins and Wright, Ltd. The chassis is built of heavy gauge steel, and the spindles run in ball bearings of ample size which ensure smooth action. All ganged condensers are matched to less than one-half per cent. For super-het. sets a model is supplied which incorporates a specially-designed section for tuning the oscillator circuit. These condensers are obtainable in the two, three or four-gang type. Other high-class components shown in the list include a new straight-line dial, anti-capacity switches, drum dials and the "Utility" Micro-Dial with a ratio of 100 to 1. This dial, with its fine vernier adjustment and smooth action is specially suitable for short-wave tuning.

Broadcast Query Corner

UNDER the above title, with the assistance of a recognised authority on foreign broadcasting matters and a regular contributor to wireless publications both at home and abroad, we are inaugurating a special Identification Service, which should prove of great assistance to our readers. When tuning in well-known stations it happens frequently that listeners pick up wireless transmissions of which they fail to recognize the origin. It is to solve these little problems that the *Broadcast Query Service* has been organised.

In order that a careful search may be made it is essential that certain data should be supplied to the best of the inquirer's ability and knowledge. When sending such queries to the Editor the following rules should be followed:—

1. Write *legibly*, in ink. Give your full name and address.

2. State type of receiver used, and whether transmission was heard on headphones or on loud-speaker.

3. State approximate wavelength or frequency to which receiver was tuned, or, alternatively, state *between* which two stations (of which you have the condenser readings) the transmission was picked up.

4. Give date and time when broadcast was heard. Do not forget to add whether *a.m.* or *p.m.*

5. Give details of programme received, and, if you can, some indication regarding the language, if heard.

6. State whether and what call was given and/or kind of interval signal (metronome, musical box, bells, etc.) between items.

7. To facilitate publication of replies, append a *nom-de-plume* to your inquiry.

Although the service is mainly applicable to broadcasting stations, wherever possible replies will be given in regard to morse transmitters (commercial stations, fog beacons, etc.) and short-wave broadcasts. For the identification, however, of stations operating on channels *below* 100 metres it will be evident to inquirers that a closer estimate of wavelength must be submitted than in the case of broadcasts on the medium or long waveband if successful identification is to be carried out.

All inquiries should be addressed to *The Editor*, PRACTICAL WIRELESS, 8-11, *Southampton Street, Strand, London, W.C.2*, and the envelope marked *Broadcast Query Service*, in top left-hand corner. Stamped addressed envelope should *not* be enclosed, as replies cannot be sent by post, but will be published in due course in each issue of PRACTICAL WIRELESS.

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