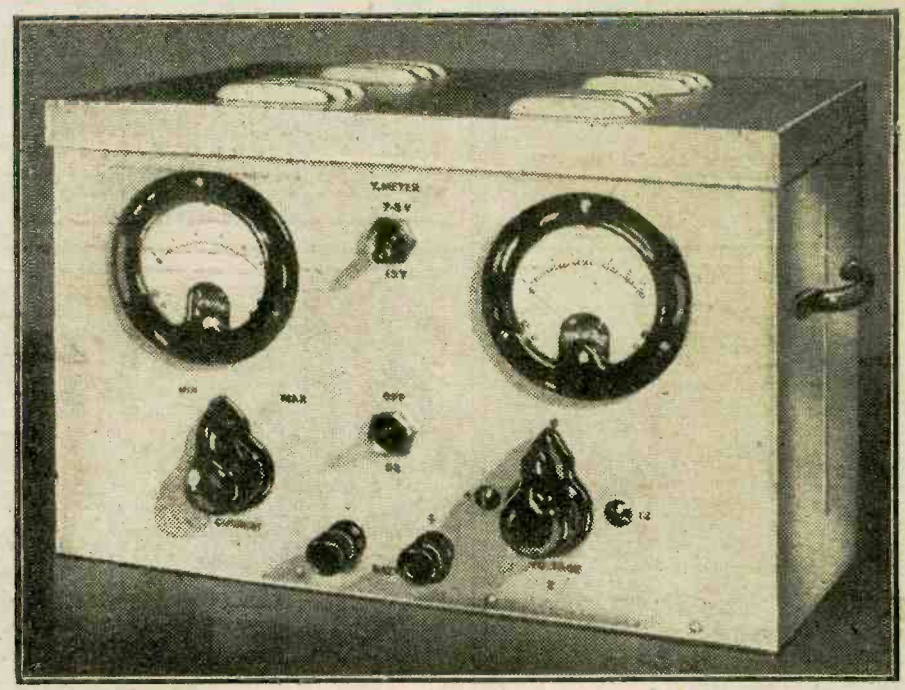
Practical Wireless

9D EVERY MONTH

AND PRACTICAL TELEVISION

Vol 25 No 514 || Editor: F. J. CAMM || MAY, 1949



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Practical Wireless
and PRACTICAL TELEVISION
17th YEAR OF ISSUE
EVERY MONTH
VOL. XXV. No. 514 MAY, 1949
Editor F. J. CAMM

COMMENTS OF THE MONTH BY THE EDITOR

The C.R. Tube Position

ATTENTION is drawn elsewhere in this issue to the guarantee position as it applies to television receivers and particularly to cathode-ray tubes. The position is really less satisfactory even than is mentioned elsewhere. For example, it is disclosed that one manufacturer has decreed that a defective C.R. tube may only be replaced by one supplied by them and not from the dealer's own stock. This replacement tube will only carry on for the remaining guaranteed period. So that if, for example, only one month of the guarantee is unexpired when the tube is replaced under the guarantee, the replacement tube will only be guaranteed for one month. No allowance is made for the time the television set is out of action pending the arrival of a replacement and the time taken to carry out the necessary repairs.

These delays can be extensive, for C.R. tubes are not in plentiful supply. One manufacturer is without a stock of spare tubes, and we fail to see how he can implement his guarantee without keeping purchasers waiting for some months. The position is quite unsatisfactory in the case of a number of manufacturers. Delays of from two to three months are quite common. The position is unfortunate, too, from the point of view of the dealer, who must bear the brunt of customers' criticisms and frequently must take the blame undeservedly.

Whilst television receivers are cheaper than they were, they are still dear enough, and purchasers are entitled to a more generous guarantee in return for their expenditure. The impression may be given that the shortness of the guarantee period reflects the manufacturer's lack of confidence in his own product.

Threat to the Cinema?

WE do not endorse the views of the managing director of Scophony-Baird expressed in a pamphlet entitled "The Cinema and Television." In this he says that television will destroy the cinema industry unless television and the cinema are combined into a unified service. He dismisses out of hand the reciprocal proposals for a working arrangement between the B.B.C. and the cinemas, and in its place proposes a co-ordination scheme which includes the granting of licences to large-screen television manufacturers to reproduce B.B.C. programmes in one nominated cinema for each manufacturer for a limited period; and of granting a G.P.O. charter to enable the cinema industry to set up its own high-definition television transmitter, radiating programmes on its own wavelength. He thinks that present programmes are largely visual reproductions of proven B.B.C. radio successes, and that very little new ground has been broken. With this view we agree, for it does not appear that much effort is being made to find an entertainment level suited to television. Perhaps that explains why the B.B.C. at the present time is endeavouring to conclude arrangements with the film companies for showing films on the television screen. This could not, from the viewer's standpoint, be superior to a home cinematograph, and if such arrangements are completed the cinema might have cause to fear the competition of the new service.

The comparatively small number of viewers—just over 100,000—has grown from 18,135 in May, 1947. It had increased to 61,700 by August, 1948, since when it has increased at a more rapid pace.

The target for 1949 is 300,000 sets, and these must perforce be absorbed within the radius covered by the present television service. By the end of this year there should be over 400,000 television receivers in use. Allowing an average of four viewers per receiver, this means that well over 1,500,000 will be looking in. As at March 15th the B.B.C. had spent £1,600,000, which represents an increase of £1,000,000 over 1948. It is obvious, therefore, that expenditure will exceed revenue for some time to come. The opening of the Sutton Coldfield station is not likely greatly to improve the economics of television.

Elsewhere in this issue we express the view that the television service should be taken entirely out of the hands of the B.B.C., so that it is freed from its influence and can, as with radio, develop independently. Only by this means will it be able to retain its position and develop in a manner which our pre-eminence in the television field warrants.

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

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

ROUND THE WORLD OF WIRELESS

Broadcast Receiving Licences

THE following statement shows the approximate numbers of licences issued during the year ended 31st January, 1949.

Region	*Number*
London Postal	2,144,000
Home Counties	1,537,000
Midland	1,651,000
North Eastern	1,790,000
North Western	1,489,000
South Western	1,007,000
Welsh and Border Counties	672,000
Total England and Wales	10,290,000
Scotland	1,083,000
Northern Ireland ..	187,000
Grand Total	11,560,000

The above total includes 111,850 television licences—an increase of 19,050.

Four hundred and sixty-four prosecutions were authorised during January for operating wireless receiving sets without a licence.

The public are reminded that directly a television set is installed a special comprehensive licence costing £2, covering both sound and television programmes, is needed. If the viewer holds an ordinary 20/- sound licence a refund of 1/8 for every unexpired month of this licence can be obtained at any Head Post Office.

Radio and Electrical Exports

AN increasing volume of work has been done during the last twelve months for manufacturers in the wireless and electrical trade and research has ranged over a large area. Quite a number of firms in the industry have been members of BETRO almost from its inception, but during the last year a marked increase in the volume of work for these and other firms in overseas markets has been done, and there is every indication that this development will continue.

The bigger trade associations to become affiliated include the Cotton Board, the Glass Manufacturers Federation, and the Leather Footwear and Allied Industries Export Corporation. But though BETRO is doing an increasing amount of work for large groups, there is no job too small or no service for the individual exporter too insignificant for BETRO to handle.

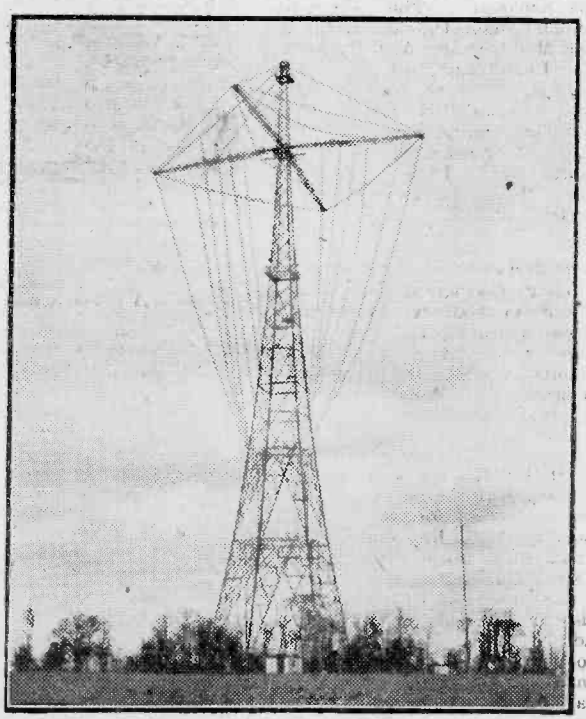
One firm, for example, asked the Canadian Office to supply someone for their Stand at the Toronto Fair; another to find a suitable shop in the New York area, and a third asked BETRO to explore the market for a Book for Brides.

Decca Navigation Service

THE Minister of Transport recently opened the Decca Lane Identification Service at Puckeridge, Herts. We already lead the world in the speed and efficiency with which we are applying the latest developments of radio to the navigation of merchant ships. When the Minister pressed the switch at the master station of the Decca Chain at Puckeridge, he initiated yet another service, designed to improve still further the navigational services provided around the shores of the U.K. Lane Identification is intended to extend the service of the Decca system to the ocean-going liners.

Ex-W.D. Batteries—a Warning

THE Chloride Electrical Storage Co., Ltd., state that they find that unused Exide batteries ex-W.D. stock are being offered for sale as new at much reduced prices. They point out that these batteries must have left their works at least three years ago, and possibly as far back as 1940. The condition of any battery of this type must have deteriorated over such a period of time. The company wish it to be understood that they



The Decca aerial array at Puckeridge

cannot be answerable for the performance or life of batteries offered for sale in this way.

Results of E.M.I. Scholarships

TWO senior schoolboys tied for first place in the nation - wide competition — organised through local education authorities—for the two electronic scholarships offered by Electric and Musical Industries, Ltd., recently. These scholarships, tenable at E.M.I. Institutes, Ltd., were announced by the Principal, Professor H. F. Trewman some months ago. Master J. Carroll of Cheadle, Cheshire, and Master D. J. Turton of Lancing, Sussex, were interviewed in London by Professor Trewman to decide the allocation of the scholarships. Both boys will, in fact, be "winners" because each award will provide a thorough training in electronics. One is a three year attendance course in telecommunications engineering, commencing this month, and the other consists of a specially grouped selection of E.M.I. Institutes Ltd. postal courses in electronics.

New BREMA Chairman

MR. M. M. MACQUEEN has been elected chairman of the British Radio Equipment Manufacturers' Association in succession to Mr. H. Slater.

Mr. P. H. Spagonoletti is the new vice-chairman. The Executive Council remains the same as for last year. Members are: A. J. Balcombe, Ltd.; Bush Radio, Ltd.; E. K. Cole, Ltd.; A. C. Cossor, Ltd.; Ferranti, Ltd.; General Electric Company, Ltd.; Gramophone Company, Ltd.; Kolster-Brandes, Ltd.; McMichael Radio, Ltd.; Philips Electrical, Ltd.; Pilot Radio, Ltd.; Ultra Electric, Ltd.

Withdrawal of Amateur Frequency Band

THE Postmaster General announces that holders of Amateur Wireless Station licences are no longer permitted to use frequencies within the band 58.5 to 60 M/cs. Licences are formally amended by a notice published in the London Gazette on 1st April, 1949.

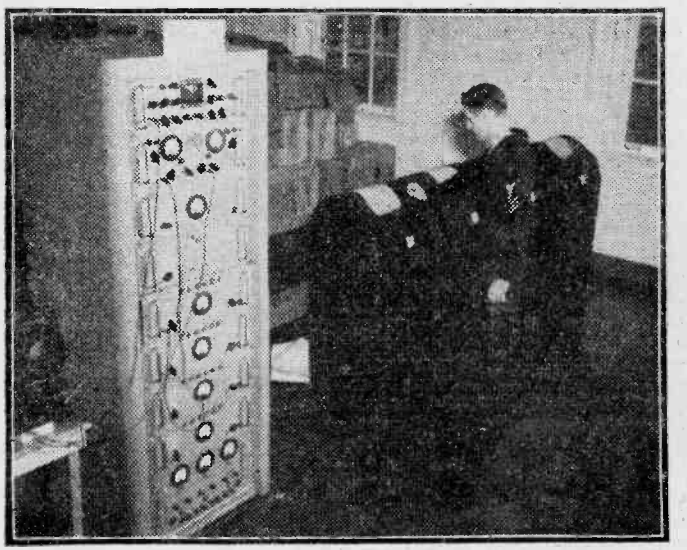
B.I.R.E. Meeting

A MEETING was held at the London School of Hygiene and Tropical Medicine, Keppel Street (Gower Street), W.C.1, recently, when a paper by J. H. Battison (Member) on "American Broadcasting" was read.

Mr. J. H. Battison, who is Allocations Engineer to the American Broadcasting Company, lived in this country until 1945; he is visiting England, and dealt with the organisation and operation of broadcasting in America, with details of the functions of the four types of A.M. stations, and examples of directional antennae used in them. American F.M. and Television services were discussed, including some details of "Stratovision."

Electronic Time Division Multiplex

THE above involved title is that given to a new system of multiple teleprinter transmission developed in the U.S.A. In this system the output of two to four teleprinter machines is rearranged so that the signals originated by these machines are transmitted over a single radio channel by a single radio transmitter simultaneously for all practical purposes. As the messages are fed into a battery of four teleprinter transmitters connected to the E.T.D.M. transmitter each is compressed in time, sorted into the proper time channels, mixed with the other signals, and fed into the main radio transmitter. At the receiving end the process is reversed and the combined messages are unscrambled and fed into separate teleprinters to provide the original messages. The process results in the transmission of 300 words per minute instead of the standard 75.



Four teleprinters and asssorted equipment for the E.T.D.M. process described above

Death of A. E. Smith

PHILIPS ELECTRICAL, LTD., regret to announce the death, at the age of 48, of Mr. Albert Edward Smith, of the Industrial Department. He died at his Chislehurst home after a deterioration of health of some months.

Mr. Smith joined Philips in 1935 as a technical assistant. He was an authority on industrial rectifiers, and specialised in condensers for power factor correction.

Mr. Smith came to Philips from Rotax, Ltd. (formerly Newtons', of Taunton), and was earlier with Messrs. Baxter and Caunter, engineers.

Until his death he represented Philips on the B.E.A.M.A. Arc Welding Section Technical Committee and on the B.E.A.M.A. Capacitor Technical Committee.

The management and Mr. Smith's colleagues at Philips extend their deep sympathy to Mrs. Smith in her sad loss.

Building a Television Receiver—4

The Tube Unit is the Subject of This Month's Article

By S. A. KNIGHT

IN comparison with the vision, sound and time-base chassis so far described in this series of articles, the construction of the cathode-ray tube unit is extremely simple. Nevertheless a sound assembly is necessary, for the tube is the most fragile part of the complete receiver, and carelessness in workmanship at this stage may result in an expensive replacement later on.

There is no metal chassis to be made for this unit, the construction being almost entirely in wood. A general sketch of the finished part is shown in Fig. 1, where all the necessary dimensions are also shown. These dimensions will be discussed in more detail a little later on, since the unit may be used without component alteration for either a 7in. or a 9in. cathode-ray tube. This interchangeability of tubes is a useful feature of this receiver, for those constructors who wish to economise with the smaller tube may do so, later changing to the larger one. A 7in. tube as specified costs £4, a considerable saving on the specified 9in. tube which costs almost three times as much. In the opinion of the writer the smaller tube gives a picture plenty large enough for the entertainment of the usual "family circle," and viewed from a distance of 5ft. to 6ft. is basically as good as the slightly larger image obtained on the 9in. tube. Both tubes specified are of the magnetically focused and deflected types, and the focus and scanning coils used are perfectly suitable for either. The choice rests entirely with the constructor.

Theory

The scanning coils, which are built up as a single unit by the manufacturer, are fed with correctly shaped pulses from the time-base amplifiers through terminals L1, L2, F1 and F2 shown on the left of the theoretical circuit diagram in Fig. 2. These leads terminate from the time-base unit (see Part II) in an International Octal plug, and on the tube unit an International Octal valveholder is mounted as shown in Fig. 1 to receive the plug. From the valveholder, leads are taken up to the scanning coil terminals which are plainly marked by the makers. The centre tap of the line coils (marked L.C.) is earthed, although if no centre tap is provided this makes no difference to the performance. On some coils a centre tap is also provided to the frame windings; this should be left free.

Across the line coils is wired a damping circuit consisting of C1, R1 and VR1 in series. The reason for this is to provide damping of the line transformer secondary circuit and so allow a linear scan to take place across the screen. VR1 is accordingly designated "Linearity" and its setting irons out the kink which would otherwise appear in the line scan. This control is rated 3 watts, wire wound, and R1 is rated at 3 watts also. They are mounted in the positions shown in Fig. 1.

The focus coil which is mounted round the neck of the tube is energised from the main H.T. supply through the focus control VR3, which is a 5-watt wire-wound resistance. The value of this resistance is 5 kΩ, and in series with it is a

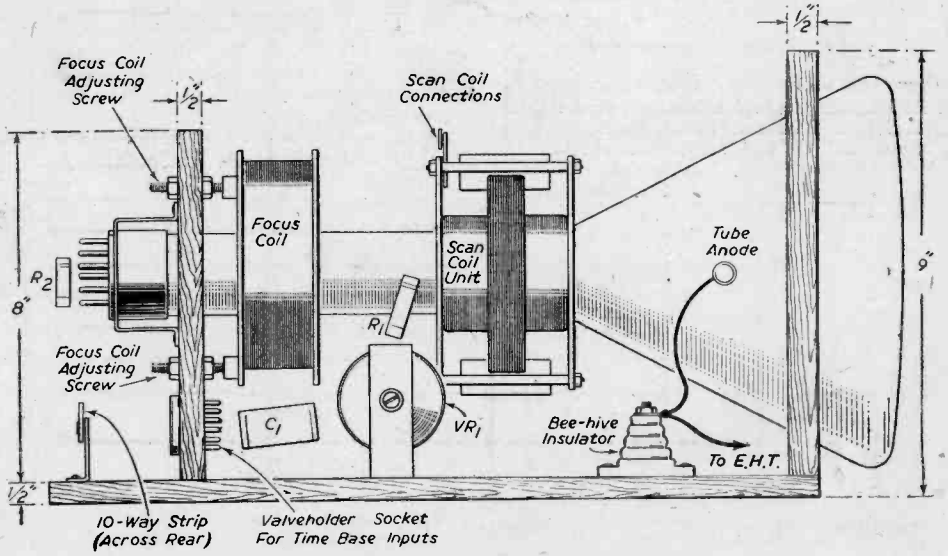


Fig. 1.—Pictorial diagram of the completed tube unit.

fixed component R4, rated 3 watts. The value of this resistance is 2 kΩ for the specified 7in. tube, but this must be increased to 3 kΩ for the specified 9in. tube. No other changes are necessary in the entire receiver, since the scanning and focus coils fit either tube, and their base connections are exactly the same.

The grid of the tube is fed with the video-signal from the cathode of V10 in the vision receiver (see Part I). The grid is returned to the cathode through R2, a quarter-watt resistance of value 250 kΩ, though any value up to 1 MΩ is suitable. It simply acts as a grid return in the event of the vision receiver not being connected; in practice it is shunted by R35 (4 kΩ) in the cathode of V10. The lead from the vision chassis to the grid is *not* screened, and on account of the low output impedance of V10 at this point its length is not particularly important: however, it should in any case be no longer than is strictly necessary, and preferably it should be kept clear of the vision and sound chassis. The cathode of the tube returns to the one side of the tube heater (a separate 2 volt winding) and thence to earth through the brightness control VR2 which has a value of 0.25 MΩ. R3, in series with this control, limits the maximum brilliance and so protects the screen of the tube. Its value is 100 kΩ, rating half-watt.

Construction

Returning now to the dimensions of Fig. 1, these are calculated for the Mullard 7in. tube, and some slight alterations are required for the Mazda 9in. tube. The best plan for the constructor is not to stick to hard and fast measurements, but to get his tube and build the wooden frame to suit it. The base of the tube need project from the rear wooden upright only enough to plug into the Mazda Octal valveholder, for which a small aluminium bracket may be made as sketched in Fig. 3. The scanning coils are slid over the neck of the tube and pushed as far forward as they will go. A trace of cotton-wool carefully pushed between them and the tube neck will suffice to hold them firmly in position. The hole for the tube neck in the rear upright is cut slightly larger than the neck diameter (35 mm.) and is lined out with a piece of soft material, such as felt, so that the tube neck just makes a tightly sliding fit. The hole in the front upright through which the large end of the tube projects is cut so as to allow the screen to lie about 2ins. to 3ins. in front of it, and a rubber mask can then be fitted later. For the 7in. tube, a hole 6in. diameter is suitable; for the 9in. tube a 8in. hole is required. The wooden stand has a base of such a length that the whole assembly is firm, and the tube is comfortably accommodated.

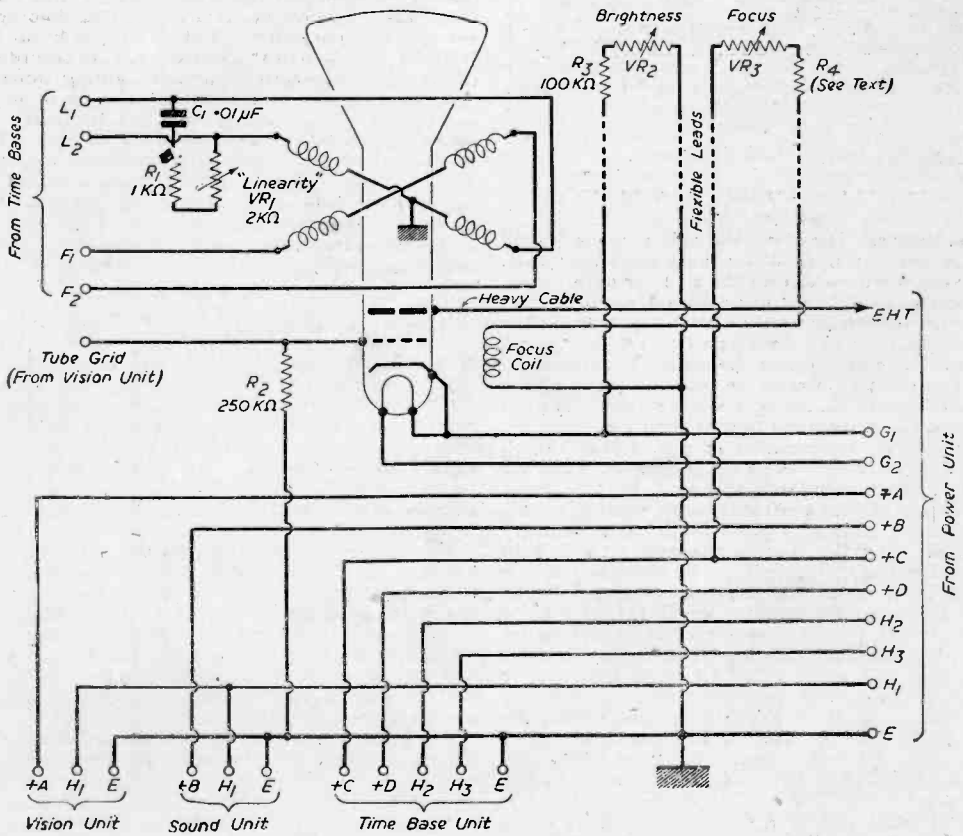


Fig. 2.—Theoretical circuit of the tube unit and distributor strip.

The front tube hole is lined with thin felt.

The focus coil is a heavy all-metal affair and must be mounted in such a manner that it does not touch or bear on the tube neck. If it is forced in any way, or allowed to drop, the tube neck may be fractured. The simplest manner of mounting it is by using the three fixing lugs already fitted to it, and extending these with short lengths of threaded studding. Three holes are then drilled in the rear wooden upright and the three threaded lengths are passed through so that the focus coil is exactly in line with the small hole for the tube neck already cut in the wood. The focus coil should be maintained in this position by the threaded rods firmly, yet at the same time it should be possible to move it slightly backwards and forwards, and also tilt it through a few degrees upwards and downwards,

LIST OF COMPONENTS

Cathode-ray tube Mullard 7in. MW18-2 : or Mazda 9in. CRM91. Premier Radio Co.
Resistances :
R1—1kΩ, 3 watt.
R4—2kΩ *or* 3kΩ, 3 watt (see text).
R3—100kΩ, ½ watt.
R2—250kΩ, ½ watt.
VR1 (Linearity), 2kΩ. (wire wound)
VR2 (Brightness) 250kΩ.
VR3 (Focus) 5kΩ. (wire wound)
Scanning and Focus Coils : Midco Radio, Wellingborough.
Condenser : 0.01 μF mica.
One International valveholder.
One Mazda Octal valveholder.
One 10-way tag strip.
Leads, screws, etc.

and sideways. The threaded rods may be locked to the wooden upright by nuts on either side. Later on, when setting up the receiver on a signal, the focus coil will have to be adjusted (mechanically) to centre the raster ; until that time it should be locked centrally and firmly around the tube neck. The coil yoke only clears the glass by a millimetre or so, so great care must be exercised in this part of the construction. Mount the coil so that its centre lies about 3ins. from the base of the tube.

Now, as an examination of Fig. 2 will reveal, the tube unit also acts as a distribution panel for all H.T. and heater leads coming from the power unit to the various separate chassis making up the complete receiver. A 10-way tag strip is accordingly mounted along the rear of the tube unit and 10 leads from the power unit (to be described in the next section of this series) are connected to it. They are brought through a length (about 2ft.) of 10-way cable (or 10 separate leads bound into a form), and are shown numbered and lettered on the right-hand side of Fig. 2. All these letters *must connect to corresponding lettered points in the power unit*, and so leads of different colours should be used in the 10-way line. A wrong connection at this point might well prove disastrous. The line bringing the E.H.T. (about 4 to 5 kilovolts) to the tube anode—which is a side cap connection—is quite separate and is a length of ignition cable to withstand the voltage. It connects to the tube anode cap by way of a small ceramic insulator (see Fig. 1) so that no sudden tug can break the tube cap.

From the 10-way tag strip cable forms lead off to the various units, supplying them with H.T. and heater-voltages. The earth lead is common to all and should be of *very heavy wire* since the total current flowing through it consists of heaters as well as H.T. points. The wire should be stranded type, suitably insulated.

To the time-base unit, a 4-way cable form is taken off, as shown, to the sound receiver, a 2-way cable form, and to the vision receiver, a 2-way cable form. The lengths of these feed lines is immaterial, but they should be as short as possible, and their final length should be left until the complete receiver is ready for test.

The letters as marked on the leads in this tube unit are the same as those already marked on all

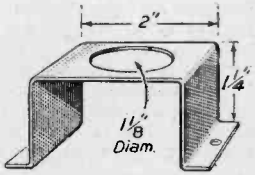


Fig. 3.—Details of the tube-base mounting bracket.

chassis previously described, and there should be no difficulty, therefore, in getting the connection correct the first time.

There are no other points of great importance to be mentioned in the building of this unit, and each constructor can adjust the actual design to suit himself. The tube should not be mounted until everything else is ready ; it can then be inserted from the front by pushing the neck through the scanning coils, the focus coil, and the rear wooden upright in that order, into the valveholder mounted at the rear. The scanning coils may then be soldered to their appropriate leads coming up from the valveholder-socket.

Radio Repair in Canada

RADIO servicing procedure in Canada differs considerably from that employed here or in the States. Very few radio repairs are made in the home. Instead, sets are picked up and an operative set left with the customer until repairs are completed. Customers expect that a replacement set will be left with them ; considerable ire would be aroused if the serviceman failed to do so.

Most radio repairs in Canada are guaranteed for 60 days and the repairman makes follow-up calls without charge unless the difficulty is unmistakably the result of tampering. Eighty per cent. of all Canada's radio servicemen own their own shops, the remainder working in department stores, or radio and appliance sales stores. In Toronto, Montreal, Ottawa, Regina, Calgary and Vancouver, most radio service shops offer service only.

The greatest need of Canadian radio servicemen is for portable test equipment. The typical repairman in the prairie provinces spends a sizable segment of his time bouncing over Dominion roadways. For this reason, portable signal generators, tube testers, set analysers, and small 'scopes are greatly desired.—*Gene Conklin.*

Remote Receiver Control–3

This Month J. R. DAVIES Concludes This Series

THERE may be losses in the lead connecting the remote unit to the receiver proper, but these should not be excessive if care is taken. Cotton-covered bell wire would not prove very efficient for this job, owing to its poor insulation and comparatively high resistance. Good quality lighting flex (used as mentioned above) should do quite well in the absence of screened twin cable. Co-axial cable would prove ideal, if the constructor considered the cost were justified. If co-axial were used, the centre-tap at the receiver could be dispensed with, the outer covering of the co-axial cable being earthed at both ends. See Fig. 14.

The current consumption of the frequency-changer is not excessive. It can be supplied from small-size batteries, the L.T. consumption for a valve type 1A7 being 50 milliamps. at 1.5 volts, and the H.T. consumption being approximately 2.2 milliamps. at 90 volts. Alternatively an A.C./D.C. circuit could be used, H.T. being provided from a small metal rectifier, and care being taken to see that the coupling coil shown in Fig. 12 is entirely free from any connections (to chassis or otherwise) in the unit.

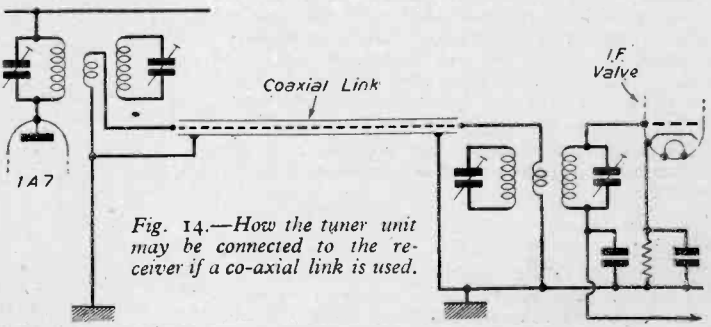


Fig. 14.—How the tuner unit may be connected to the receiver if a co-axial link is used.

The Complete Remote Control System

It will be interesting now to combine all the various devices which have been described and see how they appear in a complete remote control unit. Fig. 15 shows a complete layout for controlling a mains-type T.R.F. receiver. It will be seen that only five leads are employed between the remote control unit and the receiver, whereas all the functions of switching the set on and off, of varying the volume and the tone, and of tuning in a selection of programmes are offered. The remote switches, etc., may be embodied in the loudspeaker cabinet or a separate unit may be made. If this is fitted with a 5-core flex lead and a plug, it may be plugged in in whichever room it is required to listen. It therefore gives the advantage of enabling a really good receiver to be controlled from, and listened to in any desired room in the house.

(Fig. 15 embodies the various methods shown in Figs. 1(b), 3(d), 5(b), 9 and 11.)

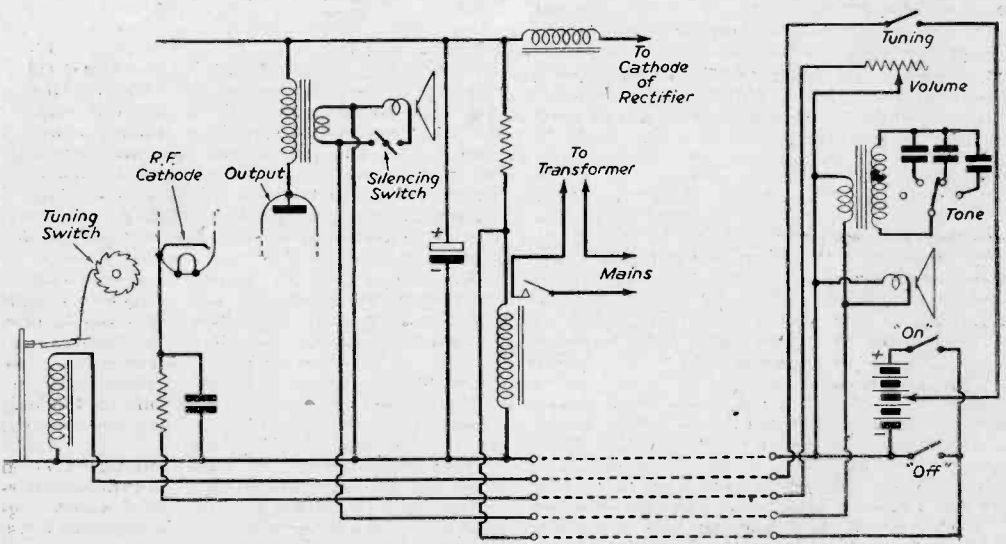


Fig. 15.—Showing how some of the devices described previously may be combined to give complete control of a receiver with the minimum of interconnecting wires.

Modified A1134

How to Convert an ex-R.A.F. Unit for Domestic Use

By K. BERRY

MANY readers have, no doubt, bought, or considered buying an amplifier type A1134. They can be bought at prices between 7s. 6d. and 25s.

The A1134 is a two-stage battery-operated amplifier. The first stage is a triode voltage amplifier (VR21=HL2) driving a double pentode power stage in Q.P.P. (VR35=QP21). Negative feedback is employed and there are also two A.F. filters, one attenuating the audio frequencies below 500 c/s and the other above 2,500 c/s.

The amplifier was tried out in its original condition and was found to be of poor quality. It was therefore decided to modify it for normal domestic use. These modifications are detailed below.

Stripping

The first job is to remove the surplus components and wiring. Unscrew the four screws at the corners of the case and take the amplifier from its case.

The unsoldering is done in six or seven steps, care must be taken not to damage the remaining wiring and components.

1. Unsolder all leads on tag board from 10-pin plug, then remove the cable and plug entirely.
2. Unsolder the microphone transformer (T1) and all leads to or from the grid of V1.
3. Two 50 pF. condensers will be found on the holder of the double pentode (VR35). These attenuate the high frequencies and they should be unsoldered.
4. Unsolder all leads to secondaries of the output transformer (T3).
5. Unsolder all leads to T4 and remove this transformer. This is a 1 : 1 transformer used to isolate the W/O's 'phones except in the case of amplifier type A1134A.
6. Unsolder key switch and remove this to facilitate unwiring.
7. Unsolder ON/OFF switch and replace with a ½ to a ¼ MΩ potentiometer with switch. Wire switch in circuit. A separate potentiometer may be used if desired.

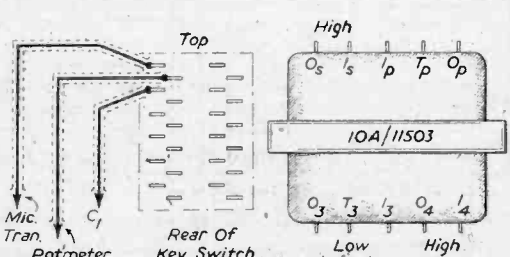


Fig. 2.—Rear of the key switch.

Fig. 3.—The output transformer.

Rewiring

The amplifier is now ready for rewiring. The new input circuit is shown in Fig. 1. Two inputs have been provided for (1), a carbon microphone, (2) a pick-up, output of a one valver, etc.

The lead with the four-pin plug has four wires in it, in two separate screened cables containing each, one red and one black wire. One pair of wires is used for the input and the other for the output.

Connect both black wires to earth. One red

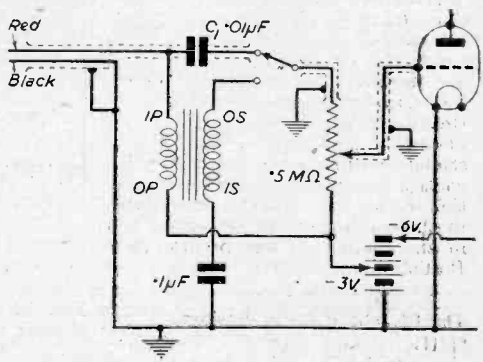


Fig. 1.—The newly arranged input circuit.

wire (input) is then connected to the terminal of the microphone transformer. A .01 μF. condenser (C1) is connected between this and a convenient tag on the tag board, and a lead taken from this to the switch (Fig. 2). The other end of the microphone transformer primary is connected to the GB −3 v. terminal (or LT+). This is to energise the carbon microphone, and if a moving-coil or electromagnetic microphone is used, this will not be needed and the OP terminal will be earthed. The OS terminal of the microphone transformer is connected to the switch (see Fig. 2). The IS terminal is taken to earth through a .1 (or more) μF. condenser; this prevents the potentiometer acting as a bias potentiometer as it otherwise would do. The potentiometer has one end of the track connected to the key switch (see Fig. 2). The other end is taken to GB−3. The wiper or sliding contact is taken to the grid of V1.

Output

There are 3 secondary windings to the output transformer T3.

One, centre tapped, is suitable for working a 2-3 ohms moving coil loudspeaker directly. The centre tap and one side of the winding give the best results. The other two are high impedance and either may be used. Whatever winding is used, earth one side of the winding and take the other side to the red wire of the output lead.

(*Continued on p. 204*)

ON YOUR WAVELENGTH

By THERMION

Radiolympia

NEW cameras, improved studio and control technique, a new aerial on the roof of Olympia, and better arrangements for the public to view both the studio and the screen picture, will, it is stated, contribute to the most ambitious demonstration yet staged by the British radio industry and the B.B.C.

There will be an enlarged section for communications (ugly term!) equipment, navigational aids, and electronics in industry, and exhibits for the first time since the war by the Royal Navy, the Army and the Royal Air Force. The Ministry of Supply, the Department of Scientific and Industrial Research and the G.P.O. will exhibit. Overseas visitors will be given special facilities for watching studio performances, camera and transmitter control, and finally reception, in private demonstration rooms. I expect considerable improvement in the quality of the television picture as well as in the quality of the programmes since the last Radiolympia in 1947.

The Fear of Rival in Business

THE theatre and the film interests are apprehensive lest television keeps people at home to the detriment of the theatrical and film box offices. When the silent films came in they were opposed by the theatre on similar grounds, but events show that the films were ancillary to the theatre and actually improved theatrical attendances.

When the gramophone record was first produced by Edison it was opposed by the musical instrument industries and by concert artistes and leaders of orchestras. The facts are that there are more bands than ever, greater opportunities for concert singers, and more musical instruments being sold. Gramophone records, like radio, have popularised music and created a demand for musical instruments.

The theatrical profession opposed broadcasting, and at one stage Equity and the V.A.F. banned their members from broadcasting. Events have shown that artistes obtain more engagements as a result of a broadcast, not less. And so it is with television; they have not learned their lesson, nor can they perceive that progress cannot be held back by a handful of selfish people banded together for self protection, for the exploitation of the public, and for securing for themselves a monopoly in a particular form of entertainment. Such efforts have always failed and it will be to the disadvantage of the theatrical profession if they take the same stupid line over television as they did over broadcasting. The sale of gramophone records to-day continues to rise; yet at one stage the gramophone companies refused to allow gramophone records to be broadcast and refused to record any artiste who broadcast.

The theatrical profession is wanted in television. The skill of the stage is required in the studio to eliminate the crude and amateur efforts at play production which we now see all too frequently on the end of the tube. The time must come when our present sightless broadcast occupies the same position in the entertainment world as the silent film in relation to talkies. With the exception of somewhat spasmodic operations in France, there are no public television sets to-day in any countries other than the United Kingdom and the United States. Australia is the first country outside these two to take action by calling for tenders for six television stations—one for the capital of each Australian state. The Australian Government intends to proceed with great speed to provide television services in their country. Canada will probably be the next.

I should like to make it clear that our manufacturers are not limited to the present standard of 405 lines and 25 frames. Television equipment up to 625 lines is available and this is a long way ahead of the American standard of 525 lines. It should also be understood that increasing the number of lines does not necessarily mean a better picture.

Radio Control of Models

ALTHOUGH those interested in the remote control, by radio, of model boats, model aeroplanes, model locomotives and other mechanisms, now have their own society, the Radio Controlled Models Society, the hobby is still in its infancy, and very few radio-controlled models have proved successful. Col. Bowden, one of the leading authorities on power model aircraft tells me that radio control has a long way to go before it can be successfully applied to model aircraft. There have been one or two radio-controlled boats, and one, I see, is to be described in our companion journal, *Practical Mechanics*.

It is a source of study to which I would direct the attention of my readers. A transmitting licence is not required for the purpose. At the same time I should welcome correspondence from readers on the subject, giving the results of any experiments they may have carried out. The introduction of the tiny electric motors marketed under the name of Rev has provided radio control enthusiasts with a device which greatly simplifies the radio control mechanism.

The Loudspeaker and Phase Inversion

Details of Cabinet Design for Quality Results.

By C. SUMMERFORD

IT is a well-known fact that an unmounted loudspeaker gives reproduction that has a preponderance of treble and middle register and relatively no bass. This is because upper register notes have a short wavelength and are, therefore, beamed out in a more or less straight line from the apex of the loudspeaker cone, causing a relatively small air displacement, whereas bass notes cannot be reproduced without a fairly considerable displacement of air. Therefore, when a heavy pulse from the amplifier causes the loudspeaker cone to move forward, thus compressing the air in front of it, this compressed air will take the line of least resistance and move around the edge of the cone into the vacuum which has been created simultaneously at the back, as shown in Fig. 1(*a*). When this occurs, cone movement will be drastically curtailed and lower register notes reaching the auditorium will be notable by their absence.

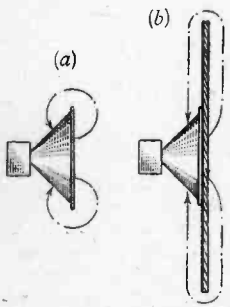


Fig. 1.—How sound waves travel round a cone and baffle.

Flat Baffle Problems

A few years ago we were told that all one required in order to obtain good bass response was a 3ft. flat baffle with speaker mounted centrally. But, although this is better than no baffle at all, it still leaves a lot to be desired. Supposing, for instance, that the loudspeaker is a 12in. one. This, deducted from the baffle size gives a shortest path distance from front to back of the cone of 2ft. (see Fig. 1(*b*)). Moreover, as the loudspeaker is centrally mounted, the distance will be the same in four directions.

The speed of sound is 1,142ft. per second; therefore, the trough frequency of a 3ft. baffle with a centrally mounted 12in. speaker will be 1,142 divided by 2, which equals 571 cycles. There will, naturally, be some radiation below this frequency; in fact, there will be a peak at half the trough frequency, i.e., 285.5 cycles, and after this a general tailing off will take place.

It should be apparent, then, that if one is to get good bass reproduction from the flat baffle it will have to be very large; although, in fairness to the smaller baffle, it should be mentioned that mounting the speaker out of the centre makes for a definite improvement in the matter of peakiness and "troughiness." Mounting the speaker in a wall between two rooms is recognised as being almost ideal from the flat baffle point of view; but this, as with any other flat baffle, does nothing about the natural cone resonance of the speaker.

Cone Resonance

Except for a few extra high-quality ones, most loudspeakers have a cone resonance somewhere between 55 and 80 cycles—I am talking of 10in. and 12in. models—and this tends to make the response "drummy" at this particular frequency. Even so, there is one thing that is far worse, and that is mounting a speaker with a certain cone resonance in a cabinet having a cavity resonance of the same order. That is almost unbearable! However, most manufacturers try to arrange things so that this doesn't occur, either by using shallow cabinets, eccentrically mounting the speaker, or by choosing the speaker to suit the cabinet. Be that as it may, it is not possible to get real bass without providing a sound path of adequate length between front and rear of the loudspeaker, except in the case of the infinite box-baffle speaker, where all radiations from the rear of the speaker are absorbed within the box and where, also, both speaker and box have to be specially designed.

So far, then, we have decided that the ordinary cabinet speaker can be made to give tolerable but not true reproduction, that the baffle-mounted

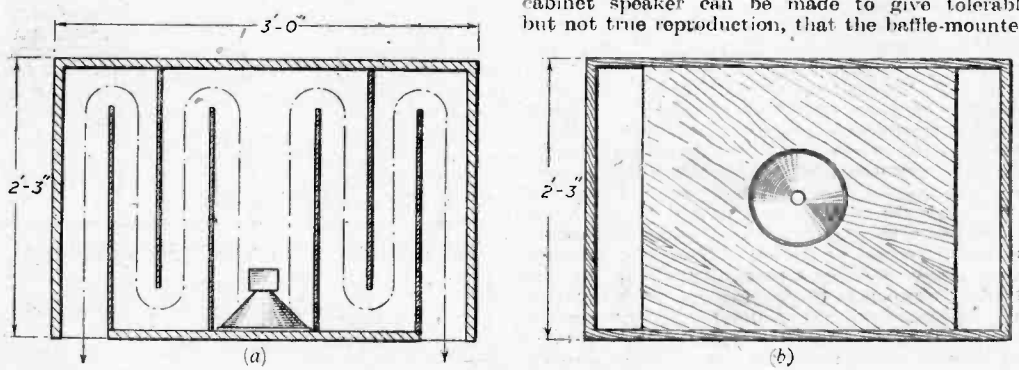


Fig. 2—On the left a long path for the sound waves to provide better low-note response. On the right is a front view of the cabinet.

speaker can only do so if it is given a large baffle plus a really high-quality speaker unit, and that the infinite box-baffle speaker does give really high quality but has to be of very special design.

The Phase-Inverter

There is, however, one kind of speaker mounting that we have not yet discussed, and this is the so-called phase-inverter. Now, this phase-inversion system, whilst not being perfect, possesses certain

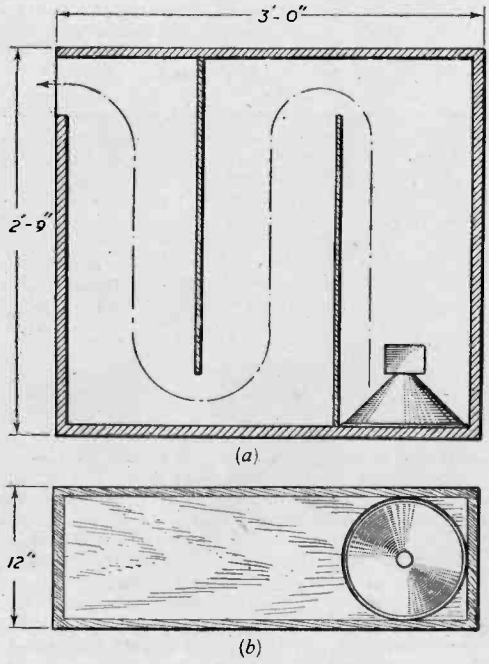


Fig. 3.—Another form of "labyrinth" seen in plan and elevation.

very attractive characteristics. Briefly, if a loudspeaker unit is mounted at the end of a tube with the opposite end open, the column of air within the tube will present a resistance to the movement of the speaker cone at some frequencies and none at others, the frequencies at which these happenings occur being dependent on the length of the tube. In figures, there will be no resistance to cone movement at 1 and ½ wavelengths and maximum resistance at ¼ and ¾ wavelengths of the applied signal. Furthermore, the phase at full and ½ wavelengths will be completely reversed and will, therefore, reinforce that emanating from the loudspeaker proper. What is needed, then, is a tube of such a length as to produce maximum resistance at the natural resonance of the loudspeaker. Supposing this occurs at about 50 cycles per sec., then the tube will have to be either 16ft. 3in. or 5ft. 9in. approximately in order to be resistive to cone movement at this frequency. As 16ft. 3in. is out of the question for the average room the ¼ wavelength figure will have to be used. The speaker resonance will now be reduced almost to the general level, but there will still be troughs in the response at higher frequencies caused by the resistive effect, the first of which will fall at 150 cycles. Fortunately, lining the tube with a sound absorbent material will in large measure overcome this difficulty, the absorbent material being such that its effect is greater as the frequency rises.

Cabinet Design

The shape of the phase-inverter cabinet is relatively unimportant, so long as the cavity is not too cramped and is of the right length for the speaker that is to be used in it. Figs. 2(*a*) and 3(*a*) show the plans of two suggested designs, the top boards being left off for the sake of clarity, whilst Figs. 2(*b*) and 3(*b*) show front elevations.

It will be seen that a split-cavity path is used in the first design so that the speaker may be centrally mounted. The second design readily lends itself to adaptation as a pedestal or table upon which the receiver may be placed.

Details of the writer's own phase-inverter cabinet are shown at Figs. 4(*a*) and 4(*b*). The unusual shape is due to the fact that the room in which it is used has a lean-to ceiling at one side, and the cabinet was designed to fit snugly into the angle thus created. The loudspeaker unit is a Rola G12 PM of 1940 vintage and this is mounted on a 1ft. 4in. × 1ft. 7in. baffle which is affixed to the top face of the cabinet by wood screws so that it may be easily detached for servicing purposes.

Material used for the cabinet is partly ⅝in. plywood and partly 11in. × 1in. board, and the whole of the inside surface is lined with three thicknesses of under-carpet felt loosely tacked into position.

It is not essential to use these materials as any wood is suitable for the cabinet provided it is solid enough, whilst material for lining the cabinet may be anything (old blankets for instance) of a sound absorbent nature.

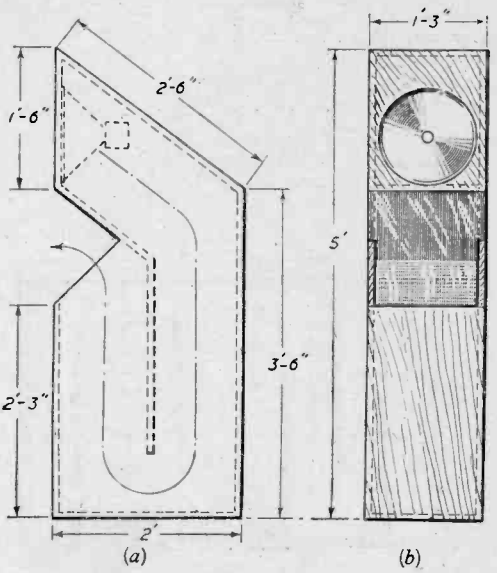


Fig. 4.—This cabinet was designed to fit into a corner with sloping ceiling.

A.C. Mains Accumulator Charger

A Unit Using a Number of ex-W.D. Parts and Capable of Charging Thirty 2-volt Batteries.

By S. BRASIER

THIS instrument is designed to operate from A.C. mains and to give an output of 12 volts D.C. at a current of 5 amps.

Both voltage and current are adjustable and full-wave rectification is employed. Indicator meters are used to ensure correct operation.

Reference to the photographs shows that the unit is built on the baseboard and panel principle, outside dimensions being given in Fig. 2.

The Transformer

The mains transformer is of sturdy construction, the core being made up of number 33 T and U stalloy stampings of the dimensions shown in Fig. 4, a stack of 1¼in. being required. A suitable bobbin to fit is shown in Fig. 4, and is constructed from sheet perspex. The thickness of the material for the former is 1/16in. and for the end cheeks ⅛in. After assembly the bobbin is given a coat of black enamel and a series of small holes drilled through the end cheeks to accommodate the wire ends.

The primary loading of the transformer is 0.5 amps. and to carry this current 26-gauge wire is used. The winding limb cross sectional area is 1½ sq. in., which allows six turns per volt. For 230-volt mains therefore, $6 \times 230 = 1{,}380$ turns are required. Enamelled wire is used.

The secondary winding gives voltages of 20, 16, 13 and 10 and for a current of 5 amps. 16-gauge wire is required. The covering used by the writer was d.s.c., but d.c.c. or enamelled may be employed.

Winding

The primary should be wound as evenly as possible and interleaved every two to three layers with thin paper. If it is required to use the transformer on 200/250-volt mains then 1,500 turns will be required, tappings being taken at 1,380 for 230 volts and 1,200 for 200 volts.

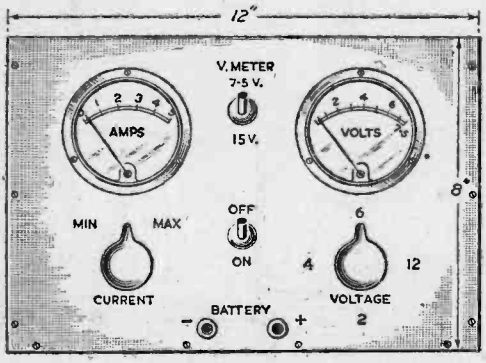


Fig. 2.—Panel size and layout.

After winding, the primary must be really well insulated by covering with paper, then empire or insulating tape.

The secondary winding must be wound in the same direction. This statement sounds obvious, but it is surprisingly easy, unless a winding machine is used, to mistake the direction, especially when the primary is completely covered with insulation. For this reason it is a good idea to mark an arrow on the outside of the bobbin before commencing.

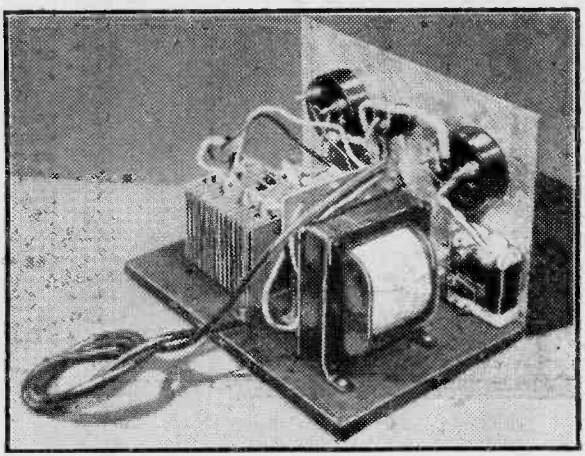


Fig. 1.—Interior view of the charger.

Owing to the robust nature of 16-gauge wire, it is very essential, when winding, to space the turns slightly and insulate each layer from the next. This is necessary because any imperfection of the wire insulation, coupled with the quite considerable pressure of one layer upon the other, may very easily give rise to short circuits which will be fatal to the correct working of the transformer. On the bobbin shown there is plenty of room to adopt the above procedure.

On a 6-turns-per-volt basis the secondary winding requires 120 turns with tappings at 96, 78 and 60. When completed, the winding is again well insulated and the laminations fitted. Brackets may be made from iron strip and the whole assembly bolted up tightly to avoid buzzing of the core.

An easy means of obtaining the laminations is to buy one of the many burnt out or Government surplus transformers that are usually available.

The Rectifier

This is a perfectly standard full-wave bridge-connected rectifier and should be rated at 5 amps., 12 or 16 volts. These are available as Government surplus at a reasonable price.

The Variable Resistor

This component calls for some comment inasmuch as various types and values may be used. The one shown in the photo was obtained from an ex-R.A.F. charger and has a ¼ rotary action, which makes it suitable for knob panel control.

The resistance of this model is 10 ohms. and gives very wide control but a value down to 5 ohms. should be suitable, providing it is rated to carry 5 amps. The type of resistor normally used in apparatus of this nature is the slider type, of which quite a few are available. The use of this type would necessitate cutting a long slot in the panel and a possible rearrangement of layout. Reference to the circuit diagram, Fig. 5, shows that a very small amount of resistance remains in circuit even though the variable resistor is at minimum. This is a necessary safety device and is accomplished in the model shown by fitting a stop at the minimum end of the variable resistor before the true minimum is reached. In this way about 1 ohm. is always in circuit. If the sliding type is used this procedure may be carried out by arranging for the sliding knob to be stopped by the slot in the panel just before minimum is reached.

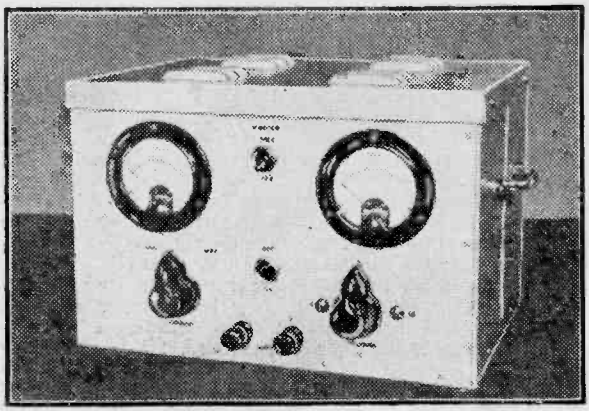


Fig. 3.—The finished charger in its cabinet.

The Voltage Switch

The switch required for this purpose is a single-pole four-way type and should be rated at 5 amps. The component shown was a heavy 15-amp. D.P.D.T. rotary type with a Q.M.B. action similar to electric cooker types. This was modified to one-way four-pole and is excellent for the purpose. Many heavy ex-Government switches are available, and little ingenuity is usually required to adapt them to one's own use. Alternatively, the problem may be overcome by using heavy sockets with a plug for adjusting.

Meters

These are both of the moving-coil type, the ammeter reading 0–5 and the voltmeter 0–7.5. This latter has a switch for doubling the scale reading.

It is unlikely that two meters to match and of the correct range will be available at a reasonable price,

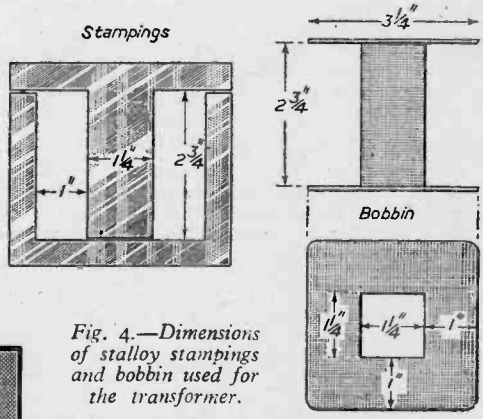


Fig. 4.—Dimensions of stalloy stampings and bobbin used for the transformer.

so it may be helpful to show later how meters of any type may be modified.

The only other components are the toggle switches S.1 and S.2. S.1 is a simple on/off type in the transformer primary circuit, and S.2 is a S.P.D.T. to control voltmeter readings in conjunction with R.1 and R.2, and to which reference is made later.

Construction

The entire layout is in no way critical and no measurements have been given for panel and baseboard layout due to the difference existing in respect of components that may be used.

The baseboard is ½in. thick in order to provide a sturdy base. The panel is 16-gauge aluminium and it is as well first to mark this out and drill to requirements, not forgetting four holes along the bottom edge so that attachment to the baseboard may be effected.

In the model shown the panel was rubbed down with fine emery and treated with grey brushing cellulose. The baseboard was given a coat of Berlin black.

There are no snags with regard to component mounting, but it is essential to ascertain that those

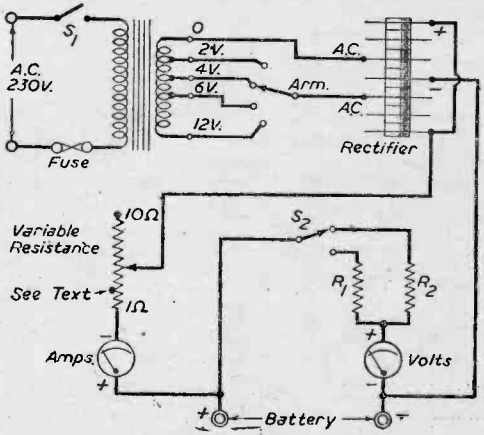


Fig. 5.—Circuit diagram of the instrument.

mounted on the metal panel are insulated from it. In this respect particular attention should be given to the variable resistor and battery terminals.

There is a 1 amp. fuse shown mounted on the transformer terminal panel, but this is easily put on the baseboard if desired.

Wiring

Owing to the simplicity of the wiring and the latitude in layout, no scale wiring diagram proper is shown, but a semi-block diagram is given in Fig. 6. A 3-pin plug is utilised to earth the case.

The Cover

The unit is housed in a steel case as shown. Here again, Government surplus was resorted to and a U.S. Army type receiver case is utilised, the front panel being cut away except for a ½in. flange each side. These flanges are used as a buttress against which the panel may be screwed. The base of the metal case fits flush over the edges of the baseboard, wood screws being passed through for retention. The lid is held in position by 4 B.A. screws passing through it into tapped holes. Whatever the type of case employed it is essential that some form of ventilation be provided. The case is treated with grey cellulose in the same manner as the panel. Owing to the considerable weight of the completed instrument it was thought necessary to fit handles as a precaution against dropping.

Panel Marking

To ensure a professional finish, small ¼in. black transfers were used for panel marking. These are obtainable at most shops where model aeroplane parts are sold. The method calls for a little patience but produces a result, on any apparatus, which is not comparable with anything one can do by hand with Indian ink.

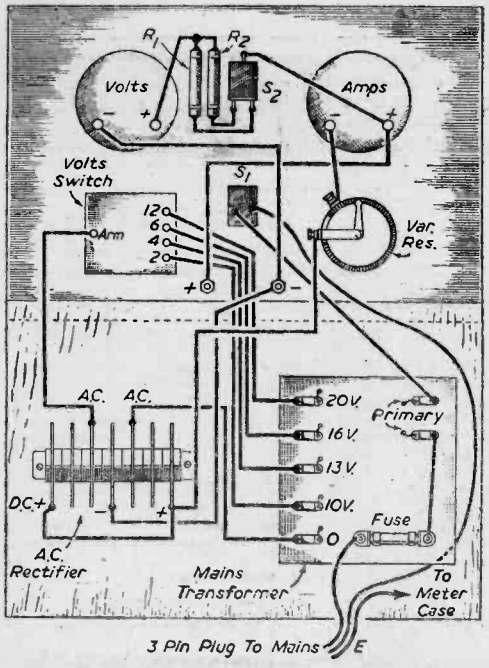


Fig. 6.—Circuit of the charger. Connections to Ammeter, Volts switch and Rect. to be in 16 s.w.g. wire. Note that the var. res. is shown in symbolic form. It is actually rectangular as may be seen in Fig. 1.

Testing

To check the finished charger see that S.1 is in the off position, S.2 at 15 volts, and that the current control is at minimum. *Note.* To avoid confusion at this point it should be remembered that *maximum* resistance of this component is *minimum* when thinking in terms of current control. In other words, with the control at minimum (according to the panel markings), the whole of the resistance element is in circuit—maximum resistance.

Select a suitable accumulator and connect with heavy flexible leads to output terminals, making sure of polarity. Next set the voltage control to the voltage of the battery. If this is 6 volts or lower put voltmeter switch to 7.5 volts. The voltmeter is permanently connected across the battery terminal so that a reading is shown before the instrument is switched on, this feature proving quite useful at times.

After switching on, the voltage will rise (showing a charging voltage) and a current of probably about 0.5 to 0.75 amps. will be shown on the ammeter. To increase the charging current slowly advance the current control towards maximum until the correct rate for the battery is registered on the meter. A few notes on the connecting of mixed batteries would not be out of place.

Any number of cells up to an added voltage of 12 may be joined in series (setting the voltage switch to the appropriate position), and will all be charged at the current indicated on the meter. Where batteries of similar voltage are connected in parallel the current is divided between them. If, therefore, three 2-volt batteries are joined in parallel and the ammeter shows a current of 3 amps., each battery is receiving 1 amp. Under these conditions the voltage control is set to 2.

Actually, quite a large number of 2-volt cells could be charged together by adopting a series-parallel arrangement. Connect six cells in series making a total of 12 volts. Then to each cell connect four more in parallel. The voltage is still 12. Therefore, by charging the bank at 12 volts 5 amps., each cell will receive 1 amp.—sufficient for the average 2-volt 40 ampere hour accumulator. Thus, for a small profit-making sideline, this instrument is quite useful.

(To be continued)

Round or Rectangular?

A New Idea in Television Picture Reproduction of Especial Interest to the Home Constructor.

By W. J. DELANEY (G2FMY)

A CERTAIN amount of controversy has recently arisen as a result of the publication in an American magazine or two of a new American television receiver fitted with a round aperture instead of the customary rectangular shape familiar to most viewers. There are, however, certain advantages with this type of screen, and the arrangement carries a step farther a scheme which I had adopted some time ago in my own receiver and which other viewers would no doubt like to try out. Firstly, what are the advantages claimed for this type of screen? Obviously, the transmitting authorities compose their scenes with the normal rectangular screen in mind, but it is noticeable that on the majority of shots little use is made of the upper corners and the extreme sides. Every effort is taken to keep the main subjects well in the centre of the screen—for obvious reasons. When there is a close-up, such as of the announcer, a singer, conjurer, etc., he or she occupies only the centre of the screen, and under this condition, obviously, there is a fairly large amount of space which is wasted.

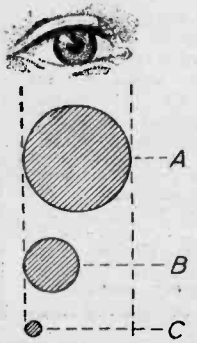


Fig. 1.—This diagram shows how the detail in an object is affected by the size of the scanning spot. The small spot at C will obviously present a much better detailed representation than if the spot is of the size shown at A.

Greater Detail?

The majority of television receivers are so adjusted that the borders of the raster come just outside the edge of the mask. If, however, the appropriate controls are adjusted so that the edges come *well* outside the mask, a larger image is obviously obtained. It will be noted that there is an improvement in detail as well as in the size of the image by doing this. The spot size of a given type of tube is dependent upon the make of tube, E.H.T. voltage, focusing adjustment, etc., and is (or should be) independent of the deflection currents. Now, assuming that full detail is transmitted, how does the spot size affect definition? In Fig. 1 is a sketch of an eye, whilst below it is a circle representative of a scanning spot (A). Obviously, if the spot compared with the eye above it is of the same size, all that would happen on the receiving tube end would be a darkish patch representing the average value of the light and dark tones in the eye.

If now the spot were reduced to half its size, in travelling across the area represented by the eye it would give a variation in tones in its travel until, when reduced to the smallest size (C), it would "build up" the detail of the eye in its travel and thus present the viewer with a more detailed object. It must be borne in mind, of course, that these facts only hold good if the detail in question is radiated by the transmitter, and that it is impossible to effect any improvement on detail which is not originally picked up by the transmitting camera. However, as the size of the spot is more or less fixed on the receiving tube, opening up of the scan in both directions will obviously build up a larger image, and the light and dark variations of the spot as it traverses the screen will present to the eye an effect of greater detail—in spite of the fact that the spacing between the adjacent lines will be slightly greater.

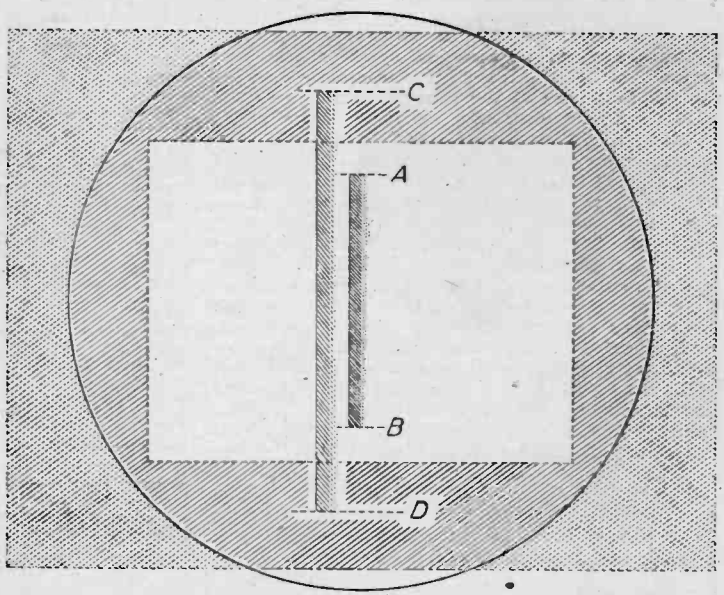


Fig. 2.—An image with dimensions shown at AB on a normal size picture will appear as large as at CD on the same size tube when the picture area is enlarged as shown by the shaded rectangle.

Adjusting the Screen

As mentioned earlier, I prefer the amplitude adjustments to be set so that the frame borders are well outside the mask edges—actually, you will find that you can go so far as permitting the upper edge of the mask to come just about half-way down the letters B.B.C. on the tuning signal which precedes every programme. To try the idea out, open up the frame amplitude control (generally referred to as "height") until half of the letters B.B.C. have come under the mask. Then adjust the line amplitude (width) until the circle is again true and round. You will find that then, on most pictures, you will lose very little, but will have a very much larger picture, and close-ups of faces will appear very much more detailed.

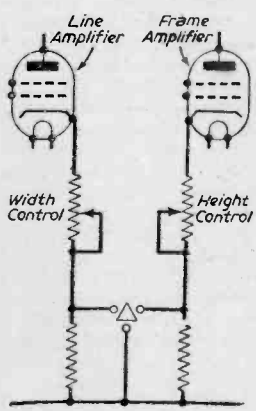


Fig. 3.—One simple method of providing an adjustable picture area.

To obtain even improved results the following idea may be introduced, and has been tried out and was, in fact, used for quite a long period in my apparatus, but was finally discarded for something better—about which more will be said later. A simple test on the head of the announcer will show that the enlarged screen idea just described gives an improvement. Now, there will be obviously a waste of space at the corners even still. Fig. 2 shows a drawing representing the end of a C.R. tube and the inner dotted rectangle is the standard picture shape of the correct aspect ratio. The vertical line in the centre of this represents between the points A and B the approximate size of the head of an announcer or solo artist. If the height and width controls are adjusted so that the head is opened up to cover the distance from C to D the effective rectangular area will be that shown by the larger rectangle, and it will be seen from this that most of the corners and only a very small part of the sides are lost. It would obviously be inconvenient to adjust two controls each time it was required to obtain the large image, and there may often be pictures in which the full rectangular area was desirable (football matches, some plays, etc.). It is also undesirable to produce the small (normal) picture area on a tube end without a mask. Here is a scheme which some may like to try out. Remove the standard rubber mask and replace it by two "L"-shaped pieces of metal blackened and so pivoted that in one position they overlap and provide the normal picture-size opening. A simple lever device can then be fitted to swing these out and thereby reveal the whole of the tube end (it will be seen that the actual movement is reasonably small).

Adjustable Bias

Normally, adjustment of height and width is effected by varying the bias on the amplifier valves in the line and frame time bases. It will now be necessary to measure the variation in bias resistance which is called for in adjusting the picture between the limits just referred to. A fixed resistor of the value found should then be joined between the cathode and the variable (or between the variable and earth), and a three-point switch mounted as a panel control or coupled with the lever which operates the mask opening. The junction of the two resistors in each amplifier circuit should be taken to one point on the switch and the third point earthed. Obviously, now, when the switch is operated it will result in the raster area jumping from one size to another instantaneously. In some circuits there may be a slight final creep, but only one circuit has so far been tried which did not function satisfactorily. It will be seen that by this idea one can have a full round screen with the announcer filling the whole tube end, and with the flick of a switch the smaller area may then be obtained for normal scenes. When some solo picture such as a singer, conjurer, etc., is announced, one simply flicks the switch and the image immediately jumps up to fill the entire tube and a round picture is obtained which will be found by some viewers much more pleasing on such pictures.

Books Received

RADIO, TELEVISION AND ELECTRICAL REPAIRS. By Roy C. Norris. 448 pp. Over 400 illustrations. Published by Odhams Press, Ltd. Price 10s. 6d.

THIS valuable book devotes the first two chapters to elementary electrical theory, and then goes on to deal with basic radio circuits, testing, instruments, fault-finding, alignment, etc. After chapters devoted to incidental accessories such as loudspeakers, pick-ups, gramophone motors, etc., it passes to normal small domestic appliances, electric fires, cookers, washing machines, refrigerators, etc., and concludes with a section on battery charging. Thirty-one pages are devoted to television, covering the main theoretical considerations and adjustment and fault-finding. This is one of the most comprehensive books we have seen on the subject, and as each section is so well illustrated, every handyman will find it invaluable, whilst the service engineer, too, will find it a valuable and constant source of reference.

RADIO VALVE DATA: CHARACTERISTICS OF 1,600 RECEIVING VALVES. Published by Iliffe & Sons, Ltd. Size 10in. (wide) by 7¼in. (quarto oblong). Price 3s. 6d.

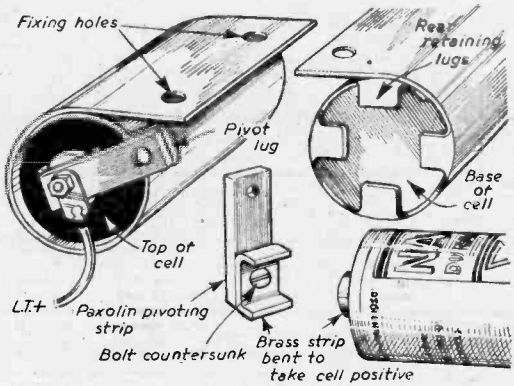
"RADIO Valve Data" gives the main electrical characteristics of 1,600 British and American receiving valves, the information comprising figures for normal operating conditions arranged in tabular form. Valves are classified according to type under the headings Frequency Changers, Screened Tetrodes and Pentodes, Output Valves, Diodes, Triodes, Rectifiers (Valve and Metal), Tuning Indicators, Barretters and Voltage Stabilisers. The British valves are further grouped under manufacturers' names and then sub-divided into obsolete, replacement and current types, according to the makers' categories.

Additional tables and diagrams give the base connections for all valves, and an index enables any valve to be easily found by type designation. A separate list of those American-type valves which are made in this country is included; data are also given on crystal valves and signal-frequency metal rectifiers.

Practical Hints

Battery Holder

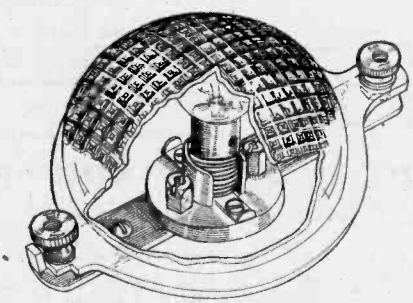
I used a piece of scrap aluminium large enough to encircle a single U2 cell, allowing ½in. over either end of the cell lengthwise. The extra ½in. of metal each end is used for lugs, four at one end cut at equal distances. These are bent inward at right-angles to form stops for the base of the cell. The other end has one single lug to support a retaining strip. I used a strip of paxolin with a short strip of the same material to hold it rigid, (this may not be necessary with a fairly stout piece). The strip is bolted to the single lug and allowed to pivot. The other end of the strip carries the positive contact, a piece of brass sheet cut and bent just to cover the brass positive cap on the battery. This



A suggestion for a battery holder.

brass strip is bolted on and the same bolt carries a small lug for connecting the positive lead. The cell is slid in the holder and the retaining strip is swung across and allowed to rest on positive of cell.

A small lip bent on either side of the contact brass strip will stop side movement.—T. A. MYERS (Wirral).



A protected light fitting.

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."

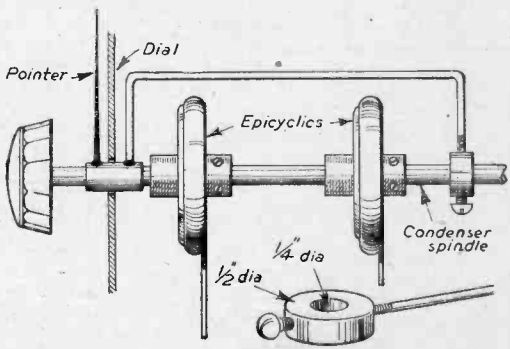
SPECIAL NOTICE

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

Pointer for Geared Control

RECENTLY a receiver was constructed in which two epicyclic drives were used in order to obtain the required reduction, and the following method was used to convey the motion of the condenser spindle to the pointer on the dial.

A small piece of brass was cut to approximately ½in. diameter by ¼in. thick, and a ¼in. hole was drilled in it, it was also drilled and tapped on opposite sides of the curved surface. This was slipped on the condenser spindle, and a bolt was screwed tightly into one threaded hole, to hold it in place. Into the other was screwed a threaded rod (approximately 6BA) which was then bent as in the figure, the other end being soldered to a small



A pointer for a geared dual drive.

brass bush about ½in. long, which was free to rotate round the drive spindle. The dial was then slipped into place, and the pointer soldered to the brass bush.—J. P. GASKELL (Shrewsbury).

Low-voltage Protected Light Fitting

THERE are many positions in the house, workshop or the car where a small type of low-voltage protected light fitting can be used to advantage. This can be made for the approximate cost of one shilling and ninepence by the following simple method. Procure from one of the well-known multiple stores a transparent tea strainer, the handle section of which should be cut off to match the opposite side. These two short sides should have a ⅛in. clearance hole drilled through them to accommodate the retaining screws. All that is now required to complete the fitting is a 3½in. drilled flat metal strip, a M.E.S. bakelite batten-holder and 4 small ½in. nuts and bolts. The batten-holder should be mounted on the centre of the strip and the fitting assembled as shown in the illustration.—F. F. TOWNDROW (Newquay).

A Cathode-r

Modifying a Type 48A R. Tester for the V

MOST users of C.R. oscilloscope equipment will recall instances when a trace of input and output simultaneously displayed would have been of great assistance.

There are several methods of getting these two traces on one tube—split beam, switched inputs, etc., but such equipment is rather costly for the average pocket and it was with the question of cost versus facilities in mind that the writer cast around for a suitable piece of ex-W.D. equipment which would be fairly easy to convert to his needs.

Such equipment was found in the R.A.F. Indicator Unit, Type 48A. This unit is fitted with two V.C.R.138A tubes, a specially designed time base using two VR65's, several potentiometers, and a number of H.V. condensers, all of which items can be utilised in conversion to a double-tube 'scope, giving the following facilities:

(a) Two 3½in. tubes, green glow, short persistence.

(b) Separate inputs for each tube (X and Y plates).

(c) Separate variable input Y amplifiers.

(d) Automatic synchronising unit, controlling both tubes simultaneously.

(e) Individual focus, brilliance, X shift and Y shift controls.

(f) Common time-base, frequency range approximately 20 cycles to 200 kc/s, switched out when not required.

(g) Common sweep width control.

As the photographs show, the unit is not at all bulky but is rather compact, internally, and components which have to be supplied in addition to those already in the unit as bought must be chosen for physical dimensions as well as electrical values.

A separate power pack is required, capable of giving the following:

4 volts at 2 amps, for C.R. tube heaters.

6.5 volts at 2 amps.

350 volts at approximately 60 mA.

1,500 volts for C.R. tube supply.

Plug and socket connections are used in the model shown; ultimate choice is left to the individual.

Cost

The approximate cost of the unit as shown was £4, not an excessive figure for such equipment. Several of the larger dealers in ex-W.D. gear are handling 48A's, and a unit should be readily available.

Modifications

On acquiring one of these units one should begin by removing the blank plate giving access to the tubes, etc. Remove these, also the time-base valves, and then strip out all the wiring, keeping the lengths as intact as possible.

The mechanical alterations should now be tackled. Apart from removing the rubber hood, retaining side-plates and outer Perspex plates, nothing is altered on the front face. The remaining

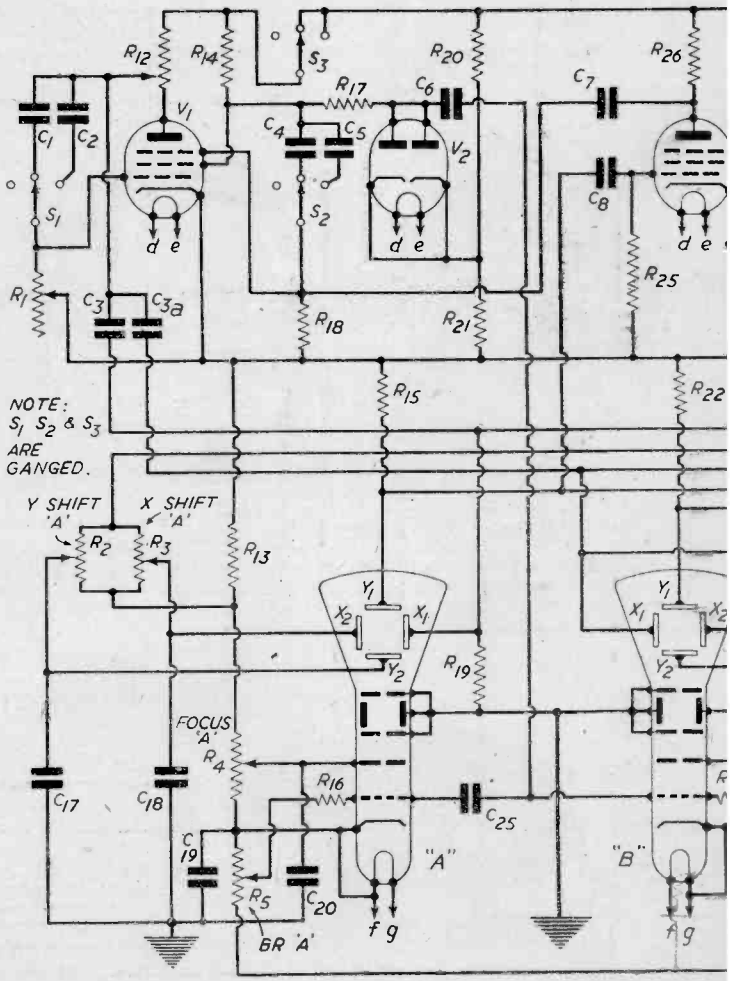


Fig. 1.—Theoretical ci

Comparator

Unit to Give a Useful Dual

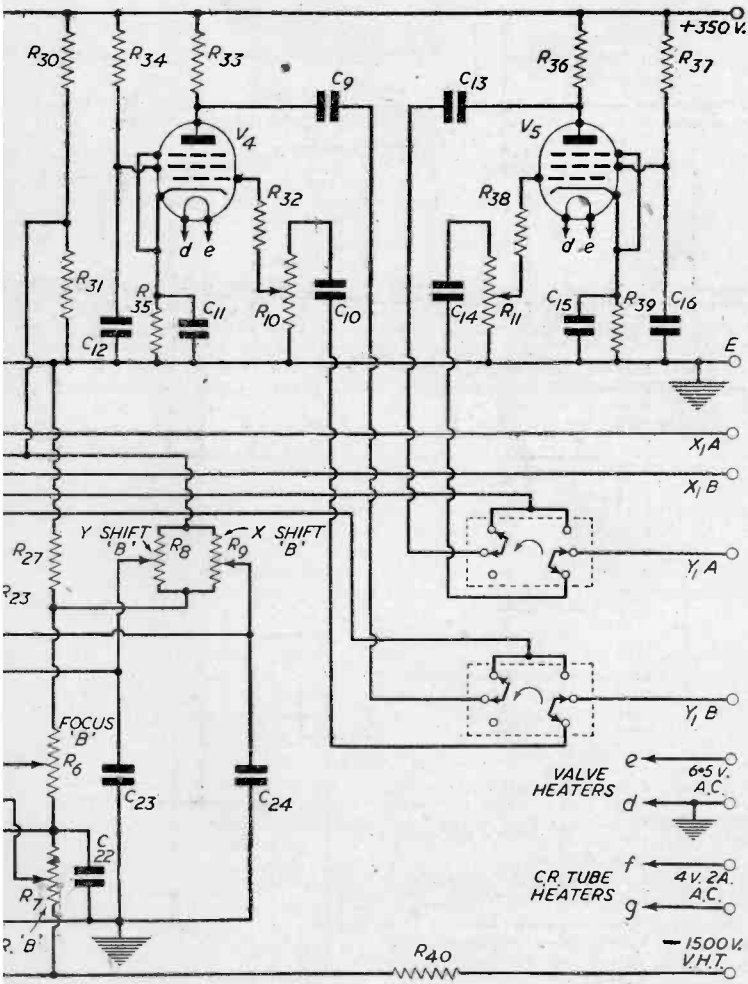
ıop or Laboratory

Perspex plates in the unit shown were marked out in ¼in. squares, using a razor blade to score the Perspex, afterwards filling in with drawing ink. This gives a fine line, and does not obscure the trace. The centre lines should be exactly in the middle of the plates.

Working back into the unit, the two potentiometers mounted on ebonite pillars on the floor of the unit should have the pillars removed and the attachment plates screwed directly to the chassis. This allows the knobs to project through the chassis, and the potentiometers now form the YA and YB amplifier input controls.

Adjacent to the YA potentiometer, a D.P.D.T. wafer switch will be seen. This should be left in position, and a counterpart of this switch fitted in a similar position alongside the YB potentiometer. These two switches change over the Y inputs from direct input to the C.R.T. to amplified input; being independent, it is possible to have one tube giving an amplified trace, while the other shows the normal input.

The transformer arrangement on the right side of the unit should be removed, also the central bracket used to support the cover plate. The time base assembly is removed, but the valve panel left for later attention. The large cable-form holding clips are removed.



the complete Comparator.

On the rear of the unit are four potentiometers. Two are marked "shift," and are left in place. The remaining two are dismantled, and the 0.5 MΩ potentiometer fitted together with a similar control at the corresponding position at the left end of the back panel. This will provide two pairs of shift controls.

The multi-way socket should be discarded, and the hole covered with a metal plate on which will be mounted the time-base rough control switch.

All the single-pin input sockets should be carefully removed from the unit. After a few moments' study, it will be seen that these can be turned "inside out" to form the insulated terminals required for the X and Y plate inputs. The threaded part is 4B.A., and when fitted with an insulated knob, are quite presentable. It is advisable to file a flat on the pin at this stage, and face with solder for easier wiring later.

Other Alterations

The additional components required are now fitted, and again working from front to back of the unit, these are:

(a) Sweep width control = 100,000 ohms.

(b) Fine frequency control = 0.5 MΩ.

These are fitted in the positions indicated in the three-quarter view photograph.

(c) Autosync EF.50 valve-holder; fitted to a side panel on left wall with just enough clearance between the focus control and EF.50 for ease of removal of the valve.

(d) Time-base EF.50 valve-

holder. This is fitted in place of the lower octal socket on the time-base valve panel. The upper socket should be changed for an international octal as a V.R.54 will be used in this position.

(e) Time-base frequency switch. A three-gang wafer switch is required which can be wired as shown in Fig. 4, which will be given next month. The height of the switch should be the smallest which can be obtained.

(f) YA and YB amplifier valves. Two "Mazda" octal valveholders are fitted to a side panel which is then attached to the right wall of the unit with sufficient clearance between the grid caps of the VR65's and the shift potentiometers to allow of easy removal of the valves.

Note that all the valves are fitted horizontally.

(g) Cable termination blocks. Two three-way tag blocks of stout make are fitted on pillars on back wall with tags in a vertical row, one on each side of the central hole left by the potentiometer removed earlier.

The central hole should be filed out to $\frac{7}{8}$in. diameter, to take an ebonite bush such as used in electrical trades, to protect leads from power-pack which will terminate on the tag blocks. Keep the pillars as short as safety permits, as the removal of the C.R. tubes is made much easier when room behind the bases is available.

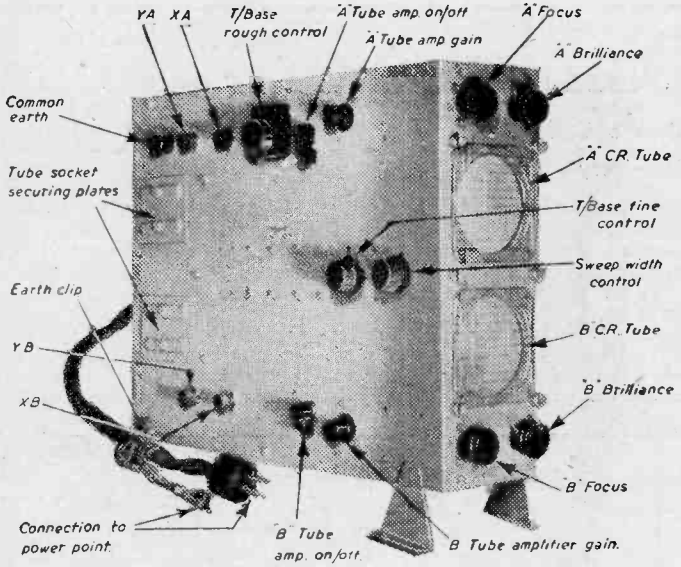


Fig. 3.—Three-quarter view of the finished instrument.

LIST OF COMPONENTS

R1—0.5 MΩ potentiometer.
R2—0.5 MΩ potentiometer.
R3—0.5 MΩ potentiometer.
R4—50,000 ohms potentiometer.
R5—1 MΩ potentiometer.
R6—50,000 ohms potentiometer.
R7—1 MΩ potentiometer.
R8—0.5 MΩ potentiometer.
R9—0.5 MΩ potentiometer.
R10—0.5 MΩ potentiometer.
R11—0.5 MΩ potentiometer.
R12—100,000 ohms potentiometer.
R13—1.15 MΩ (two resistors in series), 1 watt.
R14—0.5 MΩ, 1 watt.
R15—3 MΩ, $\frac{1}{4}$ watt.
R16—250,000 ohms, $\frac{1}{4}$ watt.
R17—250,000 ohms, $\frac{1}{2}$ watt.
R18—40,000 ohms, $\frac{1}{2}$ watt.
R19—1 MΩ, $\frac{1}{2}$ watt.
R20—100,000 ohms, 1 watt.
R21—40,000 ohms, 1 watt.
R22—3 MΩ, $\frac{1}{4}$ watt.
R23—1 MΩ, $\frac{1}{2}$ watt.
R24—250,000 ohms, $\frac{1}{4}$ watt.
R25—40 MΩ, $\frac{1}{4}$ watt (four 10 MΩ in series).
R26—40,000 ohms, 2 watt.
R27—as R13.
R28—50,000 ohms, 2 watt.
R29—5,000 ohms, 2 watt.
R30—150,000 ohms, 1 watt.
R31—100,000 ohms, 1 watt.
R32—1,000 ohms, $\frac{1}{4}$ watt.
R33—10,000 ohms, 1 watt.
R34—150,000 ohms, 1 watt.
R35—200 ohms, 1 watt.
R36—10,000 ohms, 1 watt.
R37—150,000 ohms, 1 watt.
R38—1,000 ohms, $\frac{1}{4}$ watt.
R39—200 ohms, 1 watt.
R40—100,000 ohms, 1 watt.
C1—500 pF.
C2—50 pF.
C3—1 μF. 450 v.
C3a—1 μF. 450 v.
C4—0.02 μF. mica.
C5—50 pF.
C6—0.5 μF. 2,000 v.
C7—0.01 μF. mica.
C8—100 pF. mica.
C9—0.25 μF. 450 v.
C10—0.5 μF.
C11—4 μF. electrolytic.
C12—0.25 μF. 450 v.
C13—0.25 μF. 450 v.
C14—0.5 μF.
C15—4 μF. electrolytic.
C16—0.25 μF. 450 v.
C17—0.25 μF.
C18—0.25 μF.
C19—0.01 μF. H.V.
C20—0.01 μF. H.V.
C21—0.01 μF. H.V.
C22—0.01 μF. H.V.
C23—0.25 μF.
C24—0.25 μF.
C25—1 μF. 500 v.

VALVES :
V1—EF50—Time-base oscillator.
V2—VR54—Fly-back suppressor.
V3—EF50—Autosynchroniser.
V4—VR65—YB amplifier.
V5—VR65—YA amplifier.

Between the auto-sync valve panel and the time-base valve panel a tag strip should be fitted, spaced off the wall of the unit; one having a centre row of tags in addition to an upper and lower row is very useful. One additional tag strip to take three resistors should be fitted to the left of the three-way tag block mentioned in (g), and these resistors will be mounted horizontally. A tag-strip to carry the components associated with the YA and YB amplifiers is also mounted on the right wall of the unit on stand-off pillars, between the bases of the VR65's and the focus potentiometers on that side.

To make room for the time-base Fine Control, two of the 0.01 μF. H.V. condensers are removed, and a 0.5 μF. 2,000 v. condenser is fitted at the other end of the row

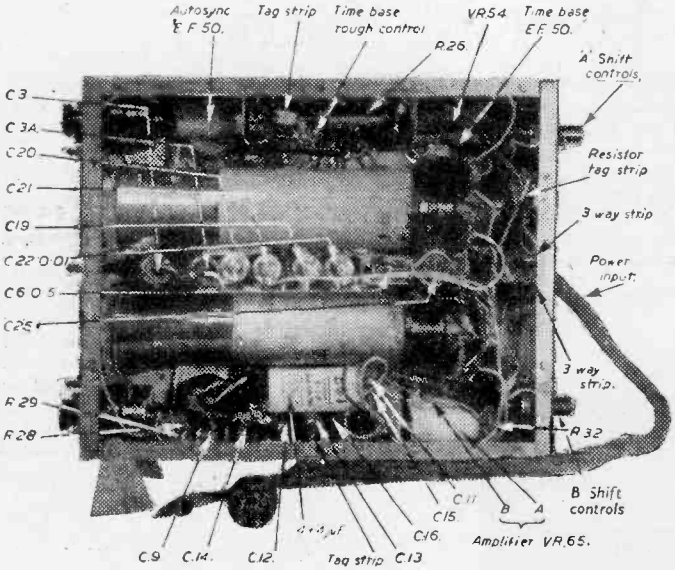


Fig. 2.—Interior view of the instrument.

(C6 in Fig. 2). An earth terminal, replacing one of the input sockets, is fitted as seen in Fig. 3, and the provision of an earth clip, seen at lower back corner, is useful for earthing Y input of a tube not in use, by simply gripping the earth clip with the Y lead clip concerned. Two brackets to elevate the tube faces for ease of observation complete the purely mechanical work; the remaining components are carried on the tag-strips or in the wiring.

Wiring

Apart from the compact nature of the unit, there is nothing in the wiring of the "Comparator" unduly difficult. The usual precautions should be observed, and all leads kept as short as positioning of the components will permit. Fig. 2 gives the layout of the most important items, and the placing of anode load resistors, coupling condensers, bias and decoupling resistors, etc., follows naturally from these and the given positions of the various controls mentioned earlier.

One or two points might be enlarged upon. The time-base condensers C1, C2, are wired directly from the switch contacts to a common lead taken to a tag on the strip which, in turn, is wired to the anode of the EF50 (time-base). C4 and C5 are similarly dealt with, and the tag in their case, taken to the screening grid of the EF50 (time-base).

R25 in the grid return of the autosync EF50 is a 40 MΩ. arrangement of four 10 MΩ. resistors wired in series, and again self-supporting. The resistors are small, and there is no risk of their breaking from the grid tag of the valve socket. The screening grid of V3 is held at +40 v. from earth, and both R26 and R28 should be not less than 2-watt types.

Grid leads to V4 and V5 should be screened, and the screening definitely earthed. Any hum picked up here will be, of course, shown as a modulation of the trace on the tube concerned. This consideration also applies to the grids of the C.R.T.'s, but great care must be taken to use really sound cable, as the voltage between grid lead and earthed screen is practically the full extra-high voltage from the supply.

No screening, other than that of the external test leads, was used in the X and Y plate wiring by the writer, and even at full amplification very little ripple is noticeable in the unit shown. R32 and R38 are carried on paxolin strips with grid clips attached and so brought right to grid caps of the VR65's.

The 4 plus 4 μF. electrolytic condenser seen in Fig. 2 is used as bias by-pass, and is sufficiently large for the purpose. It will be found to "lie in" quite safely as shown. Omission of these condensers will reduce the amplification quite considerably, and it was considered advisable to include these items.

C14, which feeds into the potentiometer input to Ya amplifier, is mounted on the amplifier component strip, although the switch and potentiometer are some distance away from C14, and the interconnections made with screened cable. No trouble has been experienced from this arrangement.

Turning to the actual tubes themselves, one or two points arise. C3, and C3a, seen in Fig. 2, are "commoned" to the sweep width control and their free ends taken one to each X1 plate, so that the sweep voltage is fed simultaneously to both tubes; the paralleling of the two X plates is avoided, however, so maintaining the individuality of the inputs on non time-base working.

(To be continued)

VALVE BASE CONNECTIONS

Valve	1	2	3	4	5	6	7	8	9
EF50	Htr.	S.G.	A	Sup.	Shield	Cath.	C.Grid	Shield	Htr.
VR65	Htr.	Cath.	A	S.G.	Sup.	Met.	—	Htr.	Top cap Grid
VR54	Met.	Htr.	A2	C2	A1	—	Htr.	C1	Nil

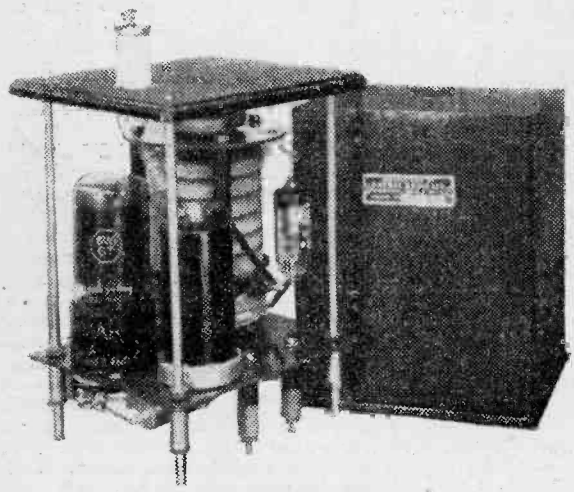
TUBE BASE CONNECTIONS FROM REAR, COUNTED CLOCKWISE FROM SPLINE

1	2	3	4	5	6	7	8	9	10	11	12
Grid	Cath.	Htr.	Htr.	A1	A2	wall coat'g.	Y2	X2	A3	X1	Y1

News from the Trade

R.F. E.H.T. Unit

PRIMARILY designed for television equipment, the E.H.T. unit illustrated below may be found of value to experimenters and others who need a source of high voltage at low current. With a maximum output of 8 kv. at 300μA., the unit is adequately screened and operates at 100 Kc/s. The output voltage may be adjusted by varying the input which is rated, for maximum output, at 300 volts 28 mA. The price of the complete unit which uses a 6V6 as oscillator and an EY51 as half-wave rectifier, is £5 8s. Complete technical details may be obtained from the makers, Haynes Radio, Ltd. Ask for Technical Publication No. 33.



The Haynes R.F. E.H.T. unit.

Varley Dry Accumulators

MESSRS. VARLEY have been asked from time to time by constructors and engineers for technical information on the dry accumulator and as a result they have now issued a pamphlet upon the subject.

Copies are available from Varley at By-Pass Road, Barking, Essex.

New Ekco Console

E. K. COLE, LTD., announce the release of a new console receiver—model C87. This is a 5-valve A.C. superheterodyne all-wave receiver with bandspreading on three short waveranges and a special combined station selector wave-change control, in a substantial walnut veneered cabinet styled on classically simple lines.

This console employs the chassis of the Ekco model A52, with the addition of a 10in. speaker, and is a direct response to the wide trade and public demand for a console version of that receiver. For operation on A.C. 40-100 cycles, 200-250 volts, this Ekco model covers the long (1,000-2,000 metres), medium (200-550 metres) and the following three bandspread short-wave ranges, 11 and 13, 16 and 19, and 25, 31, 41 and 49 metres. It is for immediate delivery at 39 guineas (inclusive of £7 5s. 10d. purchase tax).

Repairs to Plastics

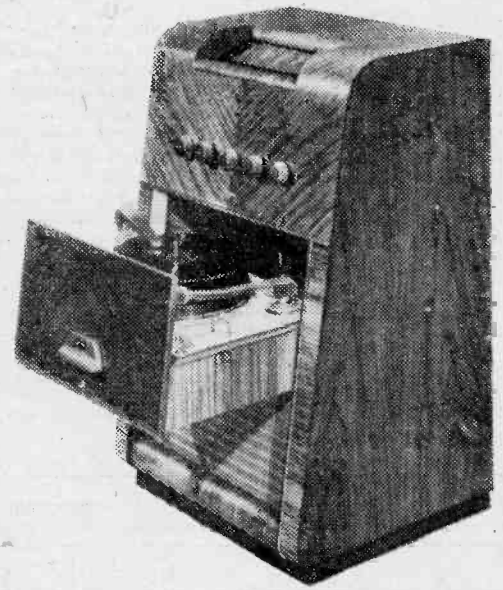
BAXTER INSTRUMENT and ENGINEERING Co., Ltd., announce that they are now repairing articles made from bakelite and similar thermo-setting plastics by a process which they have evolved combining a form of chemical welding with heat treatment. This supplies a long-felt want and opens up a completely new field of repair work in the radio and electrical trades. The joint will equal the original material in strength and in resistance to heat, water and chemical action. The process can be used for filling in crevices and the making up of corners and missing parts.

While their registered offices are still at 171, Victoria Street, all repairs and correspondence should be sent to their new works at: Carholme, River Ash Estate, Fordbridge Road, Shepperton-on-Thames, Middlesex. Telephone: Walton-on-Thames 2043.

Marconiphone Autoradiogram

MODEL ARG.19A, which is illustrated below, is a new five-valve radiogramophone possessing the following novel features:

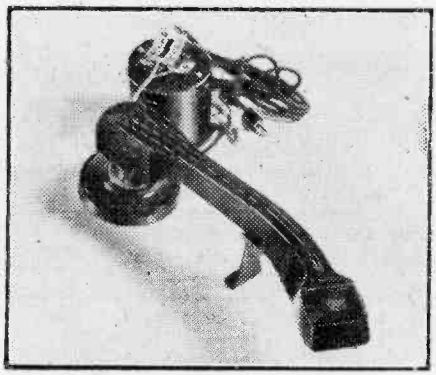
(1) Pre-selected tuning. Three extra positions on the wave-change switch select pre-tuned stations. These in turn may be easily changed and adjusted by the special trimmer tool supplied.



The new ARG.19A radiogram with autochange mechanism.

(2) Extended range record reproduction. By means of the "normal-extended range" switch on the motor-board, the frequency response on gramophone can be considerably extended to provide for reproducing extended range records.

(3) Pull-out auto-mechanism. The gramophone section is made immediately accessible by pulling out the drawer in which it is mounted.



Marconiphone pick-up, model No. 14.

The price of this model is £59, plus £25 11s. 4d. purchase tax.

Also announced by Marconiphone is the pick-up model No. 14.

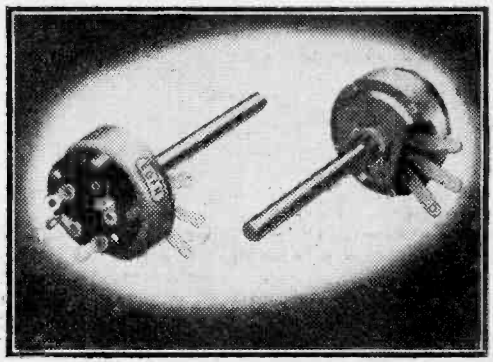
The pick-up may be purchased with or without an output transformer which incorporates a tone compensation circuit and enables the pick-up to be used with most domestic receivers that have record player or pick-up sockets. Those possessing high-gain audio-frequency amplifiers may use the pick-up without a high-ratio transformer either directly into a pre-amplifier with a low-impedance input, or via some other transformer. (Bass compensation of 6dB/octave below 300 c/s is necessary to compensate for the recording characteristic to which most records are made.)

The pick-up is designed to take the small needles of the "Silent Stylus" or Columbia 99 type. The main advantages to be derived from its use are wide frequency response, correct tonal balance and the minimum of record and needle wear.

Price, £3 15s., plus £1 1s. 8d. purchase tax. Without transformer, the price is £2 10s., plus £1 1s. 8d. purchase tax.

Egen Potentiometers

EGEN ELECTRIC, LTD., of Canvey Island, Essex, announce a stepping-up of their production of potentiometers, which will ensure a steady supply of this valuable component in this country as well as overseas.



Egen potentiometers.

These stable and reliable potentiometers can be supplied to any required resistance, but the following standard products with a 2¼in. spindle are immediately available:

(a) Log type "A" (10 per cent. resistance at 50 per cent. effective rotation).

(b) Log type "B" (20 per cent. resistance at 50 per cent. effective rotation).

(c) Linear law.

(d) Anti-log type.

These are stocked with a single-pole or double-pole switch and without switch. Switches only can be supplied separately if required.

Features of the Egen carbon potentiometer are smooth action movement, positive location tags, rigid fixing to chassis, rustproof plating of all steel parts, silent operation and mains switch design with quick make-and-break action and self cleaning contacts.

Retail prices are: potentiometer only, 2s. 9d.; potentiometer with s.p. switch, 4s. 6d.; potentiometer with d.p. switch, 5s. 3d.

Multiple Counting Circuits

TWO new electronic counters illustrating the development of simple circuits are being exhibited by Mullard Electronic Products, Ltd., at the Physical and Optical Society Exhibition in April.

One is the Diode Scaler, which uses a chain of biased diodes to form a potential gate. When equality is established between the condenser and any one of the diode-gate potentials, charging is arrested and a position of equilibrium is created. "Counting" is carried out by arranging for each incoming impulse to move the circuit as a whole from one position of equilibrium to the next.

After all the available gate potentials have been passed, the charged condenser is quickly discharged and the cycle repeated. The count at any instant is indicated on a cathode-ray tube.

The second multiple counting circuit is the Synchronised Saw-tooth Scaler, which uses two 100 Kc/s saw-tooth waves synchronised to a high frequency of 500 kc/s master oscillator. One of the saw-tooth waves (movable) therefore has five positions of stable equilibrium with respect to the other saw-tooth wave, which is fixed.

Counting is achieved by making the movable wave progress through the fixed in a regular manner. Ten positions of equilibrium are created by synchronising the movable saw-tooth on alternate counts.

Aerial Coupling Circuits—1

The Theory of the Coupled Circuit and Some Medium-wave Arrangements Described

By "EXPERIMENTER"

A LARGE number of types of circuit can be used for coupling an aerial to the first tuned circuit of a receiver and, in general, each of them has its particular advantages and disadvantages. It is the purpose of these articles to discuss the properties of several well-known circuits and to show how they can be designed to fulfil wanted conditions.

Before discussing particular circuits consider the purpose that any aerial coupling circuit has to serve. Clearly the circuit should provide a good step-up of the modulated R.F. voltage induced in the aerial and by correct design of the coupling circuit the voltage developed across the tuning capacitance can be made a maximum. The coupling is then said to be optimum and the voltage gain is equal to one half of the Q value of the first tuned circuit of the receiver. In this article the term "voltage gain factor" means the percentage of the optimum voltage gain (i.e., Q/2) which is obtained in practice. Optimum coupling is seldom used in practice, in spite of the high voltage gain, because the tuned circuit is damped by the aerial and its selectivity is impaired. In fact the selectivity is measured by the effective Q value which, as just mentioned, is halved for optimum coupling. To obtain high selectivity the coupling must be weak and this necessarily entails low voltage gain. This is illustrated by the curves in Fig. 1, which show how voltage gain and selectivity depend on the coupling factor. It will be observed that both gain and selectivity are low for tight couplings (i.e., couplings many times optimum) and high selectivity can only be obtained by sacrificing gain and high gain only by accepting low selectivity. If gain and selectivity are considered equally important as in the design of straight receivers (superhets obtain their selectivity in the I.F. amplifier, which considerably alters the problem) the aerial coupling circuit should be chosen to give half-optimum coupling, because this gives 80 per cent. of the maximum possible voltage gain and the same percentage of the available selectivity, and this represents an extremely good compromise. In receivers with fixed tuning half-optimum coupling can be used successfully, but where tuning is variable—as in most receivers—it is found for many aerial input circuits that the degree of coupling varies with the tuning. This is because the aerial impedance and the dynamic resistance of the first tuned circuit both vary as the frequency is changed. The only solution to this difficulty is to choose a type of input circuit in which this coupling variation is minimised (some examples will be given later) or to arrange for half-optimum coupling to occur at the geometric centre of the waveband and to accept the inferior performance at the extremes.

There is a third property of an aerial coupling circuit which must be taken into account in assessing its performance; this is the effect the input circuit has on the tuning of the first LC circuit. Some types of input circuit effectively add (or "reflect") capacitance in parallel with the LC circuit with the result that the tuning capacitance must be reduced to maintain resonance whilst other types of circuit effectively add inductance (or "negative capacitance") and the tuning capacitance must be increased to preserve correct tuning. In a receiver with only one tuned circuit this mistuning effect is unimportant, but it can seriously affect the performance of a receiver if—as is usually the case—the tuned circuit affected is one of a number which are tuned by the sections of a ganged capacitor. Provided the reflected capacitance is small and does not vary unduly with frequency it does not matter whether it is positive or negative: it can be corrected by adjustments to the trimmers on the first or the other sections of the ganged capacitor. Unfortunately, unless care is taken in the design of the coupling circuit it is easy to obtain a very large reflected capacitance or one which varies very greatly with the tuning and in either case accurate ganging cannot be maintained over the whole waveband.

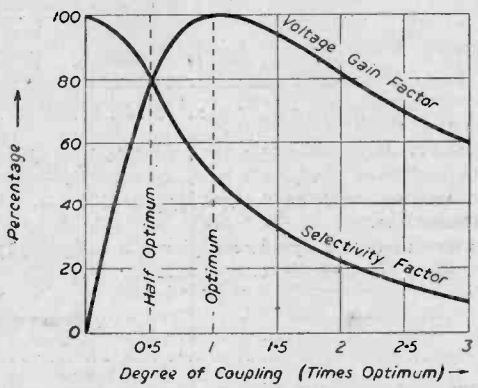


Fig. 1.—Dependence of voltage gain and selectivity factors on degree of coupling.

The foregoing gives a brief outline of the problems attending the design of an aerial coupling circuit and next month we will consider some of the popular types of circuit used for this purpose to see how they satisfy the requirements mentioned.

(To be continued)

WATCH YOUR DUSTBIN

Waste Paper, Cartons, Cardboard should be kept separate, dry and clean for salvage.

Programme Pointers

Our Correspondent, MAURICE REEVE, This Month Discusses Some Recent Programmes

THE hope that the B.B.C. expressed when they inaugurated their "Reith" lectures on December 26th, that they would achieve a measure of success sufficient to warrant their being made an annual feature, must surely be gratified. Few more stimulating, thought-provoking, yet at the same time thoroughly entertaining items have been given us than Bertrand Russell's first series of six Reith lectures on "Authority and the Individual." Few broadcasters combine to such a happy degree as Lord Russell the originality of progressive thought, as provocative as it is erudite and as controversial as it is satisfying, together with the pleasantest manner and perfect radio diction. When listening to him we feel ourselves in the pleasantest of lecture rooms with a don whose attitude doesn't prevent anybody thinking the diametrical opposite to himself, unlike many whose very tone of voice suggests that no other opinion than theirs is possible or even thinkable, and that if you happen to have any other of your own you must under all circumstances keep it to yourselves.

I will not touch on the opinions he propounded, except to say that, to one listener at any rate, they combined a sifting of the best thoughts from the past with a most enlightened, and I have no doubt accurate, outlook on the future. To those who were compelled to miss the lectures I draw attention to the fact that they are shortly to be published in book form.

Sunday Symphony

Symphony concerts on Sunday afternoons at the leading suburban cinemas are becoming a popular feature. Most of the leading orchestras, conductors and soloists appear in programmes that more or less duplicate those given by the same artists in their various series of symphony concerts in the "West End." The results are becoming twofold unfortunate. In the suburbs there is a regrettable, and, no matter how understandable, a reprehensible temptation to "play down" to what frequently is a not very sophisticated audience so far as the standards of performance it exacts. All of which tends towards resulting in some of the indifferent playing we read so much about in some of the London concerts. Furthermore, when we can hear the more popular classics played by the leading executants (no matter how) in Brixton, Kilburn or Hammersmith, numbers of people will be made to feel it not worth their while to continue their journey to Kensington to hear largely the same programme but for more money. I have no doubt that these popular Sunday shows have drawn off considerable numbers from the London audience, and are the cause of many of the empty seats now to be seen there.

Mr. Solomon has never been one of my favourite pianists. He has a neat execution, though not big enough to allow the infusion of poetry and feeling into it. It is only of sufficient size to enable him to play the difficult passages very very quickly and accurately, whilst even on this reckoning it is not always sufficient to take him safely over the summit, as witness his slight fumbling of the famous passage in the second movement of the Second Brahms Concerto at the B.B.C. symphony concert on January 19th. But it is on the interpretative and romantic side where he fails to obtain a place among those whom I consider are the great pianists of the present day. He is singularly cold and unimaginative, though I know he does not lack support among some critics.

Chopin's Second Concerto

A pianist of an entirely different school, to wit Cortot, played Chopin's Second Concerto the following week at the Royal Philharmonic Society's concert. Now Cortot is first, last and all the time a poet. He couldn't play two consecutive notes without distilling something beautiful, without getting to the very soul of the instrument and of the work. I have heard him as often as any other famous pianist during the last 30 years, and he has regaled me with hundreds of the piano's masterpieces—his Schumann Concerto was quite the loveliest of his time and as unlike Mr. Solomon's as a rose is to a dahlia. But he is 71 now and his technique—well, not quite what it was! He had one of his recurring lapses of memory the other night which, but for the presence of mind of all concerned, might have resulted in Cortot being Cort-out (this is not original, by the way). But all ended well, and by the ovation accorded him at the end everyone seemed thoroughly satisfied.

"The Truth About Blaydes"

I was disappointed in the Saturday Night Theatre presentation of A. A. Milne's "The Truth about Blaydes," which was the fault of the play rather than the presentation. Briefly, the story concerns a "great" poet who, about to die loaded with years and honours, confesses to one of his daughters whom he has made miserable with domestic tyranny and selfishness that he actually stole the poems from a young genius with whom he lodged, and who died too soon to establish his own immortality.

The play singularly lacked the wit that made "The Dover Road" and others of its author's works sparkle so. Although really bearing few points of resemblance, it reminded me of Arnold Bennett's "The Great Adventure," wherein a famous painter spreads the false report of his death so that he can wallow in the laudations of his admirers and the Press at his funeral, which, I think I am right in saying, was in the Abbey. But the gaiety and lightness of treatment which made the Bennett play so delightful were wholly missing; and though the stories only slightly converged, the infusion of some of it into "Blaydes" would not have been amiss.

As I have mentioned before, the B.B.C. sporting commentaries alternately amuse and infuriate me.

I have no doubt they set out to do the former, but the ingredients which succeed in doing the latter, by no means to me alone, seem to remain. Perhaps they are not worth troubling about; to eradicate them commentators might have to alter the whole of their commentating technique and broadcasting personalities, which would never do. I was tickled, shall I say, listening to the cup-tie between Manchester United and Bradford. I knew those were the two teams which were going to fight the battle out, and I also knew the Association football rule that lays it down that there shall only be one team on each side. But the commentator kept referring to "Bradford" as "Brentford" at least as often as he styled them correctly, that one less well versed than I in the rules of the game might have been tempted to think that the United, Cup holders, favourites for retaining the trophy, and possible league champions, were, in the plenitude of their confidence, showing off to the world their belief in their right to these illustrious titles by taking on two teams at once. Fortunately, he didn't mix "United" up with "City," else Mancunians themselves would have been down on him in their thousands.

The Brains Trust

The Brains Trust, alas! doesn't seem able to catch the high entertainment qualities of its predecessors. It is dull classroom stuff by comparison, and not always the upper VIth at that. A pity, because it used to be so good. I don't know whether the placing of "Twenty Questions" in the programme on Thursdays at precisely 8.30 is actually an attempt to make it take the place of the ever-to-be-lamented Itma as Radio's No. 1 feature, or whether it is just the temporary replacing of one first-class feature by another, pending new arrangements. I always enjoy it immensely; it maintains its standard at a remarkably uniformly high level, and is first-class in every way. Its members fit into the scheme of things as satisfyingly as the stars of a symphony orchestra, and would doubtless be as difficult to replace.

News from the Clubs

READING AND DISTRICT AMATEUR RADIO SOCIETY

Hon. Sec.: L. Watts, G6WO, 817, Oxford Road, Reading.

RECENTLY, Mr. J. Dee, G3BJE, gave a talk (the major points of which were demonstrated in practice) on the construction of oscilloscopes, and the methods of using them for various types of measurements.

A later meeting was devoted to a junk sale. On Wednesday, March 2nd, the society held its annual dinner and social at the Peoples' Pantry, and on Thursday, March 3rd, members visited the new power station at Earley.

THE RADIO SOCIETY OF HARROW

Hon. Sec.: S. C. J. Phillips, 131, Belmont Road, Harrow Weald, Middlesex.

THE annual general meeting was held recently and new officers were elected for the coming year. Harrow and Edgware Societies had a joint evening recently, and enjoyed a very interesting demonstration of 2-metre gear by the president, G4GB, and other members of the club.

Prospective members are welcome at the clubroom, 206/208, Kenton Road, Harrow, every Tuesday evening, 7.30-10 p.m.

THE BIRMINGHAM AND DISTRICT SHORT WAVE SOCIETY

Hon. Sec.: M. Shirley, 14, Manor Road, Stechford, Birmingham, 9.

RECENTLY members had a talk and a demonstration of a home-built oscilloscope. Talks have been arranged on microphones and speech equipment, and V.H.F. working. A scheme is being worked out for members who have certain "difficult" magazines on annual subscription, to loan them to members who cannot obtain them.

Commencing on Monday, April 11th, general meetings are held on the second Monday of each month at the Colmore Hotel, Church Street, Birmingham, 1. The clubroom at 220, Moseley Road, Birmingham, 12, will be open on the third and fourth Monday of each month.

DERBY AND DISTRICT AMATEUR RADIO SOCIETY

Hon. Sec.: F. C. Ward, 5, Uplands Avenue, Littleover, Derby.

MR. A. G. G. MELVILLE, F.R.C.S., radiotherapist at Derbyshire Royal Infirmary, has accepted the invitation to become the society's first president.

The society's first annual dinner and social was an outstanding success, there being 42 members and their wives in attendance. The occasion was marked by a presentation by Mr. W. Morgan Jenkins on behalf of members of a box of cigarettes to Mr. J. Goodwin, who has given great assistance to members in lectures and demonstrations relating to television construction and test equipment.

Future meetings will be held in the society's clubroom, 67b, London Road, Derby, commencing at 7.30 p.m.

LOTHIANS RADIO SOCIETY

Hon. Sec.: I. Mackenzie, 41, Easter Drylaw Drive, Edinburgh, 4.

AT the February meeting a most interesting talk was given by Mr. W. R. Eadie on aerial theory with special application to V.H.F. beams.

The society is pleased to announce that Mr. Williamson, of Ferranti, Ltd., will deliver a lecture on sound reproduction and modern trends in the design of speakers and pick-ups.

LEICESTER HAM RADIO SOCIETY

Hon. Sec.: L. Milnthorpe, 3, Minster Drive, Thurmaston.

AT the annual general meeting, officers were elected for the current year. Permanent H.Q. is now at The Holly Bush Hotel, Belgrave Road, Leicester, where meetings are held at 7.30 p.m., first Friday of each month and lectures have been arranged for the whole session to cover the needs of the beginner and old-timer alike. All are welcome and intending members should contact the hon. secretary.

General programme will include lectures, visits of technical interest, local contests and field days, participation in most of the National contests. Subscriptions are 7s. 6d. per annum, and under 18 5s. Service members free.

THE WEST MIDDLESEX AMATEUR RADIO CLUB

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

THE West Middlesex Amateur Radio Club has been entertained at recent meetings by lectures on valves, amplifiers and television, as well as an amusing and profitable evening devoted to a junk sale. Lack of proper accommodation continues to restrict the practical side of club life and a permanent "home" is still being sought. The club, however, still continues to attract new members. Prospective members are invited to contact the hon. secretary. Meetings are held regularly on the second and fourth Wednesdays of every month at the Labour Hall, Uxbridge Road, Southall (7.30 p.m.).

The annual general meeting of the club will be held on the 13th April, and readers are reminded that this meeting is restricted to members only.

STOURBRIDGE AND DISTRICT AMATEUR RADIO SOCIETY.

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

THE annual general meeting of the above society was held at King Edward's School, Stourbridge, at 8.0 p.m., on Tuesday, March 1st. There was a good attendance and the president (G6OI) presided.

Following the officers' reports the president outlined some suggestions for the coming year and stressed the desirability of better publicity.

Officers were elected for 1949, and Mr. A. Devey G2AU (hon. vice-president), officiated during the elections.

The meeting discussed future policy, and Mr. H. Porter (G2YM), secretary, Wolverhampton A.R.S., and secretary of the Association of Midland Radio Committees, then gave a short talk on the purposes of the Association, followed by a presentation to the winners of the January Top Band Contest.

THE HOUNSLOW AND DISTRICT RADIO SOCIETY

Hon. Sec.: A. Pottle, B.Sc., 11, Abinger Gardens, Isleworth, Middlesex.

THE Hounslow and District Radio Society held an interesting meeting recently when a very informative talk on "Radar Aids to Navigation" was given by Mr. K. H. A. Trott. At a subsequent meeting, the high-light of the activities was the admission of the society's first lady member, Miss V. E. Stent, of Staines. This was followed by a "Junk Sale" during which many radio components changed hands.

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).

Fitting of an "S" Meter

SIR,—I should like to hear from a reader who has fitted an "S" meter to the receiver R1224A, or anyone who has any suggestions for one.—GEORGE B. FINNEY, 124, Cross Lane, Royston, Barnsley, Yorks.

Wide-range Ohmmeter

SIR.—Many thanks for the wide-range ohmmeter circuits; it was just the thing for a novice like myself, with practically no instruments to work with, and I can recommend it for its usefulness and convenience—especially its low ranges—to even the most experienced workers.

It was a bit tricky making the shunts (from a 1,000 ohm wire-wound pot.). I made so many I'm almost an expert now. I did the last, and correct one, in about 20 minutes.

The accuracy on all ranges is very good, thanks to the conversion figures.

For a range switch I obtained a double 3-bank, 5-pos. switch, and by the addition of a single pole double-throw switch to disconnect meter from battery and S.1. to the other side of S.1. I can switch in five voltage ranges through resistors connected to the "+" high-resistance terminal.

It is already a ready made m'Ammeter—across the "low" terminals. I have now only to add a 100 mA. shunt, mark the double-throw switch ohms and mA/s and volts, and I have a good multi-range meter to cover most normal purposes.

It would be interesting to hear how other readers' instruments have turned out.

I am making the case a desk type, with a door at the back for battery changing, and a sliding panel to lift up on the back of the door to paste the calibrations on.—A. BRISCOE (Birmingham).

Electronic Organ

SIR,—I would very much like to correspond with anyone who has built an electric organ or with anyone who has any data on this subject. —B. MCGROGGAN, 52, Nansen Street, Belfast.

Mefer Resistance

SIR,—Having tried and, for various reasons, rejected nearly all the methods suggested by your contributor and readers for finding the resistance of a milliammeter, I would like to submit the following method:

(1) The formula for calculating the value of an unknown resistance when shunted across a milliammeter which has been set to F.S. Deflection by means of a battery and variable resistance is

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

when X is the unknown resistance, Rm is meter resistance, i is F.S.D. current, and I the current when X is shunted across the meter (PRACTICAL WIRELESS, December, 1948.)

(2) By substitution,

$$Rm = \frac{X(i - I)}{I}$$

and if a resistor of a known value is used as a shunt the meter resistance is easily calculated.—R. G. THOMAS (Tolworth).

Midget S.W. Two

SIR,—I feel I must thank you for the good results I have had with the Midget S.W. Two, the diagram of which you sent me last year. It was later altered slightly and I have logged around 300 calls on 10 metres and 20 metres, and all districts of U.S.A.

On Mar. 3, p.m., I was listening to what I think was VK3MM, in contact with a G2 on 20 m. I juggled with the knob for about 20 minutes, but could not be certain enough to put it in my log book. The next morning I lay in bed listening to Melbourne on the loudspeaker, approx. 8.15 a.m. Subject was Australian Economic Survey, on 11.1 Mc/s. My head was 9ft. from speaker, which was a Celestion 5in. When I first came to this street I was rather depressed at the outlook. A one-way street, a whole mass of telephone wires, and house to house relay wires. Motor car QRM, especially on 10 metres, is awful. I also picked up OX3BC, 600 miles north of Arctic Circle. Location sounded like Tulip, N.W. Greenland, this on Jan. 30th, 19 hours, 600 Wts., 20 m. He was in contact with GW4CC and G2HOP. Address, U.S. Weather Bureau, Arctic Section, Washington, 25, D.C.—A. ROBINSON (Bury St. Edmunds).

Television Receivers

SIR,—Re television receivers, I have built one using a VCR97 with approx. 980 volts on the anode, and I find the brilliance of the trace ample, providing the screen is directed away from any direct light.

I was interested to read A. S. Torrance's (W.1) letter in April's issue, and would like to see the circuit he is using, particularly the time bases, as my receiver suffers from slight trapezium distortion.

Has any reader tried mounting the tube vertically so as to use a standard console or radiogram cabinet? My intention is to experiment with this using a mirror to reflect the image. As I am well outside the television area all my activities are purely experimental, but I find great pleasure in this, and I am keenly awaiting the opening of the station at Sutton Coldfield to see the possibility of reception from this.

Hoping to see more circuits relating to Tv receivers which readers have built.—T. HILTON (Latchford, Warrington).

R1355 and Television

SIR,—The comments on my letter in the April issue of PRACTICAL WIRELESS cause me to write again.

Firstly, I did not intend to discourage people from using the R1355 for Tv. It is very suitable for Tv. after modification, but the R1355 has not got a 4 Mc/s bandwidth and I stated this fact, which no one will dispute, as a correction to statements appearing in some advertisements.

With regard to the statement that R.F. units, type 24, 25, 26 and 27 were suitable for Tv. as they stood, I was only referring to bandwidth.

Although I do not disbelieve the fact that the R1355 is suitable for Tv. I should like to accept the offer of G2ATV and 3AYA to see the R1355 in action.

There is one more point I would raise. In advertisements offering ex-Govt. apparatus I see misleading and untrue statements. Whether this is through ignorance of the truth or otherwise I would not like to say, but I often wonder.—K. BERRY (Surbiton).

Home-made Television Receiver

SIR,—I purchased a kit of parts and circuit for an ex-Service televisor last September. I looked at the circuit and discovered that I had got hold of the wrong stuff, but decided to have a go. The units are a 3118 and a 6F. I managed to get the sound on the 3118 but the picture still eludes me, and the more I read about television in your correspondence columns the more despondent I get. The letter from J. E. James, S.E.5, is the last straw. Is there anyone in the Slough locality who will come to my assistance? I might add that I am considered of average intelligence and can read and write fairly well.—P. WADE, 37, Upton Road, Slough, Bucks.

D.C. Mains Supplies

SIR,—It is with great pleasure I write to PRACTICAL TELEVISION. It sounds good, is good, to an old 1911/12 ham, gaining fresh impetus every day, and, by the arrival of another copy of our "pet journal" as the months go on, so we progress. Old hands seldom lose the fundamentals that gave such fun, but, older and wiser in other respects, we are not so clever in radio to-day. Hence my real object in writing. I, like many others tied to D.C. mains, wonder how long we shall have to curb our patience in seeking to stage our own television.—A. RALPH HALL (Aldershot).

[*Unfortunately the low-voltage mains of the D.C. type are not satisfactory for modern television equipment. Where, however, the D.C. mains are 230v. or more it is possible to make up or operate a television receiver. Series heater connections are employed. At least two commercial television manufacturers claim that their receivers will operate satisfactorily, but obviously 200 volts is rather low and we sympathise with listeners who are so situated.*—ED.]

Circular Time Base

SIR,—Mr. McDermott's article in April PRACTICAL WIRELESS reminds me of some work I did on the subject of circular time bases.

I started off with a similar circuit to that of the contributor, but my investigations were on modulating the circle. There are two methods of doing this: (1) Applying the modulation across a variable resistor in series with one of the deflector leads. This method suffers from one disadvantage: the input impedance is low, as high values of modulation resistor produce distortion of the trace. (2) Parallel modulation; the modulation is applied to one pair of deflectors in parallel with the voltage from the circular time base.

The traces produced by such circuits defy description, the most interesting traces being produced when the modulating waveform is a sawtooth wave.—FRANK F. LEE (Beverley).

Water-pipe Earth

SIR,—I read your article about the danger of using the water pipes as an earth for radio, etc. Are you aware that a well-known leading radio firm advocate the water pipe as an earth in their instruction book? The public cannot be blamed for taking notice of well-known experts, can they? One body says one thing; another says different. What are the public to do?—J. F. BIGGINTON (Ashford).

[*Follow our advice!*—ED.]

Old Receiver Performance

SIR,—In the March issue of P.W. I read in "Open to Discussion" an article from T. R. Laidlaw (Rugby) on "Old Receiver Performance." I heartily agree with him in general, but wish to make a few points. It is the British "waxed cardboard" small fixed and electrolytic condensers that I find poor and leaky, but our elect. condensers, of the *metal* type, have greatly improved in reliability during the last ten years. Small fixed condensers in *glass tubes* are first-class! American metal condensers are always 100 per cent., and cheap, and I have fitted about 10,000 without one dud, and at present several leading *British* radio manufacturers are using them in their new models. So here's hoping for more improvements and good metal condensers.—V. PHILLIPS (Newquay).

Modified A1134

(*Continued from page* 178)

General

With the key switch wired as above, positions A and B are for the pick-up, etc., and position C for the microphone. It is advisable to use screened wire where shown in the circuit, as with the fairly high gain of the amplifier instability may occur. Instability may also occur if the H.T. voltage is down or the GB voltages are incorrect.

The amplifier was used first on a magnetic pick-up, and was satisfactory although, due to the good high-frequency response, the scratch level was high. It was next used to amplify the output of an ex-W.D. 18 MK. III set. Here instability occurred, but this type of instability is easily cured by connecting both chassis by a separate earth wire.

Impressions on the Wax

Review of the Latest Gramophone Records

BACH'S Italian Concerto in F and Prelude and Fugue in B Flat have this month been recorded by Wilhelm Backhaus on *H.M.V. DB*6871 and *H.M.V. DB*6872, respectively. The Italian Concerto is conceived in the Italian taste, and was originally written for a double-manual harpsichord. Translation to a pianoforte inevitably needs some adjustment of tone, but in the hands of a fine player the contrasts in tone obtainable on the double-manual harpsichord can be conveyed, though the timbre of the two instruments is radically different. Wilhelm Backhaus' skill in reproducing for us the dynamic contrasts of the original harpsichord piece cannot sufficiently be admired.

Richard Addinsell, of Warsaw Concerto fame, has written a very attractive score for the new Cineguild film "The Passionate Friends," based upon the novel by H. G. Wells first published in 1913 and set in the time of the Boer War. The picture has been acknowledged one of the most remarkable of the year. Addinsell's music is presented attractively in this selection by Muir Mathieson and the Philharmonia Orchestra on *Columbia DX*1551.

The visit to this country by Beniamino Gigli, who has recently made an extensive tour of the provinces, has given the chance to his many admirers to see and hear him in person. His new recordings are always welcome and Melfi's arrangement of the well-known Chopin melody usually called "So Deep is the Night" makes an attractive companion to the Neapolitan cradle-song which Gigli sings beautifully on *H.M.V. DA*1892.

Another singer, also on a visit to this country, who has an equally large following is Paul Robeson, who is considered one of the finest interpreters of genuine Negro folksong. He has constantly laboured on behalf of his own people, and it is due very largely to him that Negro folksong has found a place in the hearts of countless lovers of singing. The two folksongs that he has chosen for his latest recording are "By An' By" and "Joshua Fit The Battle Of Jericho," which he sings on *Columbia DB*2505.

Josef Locke, the popular tenor, adds two more attractive titles to his many recordings. This month he sings "When You're In Love," the British adaptation of the old Mexican song "La Golondrina" (The Swallow). "Strange Music" on the reverse is the song arrangement of the Edvard Grieg melody that was such an outstanding hit in the London stage production of "Song of Norway." The number of the record is *Columbia DB*2502.

Light Music

"Violins In The Night" was specially written by conductor-composer George Melachrino for the London Hippodrome show "Starlight Roof," but has since been used as the theme of the B.B.C. Sunday evening programmes which are also entitled "Violins in the Night." This lovely melody, already familiar to listening millions, has now been recorded by the Melachrino Strings with "Midnight In Mayfair" as the coupling on *H.M.V. B*9740. This fine interpretation will be welcomed by many listeners who have requested a recording of the tune they know so well on the air.

"Hear My Song, Violetta" and "Love's Last Word Is Spoken," by Anne Ziegler and Webster Booth, is another charming record of duets for the delectation of these artists' admiring legions. George Melachrino joins them with excellent orchestral accompaniment. The two voices are ideally suited for duet work as this record proves—*H.M.V. B*9738.

Variety

"Clopin Clipant" is a French idiomatic phrase referring to a person who walks along aimlessly. This particular song tells the story of a man, disappointed in love, who is wandering along preoccupied with his thoughts. At present this unusual little number is a big hit in Paris, and now French-Canadian singer Jean Cavall introduces it to Britain on *H.M.V. B*9744. On the reverse he sings "Perhaps, Perhaps, Perhaps."

Written in 1934, "You And The Night And The Music" has lately been revived by discerning singers and bandleaders. Ray Noble's "Good Night Sweetheart," another attractive tune from the late 'thirties, is also back in demand. Both these titles have been chosen by Tony Martin for his latest recording on *H.M.V. B*9741.

Another old favourite "For You" has been chosen by Steve Conway for his new recording on *Columbia FB*3463. Joyce Cochrane's "Honey Child" is likewise suited to Steve's expressive voice. He sings it with charm and conviction to an accompaniment that is notable for its delicate string passages.

Other popular recordings are Dinah Shore singing "Steppin' Out With My Baby" and "Better Luck Next Time" on *Columbia DB*2501, "I'm In Love" and "It's You Or No One," sung by Doris Day, on *Columbia DB*2503; "Mia Mantilla" and "You Belong To Someone Else," sung by Monte Rey, on *Columbia DB*2500, and, finally, "It's Springtime Down In Lovers' Lane" and "Here Comes Me," sung by Dorothy Squires, on *Columbia DB*2499.

For his recording "Perhaps, Perhaps, Perhaps" Geraldo has employed the services of a singer whose interpretation of the lyric both in Spanish and English lends authenticity to the treatment of this beguine. He is Ivan Browne, who has also sung with bandleaders Duncan Whyte and Bob Robinson, and latterly he has been singing with Romero and his Marimba Players. The coupling on *Parlophone F*2343 is "The Crystal Gazer."

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Practical Television

Vol. 1. No. 3 NEW SERIES MAY, 1949

Some Facts About Television

AS in so many other spheres of inventions of world-wide import, Great Britain developed and perfected television. History may repeat itself as with many other British discoveries if we allow other nations to jump ahead of us, and unless the Government and the B.B.C. change their present policy of regarding television as the cinderella of the radio world, within a couple of years we shall be much behind America and certain other Continental countries. The first television service in the world commenced in London in 1936. It was closed during the war and re-opened in 1946. The second broadcasting station in this country will be opened at Sutton Coldfield sometime toward the end of this year.

But in the United States there was no public television service before 1946. In that country it is a comparatively new science and the vigour which the Americans put into any new venture is not lacking in their attack on the television market. This means that England can be left behind. For example, there are already more than 30 television stations in America, and these have been erected within the comparatively short space of two years. The chairman of the U.S. Communications Commission recently stated that there will be 400 television stations operating in the United States by 1950. By that time we *may* have two stations working. He also estimated that within seven or eight years there will be over 1,000 television stations operating in the United States.

Notwithstanding our long start, we have to date only just passed the 100,000 mark in television licences, which means that approximately that number of sets has been sold. In America it is estimated that at the end of 1948 more than 1,000,000 homes, clubs, and public places had television sets. According to authoritative estimates it is predicted that by 1955 there will be 17,000,000 television receivers in use in America.

Such figures as these should stimulate the British Government and the B.B.C. into action. The industry can do nothing of its own volition to enhance our status. Another point. We are by no means satisfied that the B.B.C. has the best television technicians or the best producers. There is much criticism of the poor nature of the programmes, and it would appear that the television department of the B.B.C. is as haphazardly run as was the B.B.C. a few years ago. In our view the television service should be taken right away from the B.B.C. and operated as a separate entity, and free from the influence, not always good, of the British Broadcasting Corporation. Unless this is done, the television service will be hamstrung by the effete methods of the B.B.C., which have been so severely criticised in Parliament and in recent books. Only by a complete separation of the services will television develop and the right type of person be attracted to it.

Now let us take a look at British television receivers. They are undoubtedly good, but the manufacturers do not seem to have an abiding belief in their wares if the guarantee issued with television receivers is any indication of their confidence. The television tube, for example, which is the most expensive part of the receiver, is guaranteed for only six months, and the valves for three months. Of what value is it therefore to the public to advertise a receiver as being covered by one year's guarantee when the parts most likely to give most trouble are expressly elided from it? F. J. C.

Telenews

Television Grows

IT is stated that about one third of the population of Britain will be within the range of television programmes by this autumn, when the Midland station is in operation.

Unlicensed Receivers

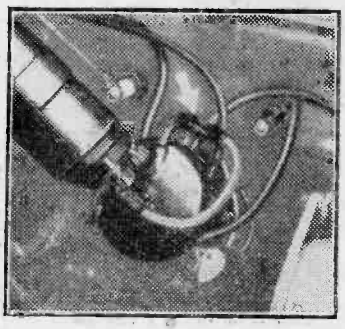
A CHECK-UP shows that far more television receivers have been sold than the number of licences issued. This does not take into account the large number of home-constructed receivers.

Receivers Forbidden

A REPORT from Detroit states that the Housing Authority have prohibited the purchase of television receivers on the ground that the money should be put towards the purchase of the tenants' homes.

Midland Conference

A TELEVISION conference for dealers in the Midlands was held on March 23rd last. A series of 15-minute talks was arranged by members of the BREMA Television Promotion Committee.



Note the suppressor fitted to the coil lead on this engine.

Underneath the Dipole

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

"SPEAK UP!" shouts a man at the back of the hall when a speaker on the platform fails to make himself heard clearly. If the meeting happens to be a political one the speaker will probably reinforce his arguments with a little electronic amplification. The experienced politician realises that a good public address equipment enables him to increase the range and volume of his rhetoric. He purrs, whispers, expands, shouts and thunders to his heart's content, confident that every syllable is either soothing or lashing his long-suffering audience. But not always. Sometimes the P.A. system leaves much to be desired both as to volume and quality, not to mention parasitic noises, and then the audience sighs with relief when he pushes the offending microphone on one side. Providing his voice production is good and his diction clear he will probably satisfy his audience.

Acoustics

Good diction is of vital importance in the theatre or music hall or in radio plays. The music halls on the Moss and Stoll circuits designed by Frank Matcham are notable for their fine acoustic qualities, and there is little excuse for the persistent use of the microphone. At the Finsbury Park Empire, for instance, a well delivered "stage whisper" can be clearly heard at the back of the gallery, and many experienced old-timers at this hall request the stage manager to cut the foot-light microphone while they are on the stage. Frank Matcham made great use of plaster ornamentations and figures, and these, together with well-proportioned halls, gave results rarely attained in the more recently built music halls and theatres, where the plain walls and hard surfaces introduce echoes, blind spots and excessive reverberations.

Seeing and Hearing

The producers of radio plays are insistent upon clear diction, doubly essential when the speaker's face cannot be seen. Television and film producers are not so particular, and some of them go so far as to instruct the artistes to "throw lines away" deliberately in their quest for "naturalness." Slovenly slurring speech and dialects which are incomprehensible are permitted and even encouraged. Actors walk about the sets, talking as they bend down to stoke the fire or look in a cupboard, to the consternation of the sound men, who are unable to manoeuvre the microphone into suitable positions. The old school of stage voice-production evolved methods of turning the head towards the footlights at the time of speaking, concealing with other actions or "business" the contrived movement which ensured that every word could be clearly heard.

Television play producers, please note! Actors should be heard as well as seen!

Continental Television

It will be some considerable time before the Continental standard of 625 lines, positive modulation, is in general use. Sir Ernest Fisk, Managing Director of E.M.I. has corrected a Press report that British manufacturers are going ahead with the design and production of television receivers for this standard. He points out that, with the exception of a 425 lines transmission from Eiffel Tower, there is no television transmission on the Continent. This does not take into account the irregular experimental television transmissions on 819 lines, also from the Eiffel Tower, or the Phillips experimental transmissions on 525, 625 and 819 lines in Holland. A friend of mine who recently returned from Holland mentioned that he had seen these transmissions, and that there was little to distinguish them from our 405 lines quality, with the exception of the 819 lines picture. This, he said, was as good as the normal cinema film projector, when seen on "closed circuit," but that the range was limited.

Musical Comedy

Cicely Courtneidge and Jack Hulbert scored a big success with the television edition of their musical comedy "Under the Counter." Cicely seemed to be thoroughly at home in front of the Emitron cameras. In several of the musical numbers the cameras remained static while Cicely moved and danced through the chorus players from extreme long-shot to head close-up. There was no slurred diction in this show even if there were a few slight "fluffs," but the professional precision of all the artistes of a large cast ensured a smooth passage. Jack Hulbert, Cicely Courtneidge, Adele Dixon and Thorley Walters led a fine company, and the music was tuneful and pleasing.

Magnetic Recording

The necessity for recording both the picture and sound of television programmes has been appreciated for a very long time, ever since the earliest days of television. Even on the pioneer low-definition mechanical transmissions of John L. Baird, the comparatively low frequencies concerned made it possible to record a picture on a wax disc or a cylinder. Recording of these early low-definition pictures has also been made on the sound track of a film and played off and reproduced later as a picture. More recently, on high-definition television, the recording of the picture has been carried out by photographing the picture on to a standard 35 mm. cine film travelling at 25 frames per second. This has not resulted in a true representation of the original television picture since only one half of the interlaced lines was, in fact, photographed, and the resultant definition was equivalent to about 186 lines. Various optical and mechanical methods have been employed to eliminate this defect so that the full value of the interlacing was recorded. An obvious method is to increase the speed of travel of the film so that 50 exposures a second are made, but this is an expensive way out of the problem.

The recording of the sound side of television has been less difficult since discs, film or magnetic tape have been available; but problems of synchronisation have necessitated that the sound recording

medium will interlock continuously with the picture medium. If, therefore, a cine film is used for recording the picture it is convenient for the sound track to be at the side of that picture, in the same way as it is in normal film projection. If the sound is separate from the picture then the tape, or whatever other form of recording is used, should be perforated in such a way as to ensure continuous synchronisation with the picture.

Recent developments in magnetic recording seem to offer a solution. During and since the war big advances have been made in the use of magnetic tape and wire recording, and by the use of high speeds of travel, very high-quality results can be obtained. It is probable that magnetic recording on cine film travelling at the rate equivalent to 25 cine frames per second will appeal to television engineers as a less expensive way of obtaining synchronous sound than the normal photographic method. Magnetically coated sound film can be used, and there is space on a 35 mm. film to accommodate several such sound tracks. These tracks can be wiped out and the film used again and again for subsequent recordings. It is within the bounds of possibility, however, that by running magnetic tape at an extremely high speed supersonic recordings could be made, and this might make it possible for both picture and sound to be recorded on the same piece of tape.

H.M.V. Television Model 1807

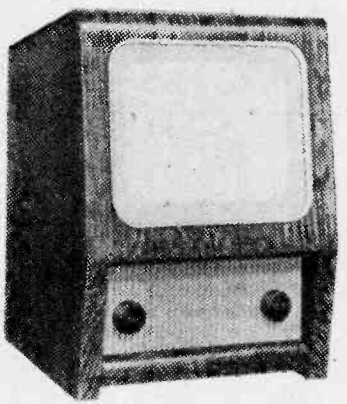
A New Low-price Receiver With Some Novel Features

TO bring television within the reach of a larger public, H.M.V. have now produced a table model receiver at 36 guineas. This receiver has a number of novel features, perhaps the most important being the brilliancy of the picture. As most readers know, there is often difficulty in the home in deciding whether or not to use a receiver when the programme being radiated only interests one member of the family. Another may wish to work, probably the wife has some needlework to do and requires good lighting. In some cases this means that the receiver cannot be used, as the picture would be too dark for comfortable viewing. It is, of course, often possible to compromise by using table or standard lamps, but the new aluminised 10in. tube used in this new H.M.V. model can be viewed quite comfortably in normal domestic room lighting or daylight, and it is claimed that it is twice as brilliant as normal tubes.

The actual chassis is very small, and compactness has been obtained by dispensing with the E.H.T. transformer and other features. The E.H.T. is generated by the line fly-back, and a metal rectifier is used for the normal H.T. supply. Dealing with the receiver from the aerial onwards, we find the following features.

Circuit Details

The vision receiver is of the T.R.F. type, with single (lower) sideband tuning. Two commoned R.F. stages are used for sound and vision. In addition to interference-suppressing circuits there is also a tube feed arrangement which helps to reduce "flutter" due to aircraft reflections. The tube is cathode modulated, and the time-bases utilise blocking oscillators, whilst, as already mentioned, E.H.T. is derived from the line fly-back. An interesting innovation in this part of the circuit is the provision of a variable control in the E.H.T. supply which is used, in conjunction with a permanent magnet, as a focusing control. The magnet gives the main focusing of the beam, and modification of the E.H.T. enables a fine adjustment to be made. There are no linearity controls in either of the time-bases, but the usual "pre-set" controls for line and frame hold, width, height and contrast are fitted at the rear of the instrument. The sound section is quite standard.



The new H.M.V. model. Note the neat lines of the cabinet.

Valves used are Z77's for the common R.F. stages, I.F., V.F. amplifier, and sound output; D77 for vision detector, DH77 for sound detector and A.F. amplifier, Z63 for sync separator, B36 for frame and line oscillators, KT33C from output. KT36 for line output and U35 and U31 for rectifiers.

The dimensions of the cabinet are: height, 19½in.; width, 13¾in.; depth, 19in. (including tube base shield) and the base of the cabinet is 13¾in. wide and 14½in. deep.

The receiver may be operated on A.C. or D.C. supplies, and the consumption is approximately 130 watts.

Telenews

Mullard Projection Tube

SHOWN for the first time at the Radio Component Manufacturers' Exhibition in London recently was a projection C.-R. Tube from the Mullard factory. It is understood that this will go into limited production shortly.

Oil Company Fits Suppressors

ALTHOUGH motor transport operators are not yet required by law to fit suppressors to their vehicles to minimise interference on television screens, Anglo-American Oil Company, Ltd., are now adding these devices to their vehicles operating in London and the Home Counties. When this work has been completed, no less than 2,600 of the company's vehicles throughout the country will be fitted with suppressors.

Office Television System

THE use of television to perform the dangerous task of observing a rocket motor in action was heralded a year ago as a new application of television. To-day in America a number of manufacturers of standard aircraft motors view the first run of each new model with a camera mounted on the rim of the test pit rather than let engineers run the risk of the occasional mechanical failure or explosion.

In the office-industrial field, a complete set of equipment is now commercially available. Known as the Vericon portable television system, it provides means for linking all parts of a large industrial establishment together by visual communication.

The Vericon consists of three units: the camera, the pulse-power unit, and the receiver (called by its manufacturer a monitor or viewer). Extension viewers up to the number of ten can be installed, so that the same scene or operation can be viewed from a number of points if desired.

The camera weighs 31½ lbs. and can be mounted in any position. Heaviest of all the units is the power supply. It weighs 49 lbs.—still quite portable. The 42-lb. viewer or receiver completes the equipment.

Video signals are transmitted on co-axial cable from the camera to the viewer, which may be as much as 4,000ft. away. This distance is, of course, sufficient for practically any industrial plant or office combine. Since there is no radio-frequency transmission, the equipment is much simpler than the standard televiser, requiring only video and sweep circuits.

Readers will think immediately of a number of applications for such a system. Classroom instruction, especially where demonstrations are given, is one of the most important. In the usual demonstration only about a dozen students are able to get a full idea of what goes on. It was possibly for this reason that the value of television in bringing surgical operations to the view of an unlimited number of students has been so widely publicised.

Retail merchandising—the televising of store scenes to a show window—is another possibility for large-scale use of wired-television equipment. The watching of hazardous operations has already been mentioned. Another important industrial use is watching various parts of a complex operation simultaneously, for example, along a conveyor belt. Traffic in tunnels or over bridges might well be regulated with a battery of television cameras set up to view strategic points and transmit their images to a central control station.

Television has been used for scanning cheques in a bank—providing for the instant transmission of the signature from the clerk's window to a point where it can be compared with an authorised signature by a qualified expert. This system might well be applied to all records in certain extensive offices where various branches might want to see the same letters or documents. All records could be placed in a central file room, equipped with one or more cameras. Should the record be required in any office, the filing clerk need only place it before the camera and leave it there as long as required by the employee or executive calling. This would make records available more rapidly and greatly reduce the danger of losing documents.

The non-entertainment aspects of the freer type of television—transmission through space instead of along a co-axial cable—have developed greatly in the past year, particularly in the military field. Ultrafax is also an example of the use of television, or at least of techniques developed by television. Employment of television in law enforcement, as a means of broadcasting pictures of missing persons and finger-prints of wanted criminals, has also progressed. But it is extremely likely that video signals transmitted along co-axial cables will prove to be the form of television best adapted to industrial and commercial applications.

(*Radio Electronics*)

New B.B.C. Mobile Equipment

NEW mobile television equipment, manufactured by Pye, Ltd., is now being used by the B.B.C. This control room is one of three that the B.B.C. ordered recently from Electric and Musical Industries, Ltd., and from Pye, Ltd., to replace the original equipments, which have been used for outside broadcasts almost since the start of the television service in 1936.

The mobile equipment consists of a trailer, pulled by a mechanical horse, in which is installed all the apparatus that is needed for televising outside broadcasts. The vision signals, complete with synchronising pulses, are sent over special cables, or by radio, to Alexandra Palace, where they are broadcast in the normal way. The apparatus is usually operated in the trailer, but is so designed that it can readily be taken out and assembled at any convenient point close to the camera positions whenever the trailer cannot be placed near enough.

Up to three cameras, Pye "Photicons," can be used simultaneously in conjunction with the mobile control room. These cameras have electronic viewfinders, consisting of a small cathode-ray tube on which is displayed the picture as televised by the camera. The cameraman has an immediate choice of four lenses, each of a different focal length, any one of which he can quickly select for use by rotating the turret assembly in which they are mounted. Cables connect the cameras to the control room apparatus, where the picture from each of them is displayed on a separate monitor tube. One operator looks after each camera channel, and a fourth operator, working under the producer's direction, selects whichever of them is wanted for transmission and makes the change-over from one camera to another. The producer, besides being able to see the picture from each camera, can speak to the cameraman over a microphone connected to the head-phones which they wear, and so pass directions to them. The control room is equipped with a receiver and aerial for picking up the television programmes broadcast from Alexandra Palace.

Practical Wireless
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Battery Hall-Mark 4 (HF, Pen, D, Push-Pull)	—	PW46*
"Acme" All-Wave 4 (HF Pen, D (Pen), LF, Cl. B)	—	PW83*
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A.C. Leader (HF Pen, D, Pow) ..	—	PW35C*
D.C. Premier (HF Pen, D, Pen) ..	—	PW35B*
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F. J. Camm's A.C. All-Wave Silver Souvenir Three (HF Pen, D, Pen) "All-Wave" A.C. Three (D, 2 LF (RC))	—	PW50
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Experimenter's Short-wave Three (SG, D, Pow)	—	PW30A*
The Prefect 3 (D, 2 LF (RC and Trans))	—	PW63*
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MISCELLANEOUS		
Blueprint, 2s.		
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SPECIAL NOTICE

THESE blueprints are drawn full size. The issues containing descriptions of these sets are now out of print, but an asterisk beside the blueprint number denotes that constructional details are available, free with the blueprint.

The index letters which precede the Blueprint Number indicate the periodical in which the description appears: Thus P.W. refers to PRACTICAL WIRELESS. A.W. to *Amateur Wireless*. W.M. to *Wireless Magazine*.

Send (preferably) a postal order to cover the cost of the Blueprint (stamps over 6d. unacceptable) to PRACTICAL WIRELESS Blueprint Dept., George Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2.

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