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Practical Wireless

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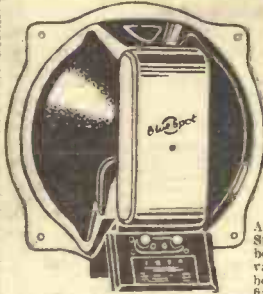
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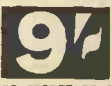
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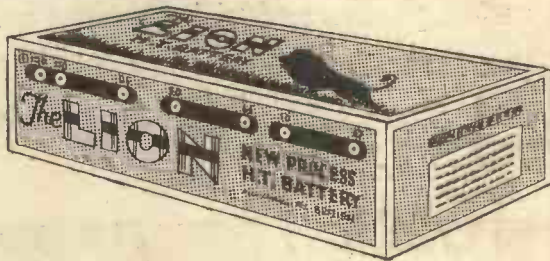
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Mazda Radio Valves are manufactured in Great Britain for The British Thomson-Houston Co. Ltd., London and Rugby.

RECOMMENDED BY ALL GOOD RADIO DEALERS



EDITOR:
 Vol. II, No. 30 || F. J. CAMM || April 15th, 1933
 Technical Staff:
 H. J. Barton Chapple, Wh. Sch., B.Sc., (Hons.), A.M.I.E.E.
 W. J. Délaney, Frank Preston, F.R.A., W. B. Richardson.

ROUND *the* WORLD of WIRELESS

Ventriloquial Announcements

WHEN listening to Radio Barcelona (E.A.J.), you may have heard, at intervals, what appeared to be a dialogue between two men. This cross-talk is mimicked by the announcer, José Trorés, a skilled ventriloquist, who in these announcements incorporates a number of publicity "puffs." They are a regular and popular feature of the Barcelona studio.

Three Interval Signals

BEROMÜNSTER (Switzerland) on 459.4m. is a station heard by most radio fans. It takes its programmes from Berne, Zurich and Basle. In each instance the city which provides the entertainment is mentioned by the announcer, and each individual studio possesses its own interval signal—a musical-box melody. Try to memorize these tunes, as if you miss the announcements they will assist you in identifying the origin of the broadcast.

B.B.C. Statistics

OF the ten shillings paid by listeners to the Postmaster-General, during 1932, the B.B.C. as its share received 4s. 7d. In all the net annual revenue, totalling £1,628,738 showed an increase of £203,388, of which extra licences represented £127,421. In 1932-33, the B.B.C. made a return grant of £150,000 to the Exchequer. During 1932, £663,424 was spent on wireless entertainments, or £5,489 more than during the previous year. Considerable credit is due to the engineering side of the concern in view of the fact that of 59,547 broadcasting hours from the B.B.C. transmitters the total time lost through technical hitches was only 17 hours and 46 minutes. Taking the share of the licence money allotted to the B.B.C. into consideration, a rough calculation shows that the cost of the home entertainments, to the average broadcast listener, is about one penny per week! Proving without doubt that wireless is the cheapest form of entertainment.

A Sequel to the Madrid Conference

THE delegates of the postal and telegraphic administrations of all States interested in broadcasting will meet at Lucerne (Switzerland) on Monday, May 15th, to formulate a new plan of

European wavelengths. Their decisions will be based on the proposals discussed and passed at the last Madrid Conference.

America's Sponsored Broadcasts

THE National Broadcasting Company and the Columbia System have come to an agreement in respect to certain characteristics of the publicity entertainments transmitted over their individual networks. The prices of commodities advertised in these programmes are permissible so long as they are only mentioned

They emanate from Istanbul (Constantinople) on 1,200 metres. The announcer (Tanburi Djemie Bey) gives out the call in both Turkish and French, namely, *Allo, Allo, boucari Istanbul telsiz telefonou (Ici Radio Istanbul)*. You may sometimes identify the transmission by its repeated strokes on a gong, at intervals between items. Oriental music is broadcast in the early evening hours, a Western European concert and news bulletin following later.

Russian Press News Broadcasters

FOR the supply of official news bulletins to the provincial newspapers, the Soviet authorities, until the short-wave wireless stations are completed, are making nightly use of the high-power broadcasters at Moscow and Leningrad. At the conclusion of the day's programmes, you may hear these stations calling distant cities such as Samara, Sverdlovsk, Kiev, Samarkand, Vladikav Kaz and so on. There then follows a slow dictation of official news paragraphs, the word *Stotka* (comma) appearing at frequent intervals. Russian newspapers are not allowed to print any news other than that supplied through Government sources!

German Political Broadcasts

UP to the present, considerable use has been made in Germany of gramophone records for the rebroadcast during more convenient hours of topical events, and political speeches were re-transmitted to listeners in the same manner. With the advent of the Hitler administration, however, programmes are now interrupted for the inclusion, at any moment, of Government pronouncements. As all transmitters can be linked up with Berlin, a simultaneous broadcast is carried out at a moment's notice. The compiling of local programmes has thus been made increasingly difficult for the organisers as the day's entertainments have to be re-arranged at the "eleventh hour" to fit in with State requirements.

IN THIS ISSUE:

**BUILDING THE BETA
 UNIVERSAL FOUR
 THE A.C. TWIN
 THE SUPERSONIC SIX
 FRAME AERIALS
 A HANDYMAN'S TESTER
 A TWO-POINT AERIAL
 SYSTEM
 A SIMPLE REMOTE
 CONTROL**

once in a fifteen-minute broadcast. It has also been agreed that in such transmissions the representatives of the sponsoring firms will not make any comparison of their prices with competitive concerns when boosting their wares over the microphone. Every effort is to be made to make these entertainments of a lesser commercialized character in order to render them more acceptable to the listening public.

The Call of the Turk

ON some evenings, providing conditions are favourable, a few degrees above your condenser readings for Radio Luxembourg, but when this station is resting, you may hear strains of Oriental music.

NEXT WEEK!
**SOLVING THE PORTABLE
 PROBLEM.**

ROUND the WORLD of WIRELESS (Continued)

Testing Valves

WHEN testing a receiver in which the valves are suspected, few constructors are sufficiently fortunate in having a complete set of spare valves to try, but this disadvantage can often be overcome, as some types of valves will work temporarily in any position. An S.G. valve will make a perfectly good detector when plugged into the valve-holder in the ordinary way, the top terminal being ignored. In the same way an S.G. valve will make a reasonably good power-valve, its impedance being round about 5,000 ohms when used in this manner.

Mains Interference

INTERFERENCE with the volume of a receiver by the electric wiring in a house is becoming increasingly common. When it is found that the volume of a receiver is changed because somebody has switched on or off a light, the trouble may usually be obviated by earthing the lead covering or iron piping system in a number of places. This phenomenon is usually accounted for by a house wiring circuit having a natural wavelength roughly equal to the station being received.

Volume Controls

THE majority of volume controls are extremely noisy in operation, which is inclined to be irritating when searching for any length of time. This fault can be minimized, or completely stopped, by connecting a condenser of 2 mfd. or more between the slider and one side of the resistance. This method can be used equally well with 3 terminal volume control or 2 terminal control, such as the variable resistance controlling a variable- μ valve. This method should never be used with volume control on the L.F. side.

Modulation Hum

MODULATION hum can usually be cured by connecting two condensers in series across a mains, and earthing the centre point. This is so well known that it would seem that we should apologize for mentioning it again, but it is not generally known that it is possible to waste the electric current night and day if the on-off switch is in the earthed side of the mains. It is, of course, best to use a double-pull switch to shut off both mains when using this arrangement.

Class B Amplification

THERE is an enormous amount of attention fixed on Class B amplification at the present time, and readers will doubtless be aware that the whole principle of this output technique relies on the output current increasing with the incoming signal. This current may rise from two to forty-five milliamps, and secondly, it is almost impossible to use an eliminator, as the variation in current would cause the voltage from the eliminator to vary within wide limits on all the valves, which would result in distortion, in addition to the extraordinary effect it would have on the reaction control.

Metal Chassis

WITH the advent of the metal chassis, many constructors and, we fear to say, designers, completely lost their heads

INTERESTING and TOPICAL PARAGRAPHS

in their desire to connect every possible terminal to the nearest point of the chassis. On a four-valve set, there may be as many

A FINE PORTABLE.



Listening to the "His Master's Voice" "Superhet Portable Six," a self-contained battery instrument which receives all worth-while stations with amazing selectivity.

as twenty wires going to the chassis, and secondly, twenty separate currents

SOLVE THIS!

Problem No. 30.

After two or three days' work Blackman had practically finished his new receiver. This was a self-contained three-valve set, employing S.G. Detector and Power valve with Band Pass Tuning and a Three-gang condenser. A particular item was to be transmitted in the evening to which he was very keen to listen, and in his hurry to get the set into its cabinet he unfortunately broke the detector valve. He had no spares, and the shops were closed. What was the simplest way of using the receiver to provide the item to which he was so keen to listen? Three books will be awarded for the first three correct solutions opened. Address your solutions to The Editor, PRACTICAL WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2, and mark your envelope Problem No. 30. No other correspondence should be enclosed in the envelope, which should reach here not later than April 17th.

SOLUTION TO PROBLEM No. 29.

Jefferies only needed a resistance of approximately 15,000 ohms to insert in series with the H.T. positive output from his Mains Unit. This would be the nearest commercial value of resistance obtainable to provide the necessary voltage drop.

The following three readers received books in connection with Problem No. 29.—

A. W. Freedy, 59, Kyree Road, Clapham Common, S.W.11. A. C. Peck, 15, Pelham Road, Wood Green, N.22. W. J. Butterfield, 104, Cambridge Road, Seven Kings, Essex.

would flow from one part of the chassis to the other. This method of omnibus returns can cause the most untraceable happenings, and instances have been known when a receiver that has been made completely unstable has had stability restored by connecting a slot in the chassis, and sending a troublesome current in another direction.

An Evil of Metal Chassis

ANOTHER evil which is common to metal chassis is the practice of connecting one side of the S.G. condenser in a mains set to the chassis. This means that the bias resistance of the valve is between the earth end of the condenser and the cathode of the valve, which can, in certain instances, cause violent instability. The low potential end of an S.G. condenser should always be connected to cathode and not to earth.

Blue Glow

FIVE years ago, a bluish glow in a valve would indicate that the valve was soft, i.e., the vacuum had become low, with the result that electrons were heating the particles of gas, and breaking them up. Until fairly recently, softness was unknown in the modern valve, and fortunately, still is, but all the same, some of the latest valves show a blue glow that would lead the average constructor to believe that it was soft. Curiously enough, this new blue glow is caused by the valve being exceptionally hard and denotes a particularly good specimen. This glow is fluorescence, and is a ray shot off the anode by the terrific impact of the electrons, which is not surprising when it is realized that an electron in a modern high-slope valve may exceed a speed of 10,000 miles per second.

"Free" Grid Bias!

THE very word "wireless" is a misnomer, and so are a good many of the associated terms. A particularly glaring example is "free" grid-bias, as, far from being free, the bias voltage supplied by it is subtracted from the H.T. voltage applied to the valve. Free bias is sometimes called automatic bias, which is equally ridiculous, as it rather implies that a grid-bias battery requires winding up, or some form of manual starting.

Keeping Your Radio Up-to-Date

EVERY year thousands of perfectly good radio sets are scrapped by their owners as worn out. Actually, the only parts of a receiver, apart from batteries, which can deteriorate, are the valves. New valves can work wonders with an out-of-date set. One important factor must be borne in mind, however. Modern valves are much more sensitive than those of two or three years ago, and care must be exercised in choosing suitable types. The Mazda range includes valves for every type of set, and radio dealers are always ready to assist purchasers in choosing them correctly. These valves are used by most of the leading set manufacturers and specified by the foremost designers. The Mazda valve research laboratories have been responsible for many of the most outstanding radio developments of recent years.

A two point Aerial System

An Ingenious Arrangement with Many Advantages

By A. C. BURNS, M.Sc., F.I.C.

It is not always realized that the average aerial is often unnecessarily long and, furthermore, that the usual "out-door" system can, in many cases, adequately be replaced by what might be termed a semi-outdoor type. This applies particularly in the case of the now commonly employed H.F. Det., L.F., set.

The alternative to the normal outdoor system, i.e., the strictly indoor arrangement, generally affords more "selective" reception or better elimination of unwanted stations, but only at the expense of volume.

The writer has for the last three years successfully employed an aerial system, arranged as shown in Fig. 1.

This system offers at least four advantages, viz:—

(1) The upright external portion is a distinct advance on the normal strictly indoor system and, if the house has unused attics or lofts, the portion inside the roof (shown by dotted lines) can be extended round and well clear of three walls of the attic and just clear of the roof. Foot-lengths of silk thread will afford ideal insulation, particularly since in many attics and certainly in lofts or lumber-rooms there is no need to sacrifice efficient insulation by fixing the aerial close to the ceiling or room walls, just for the sake of tidiness.

It is usually easy to find a point in the roof eaves, more or less directly above the windows, W1 and W2—a point where a hole is readily drilled through the wood-work, just under the roof gutter. Indeed, in most lofts there are ventilation gaps in many places where the roof meets the walls. In any case, the lead from window to roof need not be vertical and certainly can be less unsightly and less dangerous than the average outdoor aerial. As in the case of the strictly indoor type, there is no need to "earth" the aerial in thundery weather nor are atmospherics so dominant as those associated with the outdoor system.

(2) The effective pick-up of this system can be almost doubled by continuing the aerial back from the roof (see dotted lines) and down the outside of another wall of the house, thence leading it in once more, but to a different room via another window.

(3) Herein lies the main advantage of the two-point system. By providing a separate "earth" at this

second window, the set can conveniently be used in either room at will—an advantage particularly to owners of radiograms and sets with contained speakers and with no speaker extensions to other rooms. To operate the set in the other room, all that is necessary is to con-

nect the terminals in the first room unconnected. The total length of the aerial system will be unaltered by the change-over, so that tuning will remain unaffected and stations will come in at the same points on the dial in whichever room the set is used.

Variation of Aerial Capacity

An ordinary 6d. tuning-coil holder fixed in both rooms at the lead-in points, as shown in Fig. 2, makes a very neat anchorage for the aerial and earth leads, and has the advantage that it can easily be used as an earthing-switch by simply inserting the usual shorting-plug, "B" (see also Fig 3). Now for a little experiment!

Try the effect of inserting some of your obsolete tuning coils; if you no longer possess these in your junk box, they can be obtained very cheaply secondhand nowadays. The effect of inserting tuning coils in series with the aerial lead has been discussed from time to time, but equally interesting results are obtained by introducing these coils in parallel, i.e. across the aerial-earth leads. Not only is volume altered—both increased and decreased, according to the size of coil used—but the range of the tuning scale (condenser) of the set can be usefully extended.

For example, a number of well-known receivers, particularly when operated with small external aerials, cannot tune in the 1,875 metre Huizen (or Hilversum), which regularly offers such interesting programmes, particularly between 7.40 a.m. and 8.40 a.m. daily. In such sets, this station, in effect, is "off the scale." By inserting a 200 coil (or other long-wave coil) in the holder, the aerial-circuit capacity is so altered that the station now comes in at the upper end of the scale, and with a little margin to spare. Naturally the other station settings have become temporarily, but only slightly altered—being, in fact, displaced to slightly lower dial reading.

The introduction of these coils in the aerial circuit, both in parallel and in series, naturally alters the capacity of the aerial-tuning circuit, and its variable condenser, just as does the addition of a small variable condenser of the compression type. The fact that you are virtually shunting the aerial to

(Continued on page 140.)

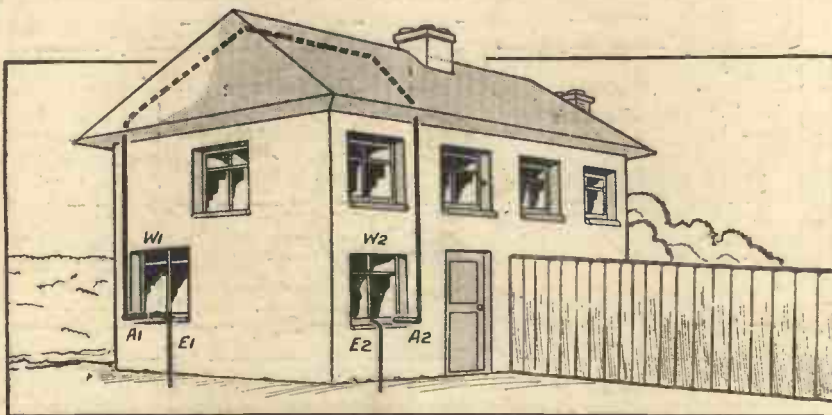


Fig. 1.—How the aerial system is arranged.

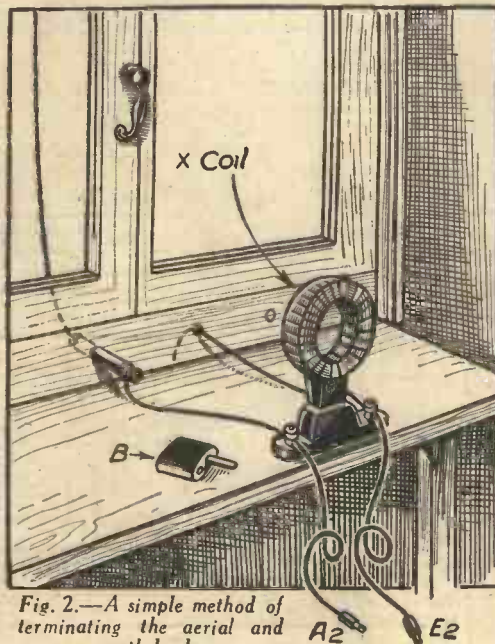


Fig. 2.—A simple method of terminating the aerial and earth leads.

A HANDYMAN'S WIRELESS TESTER

With this Easily-made Instrument Various Tests can be Quickly Carried Out.

By S. BRASIER

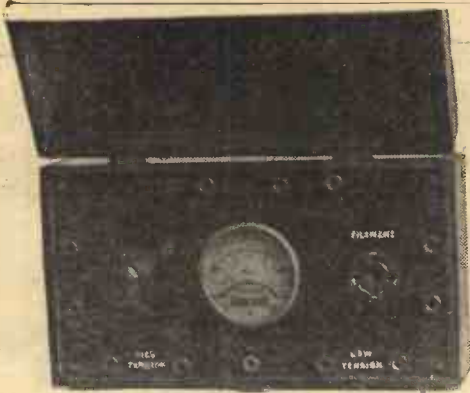


Fig. 1.—The finished tester.

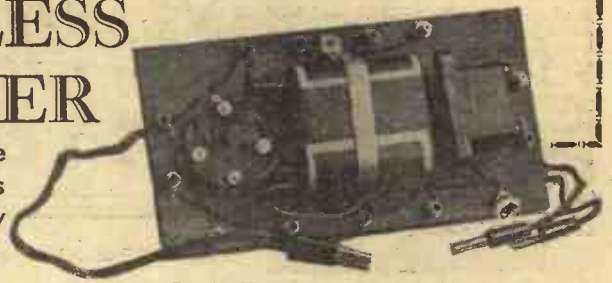


Fig. 4.—How the parts are mounted.

WHEN you are tracing that elusive fault in your set, how often have you wished that you had something to simplify and speed up the job? Quite a number of times, I expect! So with this thought in mind, the handy tester here illustrated was designed, but not without limitations. In the first place it had to be cheap to construct. Secondly, it was required to do everything that one wants to do when testing a receiver. Lastly, it had to be neat and compact.

Now as you see from the list of components, the most expensive item is the triple reading meter. In fact this more or less determines the cost of the whole outfit. The instrument used proved to be very accurate when tested against precision meters, and is quite satisfactory for all ordinary purposes. The other parts are quite usual items, and you will probably have most of them on hand. Regarding the second point, here are a few tests that can be made:—

Voltages of L.T., H.T., and G.B.; anode current of any valve; continuity tests; short circuits; valve filaments (including mains valves); tracing distortion, etc.

All this can be done without the usual confusion of pieces of wire, odd batteries, meters and the like. Just a neat box in a convenient place, and a testing lead.

Details of Construction

The construction should present no difficulties as the illustrations show everything quite clearly. The whole outfit is housed in a cigar box measuring 8½ in. by 4½ in. In the original model the lid of the box was taken off and used as the panel, and another lid, recessed to about ½ in. was made. This gives clearance for the leads when the tester is closed. If, however, you obtain a box about 3½ in. deep, you can use a separate piece of wood or ebonite for the panel, in which case it should be sunk about ½ in. into the box.

The position of the components can be seen from the panel layout (Fig. 3). A fretsaw should be used for cutting the holes for the valve-holder and meter, the latter being a good push fit to obviate other fixing. With regard to the valve-holder, the terminals on this must be reversed so that connection can be made from underneath. The holder is then pushed through the hole and screwed or bolted to the panel. A strip of thin metal, bent to shape and

wiring. Be most careful to put the 1½ and 4½-volt plugs in their correct sockets. This completes the important points regarding the construction, so now a few words about using the unit.

Using the Tester

Obtain a yard of twin flex and furnish each of the two ends with plugs. This completes the testing lead, and all you have to do is to plug one end into voltmeter, milliammeter, or whatever you like, and test with the other end. The testing points for high and low voltages and milliamp readings will be obvious. Sockets marked test 1 are for low resistance continuity tests such as point to point wiring, tuning coils, etc. Connect one end of testing leads to sockets marked test 1, the other end going to component under test. Short-circuits will also become obvious using this test, as on completion of a circuit a reading of 1½ volts will be obtained.

Test 2 is used in conjunction with telephones plugged into the sockets so marked, and should be used for testing continuity of transformer primaries, H.F. chokes, loud-speaker units, etc. Proceed as for test 1, but plug leads into test 2 sockets. A click in the 'phones on completion of a circuit gives you peace of mind here. By the way, don't forget to switch on before performing any tests. If a valve is plugged into the holder on the unit, a reading of 1½ volts will remove all suspicion from the heater or filament. Regarding the milliammeter test, it is a great advantage if you have a spare lead with one end permanently connected to a Bulgin 5-pin split anode adaptor. With this in use the milliammeter is automatically put into the plate circuit of any valve. All manner of other tests will suggest themselves to the constructor. It should, however, be realised that high tension eliminator voltages cannot be measured with the meter used. A good approximation of the voltage on the plate of a valve

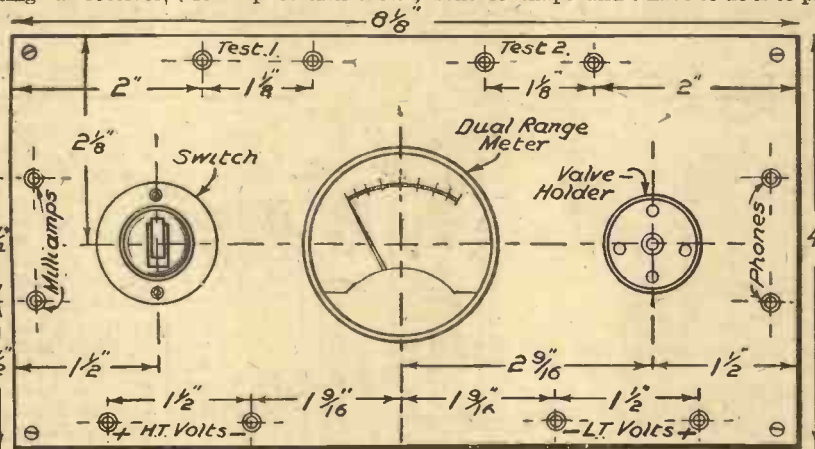


Fig. 3.—Panel layout.

screwed at each end to the panel holds the 4½-volt battery in position under the meter. This can be easily seen from Fig. 2. The .01 condenser which is connected across the milliammeter is held in position by its own wiring. Care should be taken when wiring up.

Here it should be noted that if you do not use the specified meter, the points of connection will probably be different. Also, when soldering to the spikes of the meter, do this as quickly as possible, otherwise you may disturb the inside

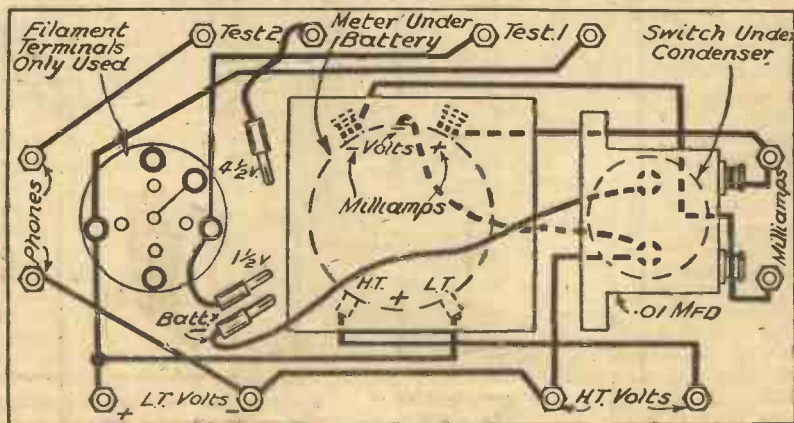
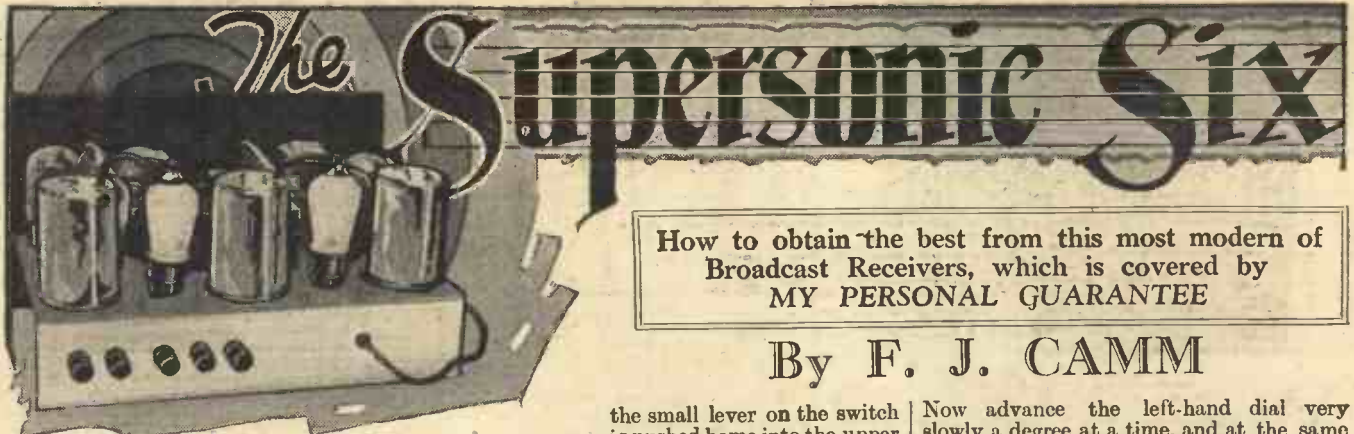


Fig. 2.—Underside of baseboard.

(Continued on page 172.)



How to obtain the best from this most modern of Broadcast Receivers, which is covered by MY PERSONAL GUARANTEE

By F. J. CAMM

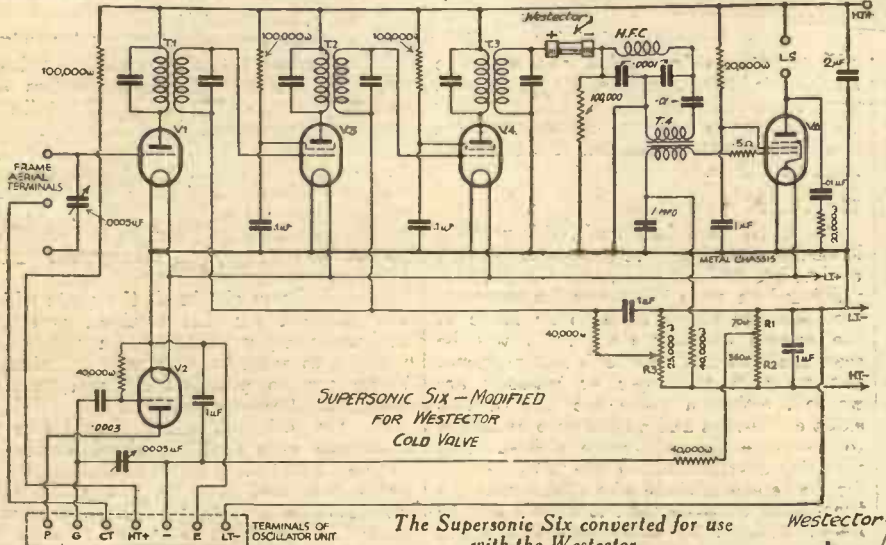
LAST week I gave you very brief instructions for handling this efficient six-valve set, and for the benefit of those who are not familiar with the superheterodyne circuit I will give more complete instructions.

The Frame Aerial

First of all the frame aerial. This is provided with three terminals, the two

the small lever on the switch is pushed home into the upper contact. The receiver is now in working condition, and is tuned to the medium waves. Turn the right-hand knob until you hear a rushing noise from the loud-speaker, and then set both tuning dials to read 'O.' To operate the receiver, at least for the first time, two hands are necessary, and therefore the left-hand tuning dial should be held in the left hand, whilst

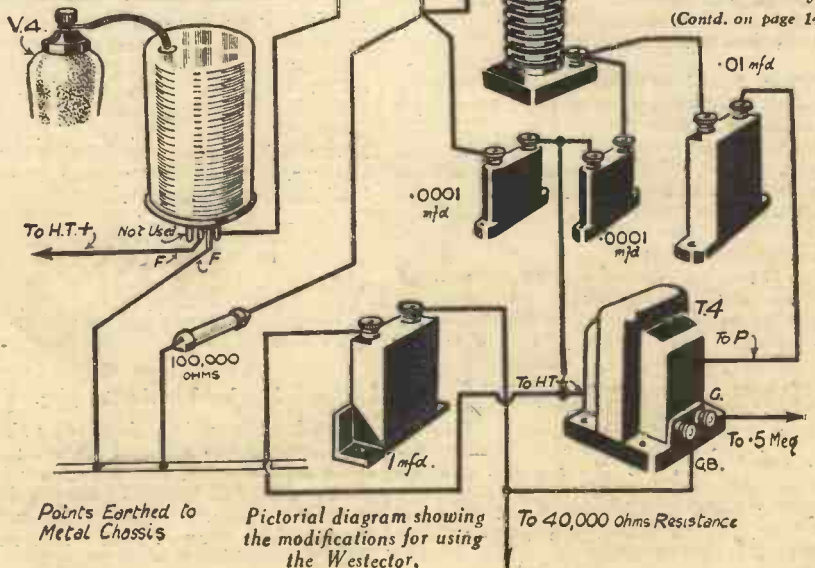
Now advance the left-hand dial very slowly a degree at a time, and at the same time swing the right-hand dial over a distance of about five degrees above and below the point shown by the left-hand condenser. Proceed through the whole scale of the condenser in this way, and the moment you hear the slightest sign of a signal, stop turning the left-hand dial and carefully adjust the right-hand. It may sound that the operation is complicated and tedious, but actually it is exceedingly simple, and is much easier when once you have appreciated the operation of the dials. You have to bear in mind that one degree on the dial in this receiver will tune in and tune out a station. For instance, in London it is possible to rotate both dials, in step, and at one degree to hear nothing, and to tune in the London station to full strength and out again before coming to the next degree. However, carry out this tuning operation right through the scale and see if you can hear a station. When something is heard the frame aerial will require orienting, and this operation should also be carried out if you find that for some reason you can tune through the whole scale without hearing a station.



The Supersonic Six converted for use with the Westector.

outside ones being joined to the ends of the frame and the centre one being connected to the centre tapping of the complete frame. These three terminals should be joined to the three terminals on the rear of the receiver in the same order, that is, the centre terminal on the receiver is joined to the centre terminal on the frame, and the two outside terminals are joined to the other two terminals on the frame. There is no other method of using this receiver, and therefore you must have the frame aerial, which must also be of the centre-tapped variety. Join the L.T. leads to the positive and negative terminals of the 2-volt accumulator, and plug the two H.T. leads into the respective ends of the 120 volt H.T. battery. Now on the left-hand side of the panel the lower knob has a small window through which will be seen the word "Off," when the knob is in one position, and rotation of the knob to left or right will show the letters "L" and "S" through the window. To commence with, turn the knob so that the letter "S" is visible, and then set the frame aerial switch so that that also is adjusted for the medium waves. On the particular aerial specified this will be when

the right-hand dial should be taken with the right hand.



Points Earthed to Metal Chassis

Pictorial diagram showing the modifications for using the Westector.

To 40,000 ohms Resistance

This is a most valuable feature, as it enables you

(Contd. on page 140.)



The Supersonic Six.

(Continued from page 139.)

to cut-out the interference caused by a station working on a wavelength very close to that of the station you want, but which is situated much closer to you than the required station. With the ordinary type of receiver, or outside aerial, it is impossible to eliminate this form of interference, but with the frame aerial you simply turn it so that it forms an angle with the interfering station. Naturally, if the two stations are in the same direction you are still at a loss, but it is even then possible to make use of the directional feature and to practically get rid of the station. On the majority of European stations it will be found unnecessary to turn the lower right-hand control full on. If turned too far, the set bursts into oscillation, and naturally you cannot receive speech or music when it is in that condition. It must be used, therefore, to bring the station to just the strength you require and no more. There are no other

adjustments to be carried out, and the receiver is, therefore, simpler to operate than many sets employing half as many valves, but the number of stations which can be received is sufficient even for the most ambitious.

The Westector

As pointed out last week, this receiver lends itself admirably to the use of the new cold valve, or Westector, and the diagram published on page 139 shows the necessary modifications which have to be made to the second detector circuit. It will be seen that the H.F. choke is still required, but no grid condenser or gridleak are wanted, although there are one or two extra condensers and a resistance necessary to complete the cold-valve circuit. The pictorial diagram shows the arrangement for the benefit of those who cannot read the theoretical diagram, and it should not be found difficult to carry out this slight alteration. Fortunately, the second detector has no bearing on any other parts

of the receiver, and all the various voltage dropping resistances and decouplers are still of the same value as when the ordinary valve is employed in this stage. The cold valve does, however, result in a saving of low-tension and high-tension current, and this is no doubt of great value to those readers who find it difficult to get accumulators charged or who cannot afford to be continually renewing the H.T. battery.

Provided you obtain all the parts which are specified for this receiver, you will find no difficulty whatsoever in getting the receiver to work as soon as it is finished. There are no pitfalls which will prevent you getting the same results as were obtained with the original, and I should like to emphasize here that the circuit employed is one of the most selective known to the radio art, and if it is not possible to separate two stations on this superheterodyne receiver, then it is not possible to separate them on any other set, no matter of what make.

(Continued from page 137.)

earth does not necessarily mean reduced signal-strength. The writer finds that, with the set tuned to Radio-Paris, for example (using a tight coupling and minimum reaction), the simple insertion of the 200 coil boosts up the volume considerably. It is all a question of aerial capacity, a subject which does not call for further discussion here.

Interesting Effects

The effects are still more pronounced when the coil-plugging is conducted at the end of the aerial remote from the set, i.e., where the aerial returns in the other room, particularly if this room contains an extension-speaker, further interesting results can be noted by plugging in different coils. For example, tune in to Daventry National in one room and plug in a 200 or 150 coil in the other room. There is no particular change, except when using smaller coils, which give some drop in volume. Now insert the shorting-plug and note that, though the aerial is now

actually shorted to earth, there is still sufficient capacity in the aerial system to afford "nice quiet volume." With the set in the other room, here is a handy method of cutting down volume. Under these conditions, too, one can enjoy reasonably good reception during thundery weather, for the atmospheric noises are diminished considerably.



Fig. 3.—The shorting plug.

Another interesting effect can be obtained by tuning in the Midland Regional in one room and shorting the coil-holder in the other. Many of you will expect a distinct drop in volume, whereas, actually, there is no audible change. Tune into London Regional, with the shorting-plug still

in circuit, and you will note a distinct increase in volume. Individual experimenters must try for themselves the effect of introducing various sizes of tuning-coil across the aerial-earth leads at the point most remote from the set end of the aerial. It is all a matter of capacity, and it doubtless so happens that the natural capacity of the writer's aerial-system gives the above effects with the 200-coil and the shorting-plug.

Finally, the presence of aerial-earth leads in two rooms allows of convenient control of volume in those cases where the speaker in use is in a room away from the set. Volume can be readily controlled by shunting a suitably high-volume high-value variable resistance across the leads, which, incidentally, allows also of some degree of selectivity control. A low-capacity variable condenser can likewise be shunted across for purposes of controlling selectivity, though in this case better results are obtained by inserting the condenser in series with the aerial, and in the manner usually recommended.

LIST OF COMPONENTS FOR THE WESTECTOR SUPERSONIC SIX

- 1 Paxolin Panel drilled 14 in. by 8 in. (Peto-Scott)
- 1 Aluminium Chassis: drilled 14 in. by 8 in. (Peto-Scott)
- 1 Oscillator Coil and Switch unit with window, dial and knob. (Wearite)
- 1 I.F. Transformer. (Wearite type O.T.1)
- 2 I.F. Transformers. (Wearite type O.T.2)
- 1 H.F. 10 Choke. (Belgin)
- 1 Special 8 mfd. condenser block. (T.C.C.)
- 0.1 mfd. condensers, type 65. (T.C.C.)
- 1 0.001 mfd. condenser, type 34. (T.C.C.)
- 2 0.01 mfd. condensers, type 34. (T.C.C.)
- 2 0.001 mfd., type 34. (T.C.C.)
- 1 Special Resistance Unit. (Dubilier)
- 1 500,000 ohms Grid Leak. (Dubilier)
- 1 20,000 ohms, 1 watt Resistance. (Dubilier)
- 2 40,000 ohms, 1 watt Resistance. (Dubilier)
- 1 100,000 ohms, 1 watt Resistance. (Dubilier)
- 1 1 amp fuse. (Microfuse)
- 1 25,000 ohms volume control. (Watmel)
- 1 Hypernik L.F., 3-1, Transformer. (Lissen)
- 2 0.0005 variable condensers with slow motion dial, type No. 2 S.M. (Polar)
- 5 Terminals (2 L.S. and Aerial 1, 2 and 3) (Belling Lee)
- 1 Centre-tapped frame aerial. (Elex)
- 8 4-Pin sub-baseboard valve-holders. (Clix)
- 1 5-Pin sub-baseboard valve-holders. (Clix)
- 1 4-way Battery Cord (H.T.+, H.T.-, L.T.+, L.T.-) (Belling Lee)
- 1 P.M. 4 Mansfield Moving-coil Speaker. (W.B.)
- 5 Cossor Valves, 210 H.F., 210 L.F., 220 V.S.G., 220 P.T.
- 1 Westector, type W4 (Westinghouse Brake & Saxby Signal Co.)
- 1 Lion 120 volt H.T. Battery.
- 1 Ediswan 2-volt 40-ampere hour Accumulator.

Building the "A.C. TWIN"



A New Type of Receiver for All-mains Operation. Two Pentode Valves in a Circuit Designed for Quality Reception on an Energized Moving-coil Loud-speaker.

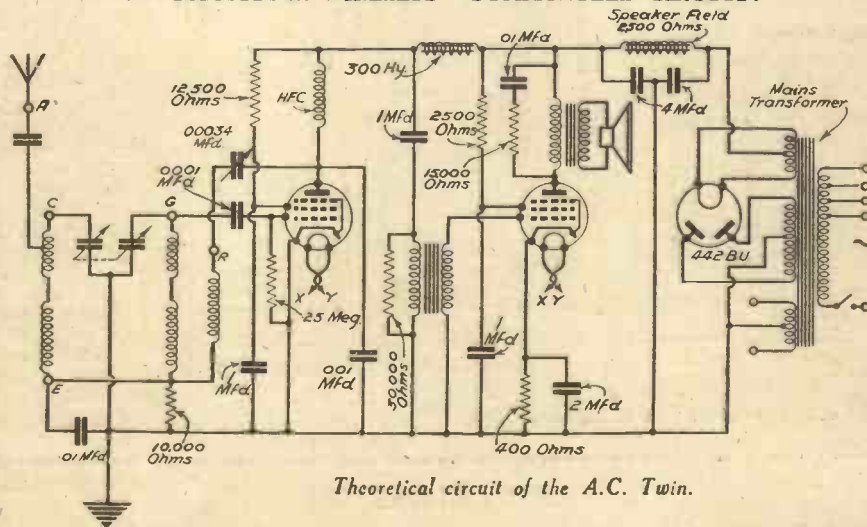
By W. J. DELANEY

FROM inquiries which I have made amongst radio retailers, and also from a number of friends, I have decided quite definitely that there is need for a mains receiver which is designed to give a really high-quality output from the local station. It is quite true that many listeners wish to receive fifty or more stations on the loud-speaker, but there are many more whose main aim is to hear the local station, with the choice of an alternative, at full room strength, with irreproachable quality of reproduction. So far, the majority of receivers which are available, either from the manufacturers, or from designs published in periodicals, and which are designed to give a really large output, are of the multi-valve type with one or more H.F. stages. The result of this is that there is more than one control to be handled, and the expense of the receiver is naturally rather high. There has not so far been available a receiver of the simpler type which will give that volume that many listeners require, without trouble and without a large outlay for a powerful receiver. Ten pounds seems about the limit to which those with whom I have discussed the question seem prepared to go, and they have asked for a receiver which will be simple to operate, capable of the volume which has come to be associated with high-class mains receivers, but which is not of the type designed to get every station in Europe.

My Experiments

I therefore set to work to try to design a small, compact receiver for as low a figure as possible, yet which would be capable of the performance which seemed to be required. I kept in mind the non-technical listener and especially the older generation to whom "knob-twiddling" would be right out of the question, and to whom a high-class musical performance from even one station would be sufficient. At the same time, I bore in mind that with both classes of listener just mentioned, there might be occasions when a little distant reception would not come amiss. At first I thought it would be quite easy to put together a receiver of this type, but one or two experiments showed me that there was quite an interesting field for study in this direction. The familiar detector followed by one L.F. stage was the basis, and

A "PRACTICAL WIRELESS" GUARANTEED CIRCUIT!



Theoretical circuit of the A.C. Twin.

after putting together such an arrangement (with the necessary mains equipment, of course) I decided that the power output was insufficient. Accordingly a pentode was used in the output stage, with the result that it was found impossible to fully load it and therefore it was not being efficiently employed. I next tried a good screened grid stage followed by a power detector operating straight into the speaker. This gave a slightly greater reach, but naturally the signal output was low. The next scheme to receive attention was a screen grid H.F. stage followed

by a pentode valve acting as a detector and feeding the loud-speaker direct. This showed a little more promise but was still failing.

The Final Circuit

Several more experiments were carried out, and finally I hit upon the most efficient arrangement. This consisted of a special high-frequency pentode valve, employed as a power grid detector, followed by an ordinary mains pentode. This gave great results, and all that remained was to decide upon the interval

(Continued overleaf)

COMPONENTS FOR THE A.C. TWIN

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

INTRODUCING THE A.C. TWIN
(Continued from page 143.)

components, so as to get the very best from the circuit design. A power detector requires a very accurate matching of the load in the anode circuit, and when a pentode is employed in this way, the difficulty arose of obtaining the correct load so that the maximum signal was passed to the L.F. stage. A suitable resistance would have required an H.T. supply of over 500 volts, so that this was ruled out. No transformer was available which could be included in the anode circuit, but obviously a really high inductance L.F. choke would be suitable. Messrs. Varley step into the breach here with a choke having an inductance of 300 henries and a D.C. resistance of 3,000 ohms. This will carry a maximum current of 10 milliamps, which is just about what the pentode will give when operating on full power. The L.F. transformer may therefore be parallel fed, and the design of this need not be so critical, provided it will give a good step-up, with a good overall response. In view of the cost of the anode component, it was felt desirable to keep the cost of the transformer low, and the Igranic component which was chosen costs only 5s. 6d.,

but gives splendid results when used in the manner I have adopted in this circuit.

The Speaker

The pentode output valve requires a load of between 6,000 and 7,000 ohms, and the next thing was to find a loud-speaker capable of giving this load without the expense of output chokes, etc., and I also thought it desirable to remove the necessity for a separate mains smoothing choke, by employing one of the energized type of speaker. These are cheaper than the permanent magnet type, and at the same time, no smoothing choke is needed, if the mains output is correctly chosen. The Gramian loud-speaker which I selected provides a load in its primary winding of 7,500 ohms when a certain pair of its terminals are employed, and this will obviously be admirable for our pentode. The field has a D.C. resistance of 2,500 ohms and requires a dissipation between 3.5 and 7 watts. The two pentodes which I selected consume just over 40 mA., and this current passing through 2,500 ohms would result in a voltage drop of just over 100 volts. This gives a dissipation of 4 watts, which is just above the minimum required and should prove adequate for our purposes.

As 250 volts are required for the anodes of the valves, and there is a loss of 100 volts through the speaker, it is necessary to design the mains portion of the speaker to provide 350 volts.

The Cabinet

The final point was to find a suitable cabinet to house the various parts so as to provide a good-looking receiver which was capable of taking its place in the home, and which would not give "boxy" or "tinny" results. The Smith Lyric cabinet which is used may be obtained by itself, or in conjunction with a very neat stool, and this is shown in the photographs in this issue. The performance of the final receiver is really excellent. Although primarily designed, as I stated above, to give the local, with one alternative, at really high-class volume and quality, with no intricate adjustments, it is capable of receiving several stations at splendid volume. It is simple to build, and there is nothing difficult about the construction or operation.

This receiver will appeal to thousands, and will undoubtedly prove to be one of the most useful receivers which has yet been described to our readers. Further details will be published next week.

MOST constructors are, perhaps, anxious to take advantage of the improvements to be obtained from screened coils. The following is a description of simple and cheap home-made screens that any handy constructor can make for himself. Firstly, it must be remembered that it is important that the screens are sufficiently large in diameter to allow at least 1 in. clearance all round the coils. This, of course, can be exceeded a little with advantage. No attempt will be made to describe the construction of a suitable dual-range coil, as this has been dealt with in recent issues of PRACTICAL WIRELESS.

Constructional Details

Procure a suitable size tin and lid; an ordinary cocoa tin will serve the purpose admirably. Strip the tin of its labels and well clean it inside and out. Then cut out the required number of slots in lid and the open end of tin, as depicted at A, Fig. 1. These should be just sufficiently wide to

HOME-MADE COIL SCREENS
By W. G. MARSHALL

admit the wire used for wiring the coil in the set. Covered wire such as "Glazite"

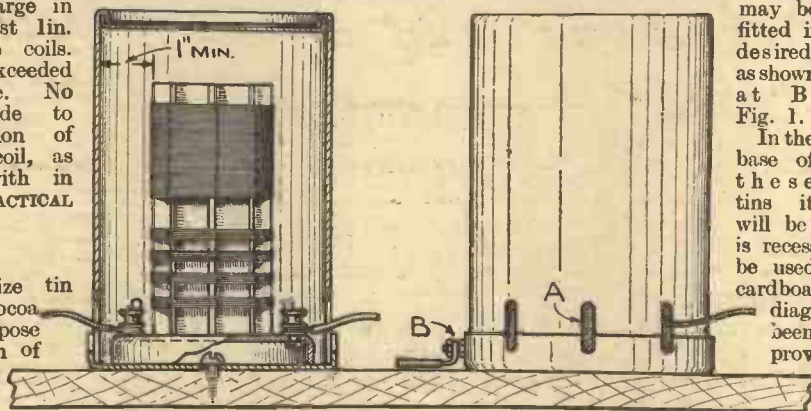


Fig. 1.—Section and elevation of the home-made coil screens.

A hole is punched in the centre for screwing down to the base board, or, alternatively, this may be omitted, as other holes will be needed to admit the screws for screwing down the coil base. An earthing terminal may be fitted if desired, as shown at B, Fig. 1.

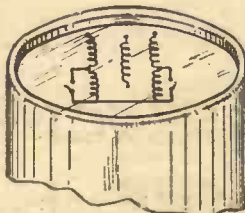


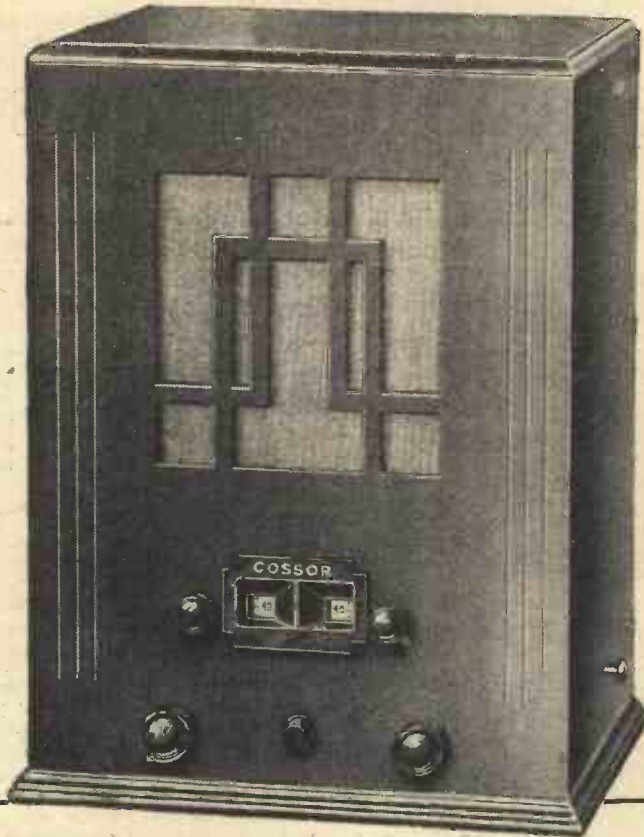
Fig. 2.—Identification circuit drawn on bottom of screen.

In the base of these tins it will be noticed that the bottom is recessed a little and this can be used for holding a disc of cardboard on which the circuit diagram of the coil has been drawn. This will provide a handy form of reference, as indicated in Fig. 2. Finally, the screens may be given externally a coat of aluminium paint, when they will assume quite a commercial appearance.

OUR CLASS B UNIT



Two views of the Class B unit described on page 97 of our April 8th issue.



NEW PRICES

BATTERY MODEL 335

with Self-Contained Loud Speaker
 Kit of Parts includes 3 Cossor Valves (220 V.S.G. Variable-Mu Metallised Screened Grid, 210 H.L. Metallised Detector and 220P. Output); Individually Shielded Coils. All-meral Chassis and all parts for assembling the Receiver as illustrated; handsome cabinet 18½ in. x 13½ in. x 10½ in. and 10 in. Balanced-Armature Loud Speaker. Provision is made for fitting Gramophone-Pick-up Socket and Plug.
Price £6.17.6

Hire Purchase Terms: 17/6 deposit and 9 monthly payments of 15/-

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Kit of Parts, similar to Model 335 except that no loud speaker is supplied. Handsome cabinet 9½ in. x 13½ in. x 10½ in.
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Hire Purchase Terms: 15/- deposit and 9 monthly payments of 12/6

BATTERY MODEL 333

Kit of Parts, complete with Valves for building Cossor Melody Maker Chassis for fitting to your own cabinet. Specification as Model 335 but without loud speaker or cabinet.
Price £4.19.6

Hire Purchase Terms: 15/- deposit and 9 monthly payments of 10/6

ALL-ELECTRIC MODEL 337

With Self-Contained Loud Speaker
 Kit of Parts for All-Electric Melody Maker Model 337 similar to Model 335 (as illustrated) but for all-electric operation, including Cossor Valves, handsomely finished Cabinet, 18½ in. x 17½ in. x 10½ in., Loud Speaker and all parts. For A.C. Mains only 100-125 or 200-250 volts (adjustable). 40-100 cycles.
Price £8.10.0

Hire Purchase Terms: 20/- deposit and 9 monthly payments of 18/6

ALL-ELECTRIC MODEL 336

Kit of Parts, similar to All-Electric Model 337 except that no loud speaker is supplied. Handsome cabinet 10½ in. x 17½ in. x 10½ in.
Price £7.10.0

Hire Purchase Terms: 21/- deposit and 9 monthly payments of 16/-

ALL-ELECTRIC MODEL 338

Kit of Parts for All-Electric Melody Maker Model 338 Chassis. Identical with Model 336 except that no cabinet is supplied. Escutcheon and template for drilling your own cabinet is included.
Price £6.15.0

Hire Purchase Terms: 28/6 deposit and 6 monthly payments of 20/-

Models 336 and 338 are available for use on A.C. Mains only, 200 to 250 volts (adjustable). 40-100 cycles.

Prices do not apply in I.F.S.

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

♥ 2683

"SELECTIVITY all one could desire . . .
and TONE and QUALITY are wonderful . . ."

writes Yorkshire user

This satisfied Cossor owner continues: "I have had all kinds of home constructed Sets since 1923 but your Melody Maker is the best yet."

For less than ever before you, too, can enjoy the remarkable performance of the Cossor Melody Maker. Equipped with Cossor Variable-Mu Valve—individually shielded coils—graded volume control—every up-to-date feature of design—the Cossor Melody Maker, at to-day's prices, undoubtedly represents the greatest possible value for money in Screened Grid Radio. Send at once for full details—use the coupon.

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 MELODY MAKER**

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

Please send me free of charge a full size Constructional Chart, which tells me how to build the Cossor Battery All-Electric Melody Maker.

(Strike out type not required.)

Name My usual
 Retailer is

Address Address

FRAC. 15/4/33.

THERE is an old adage which describes a misfit as a "square peg in a round hole." How easy it is for a radio valve to be a square peg; how frequently are unsuitable valves plugged into valve holders.

The choice of valves for a given receiver is not merely a matter of taking any screened grid valve, and any detector and any output valve, and of knowing that they will all work together satisfactorily. If that were so, the catalogues of valve manufacturers would each contain but half a dozen types in each range—battery operated and mains operated.

Number of Types

In the current lists of half a dozen well-known valve makers, however, this number of types is very greatly exceeded. To take the 2-volt range, for example, most makers list at least three screened grid valves, including variable mu types; four or five valves suitable for use as detectors and low-frequency amplifiers; three or four different three electrode output valves, and two or three pentodes.

Even supposing that each valve of one particular make had its practical counterpart in the list of each of the other manufacturers—which, by the way, is not always the case, the owner of a three-valve set of the screened grid, detector and L.F. class has the choice of at least four grades of screened grid high-frequency valves, five different types of detectors and seven different output valves. A similar state of affairs exists in the case of A.C. mains valves.

The questions which immediately suggest themselves are: How is it that such a large number of different valve types have been developed? Are they all necessary? Could not each maker's range be greatly simplified by some process of standardization?

A Logical Process

A development of a large number of valve types is the logical outcome of the great progress which has been made in valve technique during recent years. In the early days of broadcasting, a single type of valve was used indifferently for high-frequency amplification, detection and low-frequency amplification.

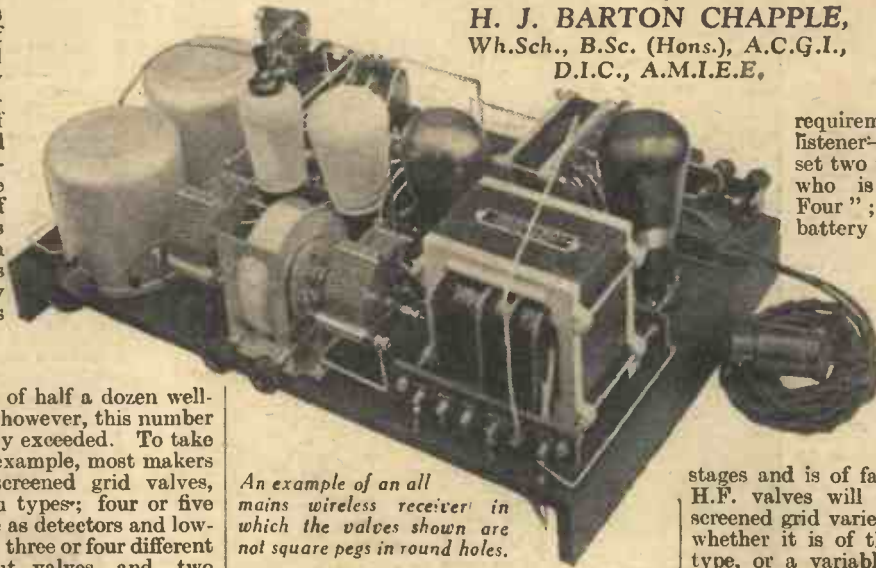
The natural process of competition tended still further to increase the number of valve types, while another factor was the invention of screened grid and pentode valves, both of which have characteristics which fit them for certain functions almost to the exclusion of all other types. Another reason for the multiplication of valve types was the demand for valves of ever-growing sensitivity and efficiency for use in battery-operated portable sets. Here the size and weight of both the low-tension and high-tension batteries are subject to severe limitations, and any development which resulted in even slightly improved output or in the saving of even half a milli-ampere of high tension current was welcome.

SQUARE PEGS IN ROUND HOLES

Notes on The Correct Choice and Use of Valves

By

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



An example of an all mains wireless receiver in which the valves shown are not square pegs in round holes.

Replacements

It will naturally be asked why, when more efficient valves are produced, are not the older types discontinued. The answer here is that to a very great extent they are. The published valve lists of to-day contain a very small proportion of the valve types developed even during the last three years.

As a matter of fact, all sets of really modern design can be equipped with suitable valves from a very restricted selection—say, two screened grid types (one variable mu and one of the normal type), a single detector, and a choice of two triode and two pentode valves. But such a range would be far too limited for the many different forms of receiver which are still in existence but, having been built two or three years, do not represent the latest practice.

An Example

To take a simple example, so greatly has the modern low-frequency transformer been improved that a very high percentage of the detector valves of to-day are coupled to the following stage by a transformer, and results from the quality point of view are as good as and if not better than the earlier resistance capacity couplings, while, of course, the stage gain is much higher. The modern detector valve has been developed to work in conjunction with the modern transformer, and its characteristics are such that it will function equally well with direct or resistance fed transformer coupling. In sets of two or three seasons ago, however, many different forms of intervalve coupling were employed. There had to be, therefore, high amplification, high impedance valves for use in conjunction with resistance capacity couplings, others suitable for choke coupled amplifiers and general purpose valves for use as detectors and low-frequency valves for use as detectors and low-frequency amplifiers with transformer couplings.

It is but right that listeners who are not able for the moment to procure a modern-to-the-minute receiver should be able to obtain still the valves which operate best with their old and possibly obsolescent receivers. A careful analysis of current catalogues reveals that the ranges of valves listed represent the minimum assortment to meet the reasonable

requirements of every class of listener—the man who owns a set two years old, and the man who is building the "Fury Four"; the owner of an all battery set, he who uses low tension batteries and mains unit for high tension and the fortunate possessor of an all mains set.

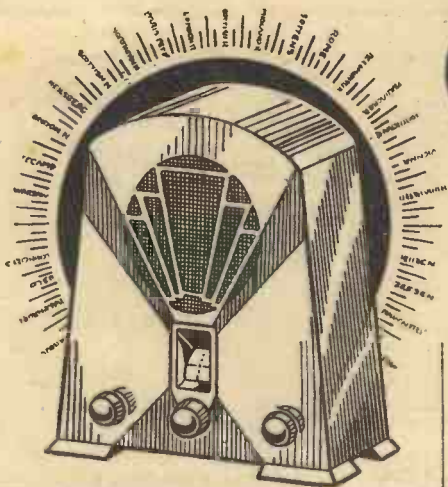
A Few Hints

To begin with, if your receiver incorporates one or more high frequency amplifying

stages and is of fairly modern design, the H.F. valves will undoubtedly be of the screened grid variety. You will also know whether it is of the normal screened-grid type, or a variable mu valve, for in the latter case there will be on the panel provision for volume control by varying the grid bias. You can hardly go wrong in the selection of valves for these stages, as most makers list only one variable mu valve and two normal screened grid valves, and you would do well to adhere to the types specified for the set you have bought or built, or at any rate to valves having very similar published characteristics. If, on the other hand, your high frequency valves are of the three electrode type, there are several alternatives. Should the stage be a neutralised one, a valve of the medium impedance type (20,000 to 25,000 ohms or thereabouts) should be chosen. For an untuned high frequency stage such as is often found in portables, a high impedance (R.C.C. type) valve, rated at 40,000 to 50,000 ohms is necessary for a resistance capacity coupled stage, or a medium impedance valve sometimes called "H" or "HF" for a choke capacity coupled stage.

For the detector in a modern set, valves of the type almost universally known as HL should be chosen, these being very sensitive and efficient valves with an impedance of the order of 20,000 ohms, and an amplification factor between the figures of 25 and 30. In an older set you will probably obtain best results from a valve designated as type L or LF if transformer coupled, or type H or HF if resistance or choke capacity coupled. In some receivers employing resistance capacity coupling with resistances as high as $\frac{1}{2}$ to 1 megohm, valves of the RCC type must be employed as detectors. Where there is an additional low frequency stage between the detector and the output valve, the valve employed should certainly be of the L or LF type which can accept a stronger input signal without over-loading than the HL general purpose type.

(Continued on page 148.)



OUR VIEWS ON RECEIVERS

THE SUNBEAM UNIVERSAL MAINS RECEIVER MODEL U.35

A RECEIVER which is available for either A.C. or D.C. mains, without alteration, is a valuable arrangement for many listeners. The first one to be received by us for test is the Sunbeam, which is, incidentally, the first all-electric model to be produced by the Sunbeam Electric, Ltd. This is, as may be seen from the illustration, a very attractive looking receiver, from both the front and the back view. The cabinet is of neat walnut, with a simple but pleasing loud-speaker fret, and contains only four controls. These are, top centre, main tuning knob with concentric trimming control, and beneath it the mains on-off switch. On the right is a combined reaction and volume control, and on the left a combined wave-change and radio-gram switch.

The Circuit

The circuit, whilst of the orthodox S.G., detector and Pentode arrangement is very novel in many ways. First of all, the H.F. valve is of the ordinary S.G. type (specially designed, as are all the valves in this receiver for D.C. mains) and the cathode is returned to earth *via* a fixed and variable resistance. This introduces a variable factor across the aerial circuit and so acts as a pre-H.F. volume control, the actual component being ganged with the Reaction condenser so that the selectivity is also improved with the use of this particular knob. As the sensitivity of the H.F. stage is reduced, the reaction applied to the detector stage results in the sensitivity of this stage being increased. When these two controls are suitably chosen, as in this receiver, the result is a very nice adjustment of volume and selectivity combined. A special tuned-anode arrangement is employed for coupling the H.F. and detector stages and a change-over switch is inserted between the grid of the detector valve and the anode coupling condenser. This changes over from radio to gramophone reproduction. The reaction is capacity-controlled. An L.F. transformer is included direct in the anode-circuit of the detector valve and feeds the output pentode, which, as in the case of the remaining valves is of the Osram D.C. mains type. The output circuit of the Pentode is provided with a transformer to match the moving-coil correctly, and two additional terminals are provided for the use of an external loud-speaker when required. The mains equipment is, of course, the most interesting, in a receiver of this nature. No mains transformer is

employed, as when the receiver is employed on D.C. mains there must, of course, be direct connection with the heaters, etc., of the valves. Accordingly a metal rectifier is included in one mains lead, whilst a smoothing circuit and special resistances are joined in series with this circuit for the purpose of voltage adjustment. The remaining mains lead is joined direct to the chassis, *via* the on-off switch. This necessitates the mains plug being inserted in the mains socket in the correct relation, and when using the receiver on D.C. mains



The Sunbeam Universal Mains Receiver Model U.35.

no signals will result when the plug is in one position, whilst with A.C. mains, hum will be excessive unless the plug is in a certain position. This is pointed out by the makers in the instruction chart so that the listener need have no fear on this score.

Test Results

Unfortunately we had very little time to give this receiver a really thorough trial, but the short test which was given showed that it was a really sound job, and was capable of really great things. On D.C. the smoothing appeared adequate and no trace of hum or ripple was observed. The volume was ample, and the tone was very pleasing indeed. It was characterised by forwardness and brilliance, whilst there was no lack of bass. A special internal aerial is fitted inside the cabinet, and with this

the volume obtained from London, in our laboratory, was more than would be needed in the average home. There was no trace of cabinet resonance, or "boxiness," and there was no difficulty in handling the receiver. The disposition of the controls enabled the best results to be easily obtained, and the receiver should appeal to many, especially those who are not in permanent residence and change from time to time from one type of mains to the other. There are one or two points which we should like to mention in the design of this type of receiver, principally with regard to the obtaining of the various potentials. First of all, the heaters of the valves are fed in series and the arrangement of feeding these valves is such that the risk of induced hum is practically removed. From the voltage dropping resistance the positive H.T. lead is fed to one side of the pentode heater from whence it passes to the S.G. heater. From this it goes to the Detector, and thence direct to the chassis. This is a splendid method of obtaining heater supplies for valves of the type employed and the advantage is reflected in the reproduction which bears no trace of commutator ripple (in the case of D.C.) or hum in the case of A.C. mains. To ensure adequate smoothing the condensers which are used in conjunction with the mains smoothing choke are of the aqueous electrolytic type, and, although the metal rectifier only provides half-wave rectification when using the receiver on A.C. mains this provides adequate smoothing. Finally, the price asked for this particular receiver, considering it is of the universal type, is very moderate, and we can thoroughly recommend it to our readers.

We congratulate the Sunbeam Electric, Ltd. on their enterprise in producing a receiver of such advanced design, and, at the same time, of such outstanding performance, at the extremely competitive price of 9 guineas. The specification which is given in brief below compares very favourably with many battery receivers.

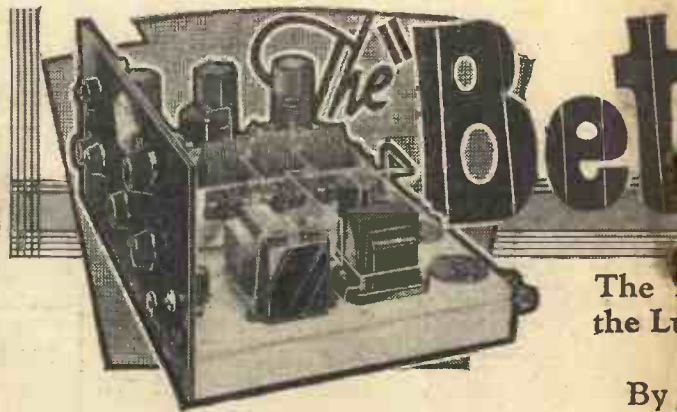
SPECIFICATION

Receiver: Sunbeam Universal U.35.
 Makers: Sunbeam Electric, Ltd.
 Circuit: S.G., Detector and Pentode tuned-anode coupling, directly-heated D.C. mains-type valves. Circuit arranged for use indiscriminately on A.C. or D.C. mains with no alteration.
 Speaker: Moving-coil, with transformer matched to the Pentode.
 Consumption: 50 to 70 watts.
 Controls: Three—tuning, wave-change and radiogram (combined) and volume and reaction (combined).
 Cabinet: 18in. by 15in. by 9in., walnut.
 Price: £9 9s. 0d.

FIRST AGAIN!

LAST week we gave a description of this new receiver, and explained the reason for the development of a set of this type. It will be seen from this week's illustrations that the panel appears to bear a formidable array of controls, but, as was pointed out in the first notes, this is not actually the case. Although there are seven knobs on the panel front, it will be found that only two are normally required, namely, the main tuning control—which is, of course, used to select the station to which you wish to listen—and the volume control (which may be the variable-mu potentiometer used to reduce the strength of the station or the reaction condenser used to increase the strength). The remaining knobs control tone or selectivity, or change the wave-band or

round the edge with a $\frac{1}{16}$ in. drill, each hole being separated by a space of about 1-16th. A sharp penknife should then be inserted in each hole and levered backwards and forwards, doing this on both sides. It will then be found very simple to give the piece of ebonite enclosed by the holes a sharp tap or two, when it will fall out. The hole need not be cleaned up, as the window will be found to fit comfortably. Drill and countersink the holes for the wood screws along the correct line, and then mount the panel components as shown in the illustration (Fig. 5). Now, before putting the panel on to one side, cut off a short length of Glazite and join one terminal on the potentiometer to the nearest terminal on the on-off switch, as shown in the wiring diagram, Fig. 6. Also attach the 10,000 ohm spaghetti to the slider terminal of the potentiometer.



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the different baseboard components, taking your guide from the wiring diagram (Fig. 6). For the three-gang condenser, again use the makers' template, marking for the purpose a line down the centre of the baseboard. When each component is in its correct position, mark with an awl or similar tool the position for each screw hole, and in addition pencil a dot where each of the numbered holes is shown. Note that there are two holes in the coil L.3 and one in the coil L.2. These should be marked through the holes in the bases of the Telsen coils. When all positions are accurately marked, remove the components and carry out assembly in the following manner. First of all attach the variable condenser, and then push the panel into position to make quite certain that the dial is accurately registered and that the spindle is on its correct centre. Next attach the three coils, but before driving in the fixing screws, remove the two band-pass coils from the small base on which they are supplied, and fit a three-gang rod through all three coils. This will ensure that the three coils are correctly centred. Again push the panel into position to make certain that the coil spindle will clear. If this is so, attach the small indicating plate on the panel for the wave-change switch. This will be found in the envelope in the coil box. Do not attach the coil L.1 too near the panel, or the bolts for the indicating disc will foul the coil screen. Attach the small limiting device

Fig. 4.—Components mounted on baseboard and partially wired.



Fig. 3.—Front of panel.

switch the set on or off, so that actually the receiver has two controls, with the others acting purely as refinements. However, the utility of these controls will be appreciated when you come to handle the receiver.

The Panel

The first part of this receiver to build is the panel, and for this purpose the panel should be drilled from the dimensions shown in Fig. 2. In this illustration, by the way, the various controls are marked to show their purpose. The holes should be drilled to just take the individual components, and, unfortunately, these are not all of the same size. Therefore drill $\frac{1}{16}$ in. holes at each point, and enlarge out to just take the various one-hole fixing bushes. The condenser escutcheon is marked out from the template supplied by the makers of the three-ganged condenser, and great care should be exercised to get this exact, as otherwise the dial markings will not be accurately registered in the window, and the pointer will not be of much use. To cut out the window for the escutcheon the best method is to scratch out the shape (from the template) and then to drill all

meter. This part of the work may now be laid aside whilst the remaining constructional work is carried out.

The Chassis

The wooden chassis is made up from the 15in. by 10in. baseboard, with side runners $1\frac{1}{2}$ in. deep. Before attaching these, drill the four holes for the valve-holders. For the valves V1, V2 and V3 these should be $\frac{1}{16}$ in. in diameter, but for V4, the 7-pin valve, a slightly larger hole is required. If a larger bit is not available, the hole may be drilled to $\frac{1}{16}$ in. and then filed out to just clear the seven valve legs. Now position all

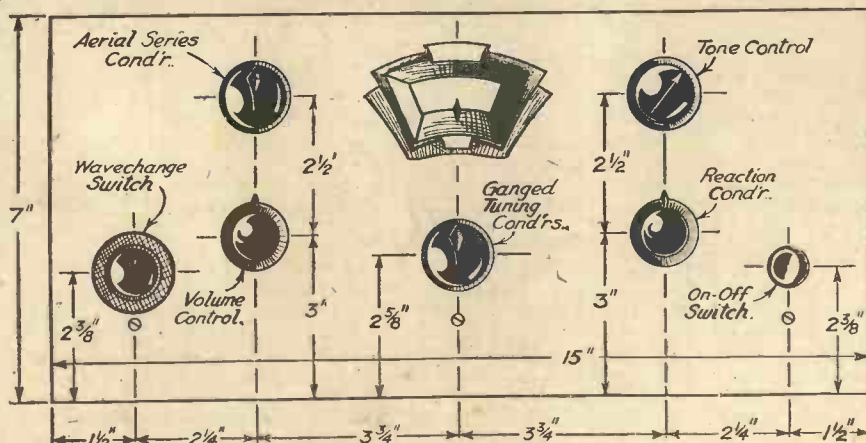
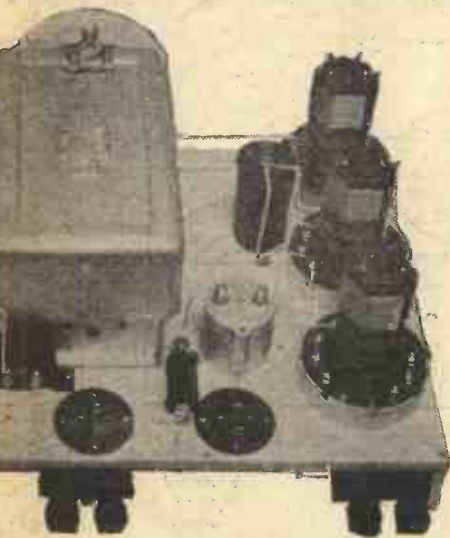


Fig. 2.—Panel-drilling dimensions.

"Universal Four"

Preliminary Steps in the Construction of Luxury Receiver which was Briefly Described Last Week. the "Practical Wireless" Technical Staff.

to the switch rod between the coils L.3 and L.2 and attach the coils by means of ordinary wood screws. The remainder of the components may then be mounted, leaving the valve-holders till last. Note that the small



fixed condensers are not screwed into position but are held in situ by the connecting wires. The .1 mfd. condenser on the underside of the baseboard should not be fitted yet.

The Wiring

Now commence the wiring, taking those wires which are shown as passing underneath the .1 mfd. condenser to their respective points first of all. When these are completed, then attach the .1 condenser to the side runner, and put in the remainder of the wires. The filament leads should be put in first, then the leads to the variable condensers, and so on, omitting for the time being those wires which have subsequently to be connected to panel components. When all wires have been completed—a process which must be very carefully checked—attach the panel. Perhaps it would be as well to

point out here that the best way of wiring a receiver is to take a blue pencil, and as a wire is put into its place to scratch through the same wire on the wiring plan. In this way it is impossible to leave out a wire unnoticed. A better plan is to make a large drawing of your receiver with the components, and also to make a large copy of the wiring plan. Then as you wire the receiver, draw in the wire on your copy of the set and scratch out the same wire on the wiring plan. When finished, you can check your large plans with the printed wiring plan, and there can thus be no mistake. Notice how the tone

controls is wired. A length of ordinary double (red and black) flex is cut off sufficiently long to reach from the potentiometer to the terminals marked TC on the Multi-tone transformer. Another length of single flex is then cut to the same proportions and the cotton covering removed from this. The three are then plaited together, and attached to the potentiometer with the plain rubber flex to the central terminal. The red and black flex leads may be attached to either of the outside terminals. On the transformer the plain rubber lead is joined to the terminal marked "G," and the red and black leads joined to either of the terminals marked TC. There are no other points about which any difficulty may arise, and all that remains is to attach the battery leads. Care should be taken in attaching these to the on-off switch, as the H.T. negative lead must feed through the fuse lamp, and the other two leads must be attached exactly as shown for

the following reason. If you examine the theoretical circuit you will see that L.T. negative and one side of the potentiometer are joined together and to one side of the three-point switch. If this is not carried out exactly as shown, there is a risk that the connections will be made in such a manner that the potentiometer is in circuit with the grid battery the whole of the time, and it will naturally discharge the battery. Do not, therefore, make any alteration to this part of the wiring, or, for that matter, do not deviate in any particular unless you are an expert in wireless matters and appreciate what you are doing when carrying out the modification. It may be noticed that there is no H.T. lead to the output valve, and that there is no output transformer shown in the wiring diagram. The reason for this is that the particular loud-speaker employed, the Rola, is fitted with a special Class B output transformer and this is mounted

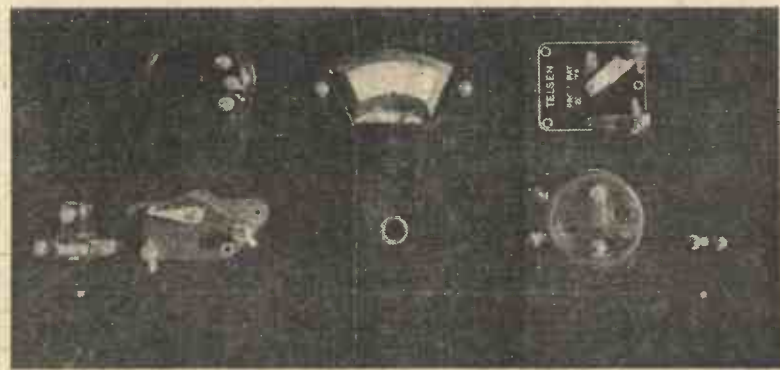


Fig. 5.—Back of panel showing how to mount components.

in the cabinet. The wiring to this will be given next week, together with details for completing the wiring and operating notes. The speaker should therefore be attached to the rear of the baffle in the cabinet, and two leads soldered to the two outside terminals on the transformer fitted to the rear of this. These leads should be identified in some way, and then a third lead soldered to the centre terminal on the transformer. This latter lead should be carried down and the end attached to the wander plug on the H.T. positive-lead of the 4-way battery cord. The remaining two leads are simply connected to the L.S. terminals on the rear of the baseboard of the receiver. It may be thought necessary, to some listeners, to vary the tone a little, and this may conveniently be carried out by connecting a fixed condenser across the two L.S. terminals. Various values may, of course, be tried out to obtain the type of reproduction which suits your particular needs. The wiring is now complete, and the receiver is all ready for a test.

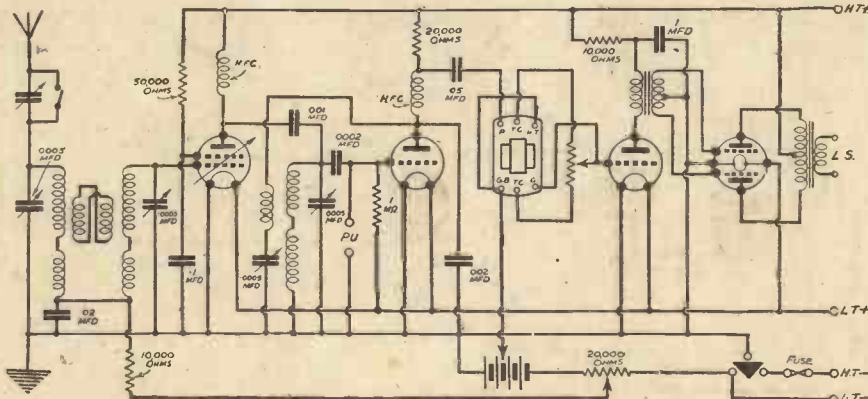


Fig. 1.—Circuit diagram of the Beta Universal Four.

Testing Out

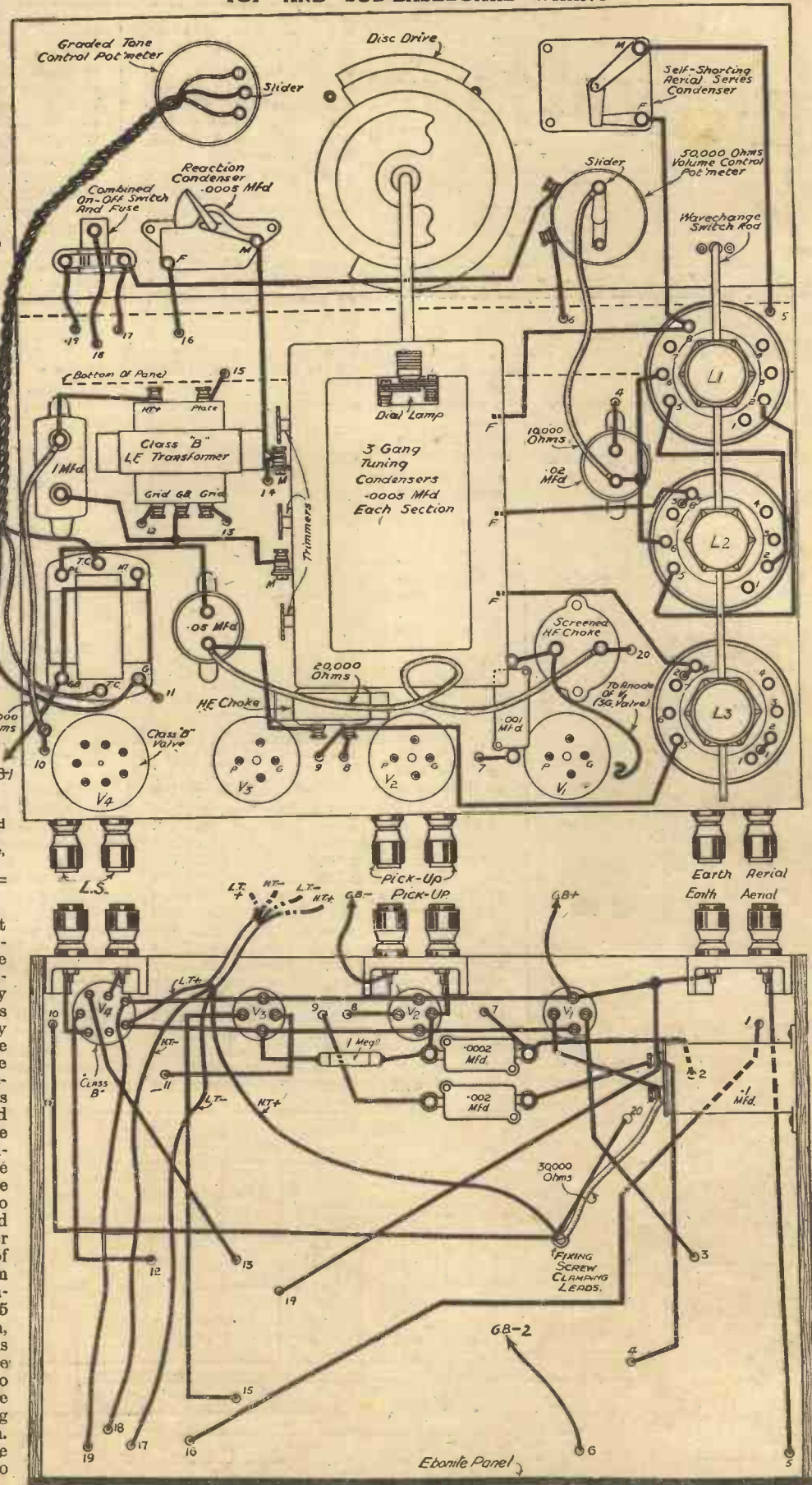
To test out the receiver it is only necessary to connect the batteries and correctly adjust the controls, but there are one or two points here which require carefully watching,

(Continued on page 154.)

TOP AND SUB-BASEBOARD WIRING

LIST OF COMPONENTS FOR THE BETA UNIVERSAL FOUR

- One Pair Telsen Band Pass Coils (Type W. 290).
- One Telsen single Matched Coil (Type W. 216).
- One Telsen Three-gang Condenser with Disc Drive.
- One Telsen Aerial Condenser with shorting switch.
- Three 4-pin chassis-type valveholders. Clix.
- One 7-pin chassis-type valveholders. Clix.
- One .02 Dubilier fixed condenser, type 9200.
- One .001 Dubilier fixed condenser, type 670.
- One .002 Dubilier fixed condenser, type 670.
- One .05 Dubilier fixed condenser, type 9200
- One 1 mfd. Dubilier fixed condenser, type BB.
- One .0002 mfd. Dubilier fixed condenser, type 670.
- One .1 mfd. Dubilier fixed condenser, type 9200.
- One 10,000 ohm spaghetti resistance. Lissen.
- One 20,000 ohm spaghetti resistance. Lissen.
- One 30,000 ohm spaghetti resistance. Lissen.
- One Bulgin H.F. Choke, Type H.F. 9.
- One Lissen standard H.F. Choke.
- One .0005 mfd. reaction condenser. Lissen.
- One Multitone Toco 1-4 L.F. Transformer.
- One Multitone Graded Potentiometer.
- One Benjamin Class B Driver Transformer.
- One Busco three-point switch with fuseholder.
- One Lewcos 20,000 ohm Potentiometer.
- One Becol Ebonite Panel, 15in. by 7in.
- One 1 megohm Lissen Grid Leak with wire ends.
- One Lissen 16-volt Grid Bias Battery.
- One Lissen 120-volt H.T. Battery.
- One Lissen 2-volt Accumulator.
- One Relo Loud-Speaker, Type F.6/PM/O1/Class B.
- One 5-Ply Baseboard, 15in. by 10in.
- One Cabinet. Peto-Scott.
- One Cossor 220 VSG valve (metallized).
- One Cossor 1210 Det. valve (metallized).
- One Cossor 215 P. valve.
- One Cossor 240 B. valve.
- Three Belling-Lee Terminal Mounts.
- Six Belling-Lee Type B Terminals (Aerial, Earth, Pick-up, Pick-up, Loud-Speaker, Loud-Speaker).
- One Belling-Lee Four-Way Battery Cord.
- Three Wander Plugs, G.B.+ , G.B.1 and G.B.2.
- Sundry Screws, Fuse Bulb, Coil of Glazite, Flex, etc.



(Continued from previous page.)

and although we propose to wait until next week before giving complete operating instructions, the following brief instructions will enable those who cannot wait to try out the receiver and get some idea as to its capabilities. The battery leads, having only four plugs, are extremely simple to connect, the L.T. leads being joined to the accumulator, and the H.T. leads being plugged into the negative and positive ends of the battery. The grid-bias is a little more complicated, the plug marked positive (that connected direct to the filament wiring) being plugged into the positive end of the battery, and the lead from the potentiometer being plugged into the other end of the 16-volt battery. The lead from the Multitone transformer is inserted, for the time being, in the 7.5 volt socket. Pull out the switch, and the receiver should show signs of liveliness. Adjustment of the potentiometer should be made to bring the set into its most sensitive condition, and then the main tuning knob rotated to tune-in a station. The series-aerial condenser and the reaction condenser may be used to adjust the degree of selectivity.

£9.9.0 only—

brings you a perfect set for reception whether your mains be A.C. or D.C.

A demonstration of the

SUNBEAM
UNIVERSAL A.C. or D.C.
3 VALVE ALL-MAINS SET

will convince you of its wonderful performance. It is really unnecessary to use an outdoor aerial in normal situations as it is possible to receive from 15 to 20 stations at full speaker strength on the internal aerial, with selectivity of a high degree—altogether a Receiver of extraordinarily high efficiency.



See "test" report in this issue of "Practical Wireless."

MODEL U.35.

SPECIFICATION :

UNIVERSAL—D.C. or A.C. 3-valve set.
CIRCUIT—S.G.H.F., Det. and Pentode.
RECTIFIER—Westinghouse.
MAINS—D.C. or A.C.
VOLTAGES—200-250 variable.
PERIODICITY—25-100 cycles.
SPEAKER—Moving Coil; also sockets for using extra speaker.
PRICE—£9:9:0 complete.

CONTROLS—Tuning: Single dial. Switching: Combined Gramo-Long-Short. Combined Reaction and Volume control.
AERIAL—Self-contained and socket for external aerial.
SELECTIVITY: Adjustable.
PICK-UP—Sockets provided.
CABINET—Walnut. Size: Height 18½". Width 15". Depth 9".

Send a Post Card to us now and we will arrange for your Local Dealer to give you a Free demonstration. Write Dept. "U."

SUNBEAM ELECTRIC LTD.,
SUNBEAM ROAD, LONDON, N.W.10.

Telephone: Willesden 1575 (3 lines).

"A common state of affairs"

and experimental work. The information given in some of the arrangements described and the trader would be well advised to consult the Technical Queries Editor:

QUESTIONS AND ANSWERS

WAS IT A BREAKDOWN?

"PUZZLED" (Andover).—"I was very interested in the loudspeaker tests of frequency of Mr. Watson Watt, but did the thing break down when he said he would go from 100 down to 35? I got nothing of this, nor did a friend to whom I mentioned it, but he was told that his set must have been at fault, as other people could hear below the 100 frequency."

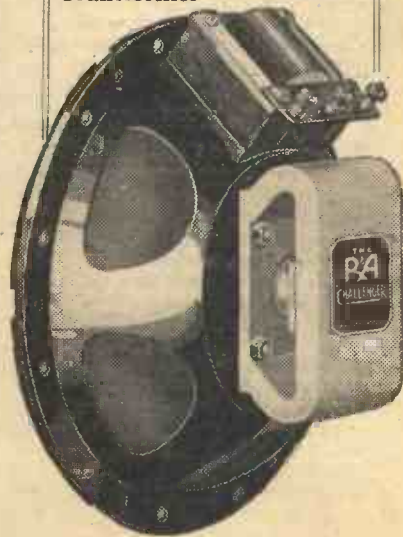
There was no breakdown so far as we are aware, so probably either your set or your loudspeaker "cuts off sharply" at 100 or so—which is a much more common state of affairs than is often suspected. Owing to the accommodating nature of the ear such a limitation in frequency response often goes quite unsuspected until shown up by a test of the kind referred to.

and a remedy

The above reprint is from a recent issue of a Wireless Journal. A remedy for the sharp cut off in response below 100 cycles lies in installing an R & A "Challenger," the reproducer which does not cut off, but which reproduces the complete orchestral range from 50 up to 8,000 cycles.

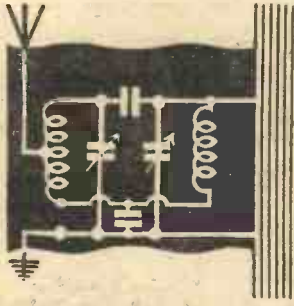
Ask your dealer to demonstrate this remarkable Reproducer, and write us for copy of Laboratory Test Reports.

"CHALLENGER" P.M.M.C. REPRODUCER, complete with 3 - ratio Ferranti Transformer 35/-



REPRODUCERS & AMPLIFIERS LTD., WOLVERHAMPTON.

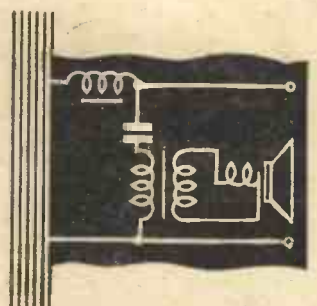
The **R & A**
"CHALLENGER"



RADIO RAMBLINGS

By JACE

Gottings from my Notebook



Radio Bargains

WE see every day glowing advertisements in the Press of wonderful radio bargains. Sets which have been selling from £50 to £60 are offered at prices ranging from £10 to £20. To the uninitiated this is apparently a wonderful chance of obtaining a well-known set at a knock-out price. The first cost in most things is not the most important to consider, but the utility, the pleasure and the upkeep. When a manufacturer replaces an old model with a new one, which combines all the latest improvements and advancements in radio, the obsolete models are gathered together and sold to dealers and stores. Some of the sets which brought in stations loud and clear are found to be unselective, others that were selective, so selective that they choked off the rich harmonies and produced distortion, some are "howlers." If you have had no past experience in radio, ask a "fan" who is a reader of a radio paper, and who has had actual experience with a radio set, for advice, or write to a journal for it. Hear his set, then, if you like it, buy or make just that set, and buy it from a regular radio dealer who will accept some form of responsibility for its good behaviour and give you service after sale. You cannot expect that when you buy a junk bargain. As a rule the store or dealer in regular radio products does not buy junk, for it does not pay to buy poor radio merchandise at any price.

Superhet or Band-pass

A COLLEAGUE said to me a few days ago: "You see, I was right when I told you the superhet would come into its own this season." I frankly admitted he was right. It has come into its own but, from a broadcast reception point of view, "it's own" does not approach the level which I think is necessary for the fidelity of perfect musical reproduction. It is willingly granted that the greatest need to-day, in wireless reception, is selectivity. There is an ever increasing number of high-power transmitters on the air, and it cannot be denied the problem is no longer how to receive them, but rather how to separate them. Exceptional selectivity is essential if programmes are to be heard free from interference or background. My contention is, the superhet gives all the selectivity needed, but, generally speaking, it is at the expense of quality, and it is for this reason my sympathies are more in the direction of the band-pass principle of tuning. The whole idea of the band-pass filter is that it should accept only a certain limited band of frequencies, consisting of the carrier waves of the wanted station and its side-bands. For good quality reproduction this band width should be preserved intact on all wavelengths. With well-chosen coils of this type, which give a 10-kilocycles separation, used in a circuit comprising two stages of screened-grid high-frequency amplification, a power

detector, and push-pull output, sufficient selectivity can be obtained, with perfect reproduction, which is far and away superior to any superhet circuit for broadcast reception.



"Grid Leak," the popular writer on wireless

Eliminators and Mains Fuses

I SEE the old subject of two-tariff electric power supplies has again cropped up when a man was fined for using an electric lamp off a power plug. Non-technical users find it difficult to appreciate why current identical in character should be charged at two widely different rates merely because they come out of different plugs, and the temptation to use a lamp from the cheapest socket is very great. I do not know if an official ruling has ever been given regarding wireless sets, but I believe it is generally accepted that as our valves are really small editions of heaters it is quite in order to use them wired up to a cheap heating supply. In any case it does not matter much on the score of cost, for this is infinitesimal, but it is usually much more convenient to plug-in to a heater socket placed low in the room than to have a long lead reaching up to the electric light hanging from the ceiling. The latter is a nuisance to everybody, and for this reason alone the heating plug is the best one to use. When wiring up to the heating circuit, however, it pays to use some sort of fuse arrangement between the switch and the eliminator, or if you prefer it, the power supply unit. This is because the fuses fitted to the house heating circuits are very hefty in order to carry the large currents needed

to warm up resistance heaters, and the average wireless set could be a smouldering heap of ashes, should anything untoward happen, before the main fuses would blow.

Electrical Unit as Basis of Monetary Transactions

DO you notice how one subject leads to another? Talking of mains reminds me of an account I saw the other day of how an American scientist and economist suggested that the best standard for basing monetary transactions is the electrical unit, and that an "Edison dollar" of 40 kilowatt-hours would have absolute stability, a property gold never seems to have had. The argument is that electricity costs much about the same to produce the world over and that something approaching the ideal standard would be obtained. This is as maybe, and funny things come and go in America, but I think the problem of transporting sufficient "juice" to pay off our war debts across the Atlantic would be quite a considerable one.

New Astronomer Royal

YOU will have read that our Astronomer Royal has recently retired and that Dr. Spencer Jones, F.R.S., has taken the place of Sir Frank Dyson, K.B.E., F.R.S., at Greenwich. The coming of broadcasting has given Greenwich some valuable publicity, and radio and electricity plays a large part in the time-keeping function of the Observatory. All the world looks to Greenwich for the time, and many other things besides, and great is the responsibility of those in charge there. The new Astronomer Royal has done good work in the interests of both astronomy and radio; he has been in charge of the astronomical station at Cape Town for many years and took over his new duties in March. When you think of it, the relationship between astronomy and radio is very close indeed. Both rely on ether vibrations for their being, and practically all we know of our solar neighbours is through the medium of the light rays they give off. These travel at practically the same speed as wireless waves and who can say that this is anything but a coincidence?

The Care of Condensers

TO avoid trouble with ganged condensers great care should be taken when fixing these components to the baseboard or chassis. The makers test the sections and adjust them to have practically equal values of capacity, but it stands to reason that if you afterwards twist the frame the capacities will be altered.

Twisting is usually caused by screwing down unevenly. The base plate or board to which the component is being fixed may not be flat. The result of tightening the fixing screws must therefore be to twist the condenser. In order to avoid the difficulty of not being able properly to gang the circuits, screw down very carefully.

THE MECHANICAL PROPERTIES OF METAL DIAPHRAGMS IN SOUND REPRODUCTION

The Possibility of Varying Sound Pitch and Tone by Diaphragm Control

By WM. CROMPTON

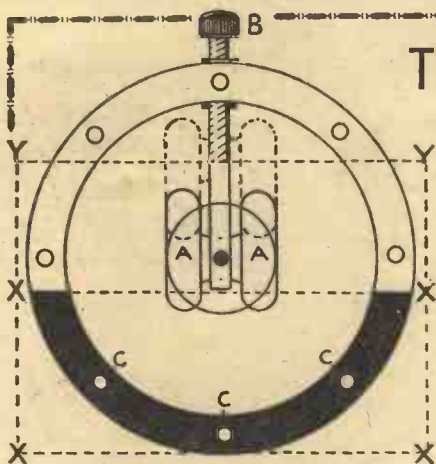


Fig. 1.—Plan view of base unit of speaker in diagram form.
 A Pole pieces of magnet.
 B Knob for adjusting the horizontal movement of pole pieces.
 C Three screw holes for clamping the cap, diaphragm and base in position.
 X—X Dark portion of base rim supporting the diaphragm. The light portion has been filed down 1/64th of an inch.
 Y—Y Shows amount of horizontal travel of pole pieces.

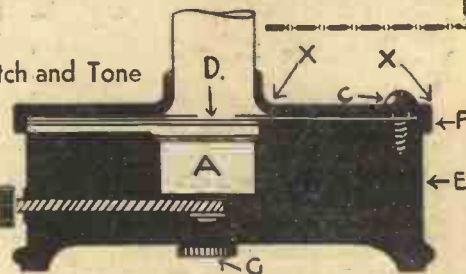


Fig. 2.—Diagrammatic illustration of the partially held diaphragm, and pole piece adjustments.
 A Pole piece of magnet.
 B Knob for adjusting the horizontal movement of pole pieces.
 C Retaining screw, gripping cap, diaphragm and base piece.
 D Free portion of diaphragm.
 E Base casing.
 F Turned-down rim of cap.
 G Knob for controlling the longitudinal or upward movement of pole pieces.

It may seem rather bold to suggest that the pitch, or tone of the sound transmitted at the broadcasting station, can be altered or transposed into a different key, as it were, at the receiving end. If that was possible we should be treated to some rather startling and even fantastic reproductions. For instance, a tenor voice could be changed to baritone, or even bass, while music of a normally high frequency ratio could be transposed to frequencies of the lower octaves, and vice versa. Whilst musical trapeze after this fashion would no doubt amuse the few, and irritate the great majority of serious listeners, yet it would appear that further research into the mechanical properties of metal diaphragms might lead to something extremely helpful in our quest for pure reproduction throughout the wide frequency range of modern broadcasting programmes.

The writer has achieved some rather interesting and novel results whilst experimenting with the ordinary circular metal diaphragm used with horn speaker models. Though the cone type of speaker is now almost universally used in the home, nevertheless the principle of sound reproduction is unchanged, and possibly the writer's experiences may open up new fields of investigation among those readers who delight in experimental work.

An Interesting Experiment
 The first experiment is shown in Figs. 1 and 2,

which give in diagram form a plan and sectional view of an old type loud-speaker base unit. In the original construction the diaphragm (D) was held rigid between the circular metal base (E) and the metal cap (F), the three components being clamped together with eight screws (C). The magnet coils (A) were fitted in the base concentric with the diaphragm and had a longitudinal adjustment (G). This arrangement follows closely that adopted in earphones. The alterations effected for experimental purposes aimed to ascertain whether the mechanical properties of the diaphragm affected reproduction in a large or small degree. The results certainly justified the work entailed.

The re-arranged unit (see Figs. 1 and 2) provided for a semi-rigid diaphragm and horizontal movement of the magnet coils, in addition to the up and down adjustment of the latter. The first part of the alterations was not difficult. About two-thirds of the upper rim of the base (shown blank in Fig. 1) was filed down, taking off approximately 1/64 of an inch, and a similar operation was performed on the corresponding portion of the inside face of the cap. Fig. 2 shows the resultant fit. The diaphragm (D) is held in position by a section of the cap and base (X-X, Fig. 2), the latter being clamped with three screws instead of eight. Thus, approximately, five-

eighths of the diaphragm is left free. The second alteration was more complicated. In order to allow a lateral movement of the coils and magnet, the metal base had to be cut away and mounted on a specially-constructed baseboard.

Comparative Results

In order to test out fully the qualities of the unit, two scales were incorporated and calibrated in sixty-fourths of an inch. The original setting was accepted as zero for both the longitudinal and lateral adjustments, and comparisons were made with a similar horn speaker (unaltered) and a moving-coil cone speaker. These tests proved beyond all doubt that the semi-rigid diaphragm was exceedingly sensitive at certain settings, and further that zero setting was by no means the best setting. There appeared to be an effective lateral variation equal to about one-third of the diameter of the diaphragm. Within these limits there was a pronounced variation in the sound reproduction with hardly a trace of distortion, and very pleasing effects were obtained with pianoforte transmissions. The results were superior to those of the other speakers, particularly in recording the notes in the lower octaves. The higher efficiency of the semi-rigid diaphragm was noticeable in the case of speech, singing, orchestral suites, and pianoforte

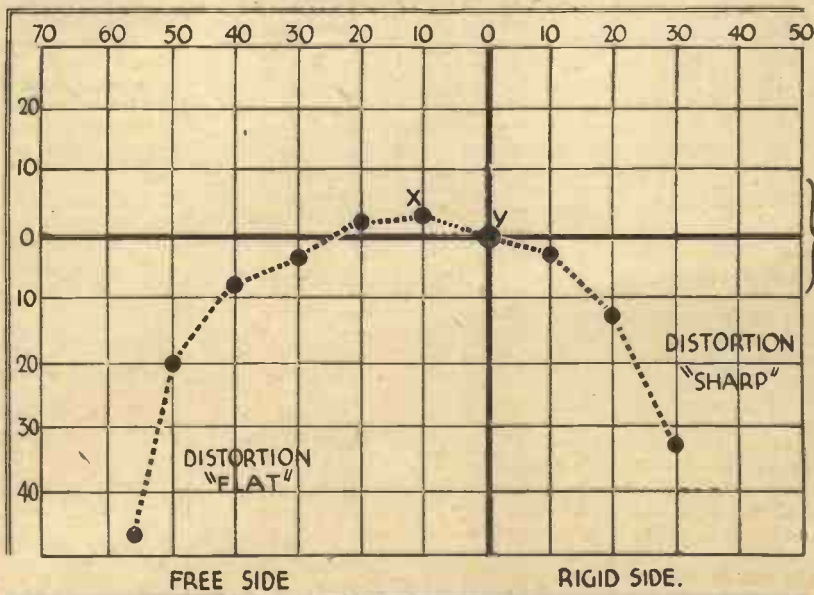


Fig. 3.—Chart showing results of tests with the semi-rigid type of diaphragm.
 X Denotes the peak of efficiency in pure sound reproduction being considerably higher than the normal good setting of the ordinary type loud-speaker unit.
 Y Ordinary setting of orthodox loud-speaker unit for good reproduction.

appeared to be an effective lateral variation equal to about one-third of the diameter of the diaphragm. Within these limits there was a pronounced variation in the sound reproduction with hardly a trace of distortion, and very pleasing effects were obtained with pianoforte transmissions. The results were superior to those of the other speakers, particularly in recording the notes in the lower octaves. The higher efficiency of the semi-rigid diaphragm was noticeable in the case of speech, singing, orchestral suites, and pianoforte

(Continued on page 163.)

Returning the Compliment

The Receiver Responds to Care and Attention, and also to Inattention and Carelessness!

By CYNIC

A WIRELESS set, like any other apparatus, will always respond to care and considerate treatment. When you come to think about it, a radio receiver operates solely on account of and by virtue of certain electrical impulses and electric currents fed into it from various sources. What it does with these impulses and currents is settled once and for all by the technical design and physical condition of the apparatus, so that within the limits of these factors the performance of the set depends entirely upon the character of the various inputs of electrical energy. If these inputs are of correct quality and quantity, the set cannot fail to give reproduction as perfect as its technical design will permit.

Electrical Inputs

Now what are the electrical inputs to a receiver? Well, first of all there is the radio signal, introduced through the aerial circuit. Then there is the heating current for the valves, supplied by the low-tension accumulator in the case of a battery-operated set, or from the filament winding of the power transformer in an A.C. mains set. Thirdly, there is the anode feed which is provided by the high-tension battery or supply unit; and last, but by no means least, there are the grid biasing voltages applied to the grids of the amplifying valves either from a small dry battery, or by making use of the voltage drop across a resistance in the negative end of the high-tension supply.

It is a definite fact that if any of these is incorrect in quantity, or variable in quality, the receiver will not be able to reproduce faithfully the programme radiated from the broadcasting station to which the set is tuned. The technical name for any departure from accurate reproduction is "distortion." It will be of the very greatest service, therefore, to see in what ways distortion can be introduced, and the ways in which it can be prevented by the exercise of that little extra consideration which will enable the receiver to respond and to return the compliment.

The First Rule

Undoubtedly the first point to consider is the radio signal itself. It may be thought that, as this emanates from the broadcasting station, it is entirely out of the listener's control, and that, provided no distortion is introduced at the transmitting end, the signal will be applied to the first valve of the receiver in a perfect and undistorted condition. But this is far from being the case. It is fatally easy to introduce the element of distortion into the radio signal before it reaches the first valve.

In the first place, if your set is unselective—that is to say, unless the tuning is sufficiently sharp to eliminate all but the actual station to which you wish to listen for the moment—any interference from stations operating on adjacent wavelengths will be amplified throughout the various stages of the set, and will mar the final reproduction. On the other hand, if you make your receiver too selective, too sharply tuned, then, by cutting off what are known as the "sidebands," the higher notes and tones in both music and speech will be lost, and the quality of reproduction will be most unpleasant. Golden rule number one, therefore, for the listener who wishes to be kind to his set is to make the tuning neither too flat nor too sharp—just sharp enough to give the normal 9 kilocycles separation, and no more and no less.

Next, even if no actual distortion is introduced either by interference or by sideband cutting, a poor aerial or earth, or an inefficient tuning system may so reduce the signal strength that the detector valve, whose job it is to convert the radio signal into an audio frequency signal, is unable to operate efficiently and will, in consequence, distort. Distortion at this point is most likely to occur if the detector is of the "anode bend" variety, for this type of detector is only at its best when called upon to handle a fairly strong signal. Note rule number two—have the most efficient aerial and earth you can provide, and give your set reasonably robust signals to work upon.

Signals too Strong

But, as if to contradict the foregoing, it is possible to ask too much of your valves by applying a signal which is too strong for them to handle without distortion. This applies particularly to the screened grid high-frequency valve if one is fitted to your set. This valve is intended to amplify the incoming radio signal before it is passed to the detector, and is therefore a most sensitive type of valve. It will accept the weak signals arriving from distant stations



Fig. 1.—A good multi-purpose test set for carrying out measurements on a set to ensure absence of distortion.

and magnify them until they are powerful enough for the detector to handle them efficiently. You are not always listening to distant stations, however, and it is more than likely that, when you tune in to your local station, the full amplification of the high-frequency valve or valves is not required. Not only may the amplified signal be too powerful for the detector to handle, but the original incoming signal itself may be too strong for the high frequency valve to handle without distortion. Rule three for the proper treatment of your set, therefore, is to provide means for relieving the high-frequency valve from overloading. There are two main methods of doing this: first, the fitting of an input volume control, and, second, by employing in the high-frequency stage a variable-mu valve, which is a special type of screened grid valve whose sensitivity can be reduced, when it is required to handle strong signals, by increasing the grid bias. Details of these devices have all been described from time to time in PRACTICAL WIRELESS, so the matter need not be amplified further in this article.

L.T. and H.T.

Having assured ourselves that no cause of distortion is being introduced by way of the incoming signal, let us consider the effect of improper low-tension supply. The low-tension current heats the filaments or cathodes of the various valves, and causes them to emit the stream of electrons by virtue of which alone the valves can function. If your accumulator has run down, the filament temperature will be too low to give full emission; the value of the anode current will therefore drop, and, although everything else in connection with the set is in order, both volume and quality will suffer. Rule four, therefore, is to have your accumulator regularly charged so that the full voltage is always available for the valve filament circuit. Our French friends have a term for the low-battery which can be interpreted as "feeding battery." It is an expressive and very apt term, for to use a run-down accumulator is analogous to starving your valves—and an ill-nourished servant cannot do good work.

(Continued on page 163).



Fig. 2.—It is a good plan to have a voltmeter and milliammeter as part of the mains eliminator equipment.

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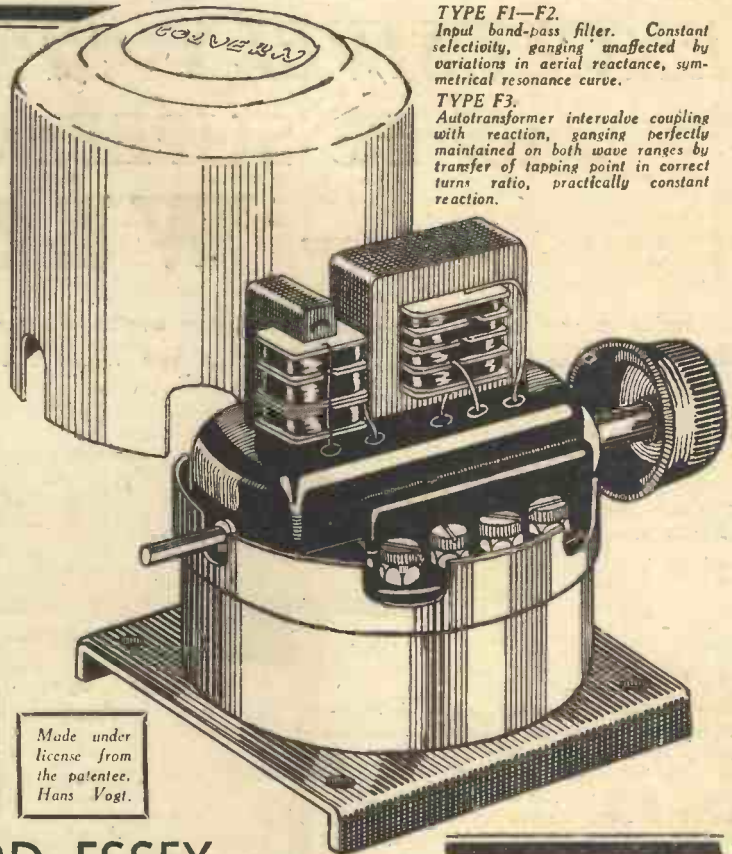
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RETURNING THE COMPLIMENT

(Continued from page 160.)

But what of the high-tension supply? Well, here again it must be remembered that the high-tension power, or at least a part of it, is the actual power required to operate the loud-speaker, and if only a restricted ration is available, both quality and volume will deteriorate. Moreover, unless each valve is fed at the correct anode voltage, it cannot work efficiently—the degree of amplification will be reduced, and probably distortion will also ensue. A third effect of a run-down high-tension battery is that a high resistance may be introduced by one or more faulty cells, and, this resistance being common to the anode circuits of several valves, will cause electric coupling between the various circuits, leading to several forms of instability ranging from howling to that curious popping noise known as "motor-boating."

The next golden rule, therefore, is to maintain the high-tension supply in good order by renewing the high-tension battery when it is showing signs of running down; to assure yourself that each anode is connected to the correct high-tension tapping; and to test the H.T. supply occasionally by means of a milliammeter in the anode circuit of each valve. One form of multi-purpose home-constructed instrument I always keep by me for this and other tests is shown in Fig. 1. The approximately correct value of the anode current to each valve is always quoted by the valve maker on his instruction sheets and catalogues, and this should be checked up in the meter. Another good scheme, especially when using an eliminator, is to have a voltmeter and milliammeter as permanent parts of the equipment as shown in Fig. 2. This will enable the user

to test immediately and see that all the "feeds" are satisfactory.

Grid Bias

Now comes the great question of grid bias. The object of applying grid bias voltage to amplifying valves is to maintain the average value of the grid voltage at such a figure that the alternate positive and negative swings of the incoming signal fall within the range which the valve can amplify without distortion. Either too high or too low grid bias results in partial rectification; that is to say, unequal amplification of positive and negative swings, and this means distortion. Check up, therefore, the value of grid bias, as indicated by the tapping used on the grid bias battery, with the anode voltage applied to the valve. The two should be in accordance with the figures given in the valve-maker's catalogue. An additional check can be made by testing the value of anode current, which should also correspond to the figure given in the catalogue.

At the same time, the nominal value of grid bias cannot be depended upon as being accurate if the bias battery has been in service for a considerable period, and it is a wise precaution to renew this small and inexpensive battery when the high-tension battery is replaced.

There is just one other cause of distortion which we have not dealt with—namely, the possibility of the amplified signal applied to a late stage of the set—say the output valve—being too great to be handled without distortion. The inclusion of a volume control after the detector stage will obviate this risk, and should you find distortion occurring and you are certain that you have eliminated all other causes, the use of a post detector volume control will no doubt remove the trouble.

THE MECHANICAL PROPERTIES OF METAL DIAPHRAGMS IN SOUND REPRODUCTION

(Continued from page 159.)

solos. It was possible to get a finer adjustment for each of these items than was possible with the all-rigid type and only a longitudinal regulator. These tests also showed that thickness and quality of the metal used affected the efficiency of the diaphragm; in fact, the writer came to the conclusion that pure reproduction depended very largely on the purity of the metal—all other things being equal, of course. For example, one test with a diaphragm having a highly-polished surface produced much better results than the use of a diaphragm of the same metal but coated with varnish.

Peculiar Distortion Effects

The graph shown in Fig. 3 sums up the results of these tests. The audible range of the lateral adjustment extends to approximately one inch beyond zero on the free side and about half that distance on the rigid side. The range for good reproduction is decidedly less, extending to 20 degrees ($\frac{1}{3}$ in.) on the free side and about 12 in the other direction. At either end of the scale distortion is encountered, but with slightly different effects. The tendency on the free side is to impart a change of key or pitch—from "open" to "flat"; whereas on the rigid side the distortion is definitely "sharp." Hence the writer's opening remarks.

These latter characteristics, admittedly, may be more novel than useful, but they certainly show that the mechanical properties of the metal diaphragm are worthy of more serious consideration than has hitherto been given them. The last word in metal diaphragms has not yet been spoken, and anyone who has the facility for trying out diaphragms made from the different alloyed-ferrous metals will quickly realize the vast possibilities in that sphere of research once they have made a few tests.

The writer makes bold to state that the standard of reproduction obtained with this combination of semi-rigid diaphragm—lateral and longitudinal adjustment—is easily 20 per cent. purer over the optimum frequency band of broadcasting than obtainable with either the all-rigid diaphragm or moving-coil cone speaker. Another important point to watch in making tests of this kind is that particular attention to the longitudinal adjustment is of supreme importance. The slightest variation of the air gap between the pole piece of the magnet and the free side of the diaphragm has tremendous effect on the quality of reproduction, particularly when experimenting at the extreme end of the lateral scale. The tendency for the metal to set up violent mechanical oscillations predominates at certain points, and is productive of some very weird sound effects. Whenever the true coincidence of the two adjustments is arrived at, the range of pure reproduction does, however, more than compensate for the time and patience exerted in finding it.

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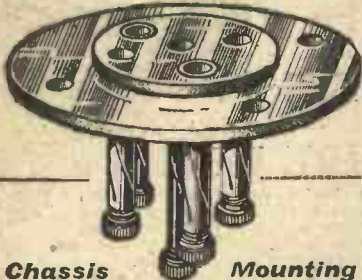
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ALL ABOUT ALTERNATING CURRENT RECTIFIERS

By G. H. WRAY, F.C.S.

AN alternating current is one which alternately reverses its direction in a circuit in a periodic manner. That is to say, it flows first in one direction and then in another, at regular equal intervals of time. To rectify an alternating current is to convert it into a unidirectional or direct current, that is, a current which

rectifier circuits for half- and full-wave rectifying respectively.

There are several kinds of rectifiers in use at present, from the simple "wet" electrolytic, to the more complex mercury-arc type in which an arc is maintained between two electrodes, the cathode being kept at an incandescent temperature by

the passage of the rectified current. It depends for its action upon the thermionic discharge from the cathode allowing the passage of current in one direction only. The mercury-arc type is unsuitable for dealing with small currents such as

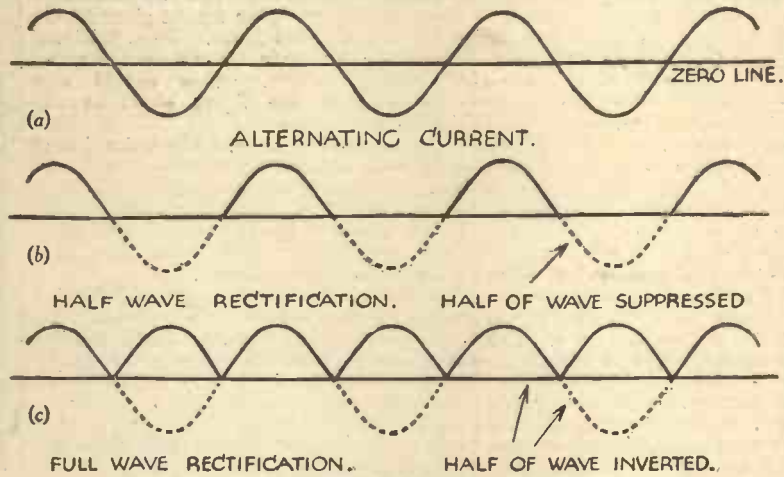


Fig. 1.—(a) The method of showing alternating current. (b) Half of the wave rectified. (c) Full-wave rectification.

flows continuously in one direction by means of a device known as a rectifier. This conversion is accomplished either by the suppression or the inversion of one half wave. Rectifying by suppression of one half wave is termed half-wave rectification, and by the inversion of one half wave full-wave rectification. The typical wave form of an alternating current, also that of half- and full-wave rectified currents are shown in Fig. 1.

A rectifier simply connected in series

those required for wireless receiving sets, and is usually employed in large undertakings where heavy currents are dealt with.

Chemical Rectifiers

Chemical rectifiers may be either the liquid or the dry type. The liquid type consists of two metals such as lead and aluminium, immersed in a suitable solution such as ammonium phosphate, or lead and tantalum, in a 20 per cent. solution of sulphuric acid. The disadvantages in the use of the "wet" electrolytic rectifier, are, its low efficiency, sedimentation

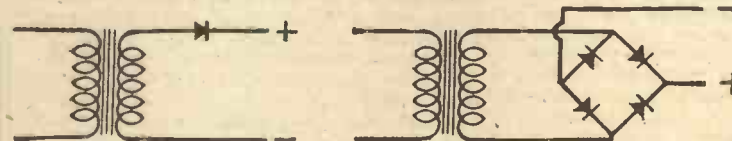


Fig. 2.—Circuit diagram of a half-wave rectifier, and a full-wave rectifier.

with an A.C. supply provides an easy path of low resistance for the current in one direction only, and offers a high resistance to the passage of current in the opposite direction. In other words, the rectifier allows the passage of the positive half of the A.C. wave, and rejects or suppresses the negative half, thus providing half-wave rectification.

Full wave, which is the more efficient method of rectifying, is obtained by the use of rectifiers connected in a suitable manner in order to utilize both the positive and the negative half of the wave, thereby converting both alternations into a movement of current in one direction. Both in half- and in full-wave, rectifying the rectified current is a unidirectional one of a pulsating character. Fig. 2 shows the

necessitating frequent cleaning and renewing, temperature rise, creeping of the electrolyte, and evaporation.

The dry electrolytic type consists of plates of such substances as copper sulphide and magnesium in contact with each other, or silver sulphide and copper oxide, and their functioning as rectifiers depends upon chemical action between these materials. This chemical action results in chemical change in the composition of these substances, which in turn results in a lowering of the efficiency and steady deterioration of the rectifier. All substances that conduct electricity, both electronically and electrolytically, can act as rectifiers. Both the wet and the dry types of electrolytic rectifier depend for

(Continued on facing page.)

(Continued from facing page.)

their action on the property possessed by certain metals and materials when immersed in a suitable electrolyte in the case of the wet type, and in contact with each other in the case of the dry type, of allowing the passage of current in one direction.

The two types usually employed and incorporated in modern wireless receiving sets, are the thermionic-valve rectifier, and the metal-oxide rectifier. The thermionic-valve rectifier consists of a discharge tube, the cathode of which is maintained at an incandescent temperature by an external source of energy. Like the mercury-arc rectifier, it depends for its action upon the thermionic discharge from the cathode allowing the passage of current in only one direction.

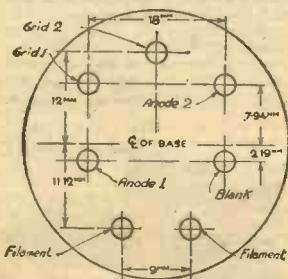
Full-wave Rectifier Valve

The full-wave rectifier valve differs in general construction from the wireless valve in that it has no grid. It consists of a glass bulb filled with an inert gas, usually Argon, and contains three electrodes, one of which is the filament or cathode. Argon gas for filling lamp bulbs and valves is produced from liquid air, which is purified, and the oxygen which contains 5 per cent. of Argon, is withdrawn and submitted to further purification. When the cathode of the valve is heated, the gas becomes ionized, thereby providing a low conductivity path for the free electrons flowing from the filament. The cathode is usually oxide coated, which provides for a copious electron flow at a lower filament temperature than would otherwise be possible. The filament is heated from a separate source of supply, and it is advisable that the voltage specified for this purpose should be adhered to.

The life of a valve rectifier is generally accepted as about one thousand hours, during which time the valve suffers a gradual decrease in efficiency, but with ordinary use its life is usually prolonged much beyond this period. Although the valve is a satisfactory rectifier, and is manufactured in various sizes suitable for small wireless purposes or for dealing with one kilowatt or so, it has the definite disadvantage that its life is limited. Its efficiency also is low compared to that of the metal-oxide type of rectifier.

The copper oxide, or metal rectifier, consists of a number of copper discs with a film of oxide formed on the surface. Its action as a rectifier is due to the electrolytic and electronic effect at the junction between the copper metal and the film of oxide. The metal rectifier possesses one great advantage over the valve type, that of permanence. Metal rectifiers may be connected in series or in parallel to provide required outputs of any magnitude.

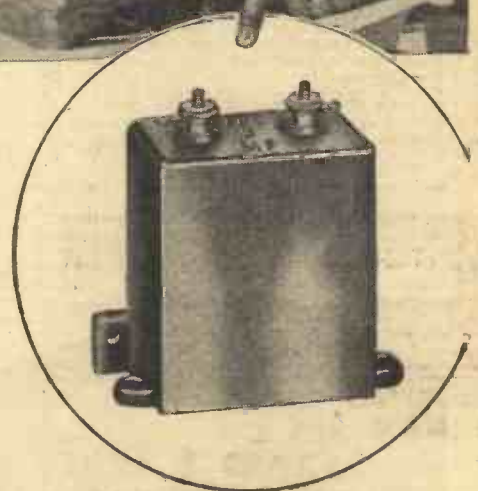
CLASS B VALVE HOLDERS



2 STANDARD SPLIT PINS 1/8" DIAM. APPROX.

This diagram gives dimensions of the new valve-holders for 7-pin (Class B) valves. The diagram is a top view.

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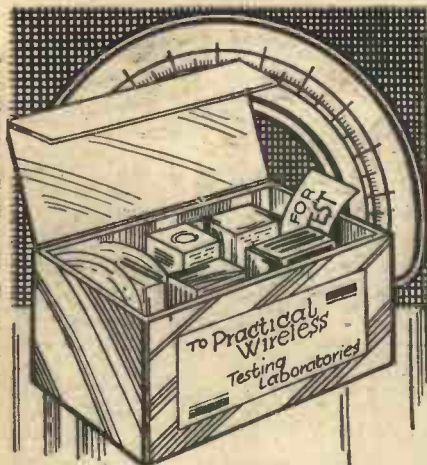
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SOUND SALES CLASS B UNIT

THE arrival of the Class B valve, and its valuable use with a battery-operated receiver, has led Sound Sales, Ltd., to produce the unit shown herewith. It is on similar lines to the unit which was described in our pages the week before last, and does, in fact, employ the same transformers. In addition, however, Messrs. Sound Sales have introduced one or two refinements, which enable the unit to be employed with practically any type of receiver. A tone compensating device is included in the unit, which is finished in brown mottled bakelite. The 7-pin valve-holder is sunk below the top of the unit and as seen from the illustration the valve-base comes level with the top of the unit. The switch on the left of the valve breaks the lead, and so prevents being left in operation



The Sound Sales Class B unit.

the receiver is switched off. The results given by the unit are really splendid, and it will be found a most valuable addition to the usual broadcast receiver. Where two L.F. stages are used in the latter, it is preferable to join the input terminals of the unit to the anode circuit of the first L.F. valve, and to use a power-valve of the Cossor 215.P type in that socket. This prevents the risk of overloading the driver valve, and so introducing distortion in the Class B valve. The price of the unit is 35s.

HIVAC VALVES

WE recently had the opportunity of visiting the factory of the High Vacuum Valve Co., Ltd., in London, and were able to inspect the elaborate machinery which is used by that firm in the production of the HIVAC Valves. No pains are spared to produce a really high-class valve at a cheap figure, and great care is taken to ensure that individual valves are up to characteristic, and all the usual machinery for life test, vacuum test, etc., is installed. In addition, there are several novelties, such as the employment of a special electrode assembly for the screen-grid valves. The particular method of making this valve enables the metal coating which is usually associated with the valve to be dispensed with, and the process of making up the complete assembly is very interesting. The valves are sold at remarkably low figures, the general types of valve, such as the H210 and the L210, costing only 4s. 6d., whilst the screen-grid valve is 10s. 6d. A variable-mu valve is obtainable at 10s. 6d. also. The L.210 valve is of the 2 volt .1 amp. type, with an impedance of 8,000 ohms and an amplification

Facts and Figures

Components Tested in our Laboratory

BY THE PRACTICAL WIRELESS TECHNICAL STAFF

factor of 10. The P.220 has a filament rating of .2 amps. at 2 volts, and an impedance of 3,000 ohms with an amplification of 6. The characteristics were checked over and were found remarkably consistent, very little error being traced. In actual use in standard receivers, the valves were all very good and noticeably free from microphony. Although these valves are cheap they may be highly recommended, and will be found to offer efficient service at a very reasonable figure.

DRIVER TRANSFORMERS

WITH the arrival of the Class B amplification a completely new type of intervalve coupling transformer is required, and the reasons for this, and the considerations governing its design, have already been described in our pages (see the issue dated April 1st, page 51). We have so far received four of these special driver transformers, and they have all apparently been designed round the Cossor 240.B valve. The Lotus component is housed in a neat aluminium-finished case, and is very clearly marked with the particular type. Unfortunately, the majority of makers do not give this special marking, and it is, therefore, difficult to distinguish one type of transformer from another. The Lotus has a ratio of 1 : 2, and a primary winding of approximately 350 ohms. This gives an inductance of approximately 30 henries under working conditions, and is intended for use with the Cossor P.215 or similar valve as the driver. The cost of this component is 11s. 6d. The Benjamin Driver transformer is made to sell at 10s. 6d., and has a primary resistance of 300 ohms, with an inductance of 8 or 9 henries at .5 mA. The ratio is 1 : 1. The Multitone Class B Driver has a ratio of 1 : 2, and the primary resistance is only 200 ohms. This component costs 9s. 6d. The Sound Sales Driver is a cheaper product, costing 9s., and the ratio is 1 : 1. The primary resistance is approximately 300 ohms, and it will be seen that this figure is practically standard with this type of transformer. In addition to those transformers which we have received, we understand from Messrs. Lissen that they are producing a special Class B Hypernik transformer and this will cost 12s. 6d. We have not yet received any technical details of the windings or the ratio.

GARRARD MOTORS

TO convert a radio set into a radiogram, the principal addition is the gramophone motor, and this can take two forms, either clockwork or electric. The Garrard Engineering Company have produced three very suitable models for this purpose, one of which is reproduced on this page. This is the Double Spring Radiogram Unit, and, as will be seen, is complete with motor-board, pick-up and arm, needle-cups, etc. All that is required, therefore, is to attach this to the upper board of the gramophone cabinet and connect up the pick-up. This unit is highly suitable for a battery-operated receiver, as the motor is of the ordinary clockwork type, fitted with a double spring, enabling a 12in. record to be played on both sides with one winding. The reserve of power supplied by the double spring ensures that there will be no slowing down due to drag on very loud passages, and the mechanism employed in the motor works delightfully smoothly and silently. The cost of this complete unit is 63s., and this will be found a valuable addition to the broadcast receiver. The other two types are built up with induction and Universal electric motors, and are, of course, only of use where the electric mains supply is accessible. They will be dealt with in a future issue.

BELLING-LEE CLIP-ON PICK-UP

SOMETHING entirely new in pick-ups has just been received by us, and has evoked considerable praise. This is an ordinary pick-up with tone arm, but is intended for a definite purpose, namely, the conversion of a portable gramophone into a radiogram. As all our readers are aware, the only addition to the normal radio set is a gramophone motor and turntable, and doubtless, many listeners already have a small portable gramophone. With this type of

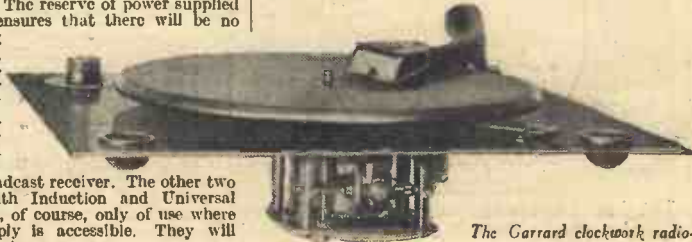


An ingenious gramophone connecting unit made by Messrs. Belling-Lee.

instrument it is very difficult to find accommodation for the ordinary type of pick-up and tone arm, as the space is so restricted. The motors usually fitted to these gramophones are quite suitable, however, for reproduction by the wireless receiver, and the problem is therefore to fit the pick-up in some convenient position which will permit of correct tracking. This Belling Lee Pick-up is mounted on a small rectangular box, covered with leatherette on three sides. The remaining side is provided with two "key-holes," and to attach it to your portable gramophone, all that is necessary is to fit two small screws on the side of the gramophone case, and then, when the unit is required for use, it is simply slipped over the screw-heads and a downward pressure locks it in position. Two terminals are provided for connecting the output of the pick-up to the receiver, and in addition, a volume control is fitted on the side of the base. Strips of felt on the side which fixes to the gramophone prevent damage to the cabinet work, and the unit may be called in every respect a "de luxe" production. The actual pick-up is of very small dimensions, but the electrical characteristics are of a high order. The reproduction is splendidly balanced, providing good quality reproduction from average records, without the use of a tone-compensating circuit. The design of the unit enables any form of tone correction to be employed, and the cost of the unit, with template to ensure correct fitting of the attaching screws, is 35s.

CLIX MOUNTING STRIPS

WE recently illustrated in these pages the new Clix chassis mounting strip for making a plug-in connection for aerial and earth. This component is used in the A.C. Twin, and Messrs. Lectrolinx have now developed a further type of strip which is especially suitable for mains receivers. This is exactly similar in appearance to the original terminal strip, but is only provided with two sockets. There are, however, three holes. Between the two holes which are the sockets, the word "IN" is engraved, and between the end hole and the socket the word "OUT" is engraved. A small ebony rod with two plugs fits these holes, and the mains aerial may thus be connected or disconnected by altering the position of the shorting plug. The strip costs 6d., and the shorting plug, 3d.



The Garrard clockwork radiogram unit.

MY OPINION!

By the Editor

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

The Bogies of Radio

ONE by one are the old bogies of radio, which were regularly dangled before awed readers by the radio parrots in the early days of wireless, being, to use a *cliche*, relegated to the limbo. The bogy-in-chief, the *bête noir*, in fact, was ebonite. Constructors were solemnly and regularly adjured to use ebonite for panels and baseboards if they wished to hear the sibilant whispers and dulcet declamations which sneaked away into the eager ether from the crude equipment which constituted Writtle—2MT. Nothing else would do, for the pundits had edicted that high-frequency currents had aversion to wood or aluminium, and would indicate the fact by stealing across the surface. Readers were even told that shiny ebonite should be dulled with emery powder to prevent surface leakage, and that the ebonite should be scoured lest any trace of the tinfoil used in its manufacture remained. It had not occurred to anyone in those days of chronic hand-capacity effects that a screened-surface ebonite would have been a boon.

Nowadays wood and metal panels and baseboards are used with impunity, and none of the dire effects forecast has been experienced.

Someone in the early days of motoring wrote that a visiting card should be used to gauge the tappet clearances, and that monstrously incorrect statement has been copied and handed down ever since, which shows that every industry has its parrots.

Have Your Copies Bound

REGULAR readers of PRACTICAL WIRELESS should carefully peruse the announcement on page 82 of issue dated April 1st. Next week we shall give details of a special offer to bind the twenty-six issues which make up Volume 1 of this paper. It is a tedious task to have to wade through twenty-six issues of a paper to find a particular article to which you wish to refer. Quite often the issue is missing or has been mislaid. I advise every reader of the paper to collect his issues together and to have them bound in the very attractive binding case, together with the title page, and very full cross-referenced index, which we have had prepared as a service to the reader. You will find that this can be done at a special bargain price of 5s. 6d., and the completed volume will provide you with a remarkable work of reference. If you require back issues to complete your file, these may be obtained for 4d. each, post free, from the Back Number Dept., Exeter Street, Strand, W.C.2. See next week's issue for details of this special bargain offer.

Readers' Queries

WE make no charge for answering readers' questions, but we stipulate that where a postal reply is desired a stamped and addressed envelope must be enclosed as well as the Query Coupon appearing on the Queries and Enquiries page. This coupon must be enclosed even when a postal reply is not required. Please note also that we cannot answer queries over the telephone, nor for obvious reasons can we modify commercial receivers. F. J. C.

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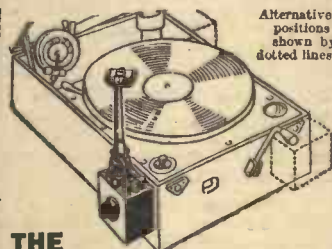
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IMPRESSIONS ON THE WAY

A REVIEW OF THE LATEST DISCS

ALTHOUGH the present time of the year is usually regarded as the "close" season for recording, there is a surprising number of good issues just now, especially in the "popular" class. First of all, some of the best of the light orchestral tunes, in which Columbia excel this month. You will like *A Wedding in Java* and *The Chinese Story Teller* on Columbia DB1018. These are two very brightly played numbers by *The Bohemians*, a clever orchestra.

Soothing, very soothing, is a record by *Albert Sandler's Orchestra* on Columbia DB1061. They play Eric Coates's *By The Sleepy Lagoon* and *Under Heaven's Blue* with a most attractive delicacy. And then, very similar is DB1056, with that very graceful little thing *Loim du Bal* and *Sans Souci (A Waltz Intermezzo)*. *J. H. Squire's Celeste Octet* are the players here, and either of these last two may be kept as a permanent cure for frayed nerves! *The Song of the Nightingale with Butterflies in the Rain* by *Fred Hartley's Quintet* on *Regal Zono MR853* is quite pleasant, too, with a vocal thrown in.

It is not a frequent occurrence to find modern dance music good enough to buy as music, but here are two records which have much to commend them as companions for some time—*He was Only a Poor Musician* and *In Santa Lucia* on Columbia CB567. This is by a very good band, *Eddie Saxon's*. The other has a pair by the *Dajos Bela Orchestra*, in *A Little Café in Hernalds* and *Play Me a Song of my Homeland*. These are on *Parlophone R1430*. *Leslie Bridgewater's Quintet* are very popular wireless artistes. They have done Strauss's *Voices of Spring and Wine, Women and Song* on *H.M.V. B4257*, and it is a very pleasant performance indeed. Then (German again) there is one of those performances which fairly shouts enjoyment with both titles and tunes. This is *Marek Weber's* performance of *Jollity on the Mountains* and *Viennese Singing Birds (H.M.V. B4008)*. The first is especially good, with a yodelling background here and there. And, writing of Vienna, here is a record to have. Try *Waldteufel's Skaters' Waltz* and *The Schoenbrunner Waltz* on Columbia DB1064. These are by the *Vienna Symphony Orchestra*, who put up a sparkling performance. The orchestration is different from anything I have heard before in the *Skaters*. It is uncommonly good all through.

Before leaving the "band" records, I must confess to a quite unashamed liking for an occasional brass band. Another of the massed brass band records (*Regal Zono MR844*) can't justly be called a "stunner." If you let your radiogram have full throttle, you may have a broken window, but you'll enjoy every bit of *The Gladiator* and *The Crusader Marches*.

Singers of All Sorts
One of the most popular of the new songs

By E. REID WARR

is *Once in a Blue Moon*. It has more than the usual appeal of its class and I recommend the singing of the *Hon. W. Brownlow* on Columbia DB1072. Its backing, *Sylvia*, is a pretty little song, too. Then, in a different sphere, that superb artiste *Supervia* has a great record in *Parlophone RO20202*. She sings (in Italian) *Santa Lucia* and *Mendelssohn's Spring Song* (in Spanish). Apart from the popularity of each, this record should be bought as an example of beautiful soprano singing. There is a vogue for what I believe are called "swamp" songs. I have come across a pair of negro laments which are very well sung. They are by *George Doshier* (bass) and the songs are *Take Me Away from the River* and *I Want to Go Home (Sterno 1142)*. Here is a voice of tremendous depth and extreme richness.

A New Musical Play

Columbia presents some of the big numbers from *He Wanted Adventure*, which has just come to London from its Manchester trial run. The songs have been recorded on the stage and there is also a little dialogue here and there. There are several attractive songs, notably *The Monarch of the Seas*, by *Raymond Newell and Chorus*, and *You Come to Me*, a duet by *Raymond Newell and Marie Burke*. There are also some neat lines in *Smile and Be Bright* by *Bobby Howes and Wylie Watson*. A short appearance of *Judy Gunn* gives evidence of a very sweet voice. Those who have seen the play will like to have these records, for they are all admirably done, although recorded on the stage. The numbers are *DX459-462*.

A Great Symphony

As you know, the Brahms Centenary is being celebrated this year, and there will be many performances of his works. There is probably no other of his compositions which will be more liked than his *No. 3 Symphony in F Major*. Not the least of its charms is the versatility which is so apparent throughout. Brahms had an uncanny knack of passing from one passage to another, each entirely diverse in character. There are movements of crashing majesty immediately succeeded by a theme which is almost pastoral in its simple melody, and yet there is no incongruity. Space is needed to analyse each movement, but I do earnestly ask those who would be really stirred to hear the fourth movement. The early part is one of the most impressive episodes in music. This Symphony is done by the *Amsterdam Concertgebouw Orchestra* under *Mengelberg*, on four records—*Columbia LX220-LX223*. The recording is superb, and, as always, one can feel *Mengelberg's* conducting. A very important contribution to musical history is here in this performance.



Practical Letters from Readers.

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

An Excellent Book

SIR,—I write to thank you for my "Wireless Encyclopædia," which I received in good condition. I think it is an excellent book, and it will be very much used by me in my wireless experimenting. It is in every way up to the standard of PRACTICAL WIRELESS, a paper I look forward to each week. The part dealing with television is most interesting and concise. Of course, I have not yet read it through from end to end, but the portion I have read contains information that gets right to the point. Thanking you again for a wonderful book and a sensible weekly paper.—E. ANYON (Huddersfield).

Getting the Foreigners in Daylight

SIR,—This morning I fully exploded the idea that a medium-sized set cannot bring in the "foreigners" in daylight. Reading in PRACTICAL WIRELESS that "Poste Parisien" was starting early morning transmissions, I got up a little earlier one morning last week to give myself time to find him. I have a big aerial, 120ft. long and a D-2 L.F. Trans. set. I cut out all selectivity and gave him the benefit of the full aerial. However, he did not take any finding—as soon as my dial was within 3 degrees of where he should be the volume was tremendous, so good-bye to the idea that medium-wave foreign stations cannot be received in daylight with ordinary battery sets.—"PRACTICAL READER" (London, W.).

An Appreciation: Television Reception

SIR,—Having read PRACTICAL WIRELESS since its introduction I must say that I am agreeably disappointed. Having been connected professionally with radio for twelve years, I have seen the rise of several so-called practical radio journals, all of which have degenerated into semi-fictional magazines within a short period. Naturally,

The Fury Four: "Wonderful Undistorted Volume"

SIR,—I have finished the "Fury Four," and am well satisfied with results. I have not heard a set that comes anywhere near it, as regards the wonderful undistorted volume. It's a real treat to listen to the pure reproduction.—E. T. SPARKE (Newport, I. of W.).

The Fury Four: A Wonderful Set

SIR,—I have made up the Fury Four and it is a wonderful set. I have fitted it into its cabinet, and I must say it is an A1 job. I get hand capacity effects when near the knob of single Lotus condenser. How can I cure this?—W. WIGHTMAN (London-derry).

The "Wonderful Encyclopædia"

SIR,—Please accept my thanks for your wonderful De Luxe Encyclopædia, which is a most interesting book. I have also your binder for the Data Sheets which I look forward to every week. I find your paper, PRACTICAL WIRELESS, is the most interesting and practical weekly wireless journal at the low price of threepence. Wishing your paper and your staff every success.—F. MARGE (Merton).

CUT THIS OUT EACH WEEK

DO YOU KNOW?

—THAT screening a complete receiver will not cut-out interference from electrical apparatus, as such interference usually arises through the Mains.

—THAT the remedy in such cases is to fit special Mains H.F. chokes in the input leads to the receiver.

—THAT a special combination 5-amp. fused plug should be used to couple a Mains receiver to a power point, as the latter is usually fused at a much higher value.

—THAT omission to attend to the above point may result in serious damage to the receiver and the house.

—THAT a larger condenser than that specified by the valve makers should not be used in the input side of a Mains unit employing a valve rectifier.

—THAT an ordinary valve may be used as a Diode and will provide practically distortionless signals.

—THAT either the grid, or the anode, or both, may be used for the purpose of using a normal valve as a Diode.

NOTICE.

The Editor will be pleased to consider articles of a practical nature suitable for publication in PRACTICAL WIRELESS. Such articles should be written on one side of the paper only, and should contain the name and address of the sender. Whilst the Editor does not hold himself responsible for manuscripts, every effort will be made to return them if a stamped addressed envelope is enclosed. All correspondence intended for the Editor should be addressed: The Editor, PRACTICAL WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, W.C.2.

Owing to the rapid progress in the design of wireless apparatus and to our efforts to keep our readers in touch with the latest developments, we give no warranty that apparatus described in our columns is not the subject of letters patent.

One-Valver Wanted

SIR,—I wish to acknowledge receipt of the Wireless Constructor's Encyclopædia, Standard Edition. One can see by a casual glance through that the diagrams of components are right up to date, and the tables, etc., are of real value. I am a one-valve fan, and should like to see published in PRACTICAL WIRELESS a one-valve set using home-made coils. Wishing PRACTICAL WIRELESS success.—H. H. ASH (Lincoln).

Splendid Book

SIR,—I received the Encyclopædia all right, and I am highly delighted with it. I think it is a splendid book.—W. DEN- DERSON (Batley).

Old Wireless Set Wanted

SIR,—Will you be kind enough to find space in your journal for an appeal to your readers on behalf of an unemployed Club.

We would ask if any reader has a wireless set which is not required by him or her, and which could be given to the above Club for educational and recreational purposes.

The Club is situated in a distressed area and cannot afford to purchase a new set. The suggestion was made of appealing to PRACTICAL WIRELESS for help, and this is what I am now doing. Can you or any of your readers come to our aid?

WM. EVANS (Rhondda).

[Letters containing offers will be forwarded.—Ed.]

"Practical Wireless" in the Navy

SIR,—We are pleased to see that you are giving us more of the ultra S.W. stuff. I am going to build that "Below 10 metres" circuit that you gave us recently and I will send my results on to you.

The data sheets are most useful. I think that many of your readers would appreciate a really good two or three valve ultra S.W. receiver. Furthermore, I shall never be without PRACTICAL WIRELESS.—E. H. SLOMAN (H.M.S. Erebus).

3 Valve Short-wave Set

SIR,—The short-wave notes in PRACTICAL WIRELESS have proved very useful. May I suggest that you publish the information contained therein in tabular form so that the particulars can be seen at a glance?

I should like to see published full constructional details for a 3-valve short-wave receiver, e.g., S.G. with tuned circuit, detector, and 1 L.F. valve.—W. W. WOODMAN (Willesden).

Quality Reproduction

SIR,—I would like to endorse H. S. Bassett's appeal for quality in PRACTICAL WIRELESS of March 25th. True, designers have to cater for the majority, but people who demand range and selectivity do not usually realize that they are sacrificing quality to obtain these things.

I appeal to PRACTICAL WIRELESS to give us a receiver, with a level frequency response between 50 and 8,000 cycles, with an output not too great, for the home, preferably with triodes in push-pull for the power stage (A.C. mains). I, for one, have a speaker capable of doing justice to such a receiver, and intend buying another, to use two speakers at half volume, rather than one at full volume, merely to improve quality.—JAMES T. BRINKWORTH (Bellingham).

(Continued overleaf.)



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PRACTICAL LETTERS

(Continued from page 169.)

An Interesting and Instructive Book

SIR,—I should like to acknowledge the receipt of my copy of the "Encyclopædia," and thank you sincerely for a most interesting and instructive book.—**REX. TAYLOR** (West Norwood).

A Remarkable Free Gift

SIR,—I have received my copy of "Wireless Constructor's Encyclopædia" safely, for which please accept my thanks, and congratulations for such a remarkable free gift.—**R. H. WAIN** (Sheffield).

Fills a Long-felt Want

SIR,—Just a few words of appreciation concerning your wonderful Encyclopædia, which I received safely. I think it is a great work and fills a long-felt want of every wireless enthusiast, amateur or professional.—**F. W. SALT** (Long Eaton).

More than Satisfied

SIR,—Having received my "Wireless

Encyclopædia" yesterday and by this time well examined it, I feel I should write and congratulate you on being able to offer such a fine volume at such cheap rates. I am more than satisfied—I am delighted.—**G. J. (Liverpool)**.

Exceeds Expectations

SIR,—I can assure you that it is a great book, and, though I do not understand wireless technique, I will soon be able to pick it up from this book. It exceeded my expectations in all respects, and, those that did not go in for one have missed a real good thing.—**A. C. V. (Shepherd's Bush)**.

A Fine Book

SIR,—I received my copy of your presentation volume, "Wireless Constructor's Encyclopædia," and wish to express my admiration for such a fine book. So well put together, and the illustrations are a fine example of much thought. The "completeness" of the volume leaves nothing to be desired.—**E. S. (Sheffield)**.

RADIO CLUBS & SOCIETIES

Club Reports should not exceed 200 words in length and should be received first post each Monday morning for publication in the following week's issue.

KETERING RADIO AND PHYSICAL SOCIETY

"Gramophone pick-ups and automatic record changers" was the title of an excellent lecture delivered to the society on Monday, March 27th, by Mr. A. Freeman. A "Heath Robinson" pick-up, weighing several pounds and having a reed nearly a foot long, was shown by the lecturer, who described the construction and action of pick-ups in a delightful non-technical manner. The whole meeting had the novel experience of "feeling" music by joining hands across the output of a 50-watt amplifier connected to the pick-up. Explaining automatic record changers, Mr. Freeman exhibited an ingenious type of machine invented by himself, which played and automatically changed twelve 10in. or 12in. records.

Hon. sec.: Mr. B. J. Pankhurst (G5YF), 9, Shakepeare Road, Kettering, and Mr. Thomas H. Hall (BRS 1018), 59, Tresham Street, Kettering.

THE CROYDON RADIO SOCIETY

The Transmission of Sound by Light" was discussed at a recent meeting in the Horse and Groom, Cherry Orchard Road, E. Croydon. The lecturer was Mr. V. H. Gilbert, who began by describing the Raycraft bridge and its uses with a relay, such as when light on to the bridge was interrupted, the relay was closed. Thus was it used for burglar alarms, and similar applications. In transmitting sound by light, signals from a wireless set's output were modulated on to a light beam, obtained by a flash-lamp bulb. Then this modulated light was directed at the light sensitive cell, which, with associated amplifier, reproduced the signals as sound in the loud-speaker. The society's club set was used for the demonstration, its loud-speaker being disconnected from the output, and connected to the Raycraft bridge's amplifier. Excellent signals were heard, and experiments were suggested, such as conversing by light across the street, and even invisible-ray messages might be sent, using the infra-red portion of the light.

Hon. sec.: E. L. Cumbers, Maycroft, Campden Road, S. Croydon.

SLADE RADIO

A lecture and demonstration was given by Mr. S. H. Cohen at the meeting of the above society held recently. Commencing with a description of Class B amplification and the problem which it had set the designers of eliminators he gave a demonstration in which the latest type of eliminator and also an experimental valve of British manufacture were used. The volume proved ample, the quality very good, and the current consumption exceedingly small. Iron core H.F. coils, and also Litz wound coils were then dealt with after which some details were given of a new type of loud-speaker which is being developed. A demonstration of this was given, the results portending great possibilities for the future. Anyone who would like details of the society and advance

programme of meetings, etc., is invited to write to the Hon. sec., 110, Hillaries Road, Gravelly Hill, Birmingham.

ILFORD AND DISTRICT RADIO SOCIETY

The meeting held on March 18th was a very enjoyable one, and members co-operated to make a very interesting series of demonstrations, which were as follows: Mr. Largen demonstrated the use of a mains valve as a light-operated cell, which operated a series of relays and associated apparatus, when a light beam from a torch was impressed on the grid. There was a slight lag as compared with a photo-cell, but a definite rise in anode current in the valve in proportion to the distance of the source of light. Some amusement was caused by a demonstration of his "Coal-scuttle Three," a three valve R.C.C. amplifier, using lumps of domestic fuel for the necessary resistances, with 6,000-volt coupling condensers, but, nevertheless, it worked well. A number of Giesler tubes were worked by Mr. Dennis, the phasing of which were most impressive, and some high frequency experiments were then made. Details of the society may be obtained from the Hon. sec., Mr. C. E. Largen, 16, Clements Road, Ilford.

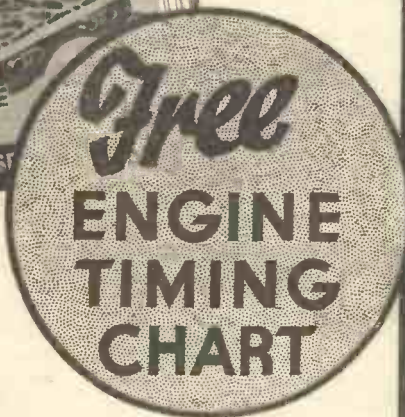
ANGLO-AMERICAN RADIO AND TELEVISION SOCIETY

In order to correspond more readily with members in foreign speaking countries the Anglo-American Radio and Television Society and associated society, the International Radio Society, have organized a committee of members who have a good knowledge of foreign languages. This committee, known as the Foreign Committee, is proving of great service. The readiness of members to join this committee when it was first suggested is a sure proof of the goodwill and fellowship these big radio societies foster. Mr. Karl Halpern has organized a New York City Branch of the A. A. R. and T. S. and I. R. S. The headquarters of the societies are at 11, Hawthorn Drive, Willowbank, Uxbridge, England. Hon. Pres.: Leslie W. Orton.

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