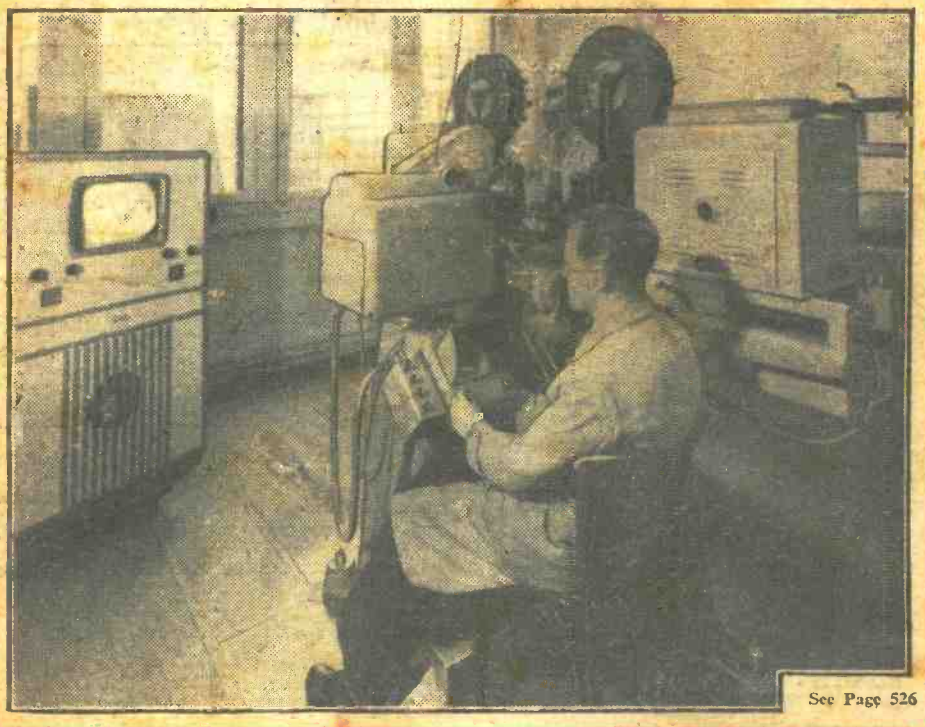
LOW VOLUME PERSONAL RECEIVER

Practical Wireless

9D EVERY MONTH

Vol. 24. No. 509. || Editor: F. J. CAMM || DECEMBER 1948



See Page 526

PRINCIPAL CONTENTS

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THE FAMOUS R.1155 RECEIVER.—These are all Brand New and Unused. Frequency range 18 mc/s-75 kc/s, in 5 wavebands. Complete with 10 valves (including Magic Eye). Complete in black crackled metal case, 16in. x 9in. x 9in. 2 12 6

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At last a gramophone motor to match the performance of the famous Connoisseur Pick-up. Voltage: 220-250 volts A.C., 50 cycles. Rim drive with speed variation. No governors and no gearing. Heavy non-ferreous turntable, machined to run dead true, fly-wheel action—no "WOW." Main turntable spindle hardened, ground and lapped to mirror finish, running in special phosphor bronze bearings. Motor runs in needle-point, self-adjusting bearing. Motor Board 4in. plastic. Pressure on Drive-wheel released when not in use, to obviate forming flats and noisy action.

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EX-GOVT. VALVES. Brand new American boxed valves, 6V6G or GT, 5Y3GT, 6J7GT, 6SC7, 6SL7, 5Z4G, or GT, 5R4; 12SJ7, GT, all at 7/6 ea.; 6L6G or Metal, 12/6 ea. Tax Paid.

EF50. Brand new and in original boxes, 7/6 ea. EA50. Brand new, 3/6 ea. Also 1R5 at 11/-, 1T4, 1S5 and 3S4 at 9/-, 1D8GT at 15/3. In addition to the above we have many thousands of brand new and boxed B.V.A. valves at current B.O.T. prices, including 25L6GT, 25Z6GT, 75, PX4, 6A7, T41, TH41, PEN. 45, PEN. 46, etc., etc.

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MIDGET TWO GANGS. .0005. Ceramic Insulation, size only 2in. x 1¼in. x 1¼in. long spindle, 10/6 only.

ALADDIN COIL FORMERS. Complete with Iron Core, 9d. ea.

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MINIATURE 8-WAY Jones Plug and Socket, 3/6, complete only.

"Q-MAX" CHASSIS CUTTERS. Complete with key, size ⅞in. (Button base), 10/3, size 1¼in., 1¾in. and 1¾in. (for EF50) at 13/6 ea.

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Practical Wireless and PRACTICAL TELEVISION
16th YEAR OF ISSUE
EVERY MONTH
VOL. XXIV. No. 509 DECEMBER, 1948
Editor E. J. CAMM

COMMENTS OF THE MONTH — BY THE EDITOR

Code of Practice for Publishers ?

THE Technical Committee of the R.S.G.B. has for some time been considering a proposal that a Code of Practice should be prepared for the guidance of contributors, editorial staff and printers, somewhat similar to the style sheet employed in all printing and editorial offices. In the course of its work the committee encountered numerous problems, the chief of which it said is that no two contemporary publications use identical technical abbreviations of circuit symbols.

The British Standards Institution had anticipated the R.S.G.B. in that they have already issued B.S.204/1943, entitled, Glossary of Terms used in Telecommunication, and B.S. 530/1948, entitled, Graphical Symbols for Telecommunication.

We pointed out to the R.S.G.B. that so many books have been produced and so many more have been prepared for press that it would be some years before these could be amended to conform with any code which may be decided upon and which publishers would agree to adopt. It would be a costly business, too, to scrap existing blocks.

In the early days of this journal we realised this difficulty and produced the "Practical Wireless Encyclopædia," which was the first effort to standardise nomenclature, definitions and circuit symbols. This has been used as a guide by our printers and by our editorial staff ever since, and we believe also that it has been adopted as a standard in many other editorial and publishing offices.

There is also a Service publication entitled "Inter-Service Standard Graphical Symbols for use in Telecommunications Engineering," published by the Air Ministry and Admiralty, under references AP/2867 and BR/1079 respectively.

The "Practical Wireless Encyclopædia," edition by edition, takes note of any changes in standard practice and any additions to it.

We agree that in some minor cases there is lack of uniformity. There is a tendency for some publishers to use American radio terms (radar, for example), and unnecessarily to add to the technical vocabulary. There are certain terms which should be expunged altogether; antenna, wobbulation, rheostat, tweeter, for example, are unnecessary and ugly. Some, indeed, are merely slang words which should find no place in technical parlance.

It would take a considerable amount of time to standardise technical terms and, having done so, to enforce its use. Should it be found necessary to hold a meeting we shall be glad to attend and give our views, but, as with all other industries, we feel that standardisation of terms is impossible of achievement beyond the limits already attained.

The Copenhagen Conference

A Conference of European nations agreed at Copenhagen on September 15th on a redistribution of long and medium wavelengths used for broadcasting.

The last effective plan of these wavelengths was made at Lucerne in 1933, and since then the claims of many countries, particularly those which were in 1933 less technically advanced, have greatly increased. But the number of wavelengths available for distribution now is practically the same as the Lucerne Conference and is considerably less than the total needed to meet the requirements of all countries. Consequently, agreement has only been made possible by nations from all parts of Europe accepting less than their full requirements.

The Lucerne Plan gave the United Kingdom one long and 10 medium wavelengths. The present B.B.C. services have only been carried on by taking into temporary use one additional long and two additional medium wavelengths allocated at Lucerne to other countries. The new Copenhagen Plan gives the United Kingdom one long and 13 medium wavelengths and in some cases increased power may be used. The alterations are sufficient to ensure that the B.B.C.'s programmes can be carried on substantially as they are at present, though most of the transmitters will have to change their wavelengths. These changes, however, will not be made until the new plan is introduced in March, 1950.

The agreement reached at the Conference represents a considerable achievement in international co-operation. Thirty-two nations have already signed the Convention.

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ROUND THE WORLD OF WIRELESS

Broadcast Receiving Licences

THE following statement shows the approximate numbers of licences issued during the year ended August 31st, 1948.

Region	Number
London Postal	2,110,000
Home Counties	1,484,000
Midland	1,611,000
North Eastern	1,747,000
North Western	1,476,000
South Western	991,000
Welsh and Border	655,000
Total England and Wales ..	10,074,000
Scotland	1,065,000
Northern Ireland	186,000
Grand Total	11,325,000

The above number includes 61,700 television licences, an increase of 3,450 over the previous month.

Prosecutions during August for operating wireless receiving apparatus without a licence numbered 509.

Despite previous warnings, some motorists continue to overlook the fact that it is necessary for them to take out a separate broadcast receiving licence for a wireless set fitted in a motor-car.

British Television in Scandinavia

TOTAL attendance at the television demonstration given by the Radio Industry Council in the British Exhibition, Copenhagen, was 117,000.

"The demonstration was an unqualified success from the point of view of public interest," said Vice-Admiral J. W. S. Dorling, Director of the Radio Industry Council. "There was some interference from medical electrical apparatus, but this was cleared voluntarily by the Danes themselves, and the only breakdown throughout the 16 days was one of two minutes due to someone tripping over a cable. I think we made a considerable impression also on the Danish State Broadcasting and Danish Government officials."

Part of a consignment of Stentorian loudspeakers leaving the Whiteley Electrical Works for Argentina, Malta, Trinidad and Bombay. Export figures of W/B products are showing a marked increase, despite world competition.

Radio Speeds Deliveries

OF parallel interest with the development of coach radio is its growing use on long-distance commercial vehicles, a new development in this country but an established practice in the U.S.A.

Firms such as Wall's Ice Cream have found that there is a considerable saving in operating costs on vehicles fitted with radio, and many other firms are now following suit.

The benefits derived from radio on commercial vehicles are that drivers make fewer stops, especially on night runs, with the result that vehicles are not "pushed" to make up lost time. They also experience less fatigue, and there is a marked improvement in maintaining schedules.

The new trend has been recognised by heavy vehicle manufacturers, some of whom now make provision for radio in the driving cabin.

The equipment recommended by Radiomobile is the standard push-button Model 100 "His Master's Voice" Automobile Radio, priced at £27 6s.

Philco (Overseas), Ltd.

THE Philco Corporation of Philadelphia, Pa., U.S.A., has recently formed a wholly owned British subsidiary known as Philco (Overseas), Limited.

This company has been formed for the purpose of selling in all export markets British-made Philco products.

The directors of the corporation are Mr. William Balderson, president of the Philco Corporation, U.S.A., Mr. J. C. Beevor, and the managing director is Mr. R. W. Cotton.

Mr. Cotton will be remembered as the chairman and managing director of British Rola until 1945 and as a previous managing director of Philco Radio and Television Corporation of Great Britain, Limited.

Television at Birmingham Ideal Homes Exhibition

THE first large-scale exhibition of television in the Midlands took place during the recent Ideal Homes Exhibition in Birmingham.

A television palace was the central feature of the exhibition. This stand, the largest ever erected for the Birmingham Ideal Homes Exhibition, was about 36ft. high, surmounted by a television mast similar to the one on the Alexandra Palace

in London. It was erected by Sobell Radio. Television was actually transmitted from a transmitting room at the stand to television sets placed on the stand and around Bingley Hall. The transmitter was designed and built at the Sobell Industries factory in South Wales. From ordinary films and sound tracks it will produce normal television and sound, so that it can be run independently of any B.B.C. television transmission.

Rows of Sobell television receivers were in operation on the stand every day throughout the period of the exhibition, so that everyone had the opportunity to see the short television programme which was specially devised by Sobell Industries, Ltd., for their entertainment.

Radio and Car-racing

ON-THE-SPOT conversations between British motor-racing drivers using two-way radio to talk to and receive instructions from their service pits in the recent Paris twelve-hour race were included in the television newsreel broadcast recently.

The sound recording, on a disc made by Radiodiffusion Française, was brought over by Peter Clark, captain of the H.R.G. team, which used Pye two-way radio during the race, and combined with an Actualités Françaises film rushed from Paris in time for last week's television programme.

The V.H.F. installations operated by Clark's drivers were the same as those installed by Pye in more than 50 taxi fleets, police cars, ambulances and other transport services throughout the country during the last year.

Muirhead-Jarvis Facsimile Equipment

CABLE AND WIRELESS, LTD., have extended their photo-telegraph equipment by the addition of the latest type of apparatus manufactured by Muirhead and Co., Ltd., and incorporating detail devised by Mr. S. W. Jarvis of the *Daily Mail* Wirephoto Department.

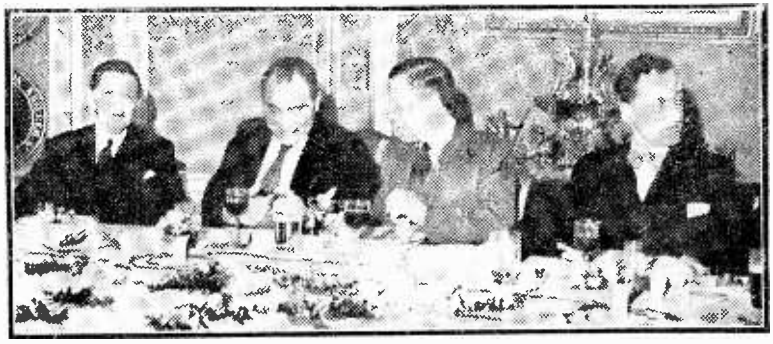
Transmitter and receiver are separate units, with a separate control panel, on the Muirhead-Jarvis equipment, which is devised for working on the new international limits—1,500 to 2,300 cycles—ranging from white to black. The transmission drum can be operated at 60, 90 or 120 revolutions per minute; 60 and 90 r.p.m. are used for oversea work, and 120 r.p.m. for landline work. A receiving unit, receiving a picture from oversea, can be coupled with a transmission unit for automatically relaying a picture by landline to an addressee equipped with the appropriate apparatus.

The picture is scanned by light from two sources, which is reflected to the photo-electric cell as a single ray. This enables more selective lighting, excluding spurious light (which tends to cause ripple on the received picture) and compensating for irregularities on the original. Further exclusion of spurious light is achieved by the transmitting drum being enclosed; the progress of transmission can be followed on an external visual traverse gauge.

Mullard Readership in Electronics

THE Mullard Company's recognition of the necessity for industrial organisations to accept some measure of responsibility, and to assist actively in the problems of the future education of electrical engineers, has prompted them to take practical steps in this connection by offering to finance a Readership in Electronics at the City and Guilds College of Imperial College.

Following discussions with Professor Willis Jackson on this subject an approach was made to the Rector of Imperial College, Sir Richard Southwell, outlining the company's views and desires, and this has resulted in the authorities of the University of London accepting the offer made by the Mullard Company.



The Prime Minister of Denmark, Mr. Hans Hedtoft, and the Danish Minister of Education, Mr. Hartvig Frisch, were among guests at a luncheon given by the Radio Industry Council in Copenhagen to celebrate the very successful demonstration of British television in the Exhibition there. The luncheon was held at the historic Den Kgl. Skydebane (a shooting club dating from the 15th century). In the picture are (l. to r.): Mr. C. O. Stanley, vice-chairman of the R.I.C.; Mr. Hans Hedtoft, Prime Minister of Denmark; Mr. J. W. Ridgeway, chairman of the R.I.C., and Mr. Hartvig Frisch, Danish Minister of Education.

Rocket Radio

SMALL transmitters capable of sending scientific information from a rocket 72 miles above the earth were operated successfully last month at White Sands Proving Grounds, according to *Science Service*. The rocket was travelling at a speed of more than 2,800 miles per hour.

The equipment used the Aerobee system to transmit 24 different kinds of continuous information to ground-based recorders. The system was evolved during the war by scientists of Princeton and Johns Hopkins Universities.

MINISTRY APPEALS TO HOUSEWIVES
Keep Waste Paper separate, dry and clean for salvage.

Bedside Portable Two

Further Constructional Notes on This Battery-operated Midget Receiver.

By R. L. G.

TWO fixing holes were found ample for securing the speaker platform to the chassis, these being arranged at opposite corners, as shown. The clamping strip was cut from a length of brass curtain-runner channel. It was passed through the magnet of the speaker, as shown, and two set-screws, one close to each side of the magnet bar, fixed the speaker tightly to the platform.

Details of the speaker platform, clamping strip and sub-panel screens "A" and "B" are shown

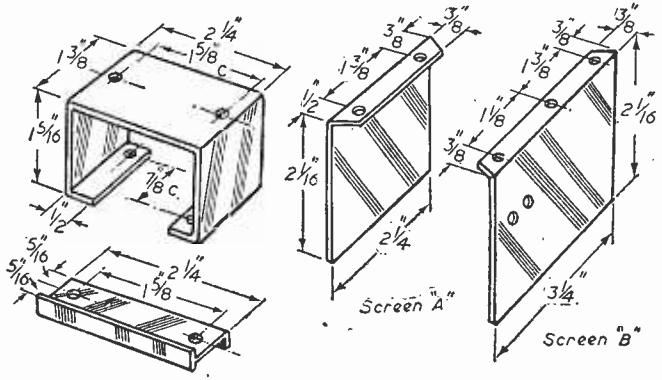


Fig. 6.—Details of the speaker platform and sub-panel screens.

in Fig. 6. The two holes in "B" are for screwing on the H.F. choke supports. These latter are merely short lengths of dowelling, of a diameter to give a good push-on fit. No distances for these are shown, as the positions are best found by trial. A similar support is screwed to the front face of the chassis for the third H.F. choke. Various holes may be drilled in the sub-panels to pass insulated wires through.

Wiring Diagram

This is clearly shown in Fig. 7. Looking at the underside of chassis, the left-hand compartment contains the coil and reaction condenser. The coil is seen plugged into the chassis-type valveholder acting as base. This is supported by two stout brass angle brackets, one to the side wood piece, and the other to the chassis by setscrews.

Owing to the restricted space, it was found necessary to cut down the legs of this valveholder to ⅛in. long, and this should be done carefully. Although this affects the resilience of the sockets somewhat, the pins of the coil should give good contact if opened out a little more.

The reaction condenser, which is of the solid dielectric type, is immediately in front of the coil, and the connections to the coil reaction leg and thence to the anode (oscil. anode) are quite short. Incidentally, it may be found simpler to solder certain wires to the coil holder before fixing this to the chassis.

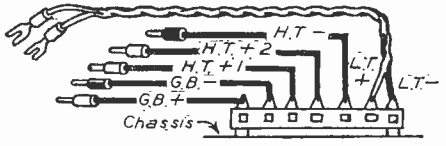
Make sure the connection to the fixed plates of the reaction condenser does not touch the metal chassis, and it may be advisable to fit a small spacing collar over the bush to space the condenser slightly from the chassis.

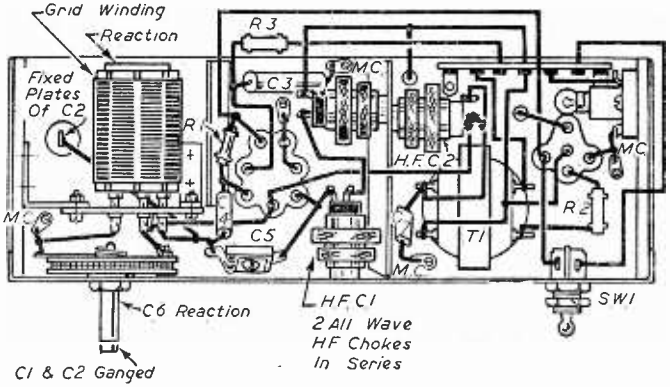
Central Compartment

This contains the two H.F. chokes in series, and is connected between anode (anode proper) and H.T.+2, the two chokes being at right-angles, and give a very efficient choking effect. One choke only may be tried if desired, but the choke in this position must be a good one. Pre-set condenser C.5 in this compartment should be positioned so that it can be adjusted from the outside, a large hole being drilled in the front face of the chassis for this purpose. In this compartment are also R.1, R.3, C.3, C.4, and there is ample room to space them and the wiring well.

The remaining right-hand compartment contains all the components associated with the audio amplifier. The author utilised a small L.F. transformer stripped down from some old R.A.F. equip-

Fig. 7.—Wiring diagram and battery lead connections





ment, but there is ample space available for most makes of the small type component. The chassis depth of 2in. of course limits the size one way, but if the size of the transformer used prevents the inclusion of H.F. choke 2, this latter might be substituted by a ½-watt resistance of about 10,000 ohms without too much loss of reaction smoothness. Note the grid stopper resistance, R.2.

As regards the actual wiring, all joining points are shown joined with a round dot, whilst wires crossing are broken.

It will be noticed that several wires are shown running outside the chassis. This is merely for clearness of illustration, and should, of course, be within chassis limits. For the same reason some wiring is longer than in actual practice, and wires should, so far as possible, go straight to and from components. Care should, however, be taken to space any wiring which carries radio-frequency currents.

Earthed points have, in all cases, been chosen as going to soldering tags screwed to chassis. It is, however, a good plan to arrange for a stout bare wire, going from one side of the chassis to the other, to which earthed or chassis points can be conveniently soldered. A 7-point tag board has been used for the connecting points from the set, and to these tags are finally soldered the several flex wires for battery connections. A separate view of this tag board is seen projected above, in Fig. 7.

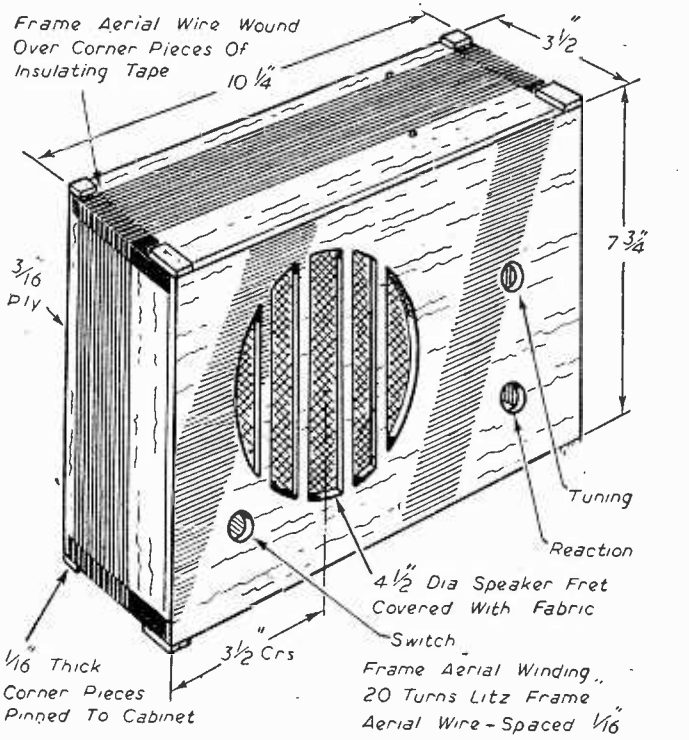


Fig. 9.—Frame aerial and cabinet details.

Case for Set and Frame Aerial

A simple rectangular three-ply case, fitted with a ply front panel, accommodates the set, and around this case is wound the frame aerial. This case, complete with frame windings, is shown in Fig. 9. Much of the efficiency of the portable lies in a carefully-made frame aerial. The author had available some Litz frame aerial wire, and this is, of course, ideal. However, medium-gauge cotton-covered copper wire will be found quite suitable, although the wire is less easy to wind, being not quite as flexible. The corner strips of insulating tape will help to keep the turns correctly spaced, but equally spaced saw cuts at the four corners can be adopted to anchor the turns if preferred. The small pieces of 1/16in. strip wood shown give partial air spacing for the winding when the set is assembled, in the outer casing, and also protect the winding from rubbing as it is slid in.

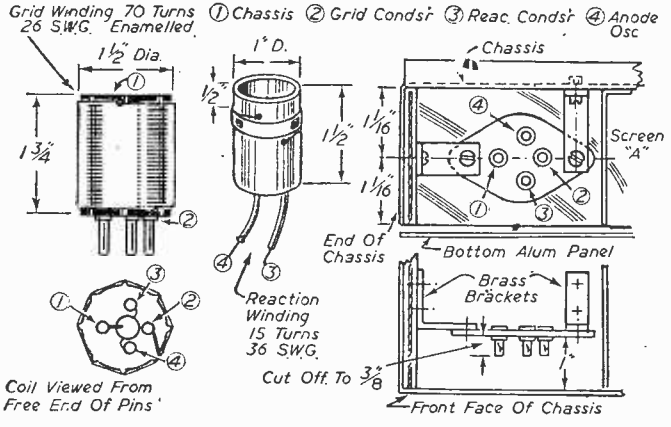


Fig. 8.—Coil winding details and coil mount.

As there is only one winding on the frame it is immaterial in which direction it is wound, although it will be found that there is a best way round of connecting the ends to the two connections on the small tag board.

The control spindle holes in the panel are best drilled out last, and their correct positions may be found by tipping the spindles with ink and pushing the set in until they touch and mark the wood panel inside.

An outer case was made to take the set and frame, with sufficient depth to accommodate the H.T. and grid-bias batteries and the Varley V.20 dry accumulator used for filament heating. It will be found that the standard size 120-volt H.T. battery will just fit in a vertical position, with the bias battery and accumulator to one side. The

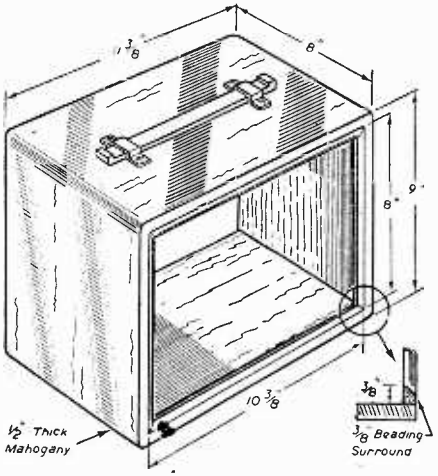


Fig. 10.—Dimensions of the containing case.

case may be of mahogany, or any suitable hard wood, the author's being ¼in. thick material. It will be noticed from the sketch of this case, Fig. 10, that there is a beading surround at the front, and this forms a finish, and also acts as a stop to the set. A simple plain plywood panel can be made to fit the back, with four simple turn-buttons for easy removal when desired.

Two simple brass brackets, with a plain strap having stop pieces sewn to its ends, forms a simple carrying grip, as shown.

The Coil

The coil was wound on a standard 8-ribbed coil former as used for short-wave coils, although its original length of 2¾in. was shortened to 1¾in., as shown in Fig. 8. Although the author used 26 s.w.g. enamelled wire for the grid winding, close winding this, it is possible that a silk-covered wire of lighter gauge would be quite as efficient. Experiments are worth while to get the best coil possible. Seventy turns of the s.w.g. will be found to fill the 1¾in. space available. The reaction coil should fit comfortably inside the grid coil, and with the connections shown the winding was at the top end of the former. This is again a matter for experiment, and the turns of the reaction may have to be increased or reduced to give the required smooth reaction results. If increasing reaction control decreases the volume, then the reaction-connections should be reversed. When making these alterations great care should be exercised to avoid wrongly connecting the reaction coil to the grid coil pins as the H.T. can easily be shorted, although the fuse should safeguard components if this happens.

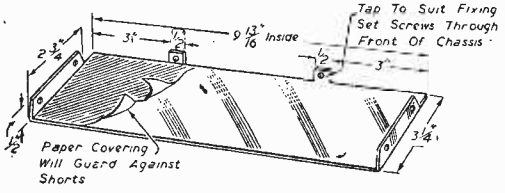


Fig. 11.—Note the use of a paper covering to avoid the risk of short circuits.

Adjusting the Set

It is best to do this with the set placed close to the frame aerial, this being joined to the small tag board.

Connect up to the batteries, using a 48-volt tap for H.T.+1 if available. If not, R.3 value will have to be increased, and is a matter for experiment.

H.T.+2 should go to the full 120 volts. Grid bias should be tried in 3-volt tap of the 9-volt bias battery.

The stations should be received with only slight adjustment being necessary to the trimmers on the ganged condenser. If no results are obtained,

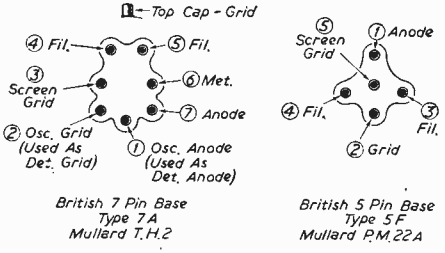


Fig. 12.—Valveholder pin connections as seen from the underside.

or only faint signals when either of the trimmers are full in, then the two circuits are not matched to each other, and the coil may need turns removed. Try, if at all possible, to adjust the coil to the frame aerial rather than altering the latter. Continuous oscillation may point to too many reaction turns, and, as a temporary test, take the inner reaction coil right out and try the set without it. With the correct number of turns, reaction should be quite smooth. The frame aerial is, of course, directional, and one position will be found to give peak results.

Results

The portable, as built by the author, gave quite nice volume on both Light and Home stations, the former being at 60 deg. of tuning knob, whilst the latter station approximated to the 90 deg. point, i.e. (12 o'clock).

Current readings were taken, and these were found to be as follows:

1st section of V.1 = 3 mA.

2nd section of V.1 = 5/6 mA.

Output at anode of V.2 = 10 mA.

With grid bias at 3 volts negative.

A Microphone Amplifier—2

Concluding Details of a High-gain Instrument Suitable for Moving-coil or Ribbon Type Microphones.

By "EXPERIMENTER"

INSTABILITY due to lack of sufficient decoupling in the H.T. supply is a common cause of trouble in microphone amplifiers and considerable attention should be paid to this part of the circuit. If the microphone amplifier has its own mains unit, it is sometimes claimed that no decoupling is necessary. The argument is that the A.C. components of the anode currents of the two valves are out of phase and therefore instability cannot be caused by a common impedance in the H.T. circuit. Although this is true, a common impedance can cause negative feedback, which may reduce the gain of the amplifier considerably. Thus, the H.T. supply for the first valve must be adequately decoupled. If the microphone amplifier and the following amplifier are fed from a common H.T. supply, considerable decoupling is necessary for both valves. As pentodes with high anode and screen resistors take very small H.T. currents, high value resistors can be used for decoupling without causing too great a loss of H.T. volts. Nevertheless, it is very doubtful if all the decoupling necessary for the first stage can be supplied by a single R.C. circuit. If it can be done, the values of R and C necessary will be of the order of 100,000 ohms and 32 μF respectively and it is far preferable to use two stages of decoupling with the values suggested in Fig. 3. Although the author has found the decoupling measures illustrated in Fig. 3 satisfactory, it is possible in particular circumstances that additional decoupling may be necessary to prevent instability. In such cases a two stage decoupling circuit may be used for V2 or a three stage circuit for V1. The loss of H.T. volts in the decoupling networks is about 50 volts for both valves, and the H.T. supply to the amplifier, therefore, should be about 350 volts.

It is clear from Fig. 3 that R5, C4 and R10 form a potential divider across the H.T. supply to V1 and that any ripple present will be amplified by V2 and all subsequent valves. It is, therefore, unnecessary to say that the H.T. supply for the microphone amplifier should be very thoroughly smoothed. This need not, however, cause undue concern, for it is usually found that if the H.T. supply is adequately decoupled it is automatically sufficiently smoothed.

In an amplifier of this nature, operating with such a tiny input, it is absolutely essential to reduce all pick-up from magnetic fields to the absolute minimum, particularly if the amplifier is to operate close to mains equipment. Some measures which should be taken to minimise hum pick-up in the input circuit of the amplifier were described earlier, but precautions are just as necessary in the wiring. Briefly, the main principles to be followed in the wiring are that all leads should be as short as possible, that leads which are at high impedance to earth and which are at low level points in the circuit should be thoroughly screened and that no component or conductor should be connected to earth at more than one point. For example, a screened lead to the top grid connection of a valve should be earthed at one point only on the metal braiding. If the lead passes through the chassis, and if this is not the point at which it is earthed, the braiding must be insulated from the chassis by means of a rubber grommet. If any conductor is earthed at two points, it forms a closed loop and e.m.f.s induced in the loop by magnetic fields can cause hum. The wiring system favoured by the author, and which has always proved successful, is to mount the components associated with a particular valve on a tag board in such a way that the inter-connecting leads are as short as possible. The tag board is then mounted at right angles to the chassis and very close to the valveholder. For example, R2, R3, R5, R6, C2 and C4 are so mounted for V1 but C3 is a bulky component and is mounted separately on the chassis nearby. One tag on the tag board is selected as an earthing point and all

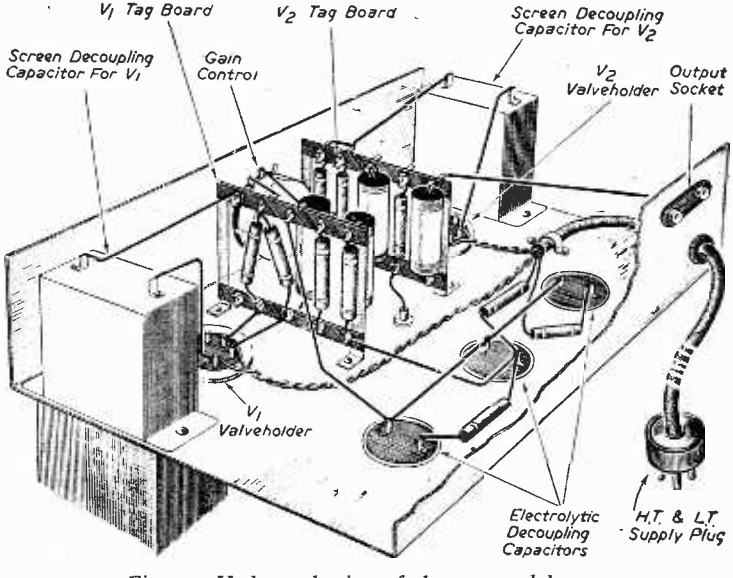


Fig. 4.—Underneath view of the suggested layout.

the earth connections associated with V1 are wired in the most direct manner to this point, including the braiding of screened leads (which are not allowed to touch the chassis). The same method is adopted for the components associated with V2 and the earth tags of the two tag boards are joined by a wire which is also connected to the chassis at one point only. Thus, the chassis can be entirely

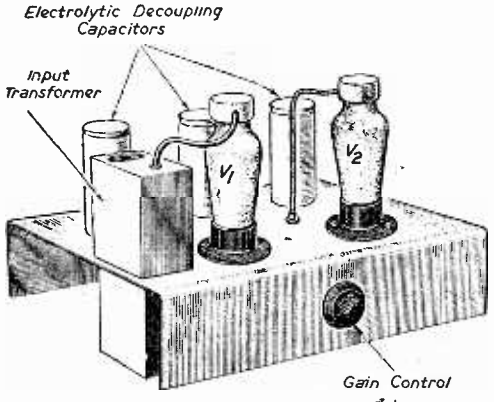


Fig. 5.—A perspective view of the suggested layout.

divorced from earth by cutting one wire and the chassis is not used as a conductor for carrying supply or signal currents. The only conductors which are earthed by direct contact with the chassis are mumetal screens and transformer cores and care is taken to see that they touch the chassis at one point only. Whenever possible the electrolytic capacitors used are chosen because the metal cans are not connected to the negative electrode: if use of the conventional type cannot be avoided, the metal can is insulated from chassis and is joined to one of the earth tags. These precautions against the pick-up of hum may seem needlessly elaborate but they are absolutely essential if it is desired to reduce the hum of the amplifier to the lowest possible level.

Even when all the precautions mentioned above have been taken, there will still be some hum present in the output of the amplifier due to sources inside the valves, more particularly V1. One cause is electronic emission from the heater to the cathode; this is particularly troublesome when, as is usually the case, the centre tap, or one side of the heater winding feeding the valve, is earthed and the cathode is a few volts positive with respect to earth. Hum due to this cause can be eliminated by biasing the heater about 30 or 40 volts positive with respect to the cathode. In the circuit diagram of Fig. 2 this is done by joining the centre point of the heater winding to the junction of R16 and R17 connected across the H.T. supply to V2. To make a low impedance path between heater and earth an electrolytic capacitor C10 is connected in parallel with R17. Frequently this method gives a worth-while reduction in hum in amplifiers handling quite large signals and it is an advantage to feed V1 and V2 from the same heater winding.

If all the precautions so far discussed are taken, the hum level of the amplifier should be very low indeed and should not appreciably exceed the hiss or Johnson noise from the first valve. Differences in hum output of several db. can often be obtained by exchanging one valve for another of the same type.

The output impedance of the amplifier of Fig. 3 is very high and it should not be connected to a load of less than 250,000 ohms, otherwise a serious loss in amplification and of bass response will occur.

Figs. 4 and 5 suggest a possible layout for a microphone amplifier obtaining its H.T. and L.T. supplies from an external source. Fig. 4 illustrates the arrangement of components under the chassis, and it must be emphasised that this sketch is diagrammatic only and does not indicate correct electrical connections. For convenience the back flange of the chassis is shown cut away.

Slide-rule Gauge Points

READERS having slide-rules may find useful the following gauge points I have evolved. The scales are referred to as A, B, C and D in the usual way.

R.M.S Voltage—Peak Voltage: With the slide inserted correctly set 1 on B against 2 on A, and now against the R.M.S. voltage on C read the peak voltage on D. By using the extensions in red at the end of the scales the peak voltage can be seen for every R.M.S. value except those starting with the figure 8.

Wavelength—Frequency Conversion: Take out the slide and reinsert it so that scale C is against scale A, then bring 10 on C under 3 on A. Wavelength-frequency equivalents are now given by the A and inverted B scales, and by placing the cursor over the known wavelength or frequency on either A or B (it does not matter which) the required equivalent will be seen on the other scale.

If greater accuracy is required at the expense of having to have two settings to cover the range, then scales C and D may be used. Against 3 on D set either the slide's left- or right-hand index (10 or 1), depending on whether the first figure of the wavelength or frequency is above or below 3, then, by using the cursor, the wavelength-frequency equivalents are shown by the D and inverted C scales. Note: If the rule has a reciprocal scale (i.e., a scale in the centre of the slide identical with scale C but the opposite way on), this can be used instead of scale C and the slide kept the correct way round.

The decimal points are easily located if it is remembered that for metres-kilocycles, or vice versa, there must be a total of seven figures (counting the figures in both numbers) before the decimal points if the first figure of each number is between 1 and 3 inclusive, while there must be a total of six figures if the first figure is between (but not including) 3 and 10. Take, for example, 1,500.0 m.=200.0 kc/s; the first figure of each number is between 1 and 3 inclusive, and the total number of figures before the decimal points is 4+3=7. Again, with 750.0 kc/s=400.0 m. the first figure of either number is between 3 and 10, and the total number of figures before the decimal points is 3+3=6. For metres-megacycles the total number of figures before the decimal points is reduced by three in each case.—R. V. GOODE (Isle of Wight).

ON YOUR WAVELENGTH

By THERMION

Annual Dinner of the I.P.R.E.

THE annual dinner, attended by 100 members and guests took place at the Connaught Rooms on October 6th, under the chairmanship of the president, J. F. Tomlin. It was a merry affair. In proposing the toast of the institution, Mr. H. A. Curtis, F.C.I.S., paid tribute to its work and pointed out the duty it had in providing a pool of qualified service engineers in whom the public could place complete reliance. The president in reply also presented to Mr. Curtis a certificate of Honorary Life Fellowship of the institution. The toast of the guests was proposed by T. E. Fevyer, with responses from L. A. Sawtell and F. J. Camm. The toast of the ladies was proposed by V. Pope, with response by Mrs. B. A. Smythe-Rumsay. An excellent musical and conjuring entertainment followed.

Brass Bands

MR. R. W. JACKSON, of Waltham Cross, thinks I am off my wavelength in criticising brass bands and suggesting that their frequency range needs changing! He says he has seen people moved to tears by brass bands. This seems to be a piece of unconscious humour, for I have been moved to tears by the cacophony of brass bands myself, and I am further moved to tears to think that at least one reader would like to hear more of it. I presume that this reader would also be moved to tears by the sound of that whining banshee instrument, the bagpipes, the only use for which it seems to me is to precede the arrival of that other concoction, the haggis. Another reader, Mr. A. Gilbert, of Redhill, says that the modern brass band is accepted as a first-rate musical medium by "such prominent musicians as Sir Adrian Boult, Sir Malcolm Sargent and John Barbirolli."

I do not, however, allow these musicians to decide what I like and what I do not like. They may prefer porridge for breakfast, or fried fish and chips and jellied eels, but that does not mean to say that I have to like them because they do.

Purchase Tax

MR. H. J. GREEN, of Colne, thinks that the makers are entirely to blame for the high prices of sets, and that but for purchase tax they would be far higher. A short while ago, he says, a five-valve battery set was advertised at £25, plus P.T. He thinks that the sets are of pre-war circuit, with uglier boxes, and that if there are any new designs the development costs have already been paid for by war contracts, and therefore sets should be cheaper. He blames high prices for lack of sales. He makes the point that there are too many valve types for the same job, and too few alternatives. Also too many valve bases, which makes for extra production costs.

I quite agree with his points concerning valves.

Television and the Cinema

THE shape of television things to come is indicated by the fact that discussions have begun between representatives of the Renters, Exhibitors and Producers Committee of the film industry, as well as with representatives of the B.B.C., under Post Office chairmanship, to consider the possibility of making co-operative arrangements for the showing in cinemas of items of B.B.C. television programmes, and for the inclusion in B.B.C. television programmes of commercial films.

It had already been agreed that in order to ascertain the reactions of the public there is scope for such arrangements on an experimental basis, subject to revision and development in the light of experience. The discussions are to continue.

The Better Listening Campaign

AT the moment of going to press it is not possible to assess the results of the better listening fortnight which ended on October 9th. Fifteen thousand radio dealers took part in what was virtually a scheme acting as a substitute for Radiolympia. Each dealer staged a sort of miniature exhibition enabling the public to see the latest products. There are, of course, many receivers in use to-day which are hopelessly out of date. The owners do not notice the lowering of quality with the passage of the years until they hear a modern receiver.

For quality undoubtedly gradually worsens—so gradually, indeed, that it is not noticed.

Another point is that an old wireless receiver, like an old car, is costly to maintain. One thing is put right and another goes wrong. It is often more costly to repair an old receiver than a new one, apart from the difficulty of obtaining spares.

The Copenhagen Conference

WHEN the proposals agreed at the Copenhagen Conference for the redistribution of wavelengths are put into effect it will mean that dial markings on all receivers will be rendered obsolete. From inquiries, I understand that manufacturers will issue for a small nominal charge new scales.

Seven Million Old Sets

ACCORDING to statistics recently published, 5,500,000 householders, or 43.5 per cent. of the radio licence holders in Great Britain and Northern Ireland, are using sets which are more than 10 years old and 1,500,000, or 11.8 per cent., are using sets over 12 years old. It would be wrong to assume that all old sets are defective, but it is correct to say that because of improvements made in design and manufacture in the last 10 years a set which was made before that has a lower standard of reception than a new set. Moreover, the B.B.C. in recent years has greatly improved the quality of its transmissions and the user of an old set is not able to take full advantage of this.

Using the Oscilloscope—3

In This Month's Article, H. R. McDERMOTT Describes the Use of the 'Scope at the Transmitter

OFTEN, it is easier to measure A and B by the following method. Switch off the modulation, when the picture will become that of Fig. 10A. If we measure the height of this, B will be equal to this figure divided by two. To measure A, switch on the modulation at the desired level for measurement and measure from X to Y, Fig. 9A. This measurement is composed of 2A plus 2B, so if we subtract twice the measured value of B and divide the remainder by two, we are left with A. A and B are then substituted in the formula given.

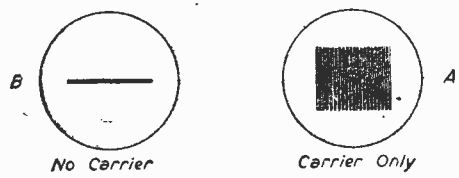


Fig. 10.—Typical oscillograms, showing carrier waveform.

Should an audio oscillator not be available, a rough idea of the modulation level can be obtained by simply connecting the microphone in place of the oscillator and speaking into it. A modulated trace similar to Figs. 9D, E, F, will be obtained with various levels of modulation. Over-modulation is easily recognised by the characteristic gap in the picture obtained, as in Fig. 9F. It will be realised that for modulation *measurements*, as distinct from observations, an audio oscillator is necessary. If a pure sine wave is used, as well as noting modulation levels, it is possible to observe the fidelity with which the transmitter is dealing with the modulating tone, by observing how closely

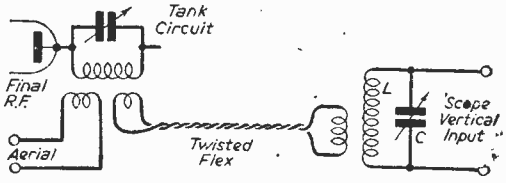


Fig. 11.—A method of eliminating transmitter harmonics.

the input and output waveforms compare. It is here that the double beam oscillograph scores, with its facilities for observing both waves at the same time.

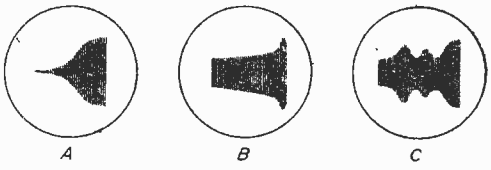


Fig. 14.—Other forms of distortion will show up as indicated here.

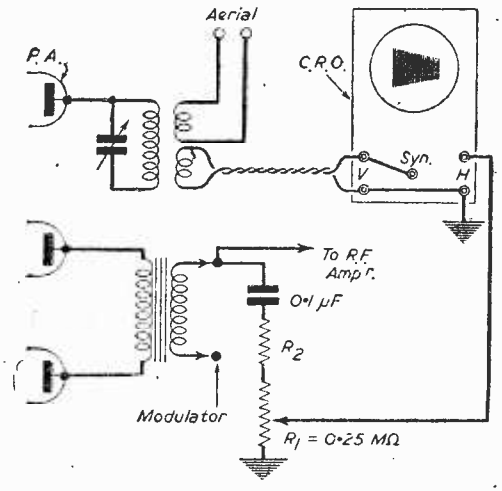


Fig. 12.—The Trapezoidal method of taking modulation oscillograms.

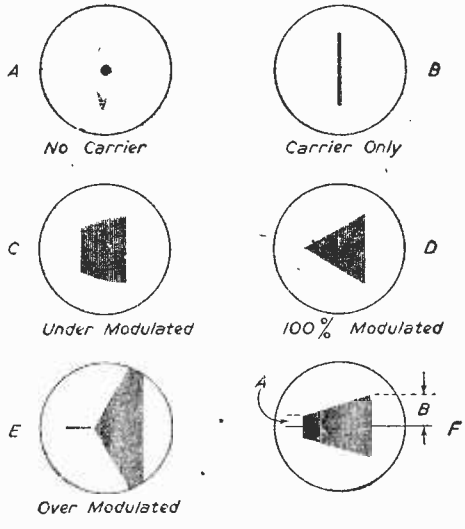


Fig. 13.—The above are some typical trapezoid traces.

Wide Range Ohmmeters

Principles of Design and Constructional Details for Two Types of Instrument

By E. N. BRADLEY

WHILST the Ohmmeter can never replace the Wheatstone Bridge for the exact measurement of resistance over wide ranges of values, the instrument can prove extremely useful on the test bench and in the home laboratory. In the servicing of modern receivers, for example, it may prove necessary to measure coil resistances of the order of tenths of ohms and grid resistances possibly as high as ten megohms, and such work can only be carried out conveniently by a single-adjustment instrument; a bridge is unsuitable. There is, moreover, no reason why the ohmmeter should not be quite accurate and capable of measuring resistances between 0.1 ohm and 1 megohm or between 0.01 ohm and 10 megohms (the overall ranges of the meters to be described); all too often the ohmmeter circuits provided by commercial analysers and multi-meters are restricted both in range and accuracy.

Basic Ohmmeter Circuits

Resistance measurements on an ohmmeter are made in terms of a change in the current registered by a milliammeter when the unknown resistance is coupled into the circuit, and the two best-known basic ohmmeter circuits are shown in Figs. 1 and 2.

In Fig. 1, the series-connected ohmmeter, the points X X are first short-circuited and the instrument brought to its full-scale reading by operating the rheostat. The resistance across the points X X can then be considered as zero. The short-circuit is then broken and the unknown resistance connected across X X so that the circuit is once more completed, although it is obvious that the extra resistance will reduce the current flowing and so cause the instrument to give a lower reading. The meter can be calibrated directly in terms of resistance, but the unknown resistance can also be calculated from the formula

$$X = \left(\frac{Rc \times i}{I}\right) - Rc$$

where X is the unknown resistance in ohms, Rc is the total internal resistance of the ohmmeter, i is the full-scale deflection current of the milliammeter and I is the new current reading obtained when X is connected in place of the short circuit.

The value Rc depends on the full-scale current flowing through the instrument and the battery voltage. If the full-scale current i is 1 mA. and the battery voltage is 4.5 volts then by Ohm's Law the total resistance of the ohmmeter, with X X short-circuited, must be 4,500 ohms; this also, of course, is the value of Rc in the formula.

The accuracy attainable in an ohmmeter finally depends on the stability of the battery voltage. Should the battery voltage fall then Rc must also fall in proportion if the milliammeter is still to be brought to full-scale with X X short-circuited, and this means that in the formula already given a different value of X will result as Rc changes. If X is worked out each time, and either Rc or the exact battery voltage is known for every resistance measurement, then a correct result will always be obtained, but as a general rule a specimen set of values for X are worked out, presuming a battery voltage of, say, 4.5 volts, and this set of values used either to calibrate the meter directly in ohms, or to draw up a conversion chart to give ohms in terms of current. Such a calibration or conversion chart cannot take into account the changing potential across an ageing battery, and so the accuracy of the instrument suffers by a variable error which is in turn dependent on the state of the meter supply.

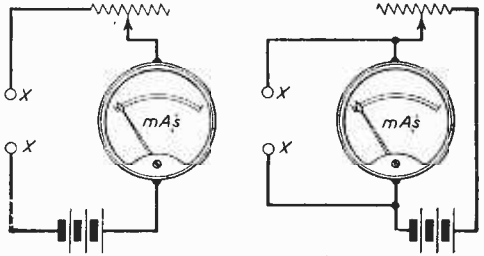


Fig. 1.—(Left) Basic series-connected ohmmeter, and Fig. 2 (right), Basic shunt-connected ohmmeter.

The degree of error can, however, be checked by making the internal series resistance of the meter part fixed and part variable. When this is done the fall in battery potential with age and use is soon made evident, for as soon as the battery voltage falls below a permitted minimum it will no longer be possible to bring the ohmmeter to a full-scale reading with X X short-circuited; the fixed series resistance will be too high to pass the necessary current even with the variable resistance turned right down to zero value. In the example quoted, where a 1 mA. instrument is being used with a 4.5 volts battery so that the total series resistance must be 4,500 ohms, the internal resistance could very well be made up of a 4,000 ohms fixed resistance in series with a 1,000 ohms variable resistance. Supposing the internal resistance of the moving-coil instrument itself to be negligible, it would be impossible to bring the meter to a full-scale reading as soon as the battery voltage fell below 4 volts; if closer control were required it would only be necessary to make the fixed resistance a little higher in value—say 4,300 ohms. Then, again assuming negligible instrument resistance, the meter could not be correctly zero'd (brought to the full-scale mark, that is, in the case of an ohmmeter), when the battery potential fell below 4.3 volts.

The series-connected ohmmeter is most suitable for measuring medium and high resistances. With the instrument used at its fullest sensitivity (so that it will measure low currents clearly and accurately) the ohmmeter will measure the higher resistance ranges; if the instrument is shunted so that a greater current can be passed from the battery (the series resistance inside the instrument

being correspondingly reduced) then lower resistances can be measured. To make the ohmmeter provide, say, three ranges of measurement, three series resistances and two shunts can be switched into circuit when, with the highest current shunt and the lowest series resistance brought in, the ohmmeter is set to measure over its basic range. If the next shunt allows the instrument to measure one-tenth of the current passed by the highest current shunt then the resistance range of the meter is multiplied by 10; similarly if the unshunted instrument is 10 times more sensitive than when the second shunt is in circuit then the basic resistance range is multiplied by 100.

On a 1 mA. instrument the current ranges provided by the shunts would be 10 mAs. and 100 mAs.; the meter with the 100 mAs. shunt and a correct series resistance would give the basic "R" range, the 10 mAs. shunt and a correct series resistance would give "R × 10" and the unshunted instrument would give the "R × 100" range.

Three common ranges, using a 1 mA. instrument and 10 and 100 mAs. shunts with a 4.5 volt battery, are 0—5,000 ohms for "R," 0—50,000 ohms for "R × 10" and 0—500,000 ohms for "R × 100."

Medium and fairly high resistances would thus be covered reasonably well with such an instrument, but low resistances would have but little effect when connected across the points X X. A high resistance, when connected across a series-connected ohmmeter causes a considerable fall in the reading, but a resistance of 0.1 ohm or even 10 ohms causes such a slight fall in the reading that the pointer of the instrument seems hardly to move from the full-scale mark, so that accurate measurement of a low resistance is very difficult.

To measure low resistances the shunt ohmmeter, shown in Fig. 2, should be used.

The Measurement of Low Resistances

It can be seen that when the shunt-connected ohmmeter is used the unknown resistance, connected across the points X X, is connected directly across the instrument itself. Before the unknown resistance is brought into the circuit the instrument is zero'd, as is the series-connected ohmmeter (although the points X X are not, of course, short-circuited but are left with no connection across them at all). By means of the variable resistance in series with the battery and the instrument the meter is brought to a full-scale reading, then the unknown resistance is connected across the instrument. If the unknown resistance is high very little current will be diverted through the alternative path and the ohmmeter reading will scarcely vary from the full-scale setting, but if the unknown resistance is low then it acts as a shunt across the instrument and provides a quite good alternative path for the current. The instrument reading therefore falls; the new current shown is lower as the unknown resistance falls. This is an opposite effect from that obtained with a series-connected ohmmeter, where a high resistance causes a greater current fall.

The value of the unknown resistance connected across the X X points of a shunt-connected ohmmeter can be calculated from

$$X = \frac{Rm \times I}{i - I}$$

where X is the unknown resistance, Rm is the internal resistance of the instrument itself (not the resistance of the battery-instrument-series resistance circuit, which is still dependent, of course, on the instrument sensitivity and the battery voltage), i is the full-scale current and I is the new current reading with X connected into circuit.

Again the accuracy depends on the battery potential and can be controlled by using a mixture of fixed and variable resistance for the meter's zero control, and different ranges of resistance can again be catered for by shunting the instrument for different current measurements. Suppose, for example, that a 1 mA. instrument with an internal resistance of 50 ohms were to be used as a shunt-connected ohmmeter. If the instrument were shunted to read 10 mAs. the internal resistance of the instrument would fall, for now it would be in parallel with the current shunt, and as the current range has increased by a factor of 10 the instrument's internal resistance must have decreased by a factor of 10—that is, its internal resistance may now be taken as 5 ohms, instead of 50. Shunting the instrument to read 100 mAs. would bring its overall internal resistance down to 0.5 ohm.

As with the series-connected ohmmeter, then, so may the basic range of the shunt-connected ohmmeter be taken as the range provided when the instrument is at its least sensitive working condition; i.e., when it is shunted to measure the highest current.

A Simple Wide-range Ohmmeter

Since a series-connected ohmmeter will measure medium and high resistances, and a shunt-connected ohmmeter will measure low resistances, it only remains to combine the series and shunt circuits to make a wide-range ohmmeter. Such a circuit combination is shown in Fig. 3, where is illustrated a meter capable of measuring, with quite fair accuracy, resistances between the limits of 0.1 ohm to 1 megohm.

The instrument chosen as the meter indicator is a 0.5 mA. moving-coil instrument with an internal resistance of 500 ohms, since such instruments are in quite good supply at the time of writing. An instrument which will measure at full-scale 0.5 mA. and which has an internal resistance of less than 500 ohms may also be used, so long as a series resistance is connected directly at one meter terminal which will bring the resistance of the meter plus the series resistor to 500 ohms. This is quite permissible, for adding series resistance to a meter does not change or impair the meter sensitivity; it is the potential drop across the combination which is changed. Any shunts must then be connected across both meter and ballasting resistance, when the instrument will act as a 500 ohms instrument with a full-scale current of 0.5 mA.

By means of a 3-pole 4-way switch various series resistances and various shunts are connected to the instrument, a rheostat and a 9-volt battery, to give three ranges of resistance measurement on both high and low resistance terminals. The shunts and series resistances must be accurate, whilst the switch must be of a good type with very low contact resistances to avoid the introduction of error in the shunt circuits.

Resistances are also shunted across the variable resistance so that the proportion of fixed and variable resistance on any range is maintained roughly constant: the maximum possible error due to battery voltage fluctuation is approximately plus or minus 13 per cent. on range R, plus or minus 9 per cent. on range R×10, and plus or minus 3 per cent. on range R×100. Range R must be allowed the greatest tolerance, since on this range the current drain on the battery is heaviest.

To measure high resistance the range switch should be thrown to the appropriate range, the "high" terminals short-circuited, the instrument brought to full-scale reading, or zero'd, by means of the rheostat, and then the short-circuit across "high" can be broken and the unknown resistance connected. The value of the resistance can then be read off from a conversion chart, drawn up from Table 1 and Fig. 5, to be given later.

To measure "low" resistance, short the "high" terminals and zero the ohmmeter as before, bringing the instrument to the full-scale reading. Then connect the low unknown resistance across the "low" terminals: the short-circuit across the "high" terminals should not be touched or broken. Once again the unknown resistance can be read off from the conversion chart.

If desired, the scale of the moving-coil instrument can be calibrated directly in ohms, but for the inexperienced worker this is not recommended. Stripping down a moving-coil instrument, and adding calibrations to its scale is very delicate work, and a conversion chart which can be fastened on to the body or lid of the instrument case is no less convenient.

The use of the conversion scale requires but little practice. Along the central line, from 0 to 50, are marked the current indications of the normal 0.5 mA. instrument, which is calibrated from 0 to 0.5 in 50 divisions. On one side of this central line—the right-hand side—are drawn lines which contact with the scale line to show the points where the instrument pointer will rest when resistances between 0.1 and 100 ohms are connected across the "low" terminals.

On the left-hand side of the central scale line are drawn lines showing the points where the instrument pointer will rest for resistances between 10 and 10,000 ohms connected across the "high" terminals.

Both sides of the conversion chart refer to the basic "R" range of the instrument, of course, and if the instrument is switched to "R×10" or "R×100," then the result obtained from the chart must be multiplied either by 10 or 100. As an example, suppose that the meter is switched to "R×10," is zero'd and then has an unknown resistance connected across the "high" terminals which cause the meter to read at 23.5. On the conversion chart this point coincides with 200 ohms, using the left-hand side of the chart to correspond with the "high" terminals; since the range "R×10" is in use, then the actual unknown resistance will have a value of 2,000 ohms.

The reader can draw up his own conversion chart by using the values given in Table 1. Draw a central line of any convenient length and accurately subdivide it into the 50 divisions, then add the given resistance points as accurately as possible, using either dividers or a good steel rule marked

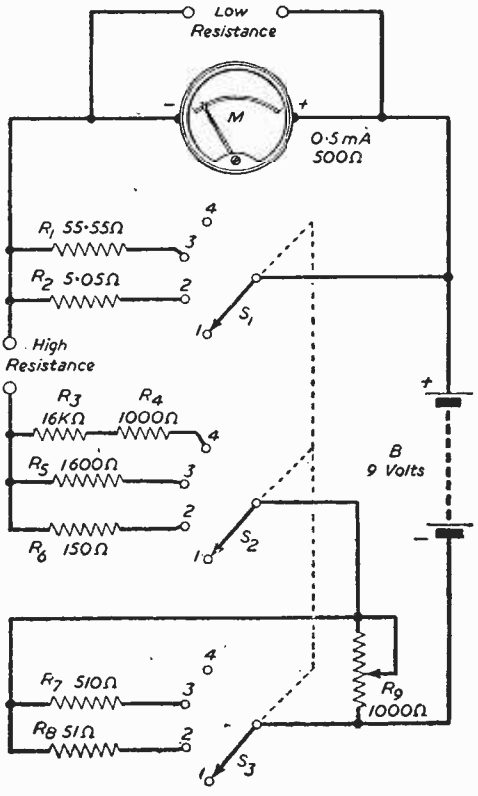


Fig. 3.—The wide-range ohmmeter for 0.1 ohm—1 megohm.

with tenth-inches. The work involved in making a good conversion chart is by no means difficult, and with a little trouble excellent accuracy can be maintained.

Building the Ohmmeter

The simple meter is shown in Fig. 3, and the following parts will be needed:

M, 0.5 mA. 500 ohm moving coil instrument.
R1, 55.55 ohm, 5 mA. shunt.
R2, 5.05 ohm, 50 mA. shunt.
R3, 16,000 ohms.
R4, 1,000 ohms.
R5, 1,600 ohms.
R6, 150 ohms.
R7, 510 ohms.
R8, 51 ohms.

All fixed resistances should be 1 per cent. accurate for best results, but 5 per cent. accurate resistors may be used. All resistors, 1 watt rating. Except for R1 and R2 (see below), all resistors are standard.

R9, 1,000 ohm wirewound potentiometer.
S 1, 2, 3, 3-pole 4-way rotary switch.
B, 9 volt grid-bias battery.
2 control knobs, pointer type.
4 terminals.

(To be continued.)

Simple Peak Valve Voltmeter

Making a Valuable Test Instrument

By E. G. BULLEY

THE peak valve voltmeter can to-day be considered as an instrument that is essential to the radio experimenter, amateur and serviceman. Instruments of this type can be used for measuring the peak A.C. voltages that are developed across the condensers located in the filter circuit of a receiver, or of any similar radio equipment. This is an important factor, because should a condenser replacement be necessary, one can then be certain of the peak voltage the condenser will have to stand. Replacements of this nature, however, should have a voltage rating higher than that read on the peak valve voltmeter.

This instrument can also be used for the measuring of A.V.C. voltages or wherever the meter consumption must be small.

Construction

The construction of the instrument is quite a simple matter as one will appreciate by making reference to Fig. 1. The meter used in this circuit

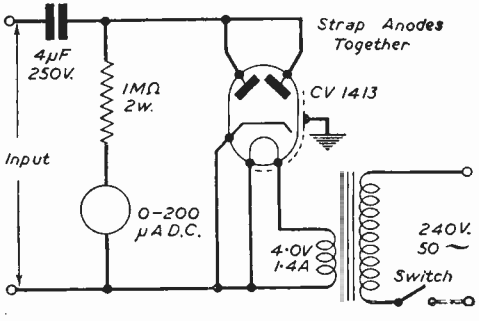


Fig. 1.—Circuit of the peak valve voltmeter.

was a 0-200 μA D.C. meter, connected in series with a 2-watt 1-megohm resistor, both being shunt connected across the valve and one side of the input feed. This procedure eliminates the necessity for a D.C. return in the input circuit.

The microammeter was chosen in preference to a 1,000 ohm per volt voltmeter to ensure greater sensitivity and accuracy, and it is as well to mention that the resistor should be carefully selected so as to maintain the sensitivity of the instrument.

An ex-Government valve, type CV1413, is most suitable for this circuit, and is the Mazda UU6, which is an indirectly-heated full-wave rectifier. It is, however, possible to obtain all the components for this instrument from Government surplus at a reasonable figure.

The other component for consideration is that of the 4 μF condenser, the presence of which is to maintain a constant time factor at 50 cycles. This condenser should have a larger working voltage than the peak voltage that is to be measured, which in this case is 240 volts.

The instrument will only measure peak voltages and not R.M.S. values. The latter can, however, be easily calculated by multiplying the peak voltage by .707. That is to say, if the meter reading is 150 volts, the R.M.S. value would be $.707 \times 150 = 106.05$ volts.

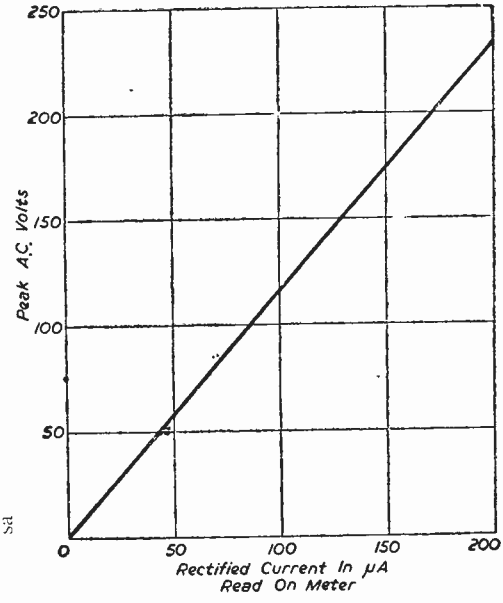


Fig. 2.—Typical calibration curve of the peak valve voltmeter.

Calibration

The peak valve voltmeter can be easily calibrated and this can be done against a 240 volt 50 cycle supply. A calibrated curve for this instrument, showing the conversion of the meter reading to the equivalent peak A.C. voltage is shown in Fig. 2; a careful study of this curve will make it self-explanatory.

It is as well to mention, however, that the calibrated curve may vary slightly for different constructors, so it is advisable to calibrate one's own instrument. This will take care of variations in the components that are purchased from different sources.

Television Topics

The New Midland Transmitter, Interference Suppressors and Picture Magnifiers are Dealt With Here. By W. J. DELANEY

THOSE readers in the Midlands who are getting ready with their home-built television apparatus may now go ahead with the design of the vision and sound receivers as details have been released concerning frequencies, powers, etc. One interesting feature is that the new station will radiate both sound and vision from a single steel mast fitted with an aerial of new and improved design. The power of the vision transmitter will be 35 kW. and that of the sound transmitter only 12 kW. Frequencies to be used are 61.75 Mc/s. (4.86 metres) for vision and 58.25 Mc/s. (5.15 metres) for sound, and the B.B.C. state that in order to conserve valuable wavelength space the upper sideband of the vision transmitter will be partly suppressed. It is claimed that this will not affect the quality or strength of the picture and that the technical characteristics of the picture will be the same as at the London station. Receivers will, of course, have to be adjusted specially for the asymmetric sideband transmission, but readers need not fear that this will affect picture detail. The writer went over to single sideband reception a year or so ago and claims that results are even better than standard double sideband reception. It is also interesting to bear in mind that the Americans suppress part of their transmitter sideband, and in this country one firm after another is changing over to this particular form of tuning. However, you now have the necessary data to enable you to go ahead and build your sound and vision receivers and get them ready set up so that you can switch on as soon as tests are radiated.

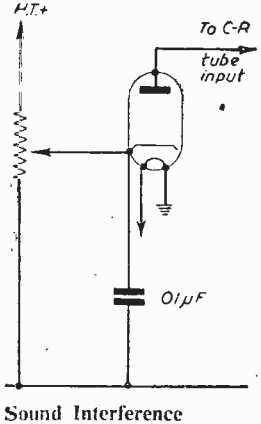


Fig. 2.—A noise-suppressor for incorporation across the input to the picture tube.

Sound Interference

Interference continues to cause trouble in varying degrees and a number of readers have asked for help in removing it. On the sound side it is quite a simple matter to cut it out or reduce it to below nuisance level. On the picture side it is, however, not so simple, if picture quality is not to be impaired. On the sound side, in some places where the interference is not too intense, a simple high-note cut of the ordinary tone-control type will keep it down without spoiling musical quality too much. A proper limiter may be built up, however, and added to an existing circuit, and so designed that it considerably reduces the peaky form of interference which is given by car ignition

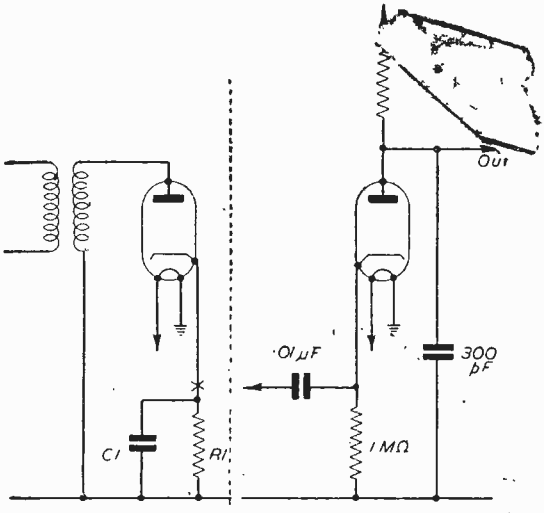


Fig. 1.—The extra diode wired for noise suppression on sound. Resistor R1 is changed to 33kΩ and condenser C1 is changed to 33 pF.

systems. The small ex-service diode, VR92 (EA50) can be used and mounted on one of the flat type holders which grips each end of the valve, and the necessary resistors and condensers may be added round it. It can then easily be added to an existing circuit. The arrangement which I have fitted to my own receiver is shown in Fig. 1. A diode rectifier was used for sound, connected across the secondary of the R.F. transformer. The second diode was wired as shown to the right of the dotted line, and before connection the values of the resistor R1 (the original load resistor) and its associated condenser C1 were changed from .1 MΩ and 100 pF to 33 kΩ and 33 pF. It will be seen that the two cathodes are coupled through the .01 μF condenser and the arrangement, whilst not entirely suppressing the noise, reduces it to such a level that it is not distracting during quiet passages in a play, for instance.

On the picture side a somewhat similar device may be used to cut down the strength of the interference and thereby prevent the defocussing effect. It will be appreciated that the white spots which are seen when a car goes by are large, unfocussed "blobs," and by reducing their intensity they become focussed and although still present, are not so obtrusive. If the effect of the interference suppressor is to cut the trouble out entirely it will

generally be found that this is carried out at the expense of the brightness of the white parts of the picture. As a matter of fact, the simple diode across the input to the C.R. tube, adjusted so that it conducts just as a car gets within about three doors of the house, will still leave the dots, but, as with the sound, at such a level that they do not bother and the picture quality remains unimpaired. Fig. 2 shows the picture suppressor circuit. There are, of course, other and much more elaborate circuits which will completely remove even very bad interference, but these have to be built up with the rest of the circuit arrangement, and need accurately setting up—a task for the factory rather than the home constructor. As a point of interest, I might mention that having cut down the *sound* of the interference, I found that with single side-band reception the slight amount of interference experienced in my district did not warrant a picture interference suppressor, and the new Murphy receiver just announced is fitted with a suppressor only for sound.

Picture Magnifier

Readers who are still in the process of building their receivers should bear in mind the new liquid magnifying lenses which are now readily available. Constructors who build their own receivers also have to make their own cabinets, and these new lenses are ideal for building on to the inside of a home-made cabinet so that the advantage of the larger picture is obtained without detracting from the finished appearance of the receiver. The lenses work very well, but the angle of vision is cut down slightly. However, it is found that if one sits too much at the side of the normal screen, vertical objects (such as door frames, etc.) become very curved and look a bit silly. At the position where this takes place the liquid lens, however, fails to show any picture, so that one has to sit round more to the front. Where a large number of people wish to see a programme, the increased size permits of everyone getting a good, square view by sitting farther back rather than crowding in a semi-circle close up to the screen. Another point is that room lighting which can be troublesome when looking at the ordinary screen, due to reflections on the tube end and glass protecting plate, does not affect the screen so much, due to the much larger curvature of the lens front and the possibility of taking the reflection at a much different angle. A little judicious placing of a standard lamp may, therefore, be found an advantage for those who prefer to see a programme with normal room lighting left on.

New Books Received

GUIDE TO BROADCASTING STATIONS. Fourth edition. Compiled by *Wireless World*. Published by Iliffe & Sons, Ltd. 64 pp.

THE demand for this booklet, first published in 1947 as "Broadcasting Stations of the World," has been such that a fourth completely revised and enlarged edition has been produced.

Details of nearly 300 European medium- and long-wave broadcasting stations and 1,100 short-wave stations of the world are given in tabular form, both geographically and in order of frequency. As in the previous edition, all entries have been checked against the frequency measurements made at the B.B.C.'s receiving station at Tatsfield.

In addition to the above information on broadcasting stations, this edition includes the revised list of international call-signs, which will be adopted in January, 1949; world time constants; wavelength-frequency conversion table; details of European television and F.M. stations, and special service stations.

CATHODE-RAY OSCILLOGRAPHS. By J. H. Reyner. 189 pp. 134 illus. Published by Pitman. Price 8s. 6d.

THIS is a simple guide to the practical application of C-R tubes in the examination of waveforms and other purposes. It covers types of tube and amplifiers, and deals with the taking of frequency-response curves; valve characteristics; R.F. measurements and frequency comparisons; and has a separate chapter dealing with special applications. It is invaluable to the student.

RADIO RECEIVERS AND TRANSMITTERS. By S. W. Amos, B.Sc.(Hons.) and F. W. Kellaway, B.Sc.(Hons.). 356 pp. 210 illus. Published by Chapman & Hall, Ltd. Price 25s.

INTENDED for the advanced student, this book covers the radio field with many worked examples. It is written for those who already have a good background in physics and mathematics, but it covers every phase of modern circuit design, including transmitters for telegraphy, A.M., F.M. and television. Four appendices deal with simple harmonic motion; Fourier analysis; solution of the equation $L\frac{di}{dt} + Ri = E$; work done during hysteresis cycle; solution to two other equations and a note on dimensions.

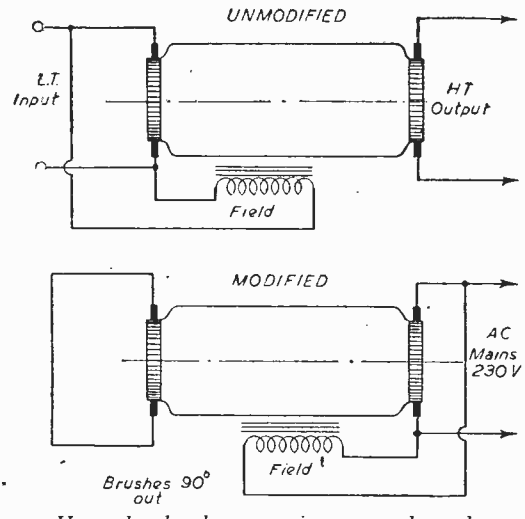
RADIO INDUCTANCE MANUAL. By N. H. Crowhurst. 48 pp. 16 illus. Published by Bernards (Publishers) Ltd. Price 2s. 6d.

THIS handy little manual deals with chokes and transformers of various types, and in addition to showing how to calculate winding data gives a chapter on testing the finished item. Two tables of wire gauges are included, and the book will no doubt be included on every experimenter's bookshelf.

Practical Hints

Converter Motors

HERE is an idea of mine for converting ex-Government rotary converters to powerful A.C. mains motors. The type of converter used must have a wound field of the shunt type so that its impedance is not too low on 50 cycle A.C. To convert to a motor, disconnect the field from the low voltage end and connect it in parallel with the brushes of the high voltage end. Then connect up to the mains. Next, put the low voltage brushes 90 deg.



How the brush connections are changed.

from where they were and short together. On many types of converter the end-piece with the low voltage brushes has four fixing bolts, which makes it very easy to fasten the end-piece one-quarter of a turn from where it was.

The modified converter has a high starting torque which drops to nil at synchronous speed and so is useful for bench drills, etc.—A. R. BAILEY (Bingley).

Test Panels

THE following is an idea which has proved very helpful in assembling a circuit quickly just to "try it out." The idea is to make up half a dozen or so 4in. by 4in. by ¼in. boards with a valveholder mounted in the centre and four tags on each side as shown in the sketch. The two outer tags are connected together by thick copper wire or straps and are H.T.+ and Earth lines respectively. The two inner ones connect across also, looping to the heater tags on the valveholder.

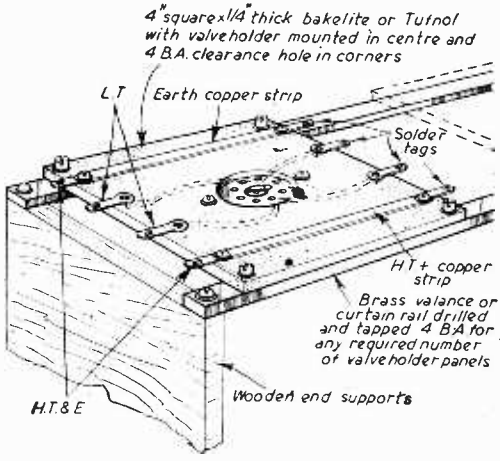
THAT DODGE OF YOURS!

Every Reader of "PRACTICAL WIRELESS" must have originated some little dodge which would interest other readers. Why not pass it on to us? We pay half-a-guinea for every hint published on this page. Turn that idea of yours to account by sending it in to us addressed to the Editor, "PRACTICAL WIRELESS," George Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2. Put your name and address on every item. Please note that every notion sent in must be original. Mark envelopes "Practical Hints."

SPECIAL NOTICE

All hints must be accompanied by the coupon cut from page iii of cover.

Two strips of brass rod or curtain or valance rail are drilled and mounted on blocks of wood so that several of the square valveholder panels can be mounted by 4 B.A. screws, side by side, on this strip, a slight space being left between panels to allow for the solder tags just touching and other connections such as to a top grid cap being brought up. It is then a simple matter to wire up each valve stage individually, place them on the strip and connect the four tags together between panels to complete the circuit. A front panel can be mounted by two side brackets, if required, for variable condensers, etc. Screens may also easily be



Mr. Whittaker's idea for a test panel.

placed between the valveholder panels.—J. L. WHITTAKER (Brierfield, Lancs.).

Output Meter

IT is not realised by many amateurs that an improvised output meter may be constructed from a loudspeaker, 0-1 milliammeter and a suitable rectifier. The speaker (or its transformer secondary) is joined across meter and rectifier in series, and to use it it is merely placed close up to a speaker being fed from a receiver. The sound waves influence the additional speaker and the resultant currents induced across the transformer secondary are rectified and a reading is obtained on the meter. In this way a ready method of comparing signal strengths may be obtained.—A. T. WINFIELD (Beckenham).

Low Volume Pe

Details of a Small A.C./D.C.

By G. T.

THE need was felt recently for a compact mains-operated local station receiver with an output sufficient for bedside listening, but not loud enough to disturb other sleeping members of the household when listening to early morning or late night programmes. It was not considered necessary to purchase new components for this set, so a simple circuit was designed around reliable components already to hand.

Circuit

A complete circuit diagram is shown in Fig. 1. One section of a 6SL7GT double triode valve operates as a cumulative grid detector; the other triode section is used as an output stage driving a 2½in. P.M. moving-coil loudspeaker. Resistance-capacitance coupling is employed between the two stages.

It might be as well to mention that although the 6SN7 valve would have been a better valve to use (having a lower value of anode impedance), this could not be done as the heater current of this type is .6 amp. Actually, one popular valve manual lists the heater current of the 6SN7 as .3A, but it has been found to be .6A by measurement. This is understandable, since the valve consists of the equivalent of two 6J5s with heaters connected in parallel.

The power supply circuit uses a 35Z5GT rectifier, and as this valve has a .15A heater a shunt resistor is employed to bring the total current up to .3A. The theoretical value for this resistor is just over 233 ohms, but a 250 ohms 5 watt wire-wound component is quite satisfactory in practice.

A line-cord dropper was made up with a 125-volt (R.M.S.) tap which is connected to the rectifier anode via a R.F. filter (R8 and C9). A 7.5v. .2A dial lamp is connected across part of the rectifier heater.

An 8μF. 200v. wkg. midget tubular electrolytic condenser (C8) is used as the reservoir, and the H.T. for the output valve is taken direct from the cathode of the rectifier. Additional smoothing for the detector anode circuit is provided by R5 and C6.

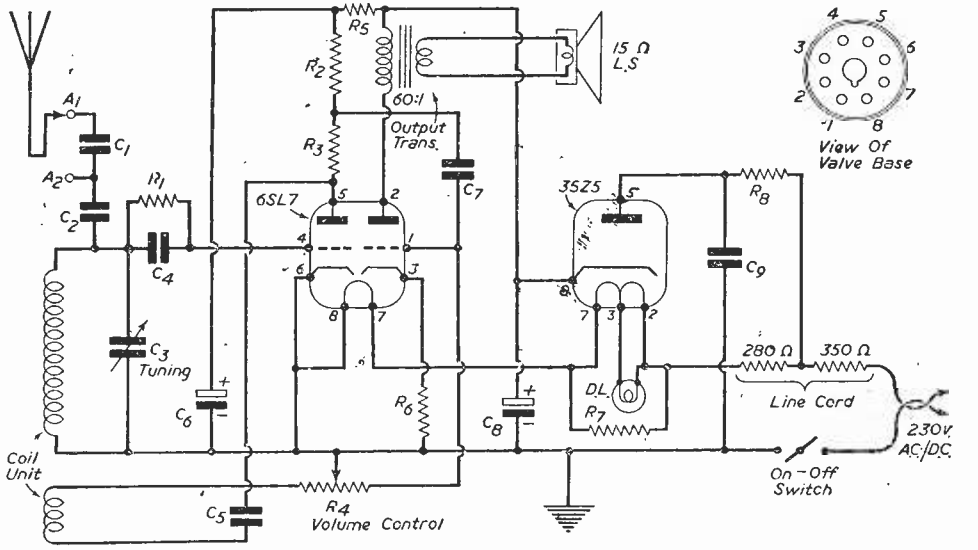


Fig. 1.—Theoretical circuit. The following are the component values.

R1	2 Meg Ω ½ watt	R7	250 Ω 5 watt W.W.	C5	100 μμF
R2	100 k Ω ½ watt	R8	100 Ω ½ watt	C6	8μF 200 v. wkg. Elect.
R3	10 k Ω ½ watt	C1	50 μμF	C7	0.1 μF 250 v. wkg.
R4	100 k Ω Variable Pot.	C2	100 μμF	C8	8 μF 200 v. wkg. Elect.
R5	50 k Ω ½ watt	C3	500 μμF Variable	C9	0.01 μF 500 v. wkg.
R6	1 k Ω ½ watt	C4	300 μμF	P/L	7.5 v. .2 A.

rsonal Receiver

eceiver for Bedside Listening.

DWARDS

Coil

The coil used is a Wearite type "P" H.F. transformer (PHF2) and, in conjunction with a .0005μF. bakelite dielectric tuning capacitor, adequate medium-wave coverage was obtained. The primary winding of the coil is used for reaction purposes, and the aerial is fed to the detector grid circuit via a choice of two capacities (C2, or C1 and C2 in series).

Volume-reaction Control

The 100,000 ohm control (R4) is connected to perform a dual function. As the control is rotated towards maximum the resistance in the reaction circuit is decreased, while the grid circuit resistance of the O.P. triode is increased. Conversely, towards the minimum position the reaction circuit resistance is increased, and the O.P. triode grid resistance is decreased (thereby "loading down" the control grid, and acting as an A.F. gain control). This circuit is more effective than the normal reaction control as it allows the volume to be turned down to a true zero.

Varying the value of grid resistance in this manner to obtain volume control is generally not considered good practice, due to the frequency discrimination characteristic of the circuit. However, in this set excellent control was obtained with little audible frequency distortion.

In order to provide a useful degree of reaction without introducing excessive oscillation towards the maximum setting of the control, the values of the components associated with the detector circuit were carefully determined by experiment.

A midget output transformer was used having a ratio of 60 : 1. The anode current of the output triode anode is in the region of 2 to 3 mAs, and, consequently, there is little danger of core saturation even with the smallest type of O.P. transformer.

Layout

Fig. 2 shows the above chassis layout employed. The chassis used measured 4½in. x 3in. x 1½in. Apart from R7, all resistors and condensers are mounted under the chassis. An under-chassis view is not given as the actual positioning of the small components can be easily decided upon as the wiring-up is being done.

Cabinet

A small cabinet was made of plywood (three-ply top, bottom and front; six-ply sides) and two or three coats of a patent white high-gloss paint were applied. This provided an attractive artificial bakelite appearance.

A simple tuning dial was marked out on the front of the cabinet in black Indian ink, and a small pointer-type knob was fitted to the tuning control spindle.

Results

With a short indoor aerial, attached along a picture rail, adequate signal pick-up was obtained. To those accustomed to the normal 2 to 5 watts output power of the average domestic receiver, this set gives, at first, the impression of being somewhat weak. After a little use in a quiet bedroom, however, it will be appreciated that the output of the set is more than adequate for its own particular purpose. Besides, the power handling capacity of a 2½in. L.S. is only in the region of 250 mW, and an input to the speech coil of, say, 4 watts would not improve the condition of the cone and coil assembly!

In the event of no regeneration being obtained when "turning-up" the volume-control, try reversing the connections to the reaction winding.

The idea of using a small 6.3v. filament transformer and half-wave selenium rectifier for A.C. operation will suggest itself to the constructor not wishing to use the line-cord arrangement.

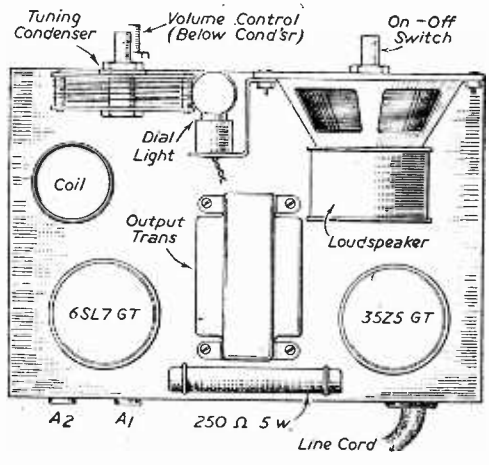


Fig. 2.—Layout of the receiver.

For those who possess a 25Z4 GT rectifier this can be used in place of the 35Z5 GT; in this case the 250 ohms heater shunt will not be necessary, but the dial lamp (6.5v. .3A rating) will have to be wired in series with the heater chain, as the 25Z4 has no heater dial-lamp tap.

Increasing Output on "'Gram"

How to Modify Certain Superhets for Improved L.F. Results

By C. L. ORSBORNE

ON many sets, when a pick-up is fitted it is found that the output is not very good. This is usually because the detector is a simple double diode and the rectified audio frequency is fed straight to the output pentode. The input to this valve, as far as radio signals are concerned, is ample. The output from a pick-up is not nearly as much, and this results in low output on 'gram.

This problem can be overcome by changing the double diode for a double-diode-triode. If a double-diode-triode is already used and more output is required a separate triode must be fitted. Valves are expensive, and additional condensers and resistors are required. This article describes how the extra amplifying stage can be added for the cost of a double-pole double-throw toggle switch and some screened wire.

The intermediate-frequency amplifier is used as a triode amplifier on 'gram, and in its normal capacity as an R.F. pentode for radio. Fig. 1 shows the circuit of the frequency changer, I.F. amplifier and detector in a typical superhet circuit. Many circuits have the screened grids of the frequency changer and I.F. amplifier connected together and fed via a common resistor. If this is not so, it is first necessary to complete this modification. The decoupling condenser (0.1 μF) should be connected to the frequency changer screened grid and the dropping resistor to the screened grid of the I.F. amplifier, and a temporary wire used to connect the two screened grids together.

The actual value of the dropping resistor R is best found by trial to give normal results on radio. It will be about 22,000 ohms, and should not be much less than this value as it constitutes the load of the I.F. amplifier when acting as an A.F. amplifier.

When the correct value of R has been decided upon the double-pole switch can be fitted. The position chosen, should be one that gives accessibility and reasonably short leads. Fig. 2 shows the connections to the switch.

Fig. 1.—A circuit such as is used in most modern types of commercial superhet, showing the pick-up connections.

Reducing Hum

The grid of the I.F. amplifier should be connected to the I.F. transformer by screened wire. The A.V.C. tag of the I.F. transformer should be connected to the switch in screened wire, and the screening continued to the pick-up terminals. This is necessary to reduce hum. It will probably not be necessary to screen the rest of the wiring to the switch.

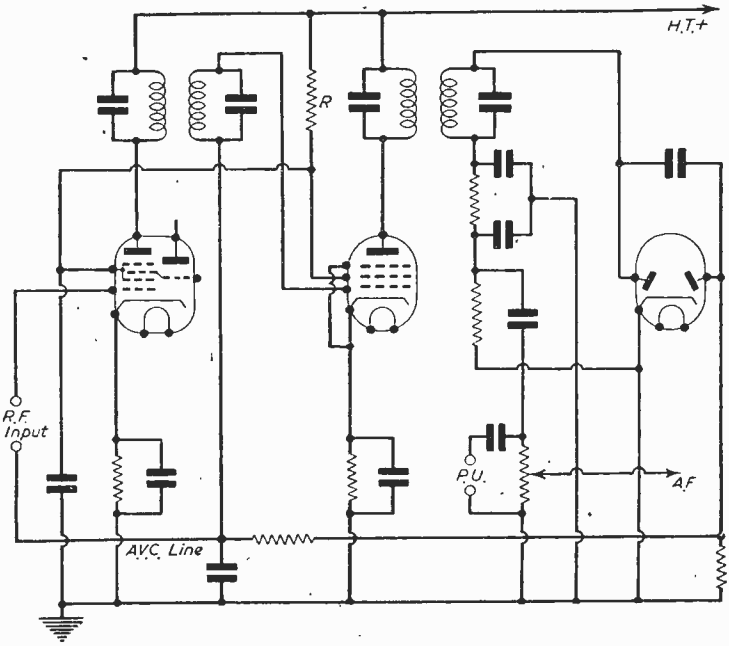
A condenser may or may not exist between the volume control and pick-up terminals, but it is necessary to connect one in the modified circuit to act as a D.C. stopper, so far as concerns the H.T. on the screened grid, which now becomes the anode, on throwing the switch to 'gram. At the same time the frequency changer ceases to function owing to the removal of H.T. on the screened grid.

It will not be necessary to alter the cathode resistor of the I.F. stage, as this will be anything up to 250 ohms and will give enough bias to accommodate the voltage swings of the pick-up. The by-pass condenser should be 0.1 μF.

Crystal Pick-up

The 30,000-ohm resistor across the pick-up terminals is to provide a grid return path if a crystal pick-up is used, and also reduces scratch, without noticeably reducing output.

Tone controls, scratch filters, or similar aids will, of course, have to be included in the A.F.



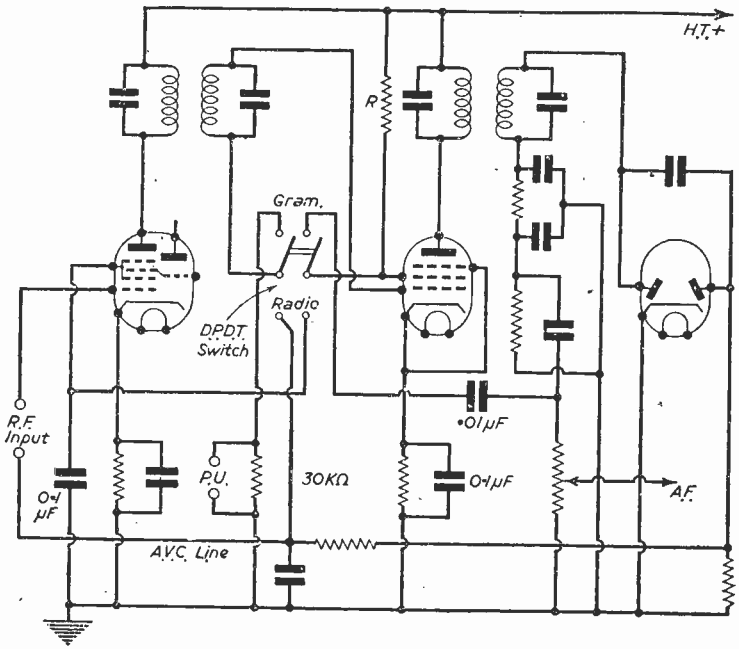


Fig. 2.—The modification referred to. Note the new double-pole double-throw switch and the new connections for the pick-up.

stages, and if the particular pick-up calls for some special form of control, this will have to be switched in when the receiver is switched over to 'gram. No doubt, this could be arranged by means of a ganged switch, but then care would have to be taken to see that unduly long leads were not included on the R.F. side of the circuit as these might lead to instability when using the receiver for radio.

Radio in Inland Australia

Some Interesting Notes by Dr. JOHN WOODS,
Flying Doctor Service, Broken Hill

AUSTRALIA is somewhat larger than Europe, but its total population is much less than that of London alone. The people are mostly settled in the large cities around the south-east coast, Sydney, Melbourne and Adelaide, which compare roughly in size with Birmingham, Newcastle and Hull.

In the inland parts, the "outback," as it is known, the population is scattered, the people living in small towns and isolated homes on ranches, or "stations," as they are called. Here, sheep and cattle are raised on very large tracts of country, comparable in size to the various English counties—a few would be half as big as England itself.

There are no railways, no telegraph lines in these vast remote areas, and so wireless comes into its own as a necessity for communication, both as between the homesteads themselves and between them and the cities. Most places are served by a "postman" with a large diesel-powered motor-truck, who often takes three months to complete his "daily round."

Some 25 years ago a Presbyterian missionary named John Flynn planned to help the isolated settlers, particularly in regard to their medical needs. During the course of his travels in the outback, often riding on a horse or a camel, he encountered terrible cases of hardship—lives lost for lack of medical care—men with broken limbs carried for weeks over rough country in bullock waggons, and arriving too late for the nearest doctor to be able to do much.

The idea of providing doctors with aeroplanes at various centres was only a partial solution to the problem. How was the doctor to know where to go? Ultimately Flynn induced an Adelaide amateur radio enthusiast, named Traegar, to devise a transmitter-receiver suitable for use in isolated areas, and capable of being used by people with no knowledge of wireless whatever.

The Pedal Set

The Traegar "transceiver," or pedal-set, is now used universally in inland Australia. Its original cost was in the region of £80, and it derived its name from the transmitting power unit, which consists of a generator fixed to the floor beneath the set, and fitted with a pair of bicycle pedals which are slowly turned by the operator's feet while he speaks into a small microphone held in the hand. In the early days Morse was used, and an ingenious device like a typewriter enabled anyone to send messages to be picked up at the base by a trained operator, who replied to him by speech.

The interior of the continent is divided up into seven areas, each of which is four or five times the size of England, and in the centre of each is a flying-

doctor base. Each base, in addition to the medical and flying personnel, hospital, flying ambulance, etc., contains an up-to-date broadcasting station fitted with receiving gear and operated by a trained man, whose job it is to keep in daily touch with the homesteads in his area.

Each base uses two short-wave channels, mine at Broken Hill sending and receiving on 44 or 72 metres, according to the time of day (6,690 and 4,130 megs.), and my radio operator, Frank Basden, communicates four times a day with any of the 120 "pedal-stations" on our 400-mile-radius network.

Medical Calls First

The sessions always start with Frank's "I'll listen now for medical calls—anyone wanting the doctor come in, please—over." Two or three may answer together, each giving his call sign :—8LG, 8UZ, 8VP, etc. Frank separates them and calls on one at a time to speak to me. He has an arrangement by which he calls me on a private telephone wire and plugs me in—I, at my home in the town itself, can hear the distant voice through the 'phone, and my replies are put over the air direct and heard on the pedal-set hundreds of miles away. Medical advice may be wanted about a child with a sore throat, or someone with a sprained ankle. After a number of questions and answers, treatment will be outlined, or in a more serious case a visit in the ambulance-plane will be arranged.

To facilitate reception by the operator our base is situated some five miles out of town, but by means of the telephone, the private line to my house or through the town exchange, I am always available for this medical advice, even when flying, the aeroplane being equipped with radio enabling me to talk comfortably with the base and with the tiny outback radio sets.

To go on with the radio session, next job is the exchange of ordinary telegrams. Frank calls a certain station for which he has a telegram from the local post office; if the station is listening it comes back, then stands by while the telegram is read out. After this someone else "pedals in" to say that he has a telegram to send: he reads it out, and Frank takes it down and later relays it over the 'phone to the local post office for transmission to Sydney, Melbourne or anywhere. Thus dozens of "radiograms" are handled each day by each base, apart altogether from the medical side of the work, which was the original object of the service.

A broken-down windmill requires spare parts; a nurse at an outback hospital "pedals" a telegram for something to be sent up on the next mail, a station manager wants accommodation reserved for him at a city hotel, etc.

The effective range of this mighty atom, the pedal transceiver, is about 400 miles—anyone farther away sometimes has to have his signals relayed by others closer in.

After the session, the air is free to all, and immediately voices pour in from everywhere—out of the jumble order materialises, appointments are made as between the two stations wishing to speak to each other ("I'll see you on 44 in half-an-hour"), then can be heard an ordinary conversation similar to that on a telephone except for the punctuating "Over to you" at the end of each over. Often a dozen of the ladies will have a yarn to each other, each taking part in turn, separated by anything from 40 to 300 miles from each other; many have never seen one another, but away they go talking about fowls, children's dresses, recent visitors, or the fashions at the race meeting held in the bush on one of the properties. "Gossip sessions" these are called, or "galah" sessions, after the ubiquitous noisy cockatoo of inland Australia. Then, in the evening, the menfolk will take a turn, a cattle muster is arranged, or a committee meeting will be held for the local races, office bearers appointed, etc. The air is indeed free, for all this costs nothing, and to avoid cluttering up the air, wavelengths are used which are of shorter range, in our case 148 metres, which can rarely be heard over more than 300 miles.

Many of the radios nowadays derive their power from electric house-lighting units run from wind-driven generators—this dispenses with the pedals; whilst the portable sets used in aeroplanes, mail-trucks and the cars of travelling padres are designed to operate on the 12-volt batteries normally carried.

A medical emergency at night is taken care of by means of an alarm system which rings a bell at the base as soon as a note of 1,000 cycles is produced and sent out by any transceiver. This note is produced by an oscillator on the newer sets for the necessary ten seconds, but until all sets are fitted out with such oscillators the required note is produced in various ways, e.g., piano or mouth-organ, or even by whistling or singing the note corresponding to the "C" above middle C on the piano. In this way the operator at the base is notified that somebody wants him—he warms up his transmitter, powered by the electricity of the town, calls up and listens, and switches through to me. I give advice and perhaps arrange to fly out at daylight.

The little transceivers have a broadcast listening band in addition to the short-wave, so that they are used as ordinary radios anywhere else: but distances are so great that the short waves are more reliable, and the B.B.C. overseas broadcasts are heard regularly by this little band of isolated people, many of whom live over 500 miles from the sea. I have often heard Big Ben striking whilst flying over the centre of Australia, and during the war the news commentaries from London were probably the most popular items for the listening public of the outback, with the possible exception of the local medical sessions, in which everybody seems to have an extraordinary interest!

Not all the inland stations are equipped with pedal-sets—there are probably 600 of them altogether—but those without them know where they are, and manage to get to one somehow when necessary. In some cases our Flying Doctor Service provides them when the money cannot be spared, particularly where there are a number of children in a household—a likely spot for frequent medical advice.

Apart altogether from the medical side, this wonderful service has provided the outback with a voice, and something to reduce the awful loneliness and feeling of isolation—something which allows the housewife to have a yarn over the back fence to her nearest neighbour 100 miles away.

Recording Technique—5

"Off-the-air" Recording

By K. KEMSEY-BOURNE

SOONER or later, for one or another of a host of reasons, every sound recordist tries his hand at recording radio transmissions. It may be that he wishes to record on discs some piece of music not available in the commercial lists, or perhaps he would like to hear by playback just what sort of signal his transmitter is putting out on the amateur bands. The local dramatic society needs a sound effect of Big Ben, or a fragment of Itma, or even some Continental transmitter's interval signal. Most of the interesting topics of the day come to us in one form or another by radio, and any of these characteristic modulations can be captured; the range is obviously enormous.

Off-the-air recording has advantages—and difficulties—that are all its own. Taking the advantages first:

1. The problems of studio acoustics, microphone pick-up and balance have been dealt with, well or badly, by those responsible for the transmission.

2. The transmission level is continuously monitored during transmission, and compression will be applied wherever necessary by the control engineers.

3. B.B.C. and other responsible broadcasting organisations can provide very good quality signals of front-rank performers and one can choose any of this output to record.

The reader will be able to amplify the possibilities. The difficulties and disadvantages are considerable, and more than a little care and experience go to the making of a really good radio recording. The more important problems are:

1. The transmission itself may be poor, or a possible good transmission may be marred by background noise, interference, mains-borne mush, and all the other unwelcome visitors.

2. The modulation levels and degrees of compression of different transmitters vary widely. On a particular radio frequency the modulation limits can sometimes be seen to change through the day, as control engineers come on shift.

3. Cueing for start and finish is sometimes difficult. Following announcements the item required may begin immediately or there may be an appreciable pause before it starts.

4. In general, it is not possible to repeat any part of a radio recording should there be any technical faults during the cutting. Everything must be perfect the first time, which is not easy to achieve when you may not know what is coming next.

Equipment

What this all means is, in essence, that we have opportunities to record music, artists, standard frequencies, amateurs, sound effects, etc., but also that we must use our native cunning to make the most of them.

It is possible to make a radio recording by setting up a microphone in front of a loudspeaker fed from a receiver tuned to the required transmission, but this type of set-up cannot be fully satisfactory. Neither the speaker nor the microphone will have perfect characteristics, there will probably be some slight distortion in the output stage feeding the speaker and possibly mains hum: and there is a chance of incidental room noise being picked up by the microphone.

It is preferable to feed the main recording amplifier from the detector or first A.F. stage of a suitable receiver, which may be a commercial set, a superheterodyne feeder designed to work into an amplifier, a T.R.F. unit primarily intended for local reception, or a D.X. or communication rig, depending, of course, on what you desire to record. The over-all set-up is represented by the block diagram of Fig. 1.

A Good Aerial is Essential

Whether you work from a super-superhet or from a broad-tuned T.R.F. circuit will depend on the audio quality required and the signal level in your area. In either case the signal/noise ratio must be made as large as possible by having an efficient aerial pick-up and interference needs to be cut down by means of screened input leads and proper layout. Any good reference book will help you to choose the best arrangement for your needs; it need not be expensive or elaborate to be reasonably efficient.

An indoor aerial will pick up a high proportion of mush with whatever signal it carries, as will a poorly placed outdoor one. After an anti-interference aerial the next best thing is a rod mounted high on a roof or chimney. The importance of sound connections and a reliable one-point earth return cannot be over-emphasised, as these things are frequently ignored, even by people who ought to know better!

The Receiver Unit

A sharply-tuned superhet circuit cannot be expected to give an even response up into the higher

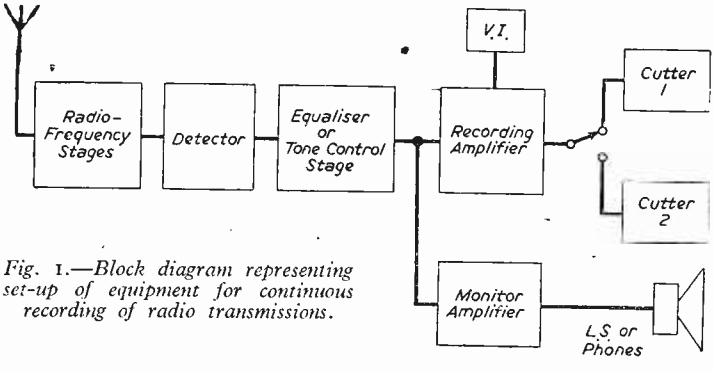


Fig. 1.—Block diagram representing set-up of equipment for continuous recording of radio transmissions.

ranges of the audio-frequency spectrum. "Live" B.B.C. transmissions (not recordings) are designed to have a flat response between 50 and 8,000 cycles, but most commercial superhets will cut off well before this upper limit, and some cut off as low as 2,500 cycles. It is not practicable to boost the top response under these conditions because this merely makes the unpleasant background noise more noticeable.

For good quality recordings of music an extended high-frequency response is essential, and that means a broad-tuned T.R.F. circuit working on high signal strengths (local station conditions), or, as a compromise, a superhet whose resonances have been flattened to decrease selectivity. For intelligible

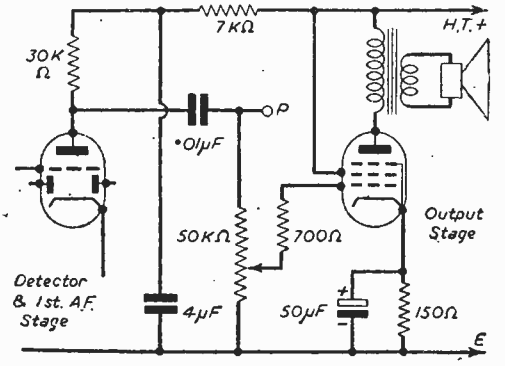


Fig. 2.—Last two stages of commercial receiver. Taking the output between point P and Earth provides an AF signal of 3 to 5 volts. See Fig. 3 for method of coupling.

speech an upper limit of 2,500 cycles is acceptable and so narrow-peaked tuning circuits may be used, especially since there is no attempt at linear response for speech transmission over long distances on communication frequencies.

At the author's home in the north-west the signal strength of the Third Programme is so low that it is usually quite impossible to obtain reception that is not at least partly spoiled by mush; under such conditions high-quality recording of the many unique musical broadcasts is impossible, and one must be prepared to sacrifice some top response, since the ear is very sensitive to high-frequency interference. The Light Programme gives the highest signal strength, and after that the Home Service.

Adapting Existing Apparatus

If you have not the facilities for using a separate good-quality feeder unit then you may draw your A.F. signal voltage from the detector stage of a normal receiver, and you will get good results if the preceding stages have been properly trimmed and adjusted for optimum output. Fig. 2 shows a typical circuit, the last two stages of a commercial receiver in which the detector/A.F. stage is resistance-capacity coupled to an output pentode through a potentiometer gain control. In this case we would bridge the input of the recording amplifier between the point marked P and earth. An A.F. swing of some 3 to 5 volts will be available here, and since this will be more than the recording amplifier requires for full loading we will include an extra resistor, marked R in Fig. 3. This serves the dual purpose of reducing the voltage appearing across the input potentiometer of the recording amplifier to a satisfactory level and of increasing the effective bridging-resistance of the shunt connection. Thus the action of the input gain control is not crowded at one end of the rotation, and the receiver pentode output stage can be used as a programme monitor, with its own independent gain control, as distinct from the recording amplifier's own quality monitor. The practical value of R will depend on the voltage available between P and earth, on the input voltage required by the main amplifier, and on the value of the input potentiometer; trial and error will give results such that satisfactory recording power is fed to the cutter when the main gain control is set at 50 per cent. of full gain. Typical values of R will lie between ¼ and 1 megohm.

Pre-tuned Receivers

For recording B.B.C. transmissions a pre-tuned receiver unit is very convenient; this can be set up for as many stations as required, and it is advisable to leave at least one switch position spare for future use. It is a simple matter to align the trimmers by using an R.F. oscillator set to the particular frequency wanted, or by tuning of the station itself. These pre-set stations are then instantly available. Sometimes it is of advantage to be able to receive a programme on any of the

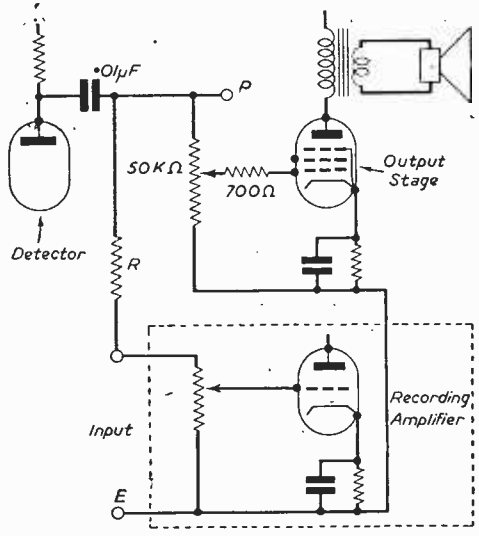


Fig. 3.—Coupling the circuit of Fig. 2 to the recording amplifier. Resistance R (250,000 ohms to 1 Megohm) provides high bridging-resistance and lowers the available AF voltage to that needed to load the recording amplifier.

several frequencies on which it may be transmitted.

On all pre-set equipment one position of the selector switch should shunt in an ordinary tuning condenser, so that other stations may be hand-tuned if needed. This is also very useful if any of the pre-set channels develops trouble or drifts off its setting; this sort of trouble always seems to occur just before a vitally interesting item comes on, and it is well to have a reserve method of recep-

tion. For recording purposes the tuning must be very accurate, and it is well worth spending some time on checking this. Fig. 4 represents a useful medium-wave tuning unit for general purpose working. Fig. 5 shows a tuner designed to have an effectively flat response from 30 to 10,000 cycles, using the Kunde cathode-follower output circuit;

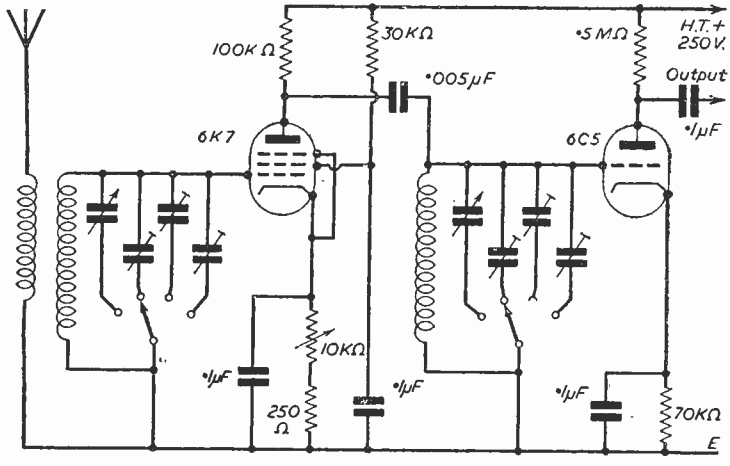


Fig. 4.—General purpose tuner, using plate rectification. Coils may be Wearite PHF2 or similar. Trimmers and ganged switches permit pre-setting of a number of tunings.

shunting the tuning condensers has the effect of flattening the tuning resonance curve and so maintaining the extremes of high and low audio response. In both circuits pre-selector switching is indicated, but this is purely a matter of choice.

Details of superheterodyne tuners will not be given here, since plenty of adaptable circuits have been published in this journal and elsewhere. Similarly, such refinements as tuning resonance indicators and A.V.C. will be left to personal whim.

Operating Technique

For continuous recording it is obvious that two machines will be needed (motor turntable, tracker and cutting head, all duplicated) together with suitable switching for changing the feed from one cutter to the other. If only one recorder is being used to record short items then a dummy load is needed—that is, a resistance capable of dissipating the amplifier output and of value equal to the impedance of the cutter-head at about 400 cycles. The dummy load can be switched into the output circuit of the amplifier in place of the recording cutter, if necessary while the amplifier is feeding power at a high level, and there is no danger of damage to the output stage. For example, suppose one item of a recital is to be recorded. During previous items the main gain control is set up to an optimum value using the V.I. shunted across either the dummy load or the cutter-head; whichever is used the reading should be the same. The monitor is fed in either case. Just before the end of the announcement of the required item the cutter-head (unenergised) is lowered on to the disc and the cut commenced. Then after the announcement has ended the output is switched to the cutter and the recording made. At the end just enough time for reverberation to die is allowed and then the dummy is switched back in place of the cutter, while the cutter makes a few blank grooves or a run-out spiral. This avoids the need for changing the main gain control and allows the monitor to be used to provide cues, announcements, etc.

For working two machines each recordist will have his own pet scheme of operations. Standardise your run-in and run-out grooves by counting in seconds. For example, suppose that Cutter 1 is working and is to be replaced by Cutter 2 during a continuous recording session. At the end of Cutter 1's disc we count three, two, one, IN (lower Cutter 2 on to disc), one, two, three, OVER (switch the output from Cutter 1 to Cutter 2), one, two, three, four, UP (raise Cutter 1 from its disc, which has a four-second run-out). Standard run-in times are invaluable when it comes to playing the finished discs continuously with two pick-ups alternately.

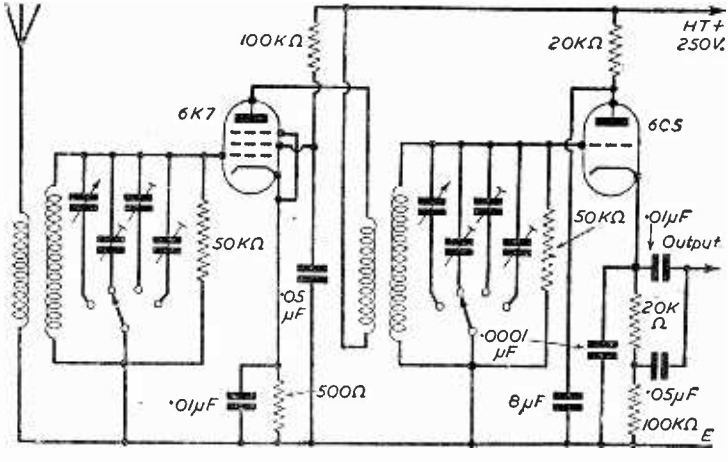


Fig. 5.—Extended-response tuner, with Kunde cathode-follower output. Coils and trimmers are as for Fig. 4.

Trade Notes

The Ekco "Consort"—a New-style Universal

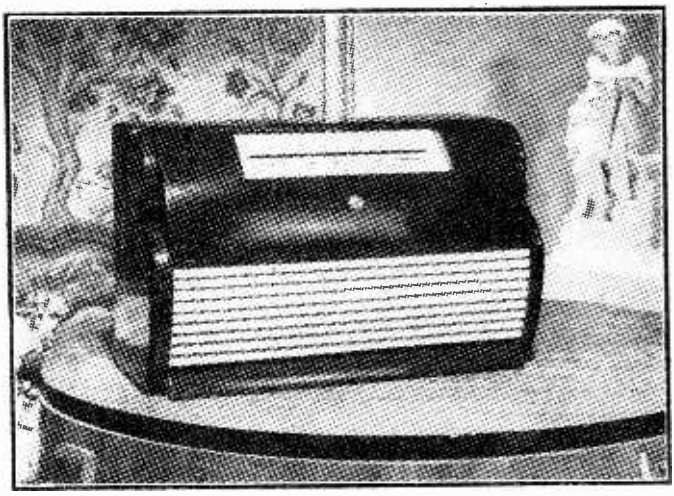
ON the right is a view of the Ekco Consort, Model U76, a keenly priced transportable 5-valve, all-wave, A.C./D.C. superhet, with an efficient built-in twin aerial system—distinctively styled in a two-colour plastic cabinet.

Special Features

The Consort breaks away from convention in design but will take its place with quiet distinction in any home, either as a second set de-luxe or as the main receiver. The use of side controls has given the stylist an opportunity of preserving clean curving lines, particularly suited to the plastics medium. Two colour schemes are offered—maroon or walnut with an ivory speaker grille in each case.

The inbuilt twin aerial system has a special loop giving a short-wave performance unusually efficient for this class of receiver. (Sockets for outside aerial and earth are provided for use in abnormal conditions where signal strength is low.)

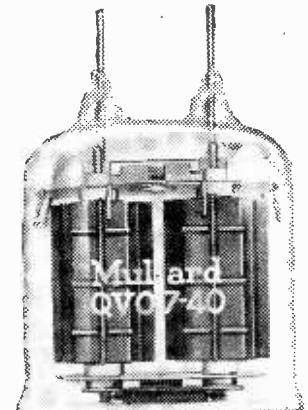
The receiver has an exceptionally economical current consumption—achieved by the use of the latest low-consumption valves. The price is 17 guineas (inclusive of Purchase Tax).



A fine view of the new Ekco.

Five New Mullard Valves

FIVE new Mullard valves have now been released for distribution through home trade channels. They are the UAF 41, UAF42, UCH42, UL41, and UY41.



The QV07-40 double-ended U.H.F. valve.

These valves are A.C./D.C. types on the new B8A base. The UAF41 and the UAF42 are variable-mu pentodes with single diodes, having 12.6-volt heaters taking 0.1 amps.

The UCH42 is an A.C./D.C. triode hexode with a 14-volt 0.1-amp. heater.

The UL41 is an A.C./D.C. output pentode with a 45-volt 0.1-amp. heater, and is capable of giving 4.2 watts output, with 10 per cent. total distortion when used as a single Class A amplifier with 165 volts applied to its anode and screen.

The UY41 is a half-wave rectifier suitable for A.C./D.C. operation, its heater taking 0.1 amps. at 31 volts. At maximum anode voltage of 250 volts, this valve will supply a rectified current of 90 milliamps.

Technical data sheets regarding these valves can be had on application to the Mullard Technical Service Department.

The push-pull power tetrode, QV07-40, recently introduced by Mullard Electronic Products, Ltd., has been specially designed to give stable and efficient performance at very high frequencies and should, therefore, prove of very great interest to those amateurs intending to use the new 144-146 Mc/s band. A particularly interesting feature of this valve is that neutralisation is not usually necessary. This advance in valve design results from special construction of the electrode assembly and the inclusion of a decoupling condenser between the second grid and cathode. As a result of this, it has been possible to reduce the anode-to-grid capacitance of the valve to less than 0.1 $\mu\mu$F. These features, together with the low internal lead inductance, ensure stable operation at very high frequencies, and an output power of 83 watts can be obtained at 200 Mc/s with an anode voltage of only 500. For reduced input it is possible to operate the valve economically and efficiently at frequencies up to 250 Mc/s.

This valve is directly equivalent to the American type 829B. The list price is £7 10s.

The following changes in nomenclature have recently been announced by Mullard:—

QV04-20 now becomes QQV04-20.

QV07-40 now becomes QQV07-40.

This modification has been introduced in order that the type numbers may be brought into line with the Mullard system of nomenclature as applied to transmitting and industrial valves.

Underneath the Dipole

Television Pick-ups and Reflections. By "THE SCANNER"

IN spite of the tense political situation, provincial interest in the probabilities of local television transmitting stations is increasing. Vague and discouraging semi-official statements in the daily Press have suggested that the stations at Birmingham, Manchester, Newcastle-on-Tyne and Glasgow will be opening respectively in one, two, four and five years' time; but even these have failed to douse the enthusiasm of a few stalwarts. Some of them, whose homes are situated on reasonably high ground, are planning to erect high and elaborate aerial arrays which they hope will pick up the new Birmingham television transmitter at distances of 100 miles or more, pending the erection of nearer stations. I have the feeling that their optimism will be justified, for the details I have heard about the new Birmingham transmitter, now under construction at Sutton Coldfield, give every indication that that station will be sending out a signal which will be considerably stronger than the Alexandra Palace. Situated on reasonably high ground in the centre of a densely populated area, with a mast 700ft. high, and with increased power and an improved system of modulation it certainly would appear to have everything in its favour.

Between Two Stations

I have been asked what the position will be of viewers who are situated mid-way between the London and Birmingham stations, or those receiving roughly the same signal strength from each. One conjures up the thought of rotating reflector-type dipoles, enabling one station or the other to be received. But there is likely to be rather more adjustment than the mere turning of a tuning dial or an aerial in order to change over from one station to another, since a modified form of modulation is likely to be employed at Birmingham. This does not mean that a set designed for London area transmissions will not receive Birmingham; but that most of the preset controls will require adjustment. However, so far as the enthusiasts are concerned, this presents an admirable excuse for enjoyable "fiddling" at the controls. Television sets sold in the Birmingham area will naturally be preset for the local transmission. And I have the impression that the rush for sets in that area will be colossal, so great will be the appeal of television to the Midlanders.

Temporary Stations

The cost of running a television service is so high that it is obvious that the majority of studio programmes must be centralised in London. The special land-line link between London and the proposed provincial stations is therefore the principal retarding factor in the opening of these stations. In the circumstances I feel that all possible speed should be made with the development of high-quality recording of picture and sound of London performances, to enable provincial stations to be put into operation at an earlier date, using recorded programmes. I know that the transmission of film (and of sound on film) still leaves a lot to be desired, judging the present standard from the Alexandra Palace. But the equipment now in use is obsolete and will shortly be replaced. I have seen some results on the newest equipment both on closed-circuit and on radio link reproduced on a large screen as well as on the usual 12in. and 15in. tubes, and have been very impressed indeed. The definition was considerably better than the present standard of direct studio transmissions from the Alexandra Palace. All the familiar "tilt and bend" faults, flares, halations and shadows were completely eliminated, and the progress of a couple of reels of a feature picture went through with the smoothness of a well-projected West-end cinema presentation. I understand that the Charter of the B.B.C. will not allow more than a certain percentage of recorded programmes and that reproduction of recorded television is similarly restricted. Nevertheless, if the recording of programmes from the end of a cathode ray tube can be brought up to the perfection of the reproduction of films on this latest equipment, then there are grounds for amending the rules. I am sure that provincial viewers-to-be would prefer to see recorded programmes next year rather than have to wait five years for the completion of a "coaxial-cum-relay-repeater" land-line from London to Glasgow.

Dollars for Programmes

High-quality recording of the Alexandra Palace programmes might also have a dollar value. I am told that, generally speaking, the American programmes are not so far advanced as ours. American television stations, which seem to be multiplying with great rapidity, stimulated by the spur of competition, have barely had time to develop the television play or revue. I feel sure that some of the best efforts of the boys at Alexandra Palace would receive a warm welcome on American television. Already they make use of our excellent television news reel and send us prints of their own efforts in this particular line. So far as television is concerned, it should be a case of "hands across the sea," and I look forward with great interest to the results of the visit to America of Norman Collins, the B.B.C.'s chief television executive.

Cabinet Design

The body of a car or the little accessory gadgets thereon will often decide a prospective buyer of a car, particularly if the buyer is a woman. And since the television set is likely to take up quite a sizable amount of space in the home, the housewife will have quite a lot to say about the choice of set. And there is no doubt that she will express a preference for the set with some particular type of cabinet rather than make a considered comparison

of the technical results of the sets offered. The cabinet work of some of the best British television receivers is poor both in design and in material. Highly polished, bulbous and opulent-looking consoles with a tiny tube may appeal to some, but I think the majority will prefer smaller and simpler styles. I must say that the plain type of cabinet design with doors entirely hiding the tube when not in use and acting as a hood, half open when viewing is carried out in a lighted room, appeals to me, and that the extra 2in. width of the 10in. by 8in. screen, compared with what has now become practically standard size of 8in. by 6in., is well worth the extra few pounds.

There was a time when it was considered desirable to disguise radio sets as china cabinets, fire screens or miniature pianos—indeed, the cabinet designer's ambition was to make a radio set look like anything else at all. Gradually came the idea of making the set look like a radio set and yet retain the aspect of a piece of furniture. Radio design has turned the full circle, and now there are television sets which are so striking in appearance, to the extent of being blatant, that they positively dominate the other furniture in a room. Radio and television have become an important part of our home lives, but should not upset the balance of the furnishings or decorations. Few people would choose to live with furnishings reminiscent of a chromium-plated milk bar—a factor which some designers appear to forget. And yet there are some modern functional designs, notably the Murphy range of radio and television sets, which have a definite modern individual style and which are pleasant to look upon.

News from the Clubs

THE WEST MIDDLESEX AMATEUR RADIO CLUB

Hon. Sec.: C. Alabaster, 34, Lothian Avenue, Hayes, Middlesex.

THE affairs of the Club are in the happy state of gradual expansion and very welcome new faces are seen at each meeting of the Club. The G.P.O. have now granted the Club their transmitting licence under the call-sign G3EDH, and plans are well in hand to utilise the facilities granted to the full. Several members went recently on a visit organised by the Club to the B.B.C. transmitter at Brookmans Park and a recent interesting meeting was an exhibition of items of equipment constructed or converted by members.

Meetings continue to be held at the Labour Hall, Uxbridge Road, Southall, Middlesex at 7.30 p.m. on the second and fourth Wednesdays of each month. Visitors and prospective members can be assured of a warm and sincere welcome.

THE GRAFTON RADIO SOCIETY

Hon. Sec.: W. H. C. Jennings (G2AHB).

MEETINGS of the Grafton Radio Society (G3AFT) are held every Monday, Wednesday, and Friday, 7.30 p.m. at Grafton School, Eburne Road, Holloway, London, N.7. Morse instruction is given at every meeting.

Lectures covering the syllabus of the City and Guilds Radio Amateurs' examination will commence shortly. Grafton's speciality is coaching amateur enthusiasts for their transmitting "ticket," and the Club is licensed under the call-sign G3AFT.

Practical sections cater for the constructional enthusiasts, and a large quantity of valves, components, and ex-Government gear have been recently stocked. In addition to being affiliated to the R.S.G.B., this Club is the official North London Chapter of the British Short Wave League, and SWL's may gain valuable knowledge and experience by meeting active transmitting amateurs. Canteen facilities are provided at every meeting.

At the Third Annual General Meeting, the following officials were elected:—President, GW3ALE; Vice-Presidents, G3RX, G8DF, and P. Beresford; Chairman, A. W. H. Wemmell; Vice-Chairman, G2AAN; Hon. Secretary, G2AHB; Hon. Treasurer, R. White; Hon. Minute Secretary, G3DCF; Committee Members, G2FRP and P. Beresford. New members welcome. Hon. Secretary, W. H. C. Jennings, G2AHB, Grafton Radio Society (G3AFT), Grafton School, Eburne Road, Holloway, London, N.7 (one minute from the Nag's Head).

SOLIHULL AMATEUR RADIO SOCIETY

Hon. Sec.: H. C. Holloway, 20, Danford Lane, Solihull.

A "DIRECTION Finding Test" was held on Sunday, August 29th, many members participating. It was agreed that a good time had been had by all.

Meetings are held every alternate Wednesday at the club headquarters, The Old Manor House, Solihull, where prospective members and visitors are given a cordial welcome.

THE HOUNSLOW AND DISTRICT RADIO SOCIETY

Vice-Pres.: E. Hott, 36, Bulstrode Road, Hounslow, Mddx.

THE Hounslow and District Radio Society opened their autumn session with a very successful meeting on September 8th, during which three short talks were given on "The Use of Neon Stabilisers on the B.C.221," "Frequency Meters" and "Electronic Transmission of Movement," by Messrs. A. W. Robertson, R. S. Parsons and J. H. Clark respectively. Arrangements for a social evening in the West End on December 18th have now been completed.

STOURBRIDGE AND DISTRICT AMATEUR RADIO SOCIETY

Hon. Sec.: W. A. Higgins, 35, John Street, Brierley Hill, Staffs.

A MEETING of the above society was held in the Science Block of King Edward School, Stourbridge, on Tuesday, October 5th, at 7.45 p.m. Mr. N. C. Heathcock (BRS6319), was in the chair, and a good attendance was recorded.

Instead of the usual lecture or talk, there were two general discussions. The first subject was "Band Planning" (as proposed by the Code of Practice Committee of the R.S.G.B.), and in this there was much divergence of opinion and feeling. Mr. W. A. Higgins (G8GF), opened the debate by reading a proposal from the Society President, Mr. J. Timbrell (G6OI), unable to attend through indisposition, who proposed that Band Planning should not be considered in any way until an international agreement was reached. G8GF supported this proposal and added that the present proposals of the R.S.G.B. favoured the high power telephony stations. On a proposal by Mr. Jacobs, it was then decided by vote that the majority of the members were in favour of the principle of Band Planning. More discussion followed with many individual opinions and the meeting finally passed a resolution by Mr. Higgins that the Society rejected any proposals of Band Planning unless they were agreed on an international scale.

In the second discussion, on 144 Mc/s. operation (two metres), Mr. F. Bills (G3CLG) figured prominently as he had some practical experience to expound. Some apparatus built by members was displayed. In the main, members were shown that it does not entail considerable expense or apparatus to operate on these very high frequencies. A vote of thanks was passed to G3CLG for his very interesting descriptions of V.H.F. working.

The next meeting will take place on Tuesday, November 2nd, and there will be a talk on "Home Recording," by Mr. D. Poe of B.S.R., Ltd. The secretary will be pleased to hear from any one interested in joining the society.

LIVERPOOL AND DISTRICT SHORT WAVE CLUB

Hon. Sec.: W. G. Andrews (G3DYW), 17, Lingfield Road, Broadgreen, Liverpool, 14.

THE average attendance has been steadily increasing over the preceding month, and club activity is gaining momentum.

The construction of a 35 mm. film strip projector is in hand, and it is hoped to give technical lectures with the aid of film strips issued by Mullard's educational service.

A forthcoming lecture of note is one dealing with high fidelity A.F. equipment and pick-ups, to be given on October 26th, by Mr. J. H. Brierly, of J. H. Brierly, Ltd.

A visit has been arranged to the main automatic telephone xchange.

DERBY AND DISTRICT AMATEUR RADIO SOCIETY

Hon. Sec.: F. C. Ward (G2CW), 5, Uplands Av., Littleover, Derby.

AS a result of the Society's stand at a recent exhibition organised by the Derby Society of Model Engineers, membership and interest in the society's activities have increased considerably.

The society's own transmitter is nearing completion, application for a licence having been made to the appropriate authorities. It is hoped to participate in a forthcoming contest with this equipment and at the same time try out a new location for future N.F.D. events.

The lectures on television receiver construction are proving very interesting and many members are anticipating results from the Alexandra Palace transmitter pending commencement of transmissions from Sutton Coldfield.

Programme Pointers

This Month MAURICE REEVE'S Subject is The Edinburgh Festival and Three Plays

EVEN without the present restrictions and frustrations of modern continental travel, it would be difficult to imagine a more delightful holiday than a trip round the Hebrides and Trossachs, or Skye and Shetland, through the most varied and mountainous scenery Britain has to offer us, winding up with a week or so in Edinburgh, the Athens of the North, Auld Reekie, or what you will from the many titles given to the loveliest city in the Empire, at the height of her newly founded Festival of all the Arts.

The second holding, which is just concluding, has been so enormously successful, that it will now take its place with Salzburg, the Three Choirs and others, as a landmark in the artistic calendar. A galaxy of world-famous artists were engaged for the Festival to appear in many of the greatest masterpieces; whilst there was also a liberal sprinkling of modern works and first performances. Some splendid concerts came over the air, and one was tempted to wish they had been present in the splendid Usher Hall in actual fact.

Not all the performances were of equal merit, and perhaps the least satisfactory was the first concerto of the Concertgebouw Orchestra of Amsterdam. Although Mendelssohn's brilliant Italian Symphony sounded rather as though the players had not quite recovered their breath from their long journey, the main trouble with Bruckner's seventh symphony was probably the work itself. Its discursiveness and the absence of the tightly-knit methods of Beethoven and Brahms were felt through the very impersonal medium of the radio even more than they usually are in the concert hall.

Two distinguished artists in Menuhin and Kentner combined for the whole cycle of Beethoven's Violin and Piano Sonatas, two programmes of which were broadcast. A dazzlingly technical team they made, making one feel that only one of them need have journeyed north; they would have combined just as perfectly with the other remaining back home in London and only a starting button, installed either end, needing pressing. They never tugged at the heart strings once.

Cosi fan Tutte

A memorable broadcast was that of Mozart's Cosi fan Tutte, from the King's Theatre, done by The Glyndebourne Company and the Royal Philharmonic Orchestra, conducted by Vittorio Gui. The incomparable work came over with all its gaiety and freshness. Stabile's personality, as Don Alfonso, "stood out" most pronouncedly. One could almost imagine oneself back in the Cambridge Theatre, where we all look forward to seeing him again in further triumphs this winter.

The Augusteo Orchestra, of Rome, under Carlo Zecchi, also gave an excellent concert, its best items being a Concerto Grosso, by Geminiani, and Verdi's Sicilian Vespers.

But I purposely leave to the last what was, to one listener at any rate, the highlight of the musical side of the Festival as broadcast: namely, Schnabel's playing of Mozart concertos, with the B.B.C. Symphony, under Sir. A. Boult, and the B.B.C. Scottish, under Ian Whyte. This was Mozart playing in excelsis. Not only is Schnabel the master pianist in this genre of music, but he knows, understands and feels it through and through to the remotest fiddle desk. Steely fingers run up and down the keyboard, but they wear a velvety glove in the slow movements. The rondos are things of sheer delight, whose tunes and rhythms are left dancing in one's mind and heart long after we have turned the knob off.

Only Casals, of contemporary artists, seems to unlock the secrets of great concerto playing to the same extent, and to have the orchestra "with him" to the same degree. When listening to playing like this, one feels that the announcement ". . . is accompanied by the such and such orchestra, conducted by so and so . . ." is, apart from the proper etiquette due to distinguished artists, quite misleading. Schnabel makes a homogeneous whole of the thing with himself, the orchestra, the conductor and, above all, the music, integral parts. Only the greatest artists can achieve this.

Also, with the B.B.C. Symphony, another night, were Menuhin and Piatigorsky in a brilliant performance of Brahms' massive double concerto for violin and violincello.

Remembering that the variety of art on show at Edinburgh ranges from Handel manuscripts and 16th century masques and moralities onwards to the best, and less good, of to-day's outpourings. I have said sufficient to show that this Festival has come to stay and to command our attentions every summer.

The Critics

Before mentioning plays, I would like to welcome back the critics "Here are the five critics again," on the Home Service on Sundays at 12.10 to 12.55, whose first programme of the present series came from Edinburgh on the 5th. This wholly delightful résumé of current films, theatre, books, art and radio, by an ever-changing number of experts on the various subjects, is probably missed by large numbers engaged either in preparing the Sunday shillingsworth or in sharpening up the appetite for same. If so this is most regrettable, as it is that rare combination—capital entertainment and first-class information. If you haven't tuned into it yet, do so. I'm sure you'll like it.

I thought the best play broadcast last month was Constance Cox's dramatisation of Oscar Wilde's remarkable novel, "The Picture of Dorian Gray." The amazing and fascinating story of the brilliant and Adonis-like young man who, sitting for his portrait, is cursed by having all the marks and wrinkles of experience—his soul, in fact—normally shown on our countenance, grow on the picture instead. Until, in middle age and still looking twenty-one, he breaks the spell, whereupon on one shattering revelation in the mirror, and seeing

corruption in his own face and the purity and looks of his youth returned to the picture, he commits suicide.

To make a play of Wilde material, Wilde, one of the stage's master craftsmen, and the creator of the gayest and wittiest comedies since Sheridan, sounds something of a paradox. But Wilde must have known that, in spite of typical Wildean wisecracks from Lord Henry Wotton, who is of the company of John Worthing, Viscount Goring, Lady Bracknell, and all the others, the dramatic and psychological qualities of "Dorian Gray" were more suited to novel form. At least, he doubtless felt that he would best express that particular story in prose rather than in stage dialogue.

Ineffective Play

Whether this is so or not, Miss Cox, together with the adaptation and production of Howard Rose, made a most effective radio play, in which the climax, the metamorphoses of both Dorian Gray and his picture, was most dramatically conveyed. Hugh Miller strolled through the part of the hardened sinner. Lord Henry, whose evil influence is Dorian Gray's undoing, with great charm and conviction. David Peel in the title role was also excellent, especially in the earlier scenes before he comes under Lord Henry's charming but corrupting influence. The ladies in the story are of less importance than the men, which is perhaps why Wilde did not himself put the story into dramatic form. They were all most convincingly portrayed.

"The Bill of Divorcement," that great West End success of twenty-odd years ago, was put over on September 4th. Like many another play heard again after such an interval of time, it is difficult to see what there is in it to have caused such a stir, bother and commotion as it did in those now lamented days. The subject, that of the woman who divorced her lunatic husband in his "absence," only to have him return, cured, and about to scotch her second romance until their daughter saves it by sacrificing her own happiness, may have been more topical then than now; I don't know. It may also have been very good "theatre." Listening-in, I thought both the story and the characters very forced and unreal, though it was played very well indeed, especially by Olive Gregg as the young daughter.

The dramatisation of Nevillo Cardus' autobiography—Home, September 1st—missed much of the essential flavour of the original, which has been the literary feature of the year. All the gorgeous cricketing and musical stories were missing as was the essential flavour of that wonderful woman, Aunt Beatrice. Also, I couldn't imagine the youthful Cardus talking and seeming like he sounded as played in the early scenes from the book; it sounded like one of the most insufferable film children—English variety. But the programme was a signal and most deserved honour to one of the most remarkable men of our time. It will be long before I read a better or more valuable book.

Television Receiver Construction

THERE are two handbooks at present available dealing with the complete construction of modern television receivers. Both books cost 2s. 6d., and one is published by Electronic Engineering and the other by Iliffe. They are obtainable from most bookstalls and newsagents.

The Televisor described in the Electronic Engineering book incorporates an eight-valve vision receiver (EF50's and EA50's), and a four-stage sound receiver (EF50's and EBC33) tetrode, with output stage (Mullard EL33). Both time bases utilise the Thyratron (T.41), with a single amplifying stage, and the power pack includes a valve rectifier for EHT. The receiver is designed primarily for a standard 9in. tube, and the input is taken to the grid.

The receiver is of the straight type (tuned anode couplings), and is designed for single-side-band reception. Aerial input is taken to both sound and vision receivers, and a simple and reliable two-stage synch separator is employed. We understand that a complete kit of parts works out at about £65.

The *Wireless World* receiver is a more elaborate circuit and utilises the first two H.F. stages in the vision receiver for the reception also of the sound signals. A filter takes out the sound signal and passes it to a further H.F. stage, feeding a diode and the output from this point is intended to feed an existing amplifier (or the pick-up terminals of a standard broadcast receiver). There are six stages in the vision amplifier (ER50's and EA50), which is designed for double-side-band reception with transformer couplings tuned by brass slugs. The time bases incorporate three valves for frame and three for the line, using a blocking oscillator and a Miller transitron integrator. The line output transformer is tapped to feed two metal rectifiers to generate EHT from the fly-back. The power pack employs two standard full-wave rectifiers connected as half-wave units to supply the necessary 500 volts at 250 mA., and the book gives full constructional data for the scanning coils, focus coil, tuning coils, frame and line transformers which, however, are now available ready-made to the specification from various manufacturers.

A 9in. tube is also specified for this receiver, and the input is taken to cathode.

We understand that the kit for this receiver works out at over £70.

Both receivers may be used to operate a 12in. tube without alteration, although naturally brilliance will suffer slightly.

The experienced amateur will no doubt find little difficulty in incorporating ex-Service valves and other items, and both receivers are relatively simple to build. A signal generator and some form of output measuring device is an essential with the *Wireless World* receiver, but although it is claimed that the Electronic receiver will give results without such test equipment, a generator is essential to obtain accurate alignment of the single-side-band tuning circuits and thus get the best from the set.

Impressions on the Wax

Review of the Latest Gramophone Records

ONE of the highlights of the recent releases is a new recording of Beethoven's "Choral" Symphony, played by the Vienna Philharmonic Orchestra, conducted by Herbert Von Karajan, on *Columbia LX*1097-1105. The soloists are all Viennese singers and the chorus is that of the Society of the Friends of Music of Vienna. This is most fitting, for after all Vienna is a city steeped in memories of Beethoven. These Viennese artists have been brought up in a great tradition, and their performance of Beethoven's crowning achievement in symphonic writing deserves the closest attention. The recording plays for over an hour.

Artur Rubinstein's recordings for "His Master's Voice" have shown collectors his phenomenal power as an interpreter of the great romantics. This month he devotes himself to a brilliant performance of a delightful suite by Francis Poulenc, which will be new to most music-lovers. Poulenc is at the head of the modern group of composers in France. "Napoli" is fascinating music, as are "Barcarolle," "Nocturne" and "Caprice Italien," played with a light touch by Rubinstein. There is little to choose in merit between the three pieces, all remarkable evocations of the Italian scene by a composer whose mastery of pianoforte writing is indisputable. The record is *H.M.V. DB*6614.

Saint-Saëns was a prolific writer of concertos—five for piano, three for violin and two for 'cello. The A Minor Concerto is the finer of the two 'cello concertos and it has been recorded by Pierre Fournier ('cello), with the Philharmonia Orchestra, conducted by Walter Susskind, on *H.M.V. DB*6602-3. Fournier's performance in this concerto is a revelation to anyone interested in 'cello playing.

Another interesting recording is Liszt's Hungarian Rhapsody No. 1, played by the Philadelphia Orchestra, conducted by Eugene Ormandy, on *Columbia LX*1107. Liszt's first Hungarian Rhapsody is not so often played as the more famous Second, yet it has an extraordinary wealth of exciting ideas in it. This Rhapsody No. 1 was No. 14 in the original piano versions of these pieces, and it exists also in an arrangement for piano and orchestra under the name of Hungarian Fantasia. The themes in the Hungarian Rhapsodies are all based on gipsy music, which must be distinguished from the real Hungarian airs.

Vocal

The dramatic cantata, Hiawatha, was the work that made Coleridge-Taylor's name. Dying at 37, he had not attained his full maturity which would undoubtedly, on the distinction of Hiawatha, have produced further fine work. Goring Thomas' opera, "Esmeralda," has yielded at least one song which is a frequent target for tenor voices. John McHugh hits the mark on *Columbia DX*1512, and the attraction of his singing of "O Vision Entrancing," and the famous aria from "Hiawatha" is ably underlined by Stanford Robinson's handling of the orchestral accompaniments.

It was the late Count John McCormack who advised Josef Locke to give up opera and devote himself to ballads, for which the rich timbre of his tenor voice was considered particularly suited. Having regard to such sound advice, it is perhaps appropriate that Josef Locke should this month feature one of John McCormack's most famous songs, "Macushla." He couples it with one of the hit tunes of the moment, "Galway Bay," on *Columbia DB*2447.

Variety

This month, Bill Johnson, star of the long-running stage show "Annie Get Your Gun," sings Walter Donaldson's American evergreen, "Little White Lies," and a new British ballad, "The Heart of Loch Lomond," on *Columbia DB*2450.

Peter Yorke's orchestra is a full-bodied ensemble which can be relied upon to add lustre to any arrangement, whether the material be light, classical or in the dance vein. His latest recording is "No Orchids for my Lady" and "Somewhere Beyond the Stars," on *Columbia DB*2452. Both the vocals are sung by Steve Conway.

A new record for the children is always an event of importance to the family. The success of any record as entertainment for youngsters depends to a great extent on the wholehearted way in which the artist enters the spirit of the story. Mr. Taylor, in "Jumbo," the true story of a baby elephant, has this ability to get right into the heart of his tale—*H.M.V. BD*1217.

Popular baritone, Tony Martin, is featured as the male lead opposite Marta Toren and Yvonne de Carlo in the new Universal film "Casbah." This month he has recorded four of the five songs he sings in the film. "For Every Man There's a Woman" and "What's Good About Good-bye," on *H.M.V. B*9685 and "Hooray for Love" and "It was Written in the Stars," on *H.M.V. B*9686.

Dance Music

Geraldo has recently commenced a big new radio series entitled "Melody Time" and his latest four titles feature the 17-piece band and vocalists heard over the air. They are, "Take me to Your Heart Again" and "So Tired," on *Parlophone F*2315, and "Everybody Loves Somebody" and "That's You," on *Parlophone F*2316. Other recordings are, "The Heart of Loch Lomond" and "Say it Every Day," by the Skyrockets Orchestra, on *H.M.V. BD*6023; "Underneath the Arches" and "Hair of Gold, Eyes of Blue," by Joe Loss and his Orchestra, on *H.M.V. BD*6021, and "On the Painted Desert" and "Mississippi Mud," by Tommy Dorsey and his Orchestra, on *H.M.V. DB*6024.

Open to Discussion

The Editor does not necessarily agree with the opinions expressed by his correspondents. All letters must be accompanied by the name and address of the sender (not necessarily for publication).

Measuring Meter Resistance

SIR,—In the November issue Mr. Bryant suggests an ingenious method of measuring meter resistance. The method is not accurate, however, unless the voltage on the slider of R_1 remains constant during the test.

This will not be the case unless the tapped-off portion of R_1 has a very low value compared with the meter resistance. The method can be made more accurate by connecting a voltmeter across the tapped-off portion of R_1. Then:

1. Set R_2 to zero ohms.
2. Adjust R_1 for full-scale reading on meter under test.
3. Note voltage on slider of R_1.
4. Successively adjust R_1 and R_2 until the meter under test reads half-scale deflection and the voltage on the slider of R_1 is the same as it was at 3 above.
5. Measure portion of R_2 tapped off.—R. W. A. HILL (Nr. Oldham).

D.2 QSL Bureau

SIR,—It would be appreciated if you could inform your readers that all QSL Cards for D.2 (other than those sent direct to D.2 Amateurs) should be forwarded to the D.2 QSL Bureau—address as follows:

D.2. QSL Bureau,
E. G. Styles (D.2. GU),
PW/DP Branch,
120 HQ CCG (BE),
Brunswick, BAOR 11.

The D.2 QSL Bureau will handle and clear incoming and outgoing QSL Cards for TX Hams and incoming SWL reports for D.2 Hams.

Thanking you in anticipation for your co-operation and wishing all Hams best 73s and 100 per cent. QSL's.—E. G. STYLES (BAOR 11).

Ex-Service Equipment

SIR,—In reference to Mr. Stevens's letter in the November issue of PRACTICAL WIRELESS, concerning the 18 Mark III set.

While agreeing this unit was built for use as a Rx/Tx, I must point out that for the past six months I have had one working perfectly without the refinement of an aerial tuning unit or any other modification.

My latest experiment with this set is the fitting of a 6in. P.M. speaker and the building up of the complete job in a cabinet with mains power pack, and it is still possible to use the two pair of headphones.

Any reader who possesses one of these sets and is interested in doing the same, will be most welcome to write to me and I will supply them with the circuit and any other details they may require.—KENNETH HEASON, 20, Holly Grove, Peckham, London, S.E.15.

Assistance Wanted

SIR,—I would be pleased to correspond with any of your readers who would be willing to help me make a start on the short-wave side of radio. I am 31 years of age but very keen to get ahead with this interesting hobby.

Their help will be greatly appreciated and returned to the best of my ability in other ways. Wishing your journal continued success.—JOSEPH O'HANLON, 7, Knowe Terrace, Inverkeithing, Fife.

10/20 Metre Log

SIR,—Not seeing a log in your columns of recent date, I submit mine, being a selection of 'phone stations heard over the past few weeks on 10 and 20 metres.

VQ4NSH, VQ2JC, MD7QRP, XG6AJ, C7TY, YV1AN, TI2OA, MD4JG, ZS6Q, TA3FAS, CX2CO, M1B, HK1FQ, MD2B, ZE2JK, XE1SE, OQ5CL, VK7AZ, ZD2RGY, CE3DW, ZL3LE, KP4HN, AP2F, AR8BM, etc., also 29 states of the U.S.A., including 35 (W6) and 12 (W7). The receivers in use here are a home-made 1-v-1 (VR91-VR91-6J5) and a modified BC348 with 3 valve 10 metre converter in front. Aerial is a 33ft., inside type, running east-west.

I would be pleased to have a chat and exchange views with anyone interested, who would care to call at this address, preferably Sundays, and dropping me a card so I can arrange to be at home. —ARTHUR F. WALTON, 396, Moorside Road, Fagley, Bradford, Yorks.

Modified Service Equipment?

SIR.—Ref. letter "Set No. 18, Mk. III," on page 394 of your September issue. Very recently I bought a set from one of the local "junk" dealers. The set was intact in every respect, except for the fact that one of the output transformer terminals was damaged.

The power plug was as stated in the letter referred to. On connecting the L.T. terminals to 3 dry cells (flash-light cells) in series, only one of the valves was found to glow. This was the first one.

The others when tested individually were found to be in good condition, but the filament "pins" were a pair quite different in position to that of the first.

The L.T. wiring to all the valve bases is on a similar basis. Therefore I believe that the valves have been replaced with types quite different from those that were used. The valves being coded as follows: 1st: V.R.65; 2nd and 3rd: V.R.53; 4th: V.R.57. As I took to radio only recently I do not know much about a superhet receiver, and I shall be grateful if any reader could let me have the correct type of valves to be used—both in Service and civilian codes—in this set

May I take this opportunity of thanking you for such a fine periodical which is of much help to very many amateurs like myself, and Mr. Moore for the information he has willingly given in the letter referred to.—S. PATHMANATHAN (Ceylon).

Reader Co-operation

SIR,—May I through your columns thank all those who so kindly answered my call for dope on the valve V.C.L.11.

I have had over 20 answers, each containing a diagram and full instructions.

Many of the letters were from radio engineers, who must realise that our magazine is a book of "Practical Wireless," not just another catalogue.

One answer came from Norway, which I have answered by return letter. In it I had sent me a complete circuit.

If anyone would like a copy, drop me a line and I'll do the rest.—G. HUGHES, 14, Fraser Grove, St. Annes, Carlisle, Cumberland.

German Valve Details

SIR,—I refer to my two letters published in your paper in May and July and can tell you that answers have come in steadily ever since (at a rate of up to six a day !). Owing to the summer months and the economic changes in Germany I am afraid I am a bit behind in answering. But everybody shall get his answer !

Owing to lack of funds, may I ask all future correspondents to enclose an International Reply Coupon ? All obsolete and commercial valve data are gladly accepted and returned in due course if required. Thanking you for your kind assistance. —WERNER MAASS (Hamburg).

Noises in Radio Receivers

SIR,—Having recently carried out some experiments with noise limiters, I studied the circuit illustrating Mr. Cartwright's article in the October issue (Fig. 2, p. 421) with particular interest. However, it appears that a slight error has crawled uninvited into the diagram : the cathode of the EA50 should have been earthed, as neither end of the diode load is at earth potential.

This circuit is similiar to one which I have tried and found to be very effective on ignition noise and short bursts of static. It was less useful for prolonged and steady noise, as this tends to build up a higher bias voltage on the limiter diode cathode, which allows this diode to pass a higher incoming voltage. The limiting efficiency is increased by tapping the bias voltage from lower down the demodulator diode load, but this causes some distortion due to the "clipping" of the negative half-cycles of modulation. Fortunately, on very weak signals, when the limiter is most needed, this distortion is less noticeable : and judicious use of this control appreciably improves the signal-to-noise ratio.—P. D. THOMAS (Natal, S.A.).

Service Valve Equivalents

SIR,—I thought readers would be interested in a list of *American* Service valve equivalents, and I wonder if any reader could supply me with English ex-Government valve equivalents. The following list is not in any way complete ; all the Service types are preceded by VT.

Service VT65=Civilian 6C5 ; VT66=6F6 ; VT68=6B7 ; VT69=6D6 ; VT70=6F7 ; VT73=843 ; VT74=5Z4 ; VT86=6K7 ; VT87=6L7 ; VT88=6R7 ; VT90=6H6 ; VT91=6J7 ; VT92=6Q7 ; VT93=6B8 ; VT94=6J5 ; VT96=6N7 ; VT98=6U5 ; VT99=6F8 ; VT100=807 ; VT103=6SQ7 ; VT104=12SQ7 ; VT107=6V6 ; VT109=2051 ; VT115=6L6 ; VT116=6SJ7 ; VT117=6SK7 ; VT120 = 954 ; VT121 = 955 ; VT132 = 12K8 ; VT134=12A6 ; VT150=6SA7 ; VT163=6C8G ; VT167=6K8 ; VT171=1R5 ; VT172=1S5 ; VT173 = 1T4 ; VT174 = 3S4 ; VT189 = 7F7 ; VT202 = 9002 ; VT203=9003 ; VT210 = 1S4 ; VT238=956 ; VT250=EF50.

Hoping this list will be found useful to readers—J. P. MOORE, 16 Silverbirch Road, Solihull, Warwickshire.

C.R. Tube Voltages

SIR,—After much correspondence regarding the pros and cons of the E.H.T. necessary for the V.C.R.97, I feel that this problem needs some clarification.

I would like to point out that if 800 volts is so suitable for the 97, why was so much work and expense put into the Service units to obtain 2,000 volts ?

The one important point that all correspondents fail to mention is what type of voltmeter was used to measure this voltage. I have made many tests with trade voltmeters against a high-grade voltmeter, and the supply has varied as much as 200-400 volts, so that if 800 volts was obtained on a voltmeter the results may appear very startling on an electrostatic voltmeter.

If the voltmeter takes 1 mA. this alone would produce a volt-drop of 250 volts across a ¼ meg. smoothing resistance.

I agree with Mr. Telco that 800 volts is not enough for a television, but gives quite a good trace for an oscilloscope.—G. A. WINCKLE (Liverpool).

Signal Tracer

SIR,—I built the Dual Purpose Signal Tracer, described in your June issue, and have found it invaluable. Would it be possible to combine this with a pattern generator so that it would make a good television test set ? I am experimenting in this direction and have so far been unsuccessful. If any other reader is looking for a good tester, I can definitely recommend this piece of apparatus, and if I am successful in making the combined tester I shall be pleased to submit the design to you for the benefit of other readers.—J. WATTS (N.W.9).

Our Cover Subject

THE French Television Service, which resumed transmissions on October 1st, 1945, has a unique service area due to the height of the radiating system, which is on the top of the Eiffel Tower. The illustration on our cover this month shows the tele-cine equipment, and the mottled finish which characterises all the French television equipment may clearly be seen. Next month we hope to publish full details of the system.

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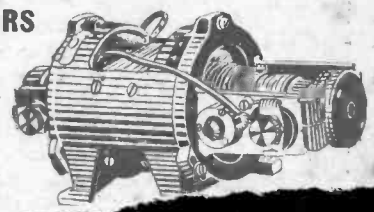

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