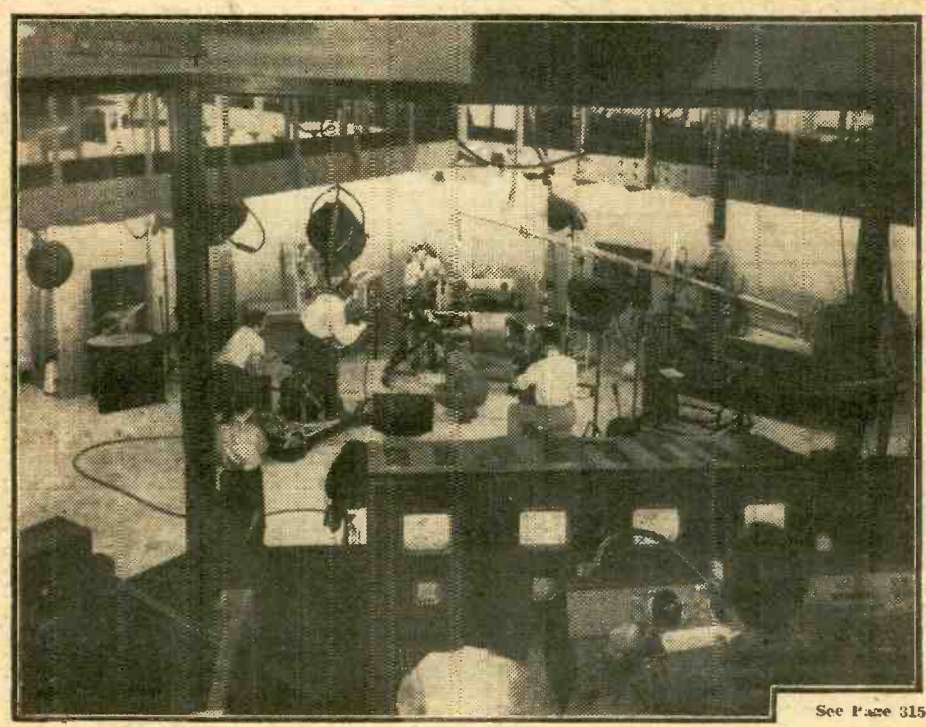
9D EVERY MONTH

Practical Wireless

AND PRACTICAL TELEVISION

Vol. 25, No. 517. || Editor: F. J. CAMM || AUGUST, 1949



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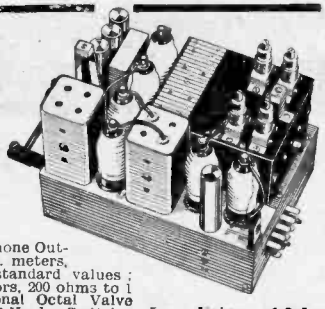
PRINCIPAL CONTENTS

6 VALVE SUPERHET



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Practical Wireless
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17th YEAR OF ISSUE
EVERY MONTH
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Editor F. J. CAMM

COMMENTS OF THE MONTH — BY THE EDITOR

Retail Price Maintenance

THE report of the Committee on Retail Price Maintenance proposes some sweeping changes in existing methods used by some trades in connection with price maintenance. This Committee was set up by the Board of Trade in August, 1947, and the President of the Board of Trade proposes to implement recommendations made by the Committee. The report reaches two main conclusions. The first is that *no action should be taken which would deprive an individual producer of the power to prescribe and enforce resale prices for goods bearing his brand.* The proviso is added that this power must not be used to obstruct development of particular methods of trading, nor may it impede the distribution of competitive goods made by another manufacturer. More important, it must not deprive the public of improvements in distribution.

The second recommendation is that steps should be taken to render illegal the application of sanctions which extend beyond the remedies open to an individual producer for any breach of resale price maintenance conditions. Presumably this is referring to price-fixing by rings or cartels, who collectively agree on a certain price for a certain commodity irrespective of manufacturing costs, thereby avoiding cut price competition. Secondly, it would appear to suggest that the present stop list employed in some industries would be made illegal.

The legal position, however, on such practices is very clear, and existing laws provide a remedy for any trader who feels aggrieved by the unfair application of the stop list. In fact, it is the law at present that any action which is in restraint of trade or which deprives a man of the means of earning his livelihood is illegal, and it has been argued in the Courts that the stop list is an illegal document.

The President of the Board of Trade recently stated in Parliament: "The Government have considered these conclusions and propose to take the following action upon them.

"In consultation with the Ministers concerned I shall invite the principal trade organisations involved to consider the most satisfactory means of ensuring that price maintenance by individual producers shall not injure the interests of the consumer. *In these discussions, I shall make it clear that discriminatory restrictions against consumer dividend or discount systems employed by the Co-operative Societies and others must be abolished,* and that the public must be allowed to reap the benefit of low-cost methods of distribution by way of reduced retail prices.

"*The Committee's second main recommendation, for the abolition of collective resale price maintenance, is based on evidence of the existence of a widespread system of trade association controls, whose scope, complexity and cumulative restrictive effects may surprise even those with long experience in the distributive trades.*

"This evidence should convince manufacturers and traders that their own interests, as well as those of the country, will be best served by freeing distribution from the many self-imposed restrictions and controls described in the report. I hope indeed that in the next few months we shall see industry itself taking steps to this end. *I must make clear, however, that, although we have every reason to hope for the co-operation of industry in this matter, the Government are fully determined to ensure that the general public shall not suffer from the private restrictions of price competition.*"

The decision that discriminatory restrictions against consumer dividend or discount systems employed by the Co-operative Societies and others must be abolished will no doubt be hotly debated. It has always been felt that the Co-operative system of giving dividends on price-controlled goods was a system of price cutting. Many firms refuse to supply the Co-operative Society with goods except under a price maintenance ex-dividend agreement. The Committee's decision on this point may mean that groups of traders or even of individuals may get together and form local co-operative societies, giving bonuses or dividends to their customers. If the Committee therefore is in favour of price maintenance, it is incompatible that it should almost in the same breath agree to a system which actually enables a fixed selling price to be reduced.—F. J. C.

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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 ending April 30th, 1949:

Region	*Number*
London Postal	2,214,000
Home Counties	1,589,000
Midland	1,660,000
North Eastern	1,826,000
North Western	1,522,000
South Western	1,021,000
Welsh and Border	697,000
Total England and Wales	10,529,000
Scotland	1,102,000
Northern Ireland	192,000
Grand Total	11,823,000

This total includes 133,250 television licences—an increase of 6,750.

Sixteen hundred prosecutions for wireless licence offences were authorised during April including a number for operating television receivers without licences.

Motorists are reminded that it is necessary for them to take out a separate broadcast receiving licence for a wireless set fitted in a motor car.

The Radio Industries Club

AT the Annual General Meeting of the Radio Industries Club the election of Lord Burghley, K.C.M.G., as President was confirmed with acclamation. The postal ballot to fill four vacancies on the committee resulted in the following (in alphabetical order) being successful: Messrs. H. A. Curtis, G. R. Fountain, E. M. Lee and J. G. G. Noble.

At the first meeting of the new committee the following officers for 1949/50 were elected: chairman and honorary secretary, W. E. Miller; honorary social secretary, F. H. Robinson; honorary treasurer, Owen Pawsey. Mr. H. de A. Donisthorpe and Mr. A. J. P. Hytch were co-opted to the committee for the ensuing year.

Radiogram on "Brisbane Star"

FOLLOWING up a recent installation of a "His Master's Voice" radiogram in the Blue Star liner *Brisbane Star* the Sound Amplification Division of E.M.I. Sales and Service, Ltd., have added a special amplifier and eight extension speakers to this instrument. This is to enable radio and gramophone programmes to be received in the officers' messes and crew's quarters. The success of this installation has resulted in orders for similarly equipping three other passenger ships of this line.

Long-distance Tv.

IT is reported from Dar-es-Salaam that Mr. T. O. Hamlyn, the Resident Magistrate there, has succeeded in picking up the television transmissions from the Alexandra Palace transmitter.

British Standard for Capacitors

IN response to a request by the Ministry of Fuel and Power the British Standards Institution has just issued a British Standard for the construction of capacitors primarily intended for incorporation in intrinsically-safe circuits.

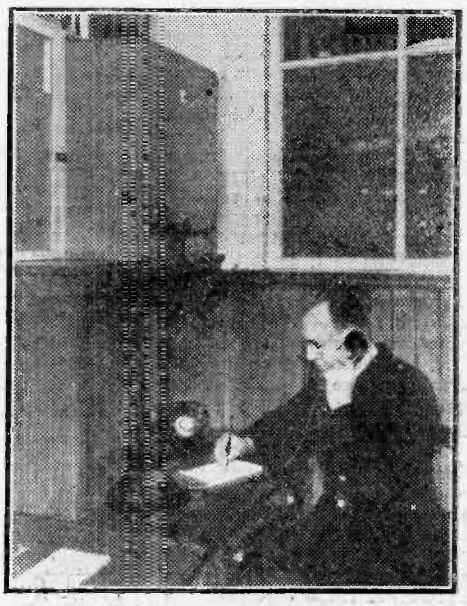
At the time that the Ministry of Fuel and Power's request was made, small capacitors were chiefly used as a means of spark suppression in remote-control circuits which were designed to be intrinsically-safe in accordance with the definition of that term given in B.S. 1,259, Intrinsically-safe Electrical Apparatus and Circuits.

As an outcome of recent research, however, alternative methods of spark suppression have been found for such circuits but there are other applications such as the coupling of an intrinsically-safe telephone circuit to the G.P.O. system. The capacitors for such a use are covered by this new standard, which deals with the dimensions of the containers and gives full details of tests.

Copies of this standard may be obtained from the British Standards Institution, Sales Department, 24, Victoria Street, S.W.1, price 2s. post free.

Safe Gun

IT was recently disclosed that the Americans have perfected an anti-aircraft and anti-tank gun which will not fire on friendly craft. No doubt based on the British I.F.F. used during the war, the gun is probably controlled by a radar system, but no official details have been released.



The 10-watt F.M. transmitter receiver is as simple to operate as a normal telephone. See story on opposite page.

Sound Equipment in the Newspaper Industry

THE G.E.C. sound installation at Kemsley House Manchester is typical of the Company's specialised study of the requirements of the newspaper industry and embodies three distinct features. There is first, a main 150 watt amplifier for general staff location and "music-while-you-work." Secondly a separate circuit relays all B.B.C. news bulletins automatically to the editorial offices and, thirdly, a small 14-watt amplifier enables football results, etc., to be relayed direct to linotype operators, who receive the news on headphones.

V.H.F. Traffic Control

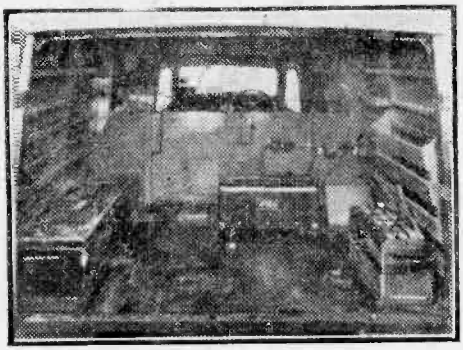
GLASGOW Corporation Transport Department have installed a 10-watt F.M. transmitter-receiver of G.E.C. design for use in controlling the public vehicle traffic of the city. The equipment is extremely simple to operate and is very small in size so that it may be housed in the Corporation's traffic control vans and still leave ample room for breakdown tools and other equipment.

Ekco Works at Hadleigh

E. K. COLE, LTD., purchased the Public Hall, Hadleigh (near Southend), in 1946 for immediate use as a stores and for subsequent use as a radio assembly factory when circumstances should warrant this. Due to the increasing television production being undertaken at the main Southend factory, it is planned, in the near future, to assemble some radio sets in the Hadleigh premises for the home and export markets, and whilst only a few local employees will be required in the first instance, it is hoped that ultimately this factory will absorb over 100 employees from the locality. This factory will be controlled and fed with supplies from the main works at Prittlewell, Southend.

New Eastern Transmitter

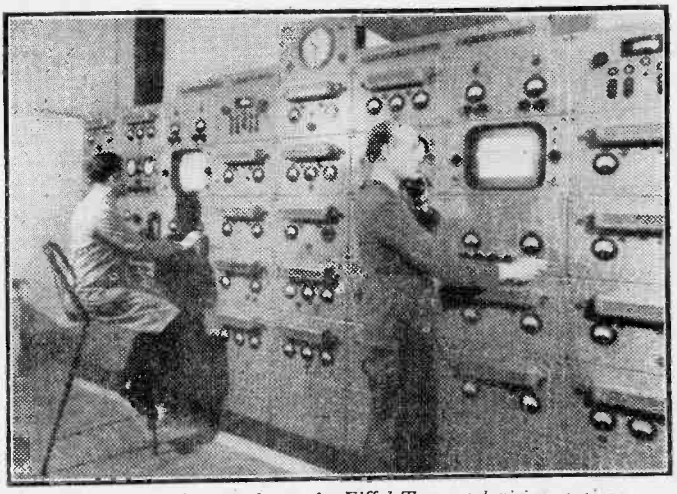
THE B.B.C. transmitter to cover Norwich and the surrounding district was opened in June. It has taken over the Midland programme, and although remaining on its original wavelength of 296 metres (1,013 kc/s), the power has been increased to 5 kW. and has a much more efficient aerial system.



The Glasgow traffic control vehicle with the equipment in position.

Ekco V.H.F. Salutes Maiden Voyage

EKCO engineers in co-operation with Southend Flying School made an interesting contribution to the Ceremonial Maiden Voyage of the new Eagle steamer *Queen of the Channel* on Whit-Sunday.



Main transmitter racks at the Eiffel Tower television station.

Three aircraft flew over the vessel as she left Southend Pier, and by means of Ekco aircraft communication equipment the leading pilot exchanged goodwill greetings with the Captain and crew. The passengers and crowds on the pier were able to hear the conversations amplified on the vessel's P.A. system.

Police Test Tyres to Check Background Noises

THE improvement of car radio when running on non-static tyres in dry weather has been checked at Fort Dunlop in a series of tests which are continuing during the summer.

The tyres are made from conducting rubber which continuously discharges the static electricity as it accumulates on them and on the car body. A car fitted with these and with standard tyres run on a moving roller machine at 30 m.p.h. showed a decrease of electricity from 3,000 to 200 volts, and of 6 decibels in background noise on the radio.

User tests in normal running include one by a mobile police car in the Midlands which reported a noticeable reduction in background noise.

Cinema and Television

IN the view of the American Society of Motion Picture Engineers the cinema and television are so closely allied that it is proposed to change the name of the organisation to the Society of Motion Picture and Television Engineers.

Using the Oscilloscope—6

The Cathode-ray Bridge Null Indicator

By H. R. McDERMOTT

DURING the last few years, the amateur has become nearer to his professional counterpart in many ways. Indeed, there are many amateurs who are professionals—if we can say such an "Irishism." Specialised test gear, from war surplus, and a higher standard of radio knowledge have both helped in the change, and oscilloscopes and wobbulators are now more or less part of everyday life. Anyone contemplating using such gear prior to the war was looked on as a budding Marconi or Hertz—how times change!

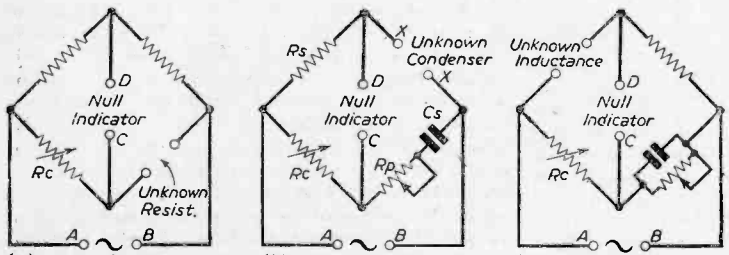


Fig. 1.—Three bridge circuits; (a) resistance, (b) capacity, and (c) an inductance bridge.

I have spoken to a number of amateurs on the subject of a C.R. bridge null indicator with surprising results. Almost all of them fought shy of the idea, apparently putting into practice the maxim that All Unknown is Best Left Alone. The fact is, however, that such a null indicator is really a special purpose oscillograph.

A null indicator is, as the name suggests, a device for indicating null or zero in a particular circuit. In the less costly commercial instruments they usually take the form of a "magic eye" tube or a meter with associated amplifier circuit, but, as we shall see, these are at a disadvantage when we compare them with the cathode-ray tube used as such. The magic eye opens or closes for null indication whilst the meter peaks maximum or minimum. Now, if you posses an instrument such as a resistance capacity bridge with magic eye indicator, you will have observed that when a poor condenser is examined, the eye will not indicate the precise point of balance unless the power factor of the condenser is balaneed by adjusting the instrument power factor control. Again, if you test a capacitance with an appreciable inductance it will be found that the magic eye will not under any circumstances balance properly; this is because of the inductive reactance being incapable of being balanced out by the bridge. Similarly, chokes and coils with appreciable self capacity will not balance properly on an inductance bridge and will not yield any easily interpretable results. All of these drawbacks are overcome in using the cathode-ray tube as null indicator. It is possible to observe quite small reactive elements, i.e., inductance or capacitance, present in the component or circuit being examined. These latter effects are cases where balance is indicated by the normal methods but does not really exist, as the cathode-ray tube shows.

The Indicator

The circuit is fairly straightforward, consisting of two R.F. pentodes each used as an oscillograph amplifier, one vertical and one horizontal. The inputs to the amplifiers are obtained from the bridge circuit in use, the three most used bridges being shown in Fig. 1. Fig. 1a is the Wheatstone resistance bridge, 1b, the Wien capacitance bridge and Fig. 1c, the Maxwell inductance bridge. Rc is, in all cases, the calibrated variable resistance, calibrated according to the bridge, i.e., in bridge (a) its dial is marked in ohms, in bridge (b) in Farads, and (c) in Henries. Terminals A and B (Fig. 1) are connected to a source of alternating e.m.f. of amplitude about one volt. Certain A.C. bridges using magic eyes as indicators have about 50 volts input, but in our case, the amplifiers are designed to operate at low level with resulting increased sensitivity. The frequency of input is not critical and 1,000 cycles is a much used value although the 50-cycle mains can be used with good results.

The method of connecting the bridge, null indicator and oscillator is shown in Fig. 2. The transformer T is needed unless the bridge happens to be of the type employing such a component. This transformer may be of the intervalve type with the low-resistance side connected across the oscillator output terminals. It's ratio is not of vital

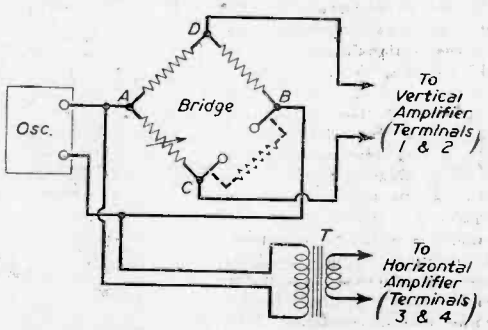


Fig. 2.—Connections for a bridge, null indicator and oscillator.

importance and anything from 1 : 1 to 5 : 1 may be used.

The trace produced on the cathode-ray tube screen is formed by the inputs to the vertical and horizontal amplifiers. When the bridge is normally balanced there will be no voltage present across the points C and D (Fig. 2) and therefore no alternating e.m.f. applied to the vertical amplifier input and accordingly no vertical component on the cathode-ray tube screen. In the case of the resistance

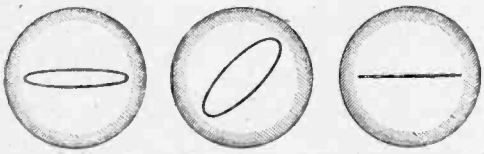


Fig. 3.—Typical null indicator traces. (a) balance, (b) unbalance, (c) balance.

bridge, when measuring a good resistor, this means that there will be only a horizontal deflection in the form of a straight line on the screen. With the other bridges, the horizontal trace may be in the shape of an ellipse, depending on the inductive or capacitative elements remaining unbalanced; or again, if the resistor of the first case, say a wire-wound one, has considerable inductance or capacitance then the picture on the screen will not be a perfect horizontal line but probably as Fig. 3a, a long narrow ellipse. Such a resistor would usually be undesirable in radio frequency circuits.

Circuit Details

V1 and V2 are 6J7 pentodes used as class A amplifiers and feeding the 1½in. tube with vertical and horizontal deflecting voltages. The anode supply is well decoupled by the R.C. combinations R5C3 and R6C7. The amplifiers are straightforward in design and conform to standard practice in having the cathodes by-passed by a large capacitor in order to preserve a good low-frequency response. The amplifier outputs are fed via 0.02 μF. coupling condensers C12 and C13 to the X and Y plates of the miniature tube. The diameter of the tube is, by the way, quite ample to observe the various patterns obtained. The main departure from standard practice is in the power pack, all voltages being obtained from a normal 350-0-350 replacement mains transformer and one rectifier. The voltage applied to the amplifier circuits is tapped off from the top of R13 and the bottom of R12, and so the centre tap of the transformer H.T. winding is not at earth potential as is usual, but negative with respect to earth, and it is this voltage which is fed to the tube modulator grid, via R11. This latter component forms the brilliance control for the C.R. tube. The full output votage available from the power pack is applied to the C.R. tube, and various intermediate voltages are available from the potential divider R11/R14. A point to watch is that as C9 and C10 are not directly earthed, their common metal container must be isolated from earth; a few turns of empire tape will suffice.

The cathode-ray tube used in the original instrument was a surplus American type 913 with octal base, but the G.E.C. type E-4103-B-4 will do the job just as well and is easier to obtain. This latter tube has a British 9-pin base.

The smoothing choke used was a standard 20 Henry 70 mA. type, and it will be noted that C11, 0.15 μF. is in parallel with it. It was found, using oscillograph technique, that the A.C. ripple was almost non-existent when this was done, indicating that under operating conditions the inductance of the choke was actually 17 Henries, as it resonated at 100 cycles (the ripple frequency) with C11. All condensers are normal 500-volt types. The wiring of the unit may be carried out in 22 S.W.G. copper with insulated sleeving. This is semi-rigid and easily workable. If desired, the

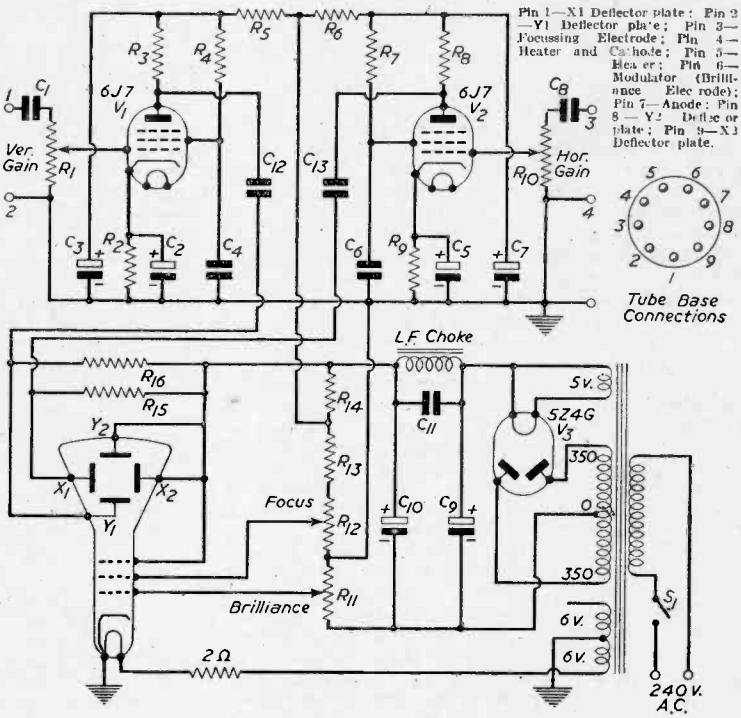


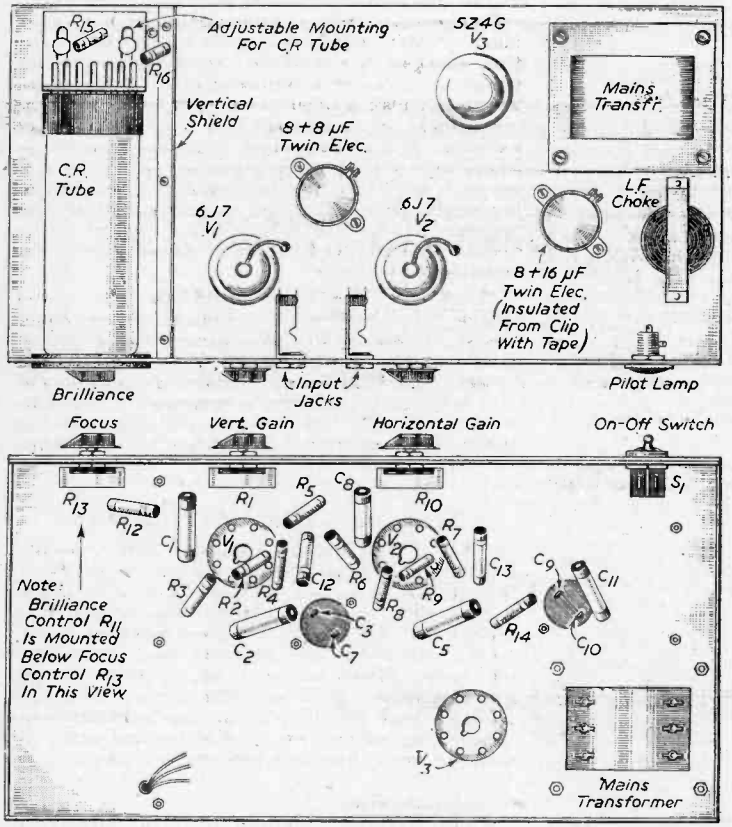
Fig. 4.—Circuit of the null indicator. When using a 913 Tube the 2-ohm heater resistor is not needed.

input jacks could be done away with and four terminals substituted.

The oscillator may be dispensed with by using a small heater transformer (see Fig. 7), a 50-ohm variable resistor connected across its terminals, and with the output obtained from one side and the moving arm. The latter is moved about a quarter of its travel so as to give just over 1-volt output for feeding to the bridge circuit. The instrument heater supply should not be used unless there is a separate heater winding (not earthed, and used only as oscillator) available.

Construction

The chassis diagrams are shown in Fig. 5. It is constructed entirely of aluminium with the exception of the vertical shield, which is of steel. This was found necessary in order to remove the last trace of interference due to the very large field of the mains transformer; as long as the transformer is eight or more inches away from the tube all will be well. The mounting of the C.R. tube employs an aluminium bracket with two slots as its base in order to slide the tube to and from the panel. The tube is also rotatable in its mounting by means of two further slots at the tube-holder, as in Fig. 6; this is necessary in order to set the trace exactly level. The tube is rigid in its mounting, as it is pressed tightly towards the front panel by the adjustable bracket. To prevent the tube being damaged by this process, and also to improve the appearance of the edge of the panel opening, a plastic washer, rather like a very large grommet, is pressed into the opening. This washer is obtainable from most garage spare-part stores, and is called a plastic oil retaining washer, being used in the hub assemblies of many cars. If the washer you purchase is rather large, remove the spiral retaining spring and cut the washer to fit exactly the panel opening, carefully match the cut ends and cement to the panel with rubber solution; cellulose cement may be used but it is inclined to crack with age and so become loose.



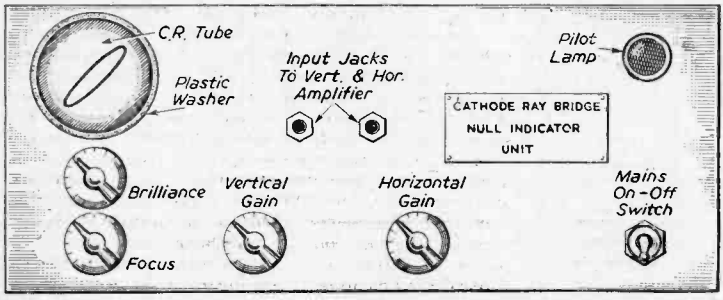


Fig. 5.—Above chassis, under chassis and panel layout details.

Before dealing with the operation of the instrument, it will be as well to refer again to the cathode-ray tube. The G.E.C. tube has its final anode voltage rated at 400 volts minimum, but in the sample examined it operated very well on the 360 volts available. If this is used, it will be necessary to provide a source of heater current at 4 volts; a two-ohm resistor may be put in series with the 6-volt supply available, or a separate 4-volt winding used. The resistor, if required, may be made from a small piece of fire spiral element, sprung between two insulated tags.

Operation

With valves and tube in position and having double checked the wiring, switch on the instrument and allow a few minutes to warm up.

Turn the amplifier gain controls to maximum and adjust brilliance and focus controls for a sharp spot on the screen of the C.R. tube. Next, touch the vertical amplifier input terminal and a bright vertical line will be visible on the screen, that is, if you have the wiring the right way round. Similarly, touching the horizontal amplifier input terminal will, if all is well, produce a horizontal line. If the trace is not exactly horizontal, rotate the C.R. tube until this is so.

Let us consider the capacity bridge of Fig. 1b, connected in place of the resistance bridge of Fig. 2. Points ABC and D coincide and the circuit is wired up as Fig. 2, except for the substitution of the capacity bridge.

Suitable values for Rs, Rc, Rp and Cs are

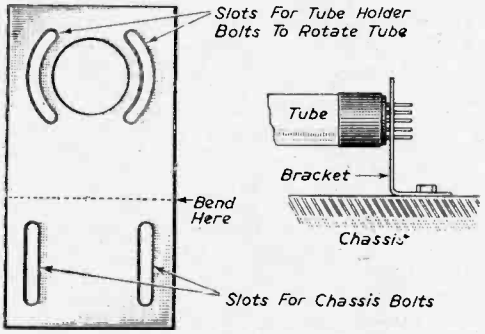
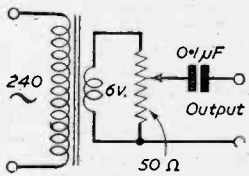


Fig. 6.—Details of the mounting bracket.

respectively 1,000 ohms, 10,000 ohms, 10,000 ohms and 1.0 μF. This latter component, the standard condenser, must be a good quality paper type. Rp is the power factor control. Rc may be calibrated by connecting known condensers to terminals XX, adjusting the bridge for balance and noting the settings of Rc. For the values given above, the bridge will measure condensers from about 0.1 μF. to 100 μF. The procedure when checking condensers is to connect up the circuit as previously described, connect the unknown condenser to terminals XX, and turn up the vertical and horizontal gain controls until a circle or elipse becomes evident on the screen. Set Rp to zero ohms and adjust Rc, the elipse will be seen to roll over; arrange matters so that the figure is horizontal, as Fig. 31. Next,

Fig. 7.—How the 50-cycle A.C. mains may be used as oscillator.



adjust the power factor control Rp and the elipse will be seen to flatten out into a straight, horizontal line. If this adjustment is not necessary, then the condenser is a good one with very low power factor. If, even after adjustment of Rp the elipse will not collapse, then the condenser has some inductance, an important point at radio frequencies. It is thus possible to diagnose a condenser and know exactly what condition it is in, and precisely the nature of the trouble, if any. Should the results obtained be not as just described, then the terminals at the low-resistance side of transformer T should be reversed as correct polarity is important.

Exactly the same type of tests may be carried out on any inductance, condenser or resistance merely by use of the appropriate bridge circuit. When you have constructed this instrument you will be quite amazed at the effectiveness and informative way in which information is presented on the tube screen. The C.R. null indicator certainly earns its keep in both amateur and professional workshops

LIST OF COMPONENTS

C1. 0.5 μF.
C2. 50 μF. 25v.
C3. 8 μF. 450v.
C4. 0.25 μF.
C5. 50 μF. 25v.
C6. 0.25 μF.
C7. 8 μF. 450v.
C8. 0.5 μF.
C9. 8 μF. 450v.
C10. 16 μF. 450v.
C11. 0.15 μF. (depending on L.F. choke).
C12. 0.02 μF.
C13. 0.2 μF.
R1. 1.0M Ω Potentiometer.
R2. 1,400 Ω.
R3. 0.22M Ω.
R4. 1.5M Ω.
R5. 47K. Ω.
R6. 47K Ω.
R7. 1.5M Ω.
R. 0.22M Ω.
R9. 1,400 Ω.
R10. 1.0M Ω Pot.
R11. 50K Ω Pot.
R12. 25K Ω.
R13. 50K Ω Pot.
R14. 25K Ω.
R15. 2.2M Ω.
R16. 2.2M Ω
Mains transformer, 350-0-350 80 mA. 5v. 6v. 6v.
L.F. choke 20H, 70 mA.
Valves, valve-holders, C.R. tube, chassis, wire, etc.

New Cold Cathode Thyratron

A NEW Cold Cathode Thyratron (1267) recently introduced by Mullard Electronic Products, Ltd., should prove of great interest to all designers of industrial electronic control equipments. As a replacement for, and an improvement upon the OA4G, this tube has the advantage of a high continuous cathode current with consistent striking characteristics. It is also characterised by high stability and freedom from photoelectric and temperature effects, with reliability and long life resulting from improved cathode activation.

Many Applications

These features, combined with the advantage common to this class of tube that no cathode heating is required, make the new tube ideal for a great diversity of industrial electronic applications. It is of particular value for operating as a relay under arduous conditions of service, and in protective systems where it must operate infallibly, if rarely. It may also be used with advantage in welding and industrial engineering timers, sequential process timers, alarm and fault systems, and remote-controlled power switching systems. Since the 1267 can be worked in conjunction with photocells, such as the industrial range recently introduced by Mullard, it should also prove of value in a wide variety of industrial control applications. The bulb is G.T. size and the list price is £1.

Reconditioning Magnets

A Simple Scheme for the Experimenter

By W. NIMMONS

THE hundred-and-one magnets that are used in various pieces of apparatus are liable, through knocks and jars, and by the passage of time, to lose their magnetism. The fact that some of the magnetism is lost may not be appreciated, and in the case of a loudspeaker, for example, the increased efficiency and "attack" of a perfectly functioning magnet is most pronounced.

The method of remagnetising adopted by the amateur often works on the hit or miss principle. This is to wind some few turns of stout wire around the magnet or polepieces and pass a heavy current through the wire from a 6-volt or 12-volt accumulator. If the wire has a resistance of a quarter of an ohm, the current in the latter case will rise to 48 amperes for a brief period, and supposing there are 20 turns of wire, this will give nearly 1,000 ampere turns—which is quite sufficient to induce an intense magnetism in most magnets, including those of loudspeakers.

The poor results which follow this treatment, however, are often inexplicable to the layman. The magnet may be in worse condition than before. This is due to a very simple fact: the lines of force in rising create magnetism of one polarity, and on collapsing magnetism of the opposite polarity. Thus, even though the magnet be sufficiently magnetised in the correct polarity, some of the magnetism is taken away when the lines of force collapse.

It will be appreciated, therefore, that remagnetising cannot be efficiently carried out by this means. Commercial practice includes the use of a high intensity current lasting a short time, with a non-return valve incorporated. Thus a pulse of 1,000 amperes lasting a fraction of a second through a one-turn coil imparts the magnetism to loudspeakers. The writer has developed a technique which achieves the same result, and which is not elaborate and costly.

Practical Data

The scheme makes use of a rotary transformer supplying a D.C. output of about 6 volts, 5 amperes; in addition, a 6-volt accumulator is used in the manner to be described.

First wind about 20 turns of No. 18 s.w.g. wire around the polepiece of the loudspeaker magnet. Connect the ends to the output of the rotary transformer and noting which way round the magnet becomes stronger, and which is positive and which is negative. The machine will probably run rather slower than usual, due to the fact that the low resistance of the coil is directly across its terminals. Its voltage output will probably be lower and the current somewhat higher.

Now, still keeping the coil across the terminals of the rotary transformer, connect for a brief instant a 6-volt accumulator to the terminals in the correct polarity—positive to positive, etc. The current from the accumulator will be split into two parts, i.e., through the low voltage winding of the rotary transformer, and also through the remagnetising coil. The effect of the first will be to speed up the machine slightly, but the second and major portion of the current will flow through the coil.

Thus, if the coil has a resistance of 1/10th ohm, 60 amperes will flow through the coil for a brief period, which will give over 1,000 ampere turns in the coil. As soon as this happens the accumulator can be disconnected, the rotary transformer being left running. Finally, switch off the rotary transformer at the high tension side and the machine will come to a stop with the cessation of all current.

If correctly performed this procedure will ensure a high flux density in the magnet without the demagnetising effect of the collapsing lines of force. The procedure is equally applicable to other magnets than those of loudspeakers, but in the case of small magnets the gauge of wire in the coil should be appropriately modified.

Test for Battery Sets

CONFRONTED with the necessity of choice between different makes of new battery sets, or between different brands of second-hand sets in a dealer's shop, the purchaser is not in a very good position to gauge the merits of the various sets. True, one may perform better than another, but sheer good performance is not alone what is wanted in a battery set—that should be confined to the mains variety. What is wanted is a set that will give good value from the money expended on its upkeep, or in other words one that is economical to run.

A set may put up a good performance when the H.T. battery is new, but tail off as it runs down. A test for battery sets, therefore, is to connect up an H.T. battery which has seen some service. If the H.T. battery is 120-volts when new, then the same battery when down to 80 or 90 volts should be used to test the set. If the set still puts up a good performance, then it should be chosen in preference to one that is poor at this voltage. By doing so the user will be assured of many more hours of listening for the same expenditure.

Another point worth considering is the question of current drain. By current drain is meant the small current which some sets draw even when the set is shut down. Such a set will run down H.T. batteries as fast as they can be supplied, since it is a 24-hours-a-day drain. A 0—1 m/A. meter should be connected in the H.T. negative lead with the set shut off. Beyond a momentary flicker, the meter should read zero. If it does not the purchaser should beware of that particular set—it will prove an expensive purchase, however cheap.

Sensitive Converter for Tv Sound

A Two-stage Unit for A.C. Supplies

By C. SUMMERFORD

TO take the fullest advantage of the very high-quality sound transmissions now being radiated from Alexandra Palace as one function of the television programme, one really needs to possess a receiver built specifically for this purpose; one, moreover, that has a relatively flat response from 40 to 15,000 c.p.s. throughout the whole apparatus. At the same time, there are, no doubt, many would-be listeners who would be quite satisfied if they could receive the transmissions at a quality level comparable to that given by their normal broadcast receiver when the latter is tuned to the local station. In point of fact, those who have high-quality T.R.F. receivers or superhets possessing variable pass-band I.F.s may safely expect extremely good results by using simple converters with these receivers. Those who live within a radius of, say, 15-20 miles of the transmitter may find that a single valve converter will meet their requirements; although there is a possibility that some trouble may be experienced with vision-signal break-through by those who are located very close to the transmitter. The remedy then is loose-coupling and adequate pre-selection.

The Circuit

The circuit of Fig. 1 has been designed to give satisfactory results whether used in the "swamp area," or at the edge of the service area. It employs one R.F. amplifying stage followed by a frequency changer. The R.F. valve is one of the now very popular EF50's which, as most enthusiasts are aware, have the Service No. VR91. With regard to the frequency changer, this may be Marconi X65, Mullard ECH 35 or Brimar 6K8G. Each of these valves is interchangeable without alterations to circuit values or wiring.

Both R.F. and F.C. stages follow normal practice with one or two small exceptions. Coils are permeability tuned and are home wound on Aladdin coil formers. The latter are threaded inside and are complete with a dust-iron core. Tuning is accomplished by screwing the core in or out of former as required, using a screwdriver made from some kind of insulating material—whalebone shirt-collar stiffeners are excellent.

Coils L2, L4 and L5 are all wound centrally on their respective formers and each has 7 turns space-wound, L1 has 2 turns wound above L2 and spaced from it by 1/32in., whilst L3 has 6 turns and is similarly spaced from L4. All coils are wound with 34-gauge D.S.C. copper wire, and windings should be held in position with a suitable glue. The heater R.F. chokes may be made by winding 20 turns of 14-gauge enamelled copper wire on a lead pencil and then slipping them off, they may then be stretched slightly so that there is adequate inter-turn spacing. It is intended that they shall be self-supporting, and their inclusion is to prevent unwanted coupling between circuits via the heater wiring, coupling which would most probably induce uncontrollable instability.

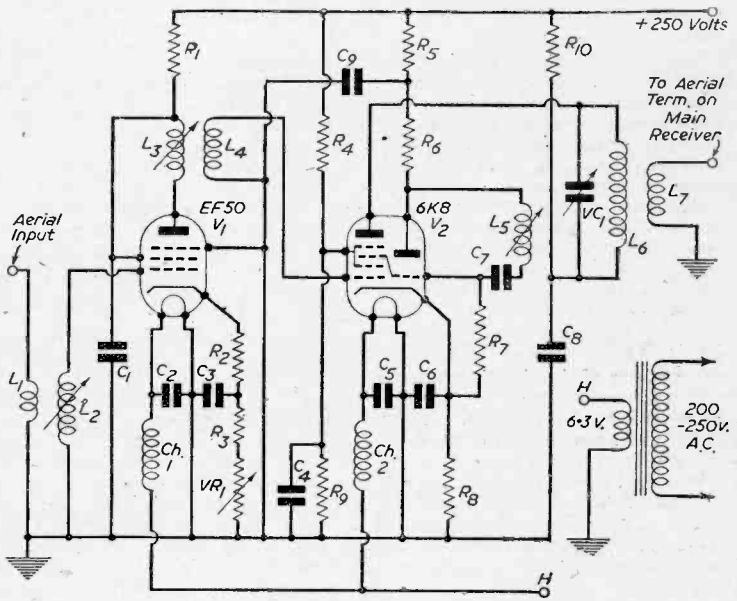


Fig. 1.—Theoretical circuit of the converter.

LIST OF COMPONENTS

L1, 2, 3, 4, 5—See Text.
L 6 plus L7—Wearite PA.7.
C1, 2, 3, 4, 5, 6—.002 μF mica.
C7—.0001 μF. mica.
C8—.002 μF. mica.
R1, 5, 10—5kΩ.
R2—32Ω.
R3—220Ω.
R4—40kΩ.
R6—25kΩ.
R7—50kΩ.
R8—230Ω.
R9—30kΩ.
VR1—10kΩ potentiometer.
VC1—.0005 μF. midget mica.
Chassis, 12in. x 3in. x 2½in.
Two screens as text, plus 1 plain one.
Other components—see text.

Variable resistor VR1 in the cathode circuit of V1 should not be regarded as a volume control but rather as a pre-set anti-swamp control for the use of those residing near Alexandra Palace. The frequency changer circuits are completely orthodox, and the only item that requires comment is the choice of intermediate frequency. This is fairly flexible as regards exact frequency but should be somewhere in the region of 600 kc/s (500 metres). A Wearite coil type PA7 tuned with a small 500 pF. mica variable condenser enables the I.F. to be adjusted to the required frequency, and the normal primary (now the secondary) winding serves as output coupling coil.

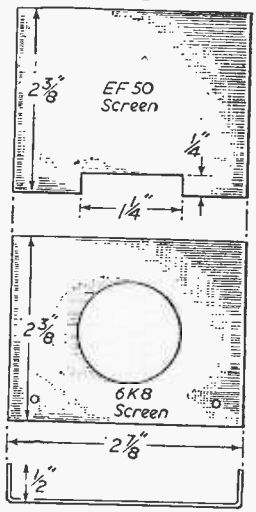


Fig. 3.—Details of the screen fitted to the EF50 valveholder.

Energising the Unit

As the total H.T. current required by the converter is only about 15 milliamps, it is hardly necessary to build a separate power-pack, for most broadcast receivers will have sufficient reserve for this. In view of this a filament transformer only is included in the unit; H.T. may then be picked up from the main receiver via a single plug and socket. Of course, those who possess power-packs of the general purpose type may use these instead, in which case, naturally, the filament transformer will not be needed.

Chassis

Two views of the chassis with position of main components are shown in Figs. 2a and 2b. A good metal from which to make the chassis is tin-plate. It is fairly easy to work and solders very easily. The drawings show the chassis as being open at the bottom with a small angle bracket at each corner. These brackets are made from the same metal as the chassis and are soldered to it. If a 13in. x 4in. baseplate is now cut it may be affixed to these brackets either by nuts and bolts or solder, thus giving total enclosure of the sub-chassis components. An alternative arrangement is to have a ½in. flange on each edge of the chassis lengthwise; then, if it is drilled about ½in. from each corner, bolting to the baseplate is simple.

Details of the sub-chassis screens are shown at Fig. 3.

Connection and Adjustment

The process of connecting a converter of this type to the main receiver is, of course, a simple matter for the more experienced constructor, but may be rather confusing for those not so advanced; therefore, for the benefit of the latter here are the main details. Firstly, disconnect the aerial from the main receiver and take a lead from L7 to the aerial terminal on main receiver. A second lead connects the chassis of the converter to earth terminal on the main receiver to which the earth proper may be left connected. The final connection between unit and receiver is the H.T. positive plug already mentioned; incidentally, a good place to obtain 250 volts positive is at the "hot" side of the output transformer.

Aerials

If a proper television aerial is not available the converter will work quite well off a normal one provided this is not too long.

It only remains now to plug in the mains lead to the converter, switch on the broadcast receiver and all is ready for alignment. To carry this out, first tune the broadcast receiver to 500 metres (just below Vienna) and turn up the gain control; set VC1 three-quarters in, adjust all coil cores via the holes in chassis so that they are approximately flush with top of chassis, and set VR1 to have minimum resistance in circuit. Some kind of signal should now be heard. If there are no results then either L5 or VC1, or both, require adjustment.

Having "resolved" a signal, final adjustments may be carried out to aerial and H.F. coils and to VC1.

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

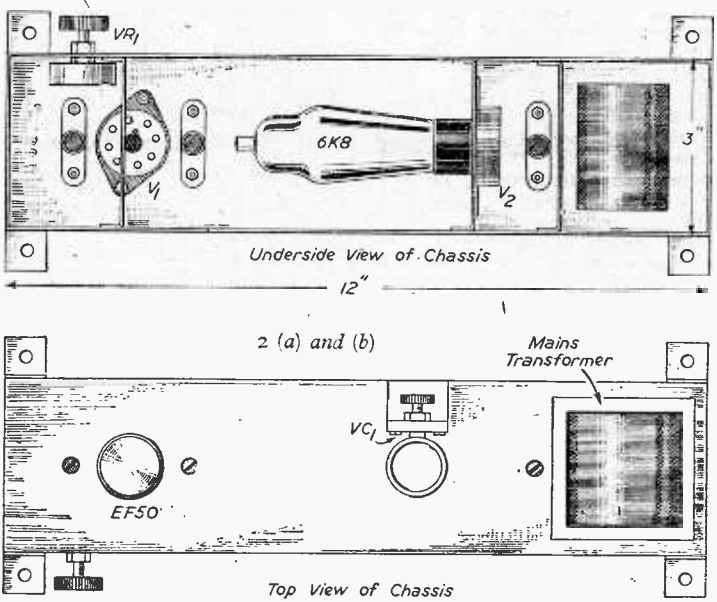


Fig. 2.—Top and bottom views of the chassis to show layout details.

ON YOUR WAVELENGTH

By THERMION

Repairing Old Sets

OUR old friend, G. Thompson, of Birmingham, after recording the pleasure which the receipt of this journal brought to him during the war, when he was in the Middle East, has a tilt at the views expressed in a recent issue on the repair of old sets. Those were not my views, of course. I was quoting the views expressed by the trade who, in their natural anxiety to promote sales, thought that if dealers refused to repair sets more than twelve years old the customer would be forced to buy a new receiver. My correspondent thinks this view, if adopted, would result in many poor and aged people as well as blind people being deprived of the boon of radio. During the war, of course, we were encouraged to make do with old things, and in view of the need for more and more exports I should have thought a lead could have been given by the Government to encourage the continuation of the austere economy which helped us through the war, and equally should help us through these times of difficult economy. Many other readers have written on this subject, stating that they have repaired receivers more than twenty years old which, with a little modification, continue to give performance of good quality. Selectivity may not be so knife-edged, but the reduction in the number of stations and the fact that listeners do not, on the medium- and long-wave bands, go world touring so much as they did, say, ten years ago, renders this point less important than hitherto.

But there is a much broader issue involved. I agree with my correspondent that very poor people may not be able to afford new receivers, and that it would prove a real hardship if they were unable to get them repaired. But the national economy cannot be altogether designed to suit a minority, however unfortunate that minority may be.

It is vitally necessary, if we are to avoid unemployment, that manufacturers should use every endeavour to find outlets for their goods. If they do not the inevitable must happen—indeed has happened in the case of one or two factories—and thousands of people will be sacked. The export markets are more difficult than they were three years ago. Some foreign countries have introduced restrictive embargoes on imports from this country, and even where the markets are free our prices do not compare favourably with those of our competitors.

The Government, by maintaining purchase tax on radio receivers, has given an indication that it wishes to restrict home sales and to force manufacturers to export goods which cannot be sold on the home market. We do not think, however, that it had in mind a campaign to force old sets off the market by the restrictive practice suggested by certain members of the retail trade who, after all, are looking at the matter from a personal rather than a national aspect.

In any case, I do not think that there is a risk that such a scheme will be put into effect. Readers will remember that I offered help in defeating such a scheme by the organisation of a panel of repairers amongst our own readers.

Radio Control of Models

I SEE in the July issue of our companion journal, *Practical Mechanics*, an article on a radio-controlled model battleship, which looks interesting and practicable. The Radio-controlled Models Association, which is supposed to foster interest in this new hobby and which claims that many of its members have made successful radio-controlled model boats and model aircraft, seems to be hiding its light very much under a bushel, for they do not circularise monthly reports of their activities to the technical Press, a common practice with national associations. Or is it the fact that only one or two models have been built which are but a qualified success?

Television Demonstration Van

IT is a sign of the times that an enterprising Ongar radio dealer has equipped a television demonstration van so that he can go to the prospective customer and demonstrate the wonders of television without waiting for the casual customer to come into his shop.

The dealer concerned is the Shelley Radio Service and the van is completely self-contained and includes a rotary converter feeding two television receivers, both operating at the same time. The van uses an H type aerial which can be erected in a few minutes. In the best days of radio we never had that.

Although television sales are creeping up I believe that only the fringe of the market in the home counties has been touched and that if more people saw it sales would leap.

One of the difficulties is that a television receiver at a price within the average purse limits is just a television receiver. It will not, of course, operate on the ordinary sound-wave bands. This means that valuable space is occupied by a second instrument, and in these days of small houses, flats and lodgings many would-be television customers, having to make the decision between television and sound radio, must perforce decide in favour of the latter and eschew the former.

Television prices must, of course, come down as time goes on, for to make an all-in television receiver the cost would be almost double. The trade must, however, work towards that end, for it is unthinkable that a house must be cluttered up with two instruments when one should suffice.

On the other hand, of course, at the present time the somewhat restricted market forces manufacturers to adopt the present compromise.

All-wave 6-valve Superhet

Modifying a T/R 1196 for Broadcast Use

By P. H. BEARMAN

MANY constructors have probably not realised that the receiver unit of the T/R1196 is the ideal basis for an inexpensive all-wave receiver, as little modification is required beyond the complete removal of the existing coil unit. It will be seen from the unmodified circuit diagram that the H.F. stage is untuned; in the author's receiver this is omitted in order to utilise a standard coil pack in stock. An H.F. stage would, no doubt, be useful, but as circuit diagrams are usually supplied with these coil packs the extra connections will not be outlined here.

The "Osmor" coil pack used in this circuit has only five connections, and are as follows:

(1) To aerial via .01 μF. condenser, aerial to chassis via 10 kΩ resistor.

(2) To full A.V.C. line via 100 kΩ resistor.

(3) To control grid of frequency-changer and two-gang condenser.

(4) To oscillator grid via 100 pF. condenser and also to two-gang condenser.

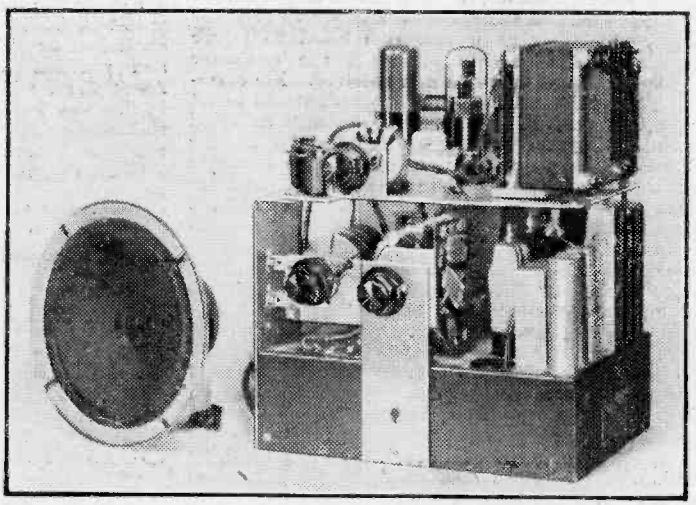
(5) To oscillator anode via 150 pF. condenser.

The circuit diagram supplied with this coil pack will clarify these connections.

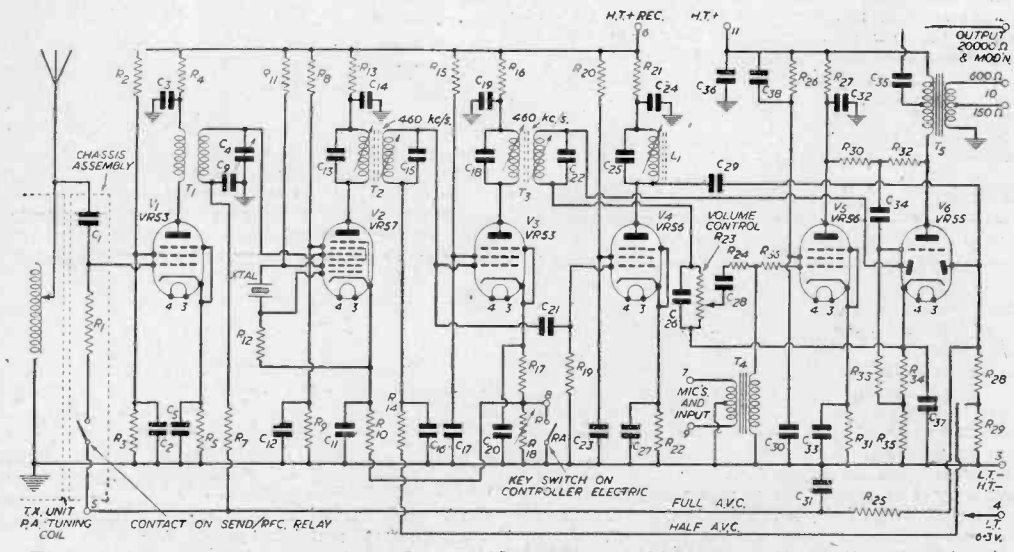
There is no objection to the use of single coils, but alignment difficulties are overcome by the use of pre-aligned packs. As the I.F. transformers are also aligned, one of the main difficulties encountered with the construction of superhets is avoided.

There is no need for the removal of the 10-pin plug, and connections used are as follows:

(3) Earth line. (4) 6.3 volts.
(6) Joined to 11. (11) 250-volt H.T.
(12) To volume control.

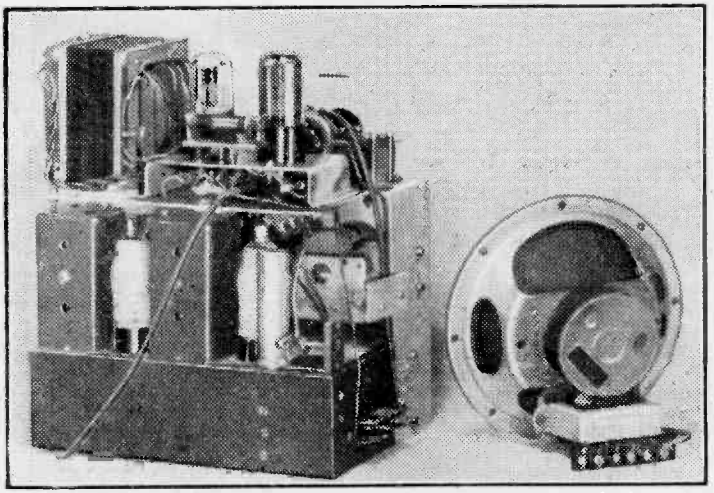


A view of the completed receiver and power pack.



Theoretical Circuit of the unmodified T/R.1196. Note: the crystal is not normally supplied with this unit.

The 'phone transformer is removed and a 100 kΩ resistor placed between the anode of the VR55 and H.T.+; the circuit output is taken from the anode via a .05 μF. condenser to No. 12 on the plug. The pre-set volume control should be left permanently at maximum gain and the bias control marked "R.A." fully anticlock-wise.



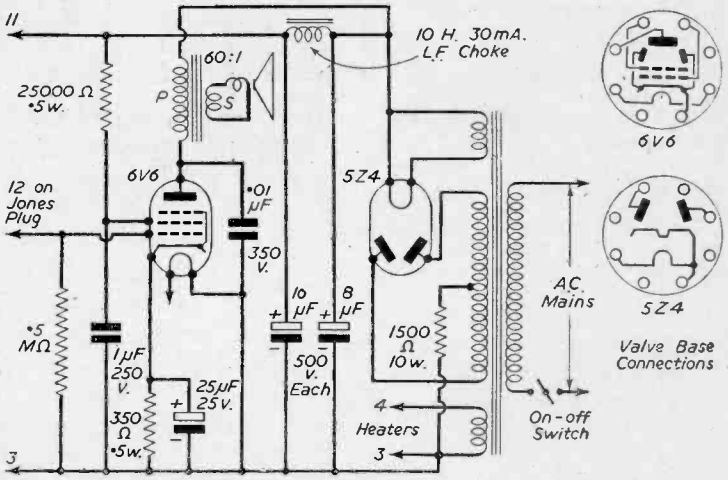
Another view of the complete receiver.

It was found that the triode section of the VR55 was overloaded by the additional A.F. stage and this VR56 was omitted simply by changing grid leads. The valveholders of the H.F. and A.F. stage and associating components may be removed for other uses, but on the author's set these were left in case subsequent alterations were required.

It will be seen from the photograph that the output stage and power pack are accommodated on a small deck above the main receiver, the actual layout being left to the constructor.

The output stage and power pack is built on conventional lines; it will be observed that unsmoothed H.T. is supplied to the anode of the 6V6 and this is to avoid the use of a large smoothing choke. The output transformer is a standard 3-watt product feeding a 6½in. L.S. A resistor has been included in the centre-tap of the mains transformer to drop surplus H.T., as the transformer was a 350-0-350 with 6.3- and 5-volt windings. A 250-0-250 could be used with advantage and this resistor omitted.

The finished receiver gives extremely good results and is quite comparable in range and quality to the average commercial model. If ex-Govt. components are used where possible, the total cost should not exceed £5 10s. to £6. This could be reduced slightly by modifying this circuit to an A.C./D.C. version by wiring filaments in series and using a suitable output valve and rectifier in conjunction with a line-cord or ballast resistor.



Theoretical circuit of the power pack and output stage, with valve base connections.

Thames Radio Service

THE Postmaster General announces that as from July 1st, 1949, a radiotelephone service for messages related to ships' business is available between telephone subscribers in the London toll area and suitably equipped ships on the Thames, approximately between Hammersmith Bridge and Southend. The call charge is 2s. 6d. for three minutes and 10d. for each additional minute, plus the normal inland call charge between the land telephone subscriber and the Dartford (Kent) telephone exchange. Initially, however, the service is being operated from the International Radio Exchange in London. Land telephone subscribers wishing to use the service should dial the telephone number MONarch 0221, or ask their local exchange operator for "Thames Radio—Monarch 0221." Calls are not accepted from coin-box lines and call offices. Personal, transferred charge and fixed time-call services are not available.

The service, which uses V.H.F. with a restricted range, is the first of its kind to be established in this country. It is hoped that the frequencies used will be standardised on an international basis in order that the ship equipment will be suitable for any other very short-range maritime radio services which may later be established.

D.D.T. Quality Receiver

A Three-stage Two-valve Local Station Receiver

By F. G. RAYER

THOUGH the ordinary triode detector gives reasonable quality, the clear crispness of a diode detector offers an improvement which is at once noticeable. Transients will be heard which the triode, with its grid condenser and leak, slurs over, so that string orchestras and similar items become more vivid and alive. Diode detectors are seldom used in straight receivers, but a diode triode, or double diode triode, may be used to provide detection and L.F. amplification. By using R.C.C. throughout and following this with a triode small power valve, an interesting circuit results which will be found very good for local reception.

Such a circuit is shown in Fig. 1. For the purpose in view selectivity is sufficient because the diode does not impose much damping on the tuned circuit. There is no reaction, of course, and the circuit is not intended for long-distance reception. A simple volume control is provided, also a tone control which allows of very natural reproduction when the element is fully in circuit.

The Chassis

A piece of aluminium 4in. by 8in. has two flanges bent on it to make a chassis of the size shown in Fig. 4. Valve holders and three slotted component-mounting brackets are bolted on as illustrated, and an insulated strip carrying four terminals is screwed near the rear edge.

In Fig. 4 the wavechange switch, which is directly below the tuning condenser, is not shown. If a complete panel is used, this should be of the size shown in Fig. 3. Wood or metal may be used, and the cabinet will need to be 6½in. wide by 5in. high by 4in. deep inside measurements. (From this it will be seen the receiver is compact and convenient for general use.)

Dual-range Coil

Any good coil for long and medium waves can be used, or one can be wound as illustrated in Fig. 2. About ¼in. space is left between windings. The ends may be anchored to small bolts or tags, the bottom of the long wave winding being soldered to one of the small brackets used to mount the coil which will be in contact with the metal chassis.

The loop forming the centre tapping on the upper section should be passed through small

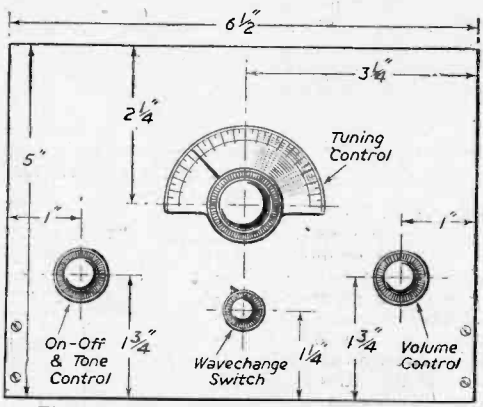


Fig. 3.—Front panel and control details.

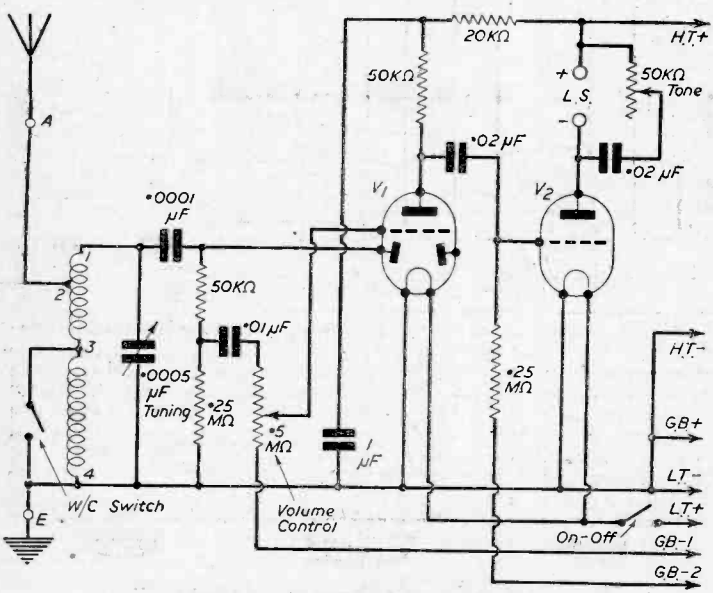


Fig. 1.—Theoretical circuit of this quality receiver.

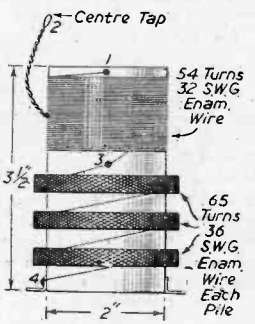


Fig. 2.—Details of the coil.

holes in the former, otherwise the winding will probably become loose.

All the connections are shown in the various diagrams, and no difficulty should arise in wiring.

Receiver Wiring

All connections below the chassis are shown in Fig. 4. Leads to the small resistors and condensers should be short, so that these parts will not move and touch the chassis. The 1 μF. condenser is bolted to a side runner. All connections should be insulated.

Fig. 4 also shows how leads passing through the chassis have to be connected.

The valve holder connections are for a double diode triode such as the Mazda HL23DD, and any ordinary power or small power triode. English base 4-pin D.D.T. valves are available, but some of these will require a higher cabinet. Apart from this, and changing the valve holder, there is no reason why they should not be employed instead of the octal type shown.

For the output stage a valve such as the PM2A or PM2 is best.

Operational Notes

A fairly good aerial is desirable. Very short indoor aerials may be connected directly to point 1 on the tuning coil. To secure maximum signal input, a reasonably efficient earth is necessary, and 120 volts H.T. should be used unless the maximum volume is not required. G.B.1 will normally go to 1.5 volts, and G.B.2 to 6 volts on the grid bias battery. These voltages may be modified for best results.

COMPONENTS FOR THE D.D.T. SET

Fixed condensers: .0001 μF., .01 μF., two .02 μF., 1 μF., .0005 μF., tuning condenser.

Resistors: 20,000 ohm, two 50,000 ohm, two .25 megohm.

50,000 ohm variable resistor or potentiometer, with switch.

.5 megohm potentiometer.

Tuning coil (see text).

Two valve holders. Three mounting brackets. Terminal strip. Wavechange switch.

Reception will be crisp and clear, and the tuning positions of the local stations should be marked on a small scale. Take care the moving coil speaker used matches the output valve correctly, or distortion will be introduced.

The description given is, of course, for a completely self-contained two-valve receiver, but there is no reason why a more powerful output stage, or a further stage of amplification should not be added, or a good H.F. stage where the input is insufficient to give a good signal.

Keep Waste Paper separate for SALVAGE.

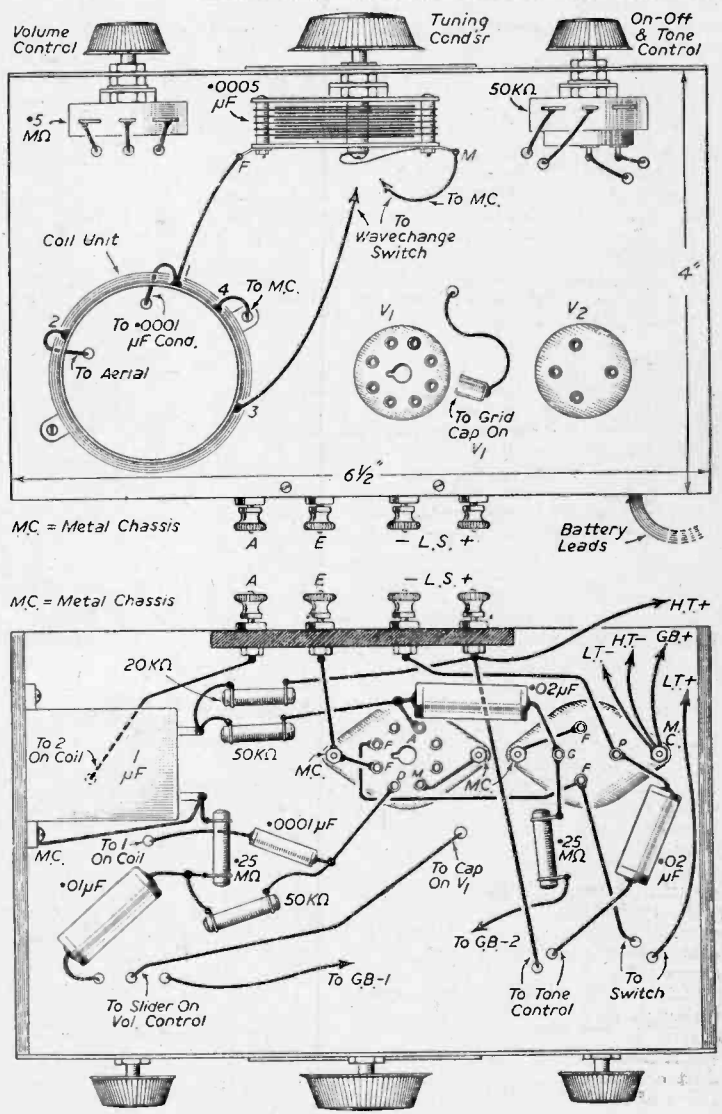


Fig. 4.—Top and bottom chassis and connection details.

The Earthed Grid Triode

Details of the Special U.H.F. Valves and their Application

By E. G. BULLEY

VALVES of this type were originally designed for use at ultra-high-frequencies and are useful as amplifiers or oscillators. Amateurs or radio enthusiasts will find these valves extremely useful and they will, in the author's opinion, be used

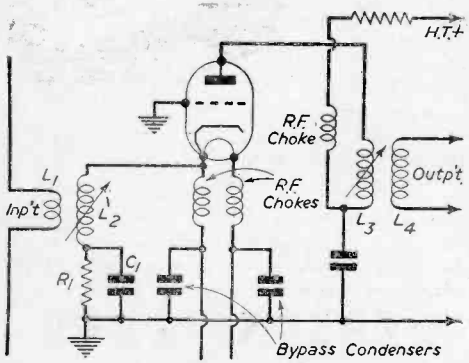


Fig. 1.—Typical circuit for use with a disc-sealed earthed grid triode.

in television receivers of the future. They are, of course, used in V.H.F. receivers and can be found amongst Government surplus.

Some designs employ a copper disc to which the glass bulb is sealed and at the same time acts as a support for the grid assembly in the valve, the rim of the disc being used to clamp the valve into the metal chassis, thereby enabling the chassis to form a part of the screening system. It is advisable, however, for the chassis to be made from copper, thus maintaining efficient screening which is necessary at U.H.F.

Other designs of earthed grid triodes look very much like the ordinary radio receiving valve, the difference being in the internal construction.

One main characteristic of these valves is that the grid is common to both the input and output circuits. The grid being at earth potential (instead of the cathode), this offers an advantage when one realises that at U.H.F., the interelectrode capacities play an important part in the actual receiver, and that these capacities in a design of this nature are common to both the input and output circuits.

A typical circuit incorporating a disc-sealed earthed grid triode is shown in Fig. 1, and can be stated as being a preamplifier feeding one or more stages. The input signal is transferred from L1 to L2, the former being loosely coupled to the latter, although in some cases it is tapped on to L2, as shown in Fig. 2.

L2, however, is tuned by means of an adjustable dust core and, in fact, is mostly preferred to other types of tuning.

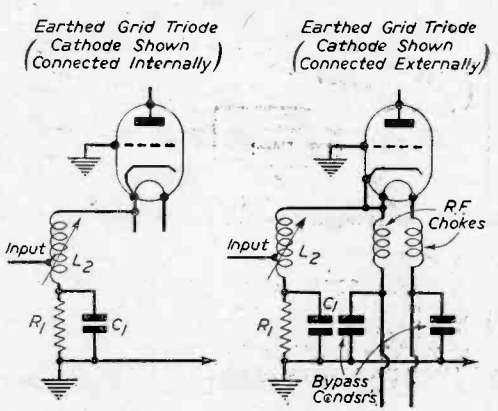
The signal is then passed to the cathode, which in this case is internally connected to one side of the heater. It is as well to mention, however, that not all earthed grid triodes are internally connected, and in this case it is necessary to connect them as shown in Fig. 3.

The output is taken in the customary way, that is, between anode and earth and transferred via L3 to L4, the former being tuned as L2. This output signal is then fed to the control grid of the following valve, that is, if it is not an earthed grid triode, in which case it would be fed into the cathode as before.

The biasing arrangement for these type of valves is conventional, and is accomplished by having a resistor and a condenser in parallel, so making the arrangement automatic. Reference to R1 and C1 in Fig. 1 will clarify this point.

H.F. Stoppers

Prevention of H.F. is accomplished by incorporating R.F. chokes, by-passed by suitable condensers, in the heater and cathode leads, as shown in Fig. 1. These chokes are, however, usually the feeds themselves wound on polystyrene formers, although commercial R.F. chokes can be used. It is as well to mention, however, that connections and feeds throughout any circuit using earthed grid triodes should be kept as short as possible, and that all stray capacitances must be kept at a minimum. Failure to fit R.F. chokes in the heater and cathode leads will only result in a capacitance effect between the cathode and heater, due to the fact that the heaters are not isolated from earth. This in turn will effect the tuned input circuit and thus cause the circuit to operate incorrectly.



Figs. 2 and 3.—Alternative input, and connections where the cathode is not internally connected to the heater.

The condensers used for by-passing or decoupling should be of the mica type, because of their very low loss characteristic and should be of very good quality.

(*Continued on page* 309)

(*Continued from page 306*)

A typical oscillatory circuit is shown in Fig. 4, and a brief description will assist those interested in these valves. The input in this case is tapped on to a suitable coil L1 in the cathode circuit, and the output taken from L2 by means of loose coupling. As mentioned earlier in this article, various chokes are incorporated throughout the circuit, and the grid being at earth potential thus fulfils the purpose of screening the input circuit from that of the output.

The tuning of both circuits is accomplished by C1 and C2 in Fig. 4, C1 and L1 forming a tuned input whereas C2 controls the feedback to the valve.

To conclude and summarise this article, it can be stated, therefore, that by having the grid at earth potential, the input is safely screened from the output circuit, an essential requirement when working at the higher frequencies.

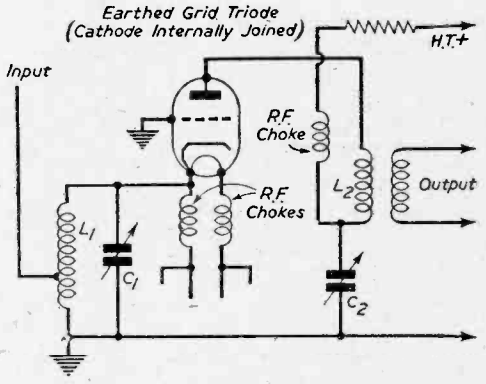


Fig. 4.—Typical oscillator circuit.

A Parallel Rod Oscillator

An Experimental Unit for Work on Centimetre Wavelengths

By A. F. GILES

THIS unit is a parallel rod oscillator which can also be used as a receiver or frequency meter. It requires a separate power supply giving 6.3 v., 0.2 amp. for heater, and about 300 v. for H.T., although it will oscillate on a lower voltage. Using 300 v. H.T., oscillation can be obtained from about 130 cm. down to about 16 cm., that is from 231 Mc/s to 1,875 Mc/s.

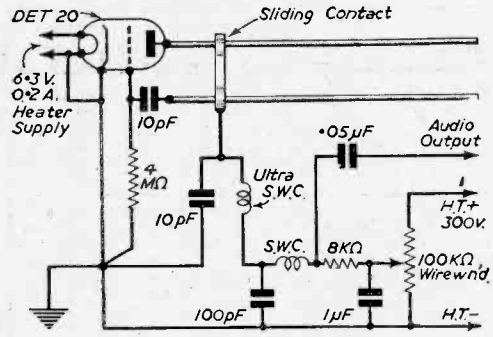


Fig. 1.—Theoretical circuit.

Construction

The valve used is the DET20, otherwise known as CV6; VR135 or E1148, which has grid and anode connections brought out to top caps. The valveholder is mounted on a duralumin or aluminium panel which is screwed to the base, a wooden board measuring 3.4in. by 1in. by 23in. The parallel rods used were 10 S.W.G. copper wires, although thicker wires silver plated would be better. One wire is soldered to a valve cap connector which goes to the anode cap and the other wire is soldered to a 10 pF. condenser which goes on the grid cap. The 10 pF. condensers are the cup and disc type, easily obtainable from ex-Govt. apparatus. The wires are supported at the valve end by a piece of 1/16in. paxolin sheet fixed to the base by two brackets. The sliding contact is made of copper foil as shown in Fig. 2, and is fixed to the wooden slider which has a hole in it through which passes a length of glass tubing. A wood or paxolin rod could be used if no glass tubing is available. The slider is friction tight on to the glass tube, but is loose enough to be moved up and down. Fine tuning is carried out by means of a piece of screwed rod at one end and a spring at the other end which keeps the glass tube tight against the screwed rod. As the glass tube moves, it takes the slider with it while the hands are kept away from the parallel rods, but if hand capacity is experienced, insulated extensions can be fitted to the potentiometer and fine tuning controls. It may be difficult to secure

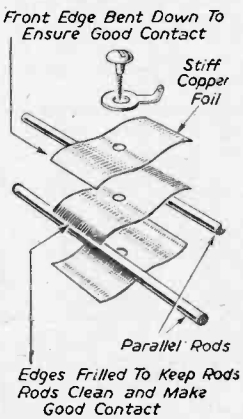


Fig. 2.—Exploded view of the sliding contact.

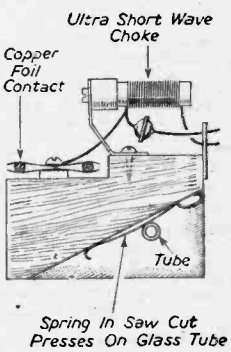
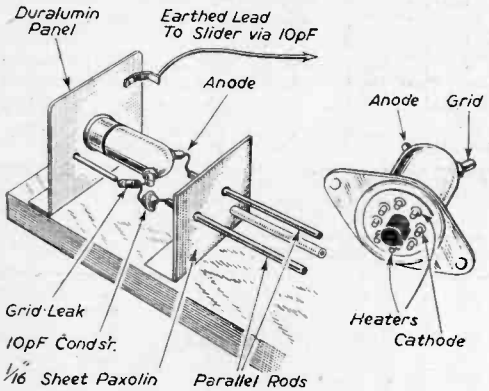


Fig. 3.—Side view of the slider.

a good fit of the slider on the glass tube in which case a spring must be fitted as in Fig. 3. At the end where the screwed rod bears on the glass tube, the tube is heat melted to give a smooth end, and the end of the screwed rod is rounded and greased so that friction is minimised. On the slider are also fixed an ultra-short-wave choke and a 10 pF. condenser. The slider is connected to earth and to the short wave choke (see Fig. 6).



Figs. 4 and 5.—Details of the valve mounting and connections on the Det. 20 valve.

When used as a receiver, the audio signal is fed from the 8,000 Ω load resistance through a 0.5 μF. condenser to an amplifier or headphones. The reaction control is a 100,000 Ω potentiometer which varies the H.T. voltage to the unit. The 1 μF. condenser is for smoothing, and to prevent crackling, as the potentiometer spindle is turned.

The grid leak is near the grid cap of the valve and is connected to earth through a length of insulated sleeving which passes through a hole in the duralumin panel. At the other end of the baseboard there is a ¼in. wood panel which carries the potentiometer and fine tuning controls. On the inner side of the hole for the screwed rod there is a square recess for a nut.

Aerial

A suitable aerial would be a ¼-wave dipole coupled to the unit by a small horizontal loop of wire placed

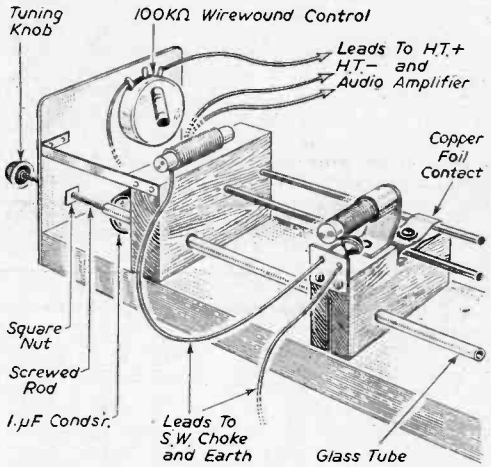


Fig. 6.—Layout of the fine tuning control and slider.

near or between the parallel rods. When the unit is oscillating and is connected to an amplifier or headphones, crackling is produced by rubbing two files or other pieces of metal together and this can be used as a test to see if the set is oscillating. A further refinement would be a metre scale mounted by the side of the parallel rods with a pointer on the slider. When adjusted, this would give direct readings of one-quarter the wavelength at which the set is oscillating.

Loudspeaker Efficiency

SOMETIMES a loudspeaker suffers from a species of general debility; it does not emit good, clear, strong signals as a good loudspeaker should. If incorporated in a set it is not always easy to say that the fault lies in the loudspeaker or in the set. Tests by an external speaker known to be in good working order are the best methods of determining this.

If it proves defective remove the speaker from the set. There are at least five causes for the inefficiency; a mis-match in the primary/secondary ratio of the transformer; shorted turns in the same windings; shorted turns in the speech coil; loss of magnetism; softening or dampness in the cone.

Dealing with these points in order. The first two can be overcome by fitting a new multi-ratio transformer which will enable the speaker to be matched-up to the output valve. Shorted turns in the speech coil can be detected as follows: touch the terminals of the speech coil to the poles of a two-volt accumulator and the cone should kick violently. If it only makes a scraping noise without kicking either there are shorted turns or the turns are fouling the gap. Another possible cause is loss of magnetism in the field magnet.

Recentring the speech coil will cure the fault if due to coil sticking, otherwise it will be necessary to rewind. If mains energised look for a partial break in the winding for loss of magnetism. Permanent magnets can be remagnetised with a few yards of No. 16 s.w.g. cotton-covered wire wound round the polepiece and connected to a six-volt or 12-volt accumulator, if of the old open type magnet. Test first with a two-volt cell to ascertain polarity, then just touch to the poles of the battery. A heavy current will flow, but it should be only momentary—there is no advantage in "soaking." Modern cast magnets are best left to the makers to deal with, but fortunately these are rarely at fault unless grossly maltreated.

Practical Hints

Optical Groove Locator

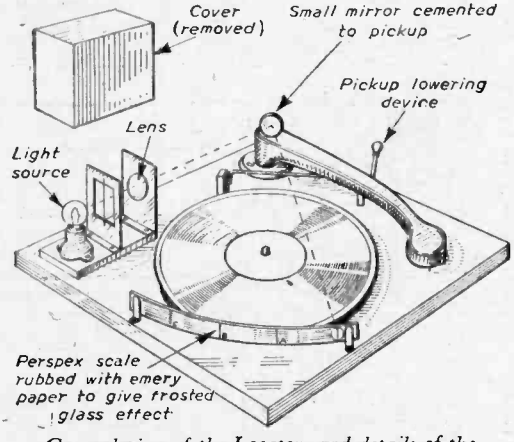
HERE are details of a device which enables any one groove on a record to be instantly located and played, and should be of interest to "sound effects men."

The basis is a normal gramophone turntable (clockwork or electric), a pickup and a light source which projects a beam of light, via a mirror cemented to the pickup, on to a perspex scale.

The light source consists of a 6-volt bulb, a sheet of tinplate with an aperture across which is fixed a piece of fine wire (or hair), and a lens. If the light is focused on to the scale so that the hair-line is clear, it will be seen that the light travels across the scale through an angle twice that of the movement of the pickup. The scale is a curved piece of $\frac{1}{8}$in. perspex treated with emery paper to give a "ground-glass" effect and bent so that the mirror is the centre of the arc. The lifting device is merely a piece of $\frac{1}{8}$in. copper or galvanized wire cranked and mounted between two brackets so that the pickup may be lifted just clear of the record.

Operation

Play through the record and mark with pencil a line on scale where "hair-line" is projected, when start of required passage is heard.



General view of the Locator, and details of the various sections.

To play back: Lift pickup by means of lifting gear and move pickup until "hair-line" coincides with pencil mark, and lower pickup. If desired several "cues" can be marked on the scale, or the scale can be graduated similar to a rule, in which case all that is necessary is to note the point on the scale where a particular passage commences.—J. A. G. LAVENDER (W.C.2).

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

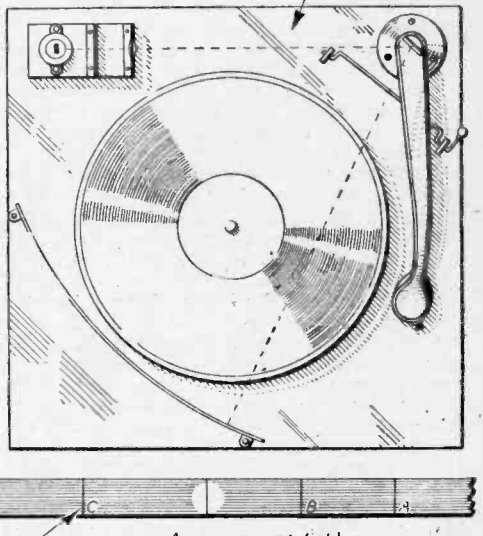
All hints must be accompanied by the coupon cut from page iii of cover.

Tv Screen Filter

READERS who have made and are using ex-W.D. television receivers may be interested to know that a good black-and-white picture may be obtained from a V.C.R.97 or 517 by using a colour filter before the tube face. I found a square of orange-coloured cellophane quite satisfactory, but some experimenting is required to find the most suitable tint. If necessary, more than one sheet may be used, and red and orange may be mixed. There is some loss of brilliance, but this can be counteracted by adjustment of picture brightness and contrast.

If an enlarging lens is used, the filter can be conveniently mounted on the flat surface, though I found it preferable to sandwich the cellophane between the lens and the protective glass in front of the tube. One soon becomes accustomed to viewing a green picture, but it is surprising how many friends and acquaintances find it rather "weird," and prefer to see black and white.—D. MCILWAIN (Leyton, E.10).

Plan view showing arrangement of light source, mirror, scale, and lowering gear



Plan of the Locator.

Midget Porta

An All-dry "Can

By J. \

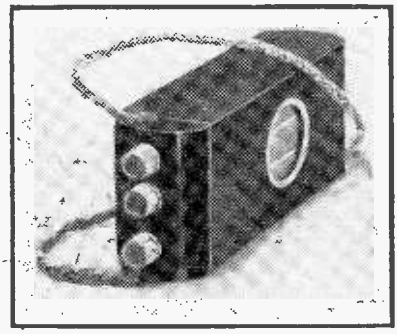


Fig. 1.—The midget portable in its carrying case.

ALTHOUGH there have been several articles in previous issues on midget portable design and construction, these usually take the form of T.R.F. receivers, and consequently the writer thinks readers will be interested in the set about to be described.

This, as can be seen from Fig. 4, uses four valves of the B7G class and although the circuit is quite conventional the results are really astounding.

The overall size of the set is 8¼in. x 3⅜in. x 2¼in., this size chosen as being handier to carry around than something more square in shape; in fact, it has been found that it fits comfortably in a normal raincoat pocket.

The H.T. battery is a 30v. deaf aid "Drydex" type DH505, the size of which is ⅝in. x 1¼in. x 2⅜in. long, and although of such small physical size this has lasted over 20 hours and is still going, the total consumption being 4½ mA. The L.T. is provided by an "Ever-Ready" U2 1½v. cell, the filament consumption being ¼ amp.

Components

All parts are standard except for the two switches and the speaker transformer. The switches, 2-pole 2-way rotary, were purchased ex-W.D., but these can be replaced by miniature "Oak" switches.

It was decided when making this set to have switched tuning for the Home and Light stations; this, of course, means that no tuning condenser is required, and keeps the overall size down, and also does away with another rather difficult job, namely, that of getting the oscillator tracking correctly—a difficult job at the best of times but even more difficult with a midget set.

The coils were made from modified Aladdin formers as shown in Fig. 3. The oscillator anode coil, as will be noticed, has tight coupling and considerably more turns on than is usual; this is to ensure that the frequency changer will oscillate with a low H.T. voltage. However, with this coil, oscillation will take place as low as 20v., the grid current being in the nature of 20μA.

The aerial has been made with a dual purpose in mind, and acts as a frame aerial and as a strap for carrying the set. It is made by cutting eight lengths of 7-36 P.V.C. covered wire 4ft. 3in. long. By keeping together 2 sets of 3 wires, and one set of 2 wires, the three sets may be plaited together. All-white covered wire was used for this purpose but it might be rather effective to try different coloured covering.

Since the frame aerial is connected in series with the aerial coil this does to a certain extent obviate one of the inherent difficulties associated with frame aerials as applied to portable radios, as the directional properties of the aerial are to a certain extent nullified and the angle of acceptance is approximately 120 deg. out of 180 deg. before there is any appreciable change in the signal strength. Therefore, the set can be used comfortably while walking or cycling.

The two ends of the aerial are placed through holes in the top and bottom sections of a front false member, and joined together inside so as to form a continual length of wire as shown in Fig. 8.

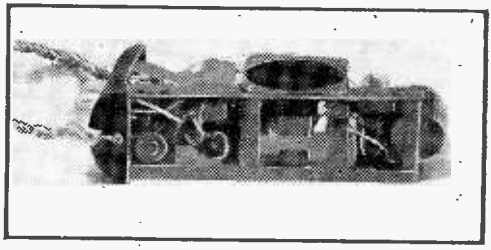


Fig. 2.—An underside view of the receiver.

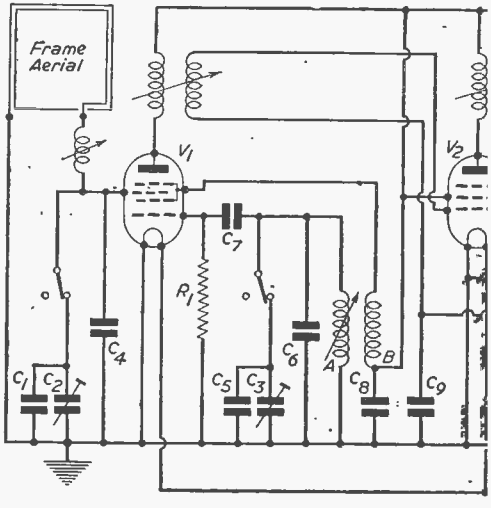


Fig. 4.—Theoretical

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ARE

The Chassis

Tho chassis is made of a piece of 20G copper plate together with an end plate, supports and L.T. battery fixing attachments (Figs. 6 & 7). After making the chassis, solder the end plate in position, and L.T. battery fixing attachments, but leave the fixing of the supports until the wiring is completed. The components may now be mounted, but before assembly of coils solder wires to the station selector switch mounted on the end plate under the chassis and pass these wires through holes to the top of the chassis ready for fixing to the two postage stamp trimmers, the coils may now be mounted.

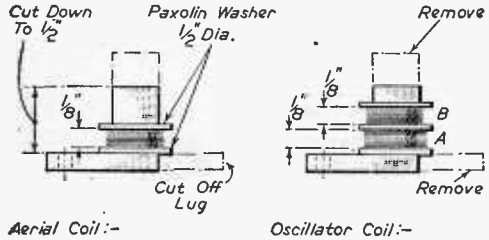
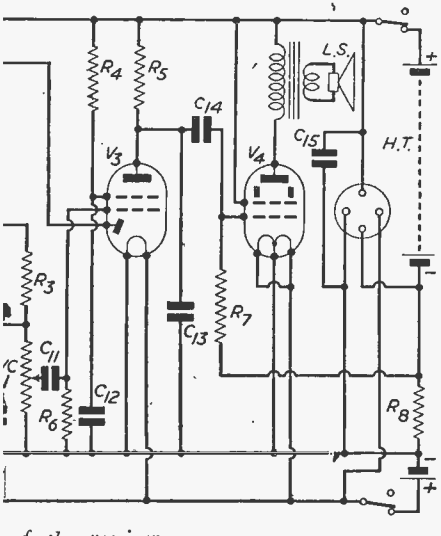


Fig. 3.—Details of the coils.



of the receiver.

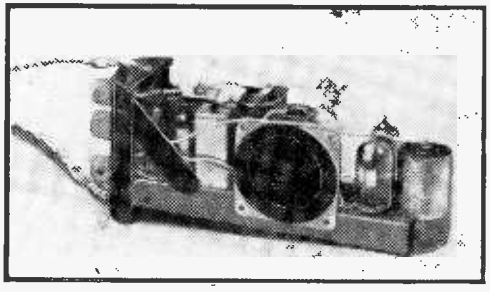


Fig. 5.—The chassis removed from the cabinet.

The valve-holders, B7G ceramic with metal top plates, may be soldered direct to the chassis. Another point regarding these valve-holders is that they must be earthed efficiently to the chassis by the metal ring in the centre of the holder, as there is a metal plate pressed into the glass base of these valves which locates centrally over this ring and acts as an internal screen in the valve.

Wiring

Having completed the assembling of components wiring can now be tackled, the same type of wire being used as specified for the frame aerial.

When fitting L.T. cell remove cardboard tube before assembling.

If another 465 kc/s superhet. receiver is available the I.F. transformers in the midget set can be easily aligned by wrapping a covered wire around the I.F. valve grid or anode, on the second receiver, when this is tuned to a station, and connecting

LIST OF COMPONENTS

Condensers

C1, 75pF ceramic tube.
C2, 3, 50pF postage stamp trimmers.
C4, 6, 200 pF midget.
C5, 50pF ceramic tube.
C7, 10, 13, 100pF midget.
C11, 14, .001μ F midget.
C8, 12, 9, .1μ F midget 150 v.w.
C15, 1μF. midget 150 v.w. Hunt's type W49.

Resistors ($\frac{1}{4}$ *w. midget*)

R1, 100 kΩ.
R2, 4, 7, 3.3. MΩ.
R3, 47KΩ.
R5, 1MΩ.
R6, 10MΩ.
R8, 620Ω.
Valves—V1, 1R5 ; V2, 1T4 ; V3, 1S5 ; V4, 3S4.
Two I.F. Transformers, Wearite type M400B.
2$\frac{1}{2}$in. dia. P.M. loudspeaker.
Midget volume control, VC1, 1MΩ $\frac{3}{4}$in. dia.
2 miniature 2-way 2-pole switches.
4 B7G ceramic valve bases.
2 Aladdin formers with dust cores.
H.T. and L.T. batteries (see text).
Connecting wire, 7/36 P.V.C.
Plug and socket optional (see text).
3 knobs, $\frac{3}{4}$in. dia.

the other end of this wire through a .01 μF. condenser in turn to the grid and anode ends of the second and first midget I.F.Ts. These may then easily be tuned by screwing in or out the dust cores for max. signal. While making these adjustments the frequency-changer from the midget set should be removed.

The dust-iron cores in the tuning coils may be adjusted, with the additional condensers switched out of circuit, until the Light programme is heard. If, by virtue of the 20 per cent. tolerance on the fixed tune condensers the dust-iron cores protrude beyond the end of the coil formers when the station is peaked, remove core from former and cut down the lengths a little at a time until the coil can be peaked with the core either parallel or below the top of the coil former. This is necessary since, if the core protruded above the former, it would foul the case. Having tuned in the Light programme, switch the additional condensers into circuit and adjust postage stamp trimmers for the Home programme.

The on-off switch is a two-pole type since it is essential to switch both the H.T. and L.T. supply.

The speaker transformer, which is shown on the photograph as fixed above the loudspeaker magnet, is an extremely small item salvaged and rewound from ex-W.D. equipment. There are, however, several midget ones on the market, and if one cannot be obtained as small as the one shown there is space between the speaker and the output stage where a larger one could be fitted, the ratio required being 35 : 1. This space was originally left for an additional H.T. battery to be run in series with the remaining one. However, having tried the two batteries and finding no improvement

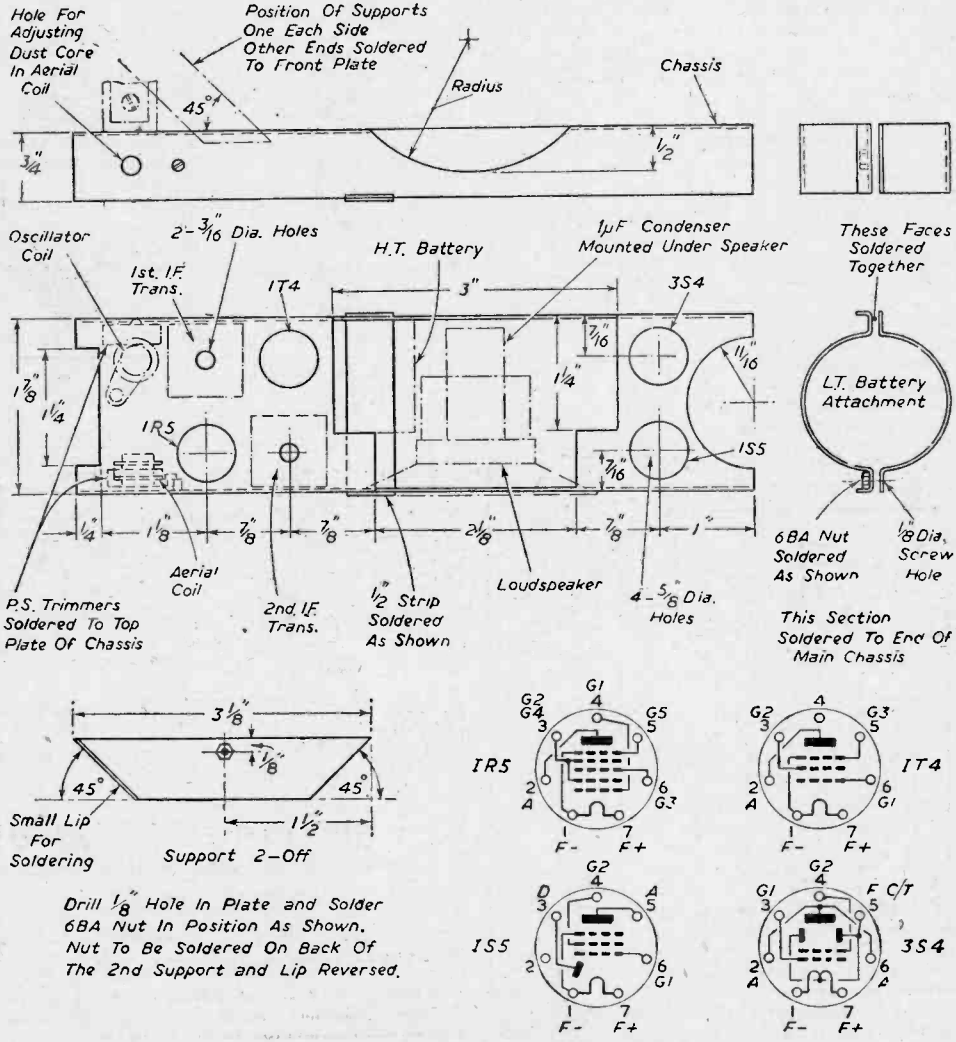


Fig. 6.—Cutting and drilling details of the chassis, and valve-base connections.

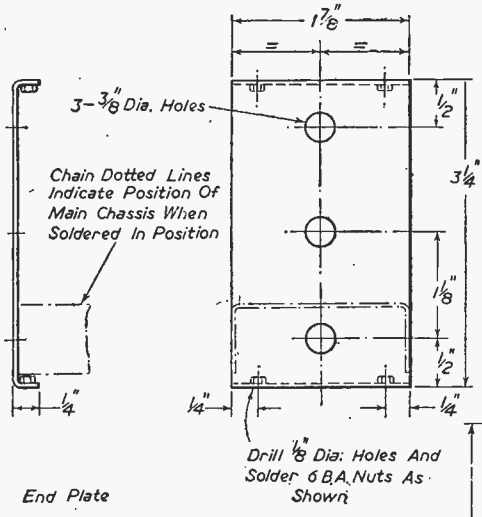


Fig. 7.—Further chassis details.

in the volume, although the H.T.-current rose to 11 mA., it has been left out.

The Case

The case is made of ⅛in. thick plywood, one end of which is rounded to the same profile as that of the plate around the false member, in the front of the receiver, and a plate of similar dimensions is then fixed around the end. The other end of the case butts up against the front false member top and bottom, while the two sides fit inside the front flanges. Two countersunk screws are then put through two small holes in the case to engage with the nuts soldered on the back of the supports. To give a professional finish the case may be covered with rexine or similar fabric.

In conclusion, there are two points that are worth mentioning. If the 185 diode pentode valve is purchased ex-W.D., be very careful to check that the filament is not touching the diode at the top of the valve as this appears to be a rather weak point with these valves since the filament goes through the diode and is very close to it. The other point being that a socket has been added at the back of the speaker magnet so that with the internal batteries switched off external batteries may be connected. This was done in the writer's case so that it could be run with a suitable vibrator and L.T. dropping resistance off his motor cycle accumulator.

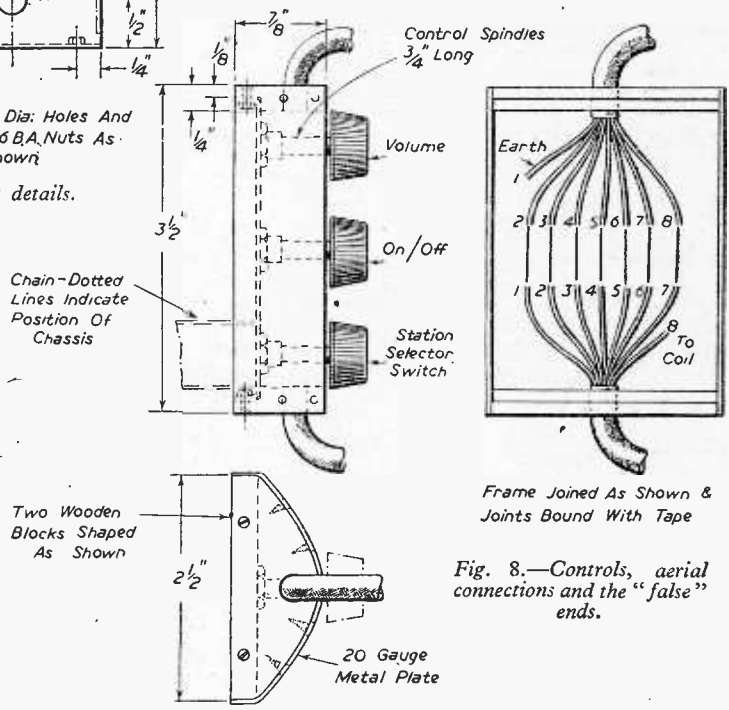


Fig. 8.—Controls, aerial connections and the "false" ends.

Our Cover Subject

THE U.S. Navy have installed an experimental television laboratory by means of which it is hoped to reach a number of naval centres from one central point. In the illustration on our cover this month (reproduced through the courtesy of the U.S. Navy) is a general view of the studio and the control room with the four monitors. A special projection type of television receiver is employed capable of throwing a picture varying in size from about 18 by 22in. to 18 by 22ft. The instructor may be seen in the picture giving an explanation of the mechanism and workings of the J.33 turbo-jet engine. Viewers of the A.P. transmissions will, no doubt, have recently seen a film made in the U.S. Navy centre illustrating this equipment and showing students at various classes receiving the illustrated lecture.

Other television news will be found in the special television supplement included every month at the back of the issue.

The "Best" Aerial

How to Select an Aerial for Best Results at Given Frequencies

By W. J. DELANEY (G2FMY)

A QUERY which we often receive, not only from keen listeners, but also from amateur transmitters who are just taking up that branch of radio, is "What is the best aerial to erect for such-and-such a purpose?" Unfortunately, it is not possible to answer such a question as there are so many additional factors to be taken into consideration. An indication can be given as to the lines upon which an aerial may be designed, but in the vast majority of cases some keen experimental work is called for by the user to find the best aerial, or, in other words, the aerial which will give optimum results for a given purpose.

Most readers know that a directional aerial array can be built fairly easily. It is possible for an amateur who, say, requires maximum reception from South Africa to work out very carefully the exact bearing using a compass, a Great Circle map and considerable patience, only to find when the aerial is erected that the results are poorer than when a simple horizontal wire is used. It may eventually be found that not far from the site on the correct compass bearing is a hill or rise in the ground, the effect of which is to deflect the particular signals, with the result that the aerial may be swung slightly to one side or the other and an improvement obtained.

Types of Aerial

Most listeners who use an all-wave receiver will find that a standard type of horizontal (or, more correctly, an inverted-L) aerial will give the best all-round results. Its length may not be critical unless optimum results are called for on a particular short waveband, when the aerial would probably be improved by cutting it for that band. It must always be borne in mind that height is the most important factor in aerial design, a properly cut aerial 10ft. from the ground undoubtedly giving poorer results than a wrongly cut aerial 30ft. up. Multiple aerials consisting of short-wave (or half-wave) aerials and longer wires for the medium and long waves, connected to the receiver through multi-tapped transformers, have gone out of fashion in view of the increased efficiency of modern valves and circuits.

Some amateurs find difficulty in calculating the length of aerials, especially the dipole. This is, of course, a half-wave aerial, or a wire cut to one-half of the wavelength required. In actual practice, there is an effect present on half-wave aerials on the short waves which makes it necessary to use a wire which is actually less than the actual measured half wavelength. It is necessary to convert the wavelengths to feet, and as most modern tuning dials and station readings are given in kilocycles (kc/s) or megacycles (Mc/s) it is found a somewhat difficult task for some readers to make the necessary calculation. However, by dividing 467.4 by the number of megacycles, or 467,400 by the number of kilocycles, the correct length of a half-wave aerial may easily be found. Expressed mathematically this is:

$$\text{Length of aerial in feet} = \frac{467.4}{\text{Mc/s}} \text{ or } \frac{467{,}400}{\text{kc/s}}$$

Obviously if one intends to cover a certain band (say 20 to 40 metres) the length chosen would be such as to resonate in the centre of the band (30 metres in the case of the figures given).

Experimental Ideas

Having found the requisite length, the next problem is to decide on the type to use. It will probably be found that the full length is too great to be accommodated in the garden space available. The aerial may then be folded, and there are some interesting fields for experiment here. The connection to the receiver or transmitter may be taken to the centre of the half-wave aerial, and the two side pieces may be folded back upon themselves, keeping them on a level plane or raising them above one another. The connecting point will vary according to the type of feeder used. Ordinary twin-flex of the plastic type can be used, and will stand quite a lot of bad weather. By adopting a Y-match or Delta connection maximum results may be obtained with quite simple experimental adjustments. A length of wood or ebonite, 6in. long, should be provided with a hole 1in. from each end. The ends of the flex should be threaded through these and attached to the cut ends of the aerial at the centre. The two ends should then be tied with a length of cord which may be doubled in the form of a half-hitch and held in position with ordinary plastic garden clothes pegs. By this arrangement the two ends of the aerial may be slid apart, whilst the strip of wood may be slid down the flex so that the triangle formed by the two ends of the flex and the centre space in the aerial can be gradually enlarged. The optimum position can thus be found on an actual transmission and the final arrangement determined upon with certainty.

Rotating Arrays

Obviously, for the very short waves, the aerial will only be from 3ft. to 10ft. in length, and at this size they are more conveniently made from metal tubing. Ex-Government car aerials, R.A.F. dinghy aerials and similar apparatus are readily available, and are generally of dural tube, which is strong and light. Thus an aerial with reflector and even directors may easily be supported on a short mast, and may be made so that it can be rotated to cover any given direction. It must be remembered, however, that if a transmitter is radiating a signal from a vertical aerial it will be necessary to employ a vertical aerial at the receiving end to obtain maximum results, but this should not worry the listener unduly, as most amateurs using rotatable arrays adopt the horizontal scheme for a number of reasons. Firstly, it is much simpler to erect and control; secondly, most amateurs find that signals

(*Continued on page* 318)

(*Continued from page* 316)

from a horizontally polarised aerial follow the contour of the earth better and carry farther. However, all B.B.C. medium- and long-wave transmitters use vertical aerials and best results are therefore obtained on these stations with vertical receiving aerials.

It will pay every listener who is anxious to get the very best from his equipment, whether it is a simple receiver or a multi-band transmitter, to spend a week-end or two in trying out different arrangements until he finds one which suits his own local geographical position and equipment in use.

Disc Recording Equipment

An Outline of the Apparatus Required—with a Survey of Commercial Equipment

READERS interested in disc recording have complained of the difficulty of obtaining suitable apparatus, and it is unfortunately true that much of the recording gear on the market at present belongs to the professional class, in that it is expensive by amateur standards. By all means *experiment* with old moving-iron pick-ups as cutter-heads, or even dabble with plain aluminium discs, but do not expect to make high-quality recordings by such means.

Basic Equipment

Let us consider the elementary requirements. These are: A blank recording disc, clamped on a steady, vibrationless turntable rotated at constant angular velocity; a cutter-head, traversing evenly across a disc radius and bearing a stylus correctly ground and mounted, that modulates laterally the cut groove according to the signals fed to it; a programme-source, such as a radio tuner or one or more microphones, with suitable voltage pre-amplifiers, feeding the main recording amplifier as distortionless as possible and with ample power-handling capacity to operate the cutter-head. Useful additions, vital for first-class work, are tone-control or equaliser stages to control the frequency characteristics, with monitoring equipment and volume indicators. Refinements include low-power microscopes to examine the cut groove, multi-speed turntables and scrolling devices.

The available equipment will be reviewed later, but first comes an analysis of individual items.

Recording Discs (Blanks)

In this country only one main type of direct-cut disc is available. This is the M.S.S.-Watts disc, consisting of a thin (6 mils.) layer of black cellulose-nitrate lacquer on a base of aluminium or zinc. It is obtainable in diameters of 5, 6, 8, 10, 12, 13, 16 and 17½in., single or double-sided. The larger discs are used single-sided for masters from which pressed copies can be made. Normally no copies are required, or these are made by direct re-recording ("dubbing"), and the disc as cut is played-back immediately without processing of any sort. These discs have low surface-noise, good response capabilities, are not breakable and have a long life if properly treated.

Turntables

The rotational speed must be constant within narrow limits under different conditions of cutter-loading. The turntable must have good bearings and be accurately balanced. All the recorders tabulated below, except the C.D.P. recorder, have a rim-drive through an idler wheel, and so apply the driving torque at maximum diameter from a fractional-horsepower synchronous motor mounted on vibration absorbers. The C.D.P. turntable is a heavy, machined casting into which is built the rotor of Simpson-type synchronous motor, and the corresponding stator is A.C. energised by the mains input, the driving torque being applied at 10½in diameter in a 13in. diameter table.

Cutter-heads

In most cases these are balanced-armature moving iron types, although piezo-electric cutters are also available. The design of cutter-heads presents a wide variety of complex problems; for example, the difficulty of obtaining satisfactory damping over a range of temperature and simultaneously achieving an even frequency characteristic. Moving-iron heads have a "cross-over" point at which the response changes from constant-amplitude to constant-velocity; this point depends on the damping used, and must be known so that it can be corrected in play-back.

A gruelling test for evenness of a cutter-head is to record some programme for 15-20 seconds, then drop the stylus of the play-back pick-up into the first groove of the cut disc and continue recording with the equalised output of the play-back channel feeding the recording amplifier and cutter. By this means is generated a series of 15-20 second bands, first the normal recording, then a recording of the replayed recording followed by a second re-recording, and so on, analogous with a series of reflections in two parallel mirrors.

Styli

A stylus is a machine-tool and must be accurately made. Sapphire is the best material. It is next in hardness to the diamond, and takes a high polish without irregularities; this polish is applied to the cut groove. Steel and alloy styli are readily obtainable and much cheaper than sapphire, but they have a small useful life and may lose their edge suddenly in the middle of a recording. Sapphires are brittle and need careful treatment, but they can be resharpened (relapped) as required; this should be done only by the makers, since it is a highly specialised art.

Swarf-removal Devices

A 12in. disc can yield a third of a mile of offcut swarf, which must be rapidly removed in case it fouls the stylus. Electrostatic attraction between

swarf and disc makes this difficult. Long, flat brushes lying across the turntable are standard on most recorders, or can be bought separately. A soft paint brush held in the hand is a useful auxiliary. Turning the stylus very slightly in the cutter-head helps to throw swarf to the centre of the disc, and so does advancing the line of traverse of the stylus relative to the radius through the centre of the turntable. The B.B.C. have an air system in which the swarf is sucked away continuously. Swarf is highly inflammable and must be carefully disposed of.

Recording Amplifiers

Commercial amplifiers are available, each usually designed for use with a particular recording head. Home-built equipment can give excellent results if properly designed, and may include personal preferences in switching, layout, dial arrangements, etc. The main requirements are 10-15 watts output at low distortion, negligible hum level, noiseless switching and volume control. Sound construction from reliable components is essential. In general, push-pull triodes (PX4 or PX25) or tetrodes with negative feedback (6V6 or KT66) will be necessary.

Programme Sources

Radio tuners should present no difficulty. Microphones must be good; carbon buttons and cheap P.A. models are useless. For general-purpose work a good moving-coil model is suggested. Ribbon microphones are more expensive, but have directional properties useful in multi-microphone work with orchestras, or singers with piano accompaniment. Do not use ribbon instruments out of doors, or for close speech.

It is as well for beginners to experiment by recording B.B.C. programmes, where problems of pick-up and balance have been solved in the transmission chain.

Play-back Pick-ups

The pick-up is best mounted on the recording turntable. It can then be used to check quality and volume directly, even during recording. Heavy or highly-damped pick-ups are bad enough for shellac pressings, but they spell disaster for direct recordings on lacquer, even with trailer needles. Use one of the recent lightweight pick-ups, with a small moment of inertia and low head-weight, preferably with a sapphire stylus. The makers will be able to indicate the bass-correction needed to give a substantially flat overall response. Fibre or thorn needles must not be used on lacquer, since they are rough and leave a fine dust of broken particles in the cut groove.

Details of Available Equipment

We come now to a survey of equipment on the market. This will be outlined maker by maker, and full specifications can be obtained from the individual manufacturer. Some of it is for professional use, and price may rule this out for the purely amateur experimenter.

E.M.I. ("His Master's Voice") recently marketed the 2300H recorder, a complete equipment in three portable cases—(1) record cutter and play-back pick-up, (2) amplifier and (3) loudspeaker, microphone and leads. The eight-watt amplifier has five valves. A ribbon microphone is used. The whole unit works on 200-250 volts, 50 cycles supply, and can be used for P.A. Retail price is £235. Also available from E.M.I. is the Type 14 lightweight play-back pick-up, which costs £4 16s. 8d. with bass-correcting and matching transformer (output 1.5 volts) or less transformer £3 11s. 8d. (output 6 mV.).

The M.S.S. Recording Co., Ltd. make a portable recorder, type PR/4B. A four-stage amplifier is built-in. Three stages are used for play-back; the speaker is in a separate case. Groove spacing is adjustable. Price £150. M.S.S. also make type ED45 recorder-only unit, with a 2,000-ohm head, cutting 90 grooves/inch. This costs £57. Cutter-heads, types CH/2A and CH/4A, are sold separately. M.S.S. sell a range of play-back pick-ups, styli and other apparatus, and they make recording blanks in all sizes. The new LED lightweight recorder has recently been produced.

Birmingham Sound Reproducers have the AR33C recorder, using a 15-ohm head, taking 10 watts peak. A Connoisseur play-back pick-up is fitted. Price £160. Recording amplifier type RT has input switching, volume meter, and bass and treble equalisers built-in. Output is 20 watts maximum. Price £60. This firm also make moving-coil and ribbon microphones and amplifiers, and they handle styli, blanks and speakers. They now make a replay motor and turntable at £3 5s.

The Grampian type SR2 recorder cuts inside-out or out-in at either 96 or 110 grooves/inch. The cutter is to B.B.C. specification. An E.M.I. No. 12 pick-up is mounted for play-back. The 10-watt recording amplifier, type RA2, includes microphone mixing, output meter, play-back equaliser, and loudspeaker. Ten watts are obtained from push-pull PX4s.

Grampian also market recording heads, a dual-speed recorder for studio use, loudspeakers, and microphones.

Bourne Instruments make the cheapest recorder available, with a 15-ohm head cutting at 95 grooves/inch and the turntable-drive referred to above. Price £32. The balanced-armature head costs £6. Average modulation is given by 1 watt. C. D. Pickersgill, of Bourne, has recently developed a modified version of this recorder, cutting a micro groove giving 10 minutes playing-time on a 12in. disc.

S. G. Brown produce a 13in. portable recorder, complete with S.T.C. microphone, amplifier, speaker and pick-up for £210. The recorder only, with 15-ohm cutter, volume meter and Connoisseur pick-up, will work with a 10-watt amplifier and costs £130. S. G. Brown can supply recording accessories.

Technifon Ltd. make sapphire styli for recording and play-back purposes, and they have a regrinding service. Their type TG2 traverse gear is designed for 12in. or 13in. turntables, taking its drive from the turntable shaft through a worm. With a 4- or 15-ohm cutter head this costs £21. Feedscrews can be supplied for 96, 104 or 120 grooves/inch, inside-out or out-in. Technifon supply cutterheads separately, such as the CL4, at £10, and also make turntable units and pressings from masters.

Cosmocord Ltd. make a piezo-crystal recording head, which can be loaded to cut a required frequency characteristic. They also make pick-ups, in particular the GP12.

The E.M.I. type 14 pick-up has already been referred to. Other lightweight types suitable for lacquer recordings are the Connoisseur, made by A. R. Sugden, Ltd., and the Decca pick-up, recently released by the Decca Record Co., Ltd.

In addition to the major items used for recording, a large assortment of accessories—swarf brushes, stroboscopes, cable, disc envelopes, sound-proofing material—can be had from a number of suppliers, including Simon Sound Service and the University Recording Co.

For general-purpose work a good moving-coil microphone is the type A (25 ohms) unit made by Vitavox Ltd. This firm also make other microphones and a range of loudspeakers.

Addresses of Firms Mentioned

Bourne Instruments, Bourne, Lincs; S. G. Brown Ltd., Shakespeare Street, Watford, Herts; Birmingham Sound Reproducers Ltd., Old Hill, Staffs; Cosmocord Ltd., Enfield, Middlesex; Decca Record Co., Ltd., 1-3, Brixton Road, London, S.W.9; E.M.I. Sales and Service Ltd., Hayes, Middlesex; Grampian Reproducers Ltd., Hanworth Trading Estate, Feltham, Middlesex; M.S.S. Recording Co. Ltd., Poyle Close, Colnbrook, Bucks; Simon Sound Service, 48-50, George Street, Portman Square, London, W.1; A. R. Sugden and Co. Ltd., Brighouse, Yorkshire; Technifon Ltd., 99, Belgrave Road, London, S.W.1; University Recording Co., 16, Burleigh Place, Cambridge; Vitavox Ltd., Westmoreland Road, London, N.W.9.

Trade Notes

New Ekco Mains-battery Portable

E. K. COLE, LTD., have just announced for immediate release the Ekco "Stroller" (Model MBP99), an attractively styled A.C./D.C. or battery portable, at 19 gns. (including tax and long-life batteries).

The set is a four-valve, plus rectifier, all-wave superhet portable operating on A.C./D.C. mains or from all-dry batteries, incorporating in-built frame aerials. In a grey lizard "rexine" covered case with easy-grip carrying handle, and with tuning escutcheon and speaker grille in an attractive new "opal" plastic material.

Special attention to the circuit design with the use of miniature valves ensures economical consumption on both mains and battery.

High quality of reproduction is achieved by the use of selective negative feed-back over the output stage.

Double-pole switching, isolation of battery compartment and other I.E.E. and B.S.I. safety precautions have been included.

New Mullard Booklet on Industrial Valves

MULLARD ELECTRONIC PRODUCTS, LTD. have published a new booklet giving particulars of a wide range of valves and electron tubes suitable for industry and communications.

The booklet, in four colours, contains 23 pages. It is the first comprehensive one of its kind yet produced by the company, which periodically issues information of use to engineers. The contents include abridged data on a complete range of general-purpose valves, transmitting and industrial power valves; on cathode ray tubes and photographic flash tubes; on photocells, thyratrons and other special valves.

Ten thousand copies of the booklet are ready for general issue to industrial, electronic and communication engineers.

Advance Components

ADVANCE COMPONENTS LTD. advise us that the damage to their factory caused by the recent fire is not as extensive as was at first feared, being confined chiefly to office buildings and one corner of the works.

They have been able to resume production after a break of two days, but deliveries of several items from their range of signal generators and constant voltage transformers may be delayed through the occurrence.

However, they are now in a position to quote a specific delivery time for all items from their catalogue.

New Philips Table Radio

PHILIPS ELECTRICAL LTD. announce the introduction of a new table radio receiver incorporating a unique bandspread arrangement which produces a stability on short-waves hitherto unobtainable.

The receiver (Model 681A) is essentially a high-class set in which nothing has been spared to give absolutely first-class performance and quality and it caters especially for the man whose interest does not stop short at the medium- and long-wave programmes but who looks as well for good short-wave performance.

This has been achieved by the use of the "double superhet" principle which reduces short-wave listening, from the tuning and station-logging point of view, to the same order as its medium-wave counterpart; that is to say, the dial space allotted to each short-wave band is of the same order as that allowed for medium-wave coverage and each band is spread electrically over the entire scale of 180 deg.

Furthermore, the stability and logging facilities, on short-waves, are as good as on the medium-waves. Even on 11 or 13 metres the tuning remains constant when the set is subject to vibration, and the drift is less than the width of one broadcast channel.

On the L.W., M.W., and general coverage bands the bandspread frequency changer is inoperative and the normal superhet function is followed.

On bandspread, the R.F. valve is made to become a wide band amplifier covering the half megacycle required. The bandspread frequency changer is run as a fixed frequency oscillator on each band (hence the high stability) and converts the signals incoming at the aerial on the selected short-wave band into the range 2.75-3.25 Mc/s. The normal frequency changer then acts as a superhet receiver tuning over this range to give the 2nd I.F. of 452 Kc/s.

The price is 38 guineas plus P.T.

Programme Pointers

Our Music Critic, MAURICE REEVE, discusses recent programmes and features

THE newly constituted Brains Trust has put up two or three shows which, for wit and debating skill, have been a vast improvement. Blessed with what must ever be the crux of a successful trust, good questions, they have both entertained and instructed to a greater degree than for some time past. All would be most sorry to see this long-established show go west, but I do feel that one thing and one thing only can save it—and the B.B.C. could and should act immediately. All questions eliciting *facts* should be rigorously barred, and the show confined exclusively to the expression of *opinion* and the differences thereon freely aired and expressed. The whole entertainment value of the show is wrapped up in this—what the public wants is to hear a good, red-blooded Socialist and Tory defending their respective theories and shibboleths hammer and tongs, or a classical versus jazz musician going at it sixes and sevens, or a lady on equal pay for equal work against the opposite sex, and a thousand-and-one other questions which involve *opinion*. The others should never be sent in, in the first place, as they could all be answered, either by inquiry at home or by an "answers to questions" board, which, if it sat for a few minutes immediately after the Brains Trust had finished, would prove in one session how right I am.

Superflous Announcements

An important point which has been raised before, though not for some time to my knowledge, is the awful amount of time lost in announcing and signing off items, more especially in dance-band sessions and programmes of a like genre. At least half an hour daily could be saved and programmes lengthened accordingly. Is there really any demand for people being brought to the microphone, albeit with a considerable oration from the announcer, only to say, "Well, ladies and gentlemen, it has been a great pleasure to me and my boys to play to you again, and we only hope you have liked our little number. We shall be on the air again next week . . . so in the meantime, here's so-and-so—saying good-bye—and cheerio—till Monday"—all, be it noted, getting slower and slower, and more plaintive and whiny as it draws to its cadence? Several times a day, seven days a week, etc. Surely, if so-and-so and his boys are so popular, an additional number to their programme would be welcome.

When I broadcast before the war, a half-hour recital programme contained 26 playing minutes, the items having to be timed at home and set out in the contract. And that was, and still is, the rule for "straight" shows. Pianists and their like, even the greatest, are not allowed time in which to tell the world how pleased they are to be there, etc., etc., thank God. The "Saturday Evening Theatre" sets an admirable example in the brevity and conciseness of its announcement; no one feels that the show has suffered in any way thereby, or that our enjoyment as listeners has abated one jot. In fact, the contrary is the case, as we are left free to form our own judgments and opinions at the end of the play, instead of having other people trying, at any rate, to influence them. "Twenty Questions" and "Music Hall" are also very well announced and signed off. On the other hand, I have spoken of the interminable and boring "histories" and "analyses" which precede most performances of major musical classics. The time taken up over these mostly unwanted growths on the programme politic, if I may be allowed to mix my metaphors, must be colossal; not to mention frayed nerves and exhausted patience. Whether all these social pleasantries and professional formalities serve any useful purpose as media on which new listeners can tune in, I wouldn't know. But I would like to repeat and emphasise that I feel sure that most of these good people's performances are very preferable to their voices, and that they would be much better employed, and appreciated, in giving us an extra number rather than telling us, in long-winded and sing-song phraseology, that they will be "on the air again next week."

Faure's Music

The recitals of Faure's piano music have been very welcome breaths of fresh air, and their performance, for the most part, excellent. We could do with more of it in our recital programmes. Though it lacks, both in melody and ornamentation, the magic of Chopin and of much Liszt and Schumann, it has exotic moments, brilliant technical embellishments and fascinating rhythms. The neglect of men like Faure is as short-sighted as it is foolish in other ways, as pianists who do venture it bring both themselves and their audiences to it free of satiety and familiarity; a boon, surely, of inestimable worth.

Parsifal

Was the Good Friday Parsifal concert a material success? I hope so. I heard Sir Henry Wood's many, many times between the wars, when numbers were invariably unable to gain admission. The audience this year didn't by any means fill the Albert Hall, but it would have been unable to pack into Queen's. I have seldom heard the B.B.C. Symphony Orchestra, under Sir A. Boult, play more beautifully, though the singing was not always on the same high level. The Flower Maidens, dressed to kill for a stroll in Klingsor's Magic Garden, neither looked happy nor sang too well, arrayed under the organ loft.

Reading

The new series of Sunday evening talks on Reading had a good send-off by Field Marshal Earl Wavell, himself an experienced reader and anthologist. The second and third were by P. H. Newby and Col. Spencer-Chapman. They should prove a big attraction. The diversity of choices for the "desert island" are amazing and most intriguing. Lord Wavell's selections were those of the scholar rather than the soldier, though we wouldn't necessarily expect to pop into his tent at any time and

catch him reading Napier's "Peninsular War" or Cressy's "Fifteen Decisive Battles," just because he donned khaki for his calling. Mr. Newby, too, took an amazing collection to all sorts of weird places in the Arctic and elsewhere. It will be fascinating to hear what others choose, and whether anyone dares omit Shakespeare.

"Die Fledermaus"

Johann Strauss's immortal *Die Fledermaus* suffered, rather more than most broadcast opera has to, from the absence of the visual element. It is always pleasant to hear this haunting music, which was very well played and sung by all concerned, under Stanford Robinson's direction. But the full exotic flavour cannot be tasted without the *mise-en-scene*. However, half a loaf, or perhaps three-quarters of one, is better than no bread.

Mr. Raymond Mortimer's centenary talk on the famous French critic and man of letters, Sainte-Beuve, was most enjoyable, and served to remind us how the celebrated "Causeries de Lundi" deserves to be better known in English than it is. Exactly a hundred years ago, for the talk honoured the centenary of the "Causeries" rather than its author's birth or death, Sainte-Beuve was commissioned to write a literary article in the *Constitutionnel* paper, every Monday, of 8,000 words. He wrote them for the rest of his life. Collected, they fill 28 volumes of most delightful essays on people and events, forming a veritable history of France in its most attractive form. The most brilliant are on the many famous women that so conspicuously adorn French history. A selection, in eight volumes, in translation, used to be published by Routledge in small pocket size. They are well worth having.

News from the Clubs

EXETER AND DISTRICT RADIO SOCIETY

Hon. Sec.: E. G. Wheatcroft, 27, Lower Wear Road, Countess Wear, Exeter, Devon.

THIS society hopes to hold a D.F. Contest on Woodbury Common early in July. Contestants from local clubs welcomed. 7 Mc/s band.

Regular meetings are held on Thursdays, at 7.30 p.m., at 9, Palace Gate, Exeter.

THE SOLIHULL AMATEUR RADIO SOCIETY

Hon. Sec.: G. Haring, 121, Bradbury Road, Alton, Birmingham.

A DISCUSSION on D/F receivers, opened by Mr. C. A. Cheshire, marked the high spot at the June 1st meeting.

Members showed their enthusiasm for this popular subject by asking many and varied questions. The visit of Mr. Griffith, of "Slade Radio," relating his experiences, was also greatly enjoyed.

An announcement made at this meeting that the hon. treasurer G5TU had kindly presented to the club new headquarters, a building 60ft. long, where every form of "ham" activity can be indulged in, was received with great appreciation, and thanks were offered to him for his very acceptable gift.

READING RADIO SOCIETY

Hon. Sec.: Mr. F. Hill, G2FZI, 997, Oxford Road, Reading.

THE following were the activities of the Reading Radio Society during the month of May.

At the normal meeting on Thursday, 12th, a visiting panel of experts formed a Brains Trust to answer technical questions.

On Saturday, 14th, the first meeting of the Instructional Section was held, when Dr. Lemon gave the inaugural talk on the Complete Frequency Spectrum of Radiant Energy.

On Saturday, 28th, Mr. G. Guy, G8TH, gave a talk on the directivity and gain of Aerial Arrays, demonstrating the field strength patterns obtained by means of model aerials fed from a 50 cm. transmitter.

Visits were also made to the technical departments of the B.B.C. at Caversham Park, and to the grid-switching station at Earley.

BASINGSTOKE AND DISTRICT AMATEUR RADIO SOCIETY

AT the club's first Annual Exhibition, held at the Town Hall on Easter Saturday and Monday, the midget 4½ volt Rx (described in these pages recently), built around the 6K7, attracted great interest, and the member who built it assured the public that it was first-class, having taken it to work to hear the test match results. Other items shown were TX under GTUM/A, Denco 12v. Rx, Three-valve and 5 and 10m. Rx, Oscilloscope, Wheatstone Bridge, etc., etc.

It is hoped, by the interest shown, that the Exhibition will have brought in new members.

CARLISLE AMATEUR RADIO SOCIETY

Sec.: J. Ostle, G2 DYV Outgang, Aspatria, Cumberland.

THE club is now meeting monthly during the summer months, meetings being held fortnightly during the winter.

Visits are being arranged to the local station of the B.B.C. and the local General Post Office. It is also hoped to arrange a visit to the electricity station.

At the moment, the active members belong to the transmitting fraternity, but the club hopes to extend its activities to cater for those members confined to receiving, particularly the younger boys.

Support from local radio experimenters is unhappily small, and the club would welcome new members.

Visits to the Manchester Convention were discussed, and several members expressed a desire to be present.

BRIGHTON AND DISTRICT RADIO CLUB

Sec.: L. Hobden, 17, Hartington Road, Brighton.

MORE interesting talks and demonstrations have been given during the last few weeks. Mr. Hobden demonstrated his home-built A.C. superhet. Valve theory and oscilloscope construction have also been dealt with, complete with a demonstration of a home-built 'scope. Morse classes are held every club night. Much time and labour for N.F.D. proved worth while, and under the able leadership of Mr. How a good week-end was had by all participating.

Open to Discussion

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

Measuring Meter Resistance

SIR,—In Mr. J. Amphlett's letter, published in the July issue of PRACTICAL WIRELESS, he states that the equation:

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

as used in the wide range ohmmeters for the shunt measurement of low resistance is incorrect, and that Mr. R. G. Thomas (May issue), should, therefore, not use it in his method for determining the internal resistance of a meter.

I quite agree with Mr. Amphlett that the equation is incorrect, but I feel that he would have done Mr. Thomas more service by discussing the amount of error introduced.

In a later paragraph, Mr. Amphlett shows correctly that if the series resistance R in the circuit (referring to Mr. Amphlett's diagram) is large, the equation is approximately correct. This, of course, is the whole crux of the matter. In the wide range ohmmeter circuits I, too, was confronted with a mass of calculations, and the designs were therefore made to reduce the resultant error to negligible proportions, by making the series resistance high.

I can assure constructors and intending constructors that their wide range ohmmeters are quite sufficiently accurate for all practical purposes, and by the same token Mr. Thomas's method of determining meter resistance is perfectly satisfactory *so long as he uses a high series resistance and, therefore, a high voltage source* relative to the resistance and voltage drop across his meter.

As many readers prefer an ounce of practice to a ton of theory, may I be permitted to describe an experiment conducted in the space of a minute or so. I took a 0-1 mA. meter whose resistance I knew to be 139.7 ohms, and measured this meter resistance by Mr. Thomas's method. To reduce error to negligible proportions I used a 67.5 volts layer-type battery which was old, had a high internal resistance, and whose accurate voltage on load I had not measured. The series resistance consisted of a 47,000 ohms fixed resistor and a 20,000 ohms potentiometer, and with the circuit completed the meter was set to full scale deflection. The first standard resistance to hand, a 680 ohms 1 per cent. component, was then shunted across the meter terminals, the 1 mA reading falling to 0.83 mA's.

If Mr. Thomas's adaptation of my equation is employed to calculate the meter resistance from these figures the value obtained is 139.27, say 139.3 ohms. Since the true resistance is 139.7 ohms the error is 0.4 ohm in 139 ohms, a percentage error of less than 0.3 per cent.

Admittedly, had I chosen a lower resistance as the shunt—say 50 ohms instead of 680 ohms, the error would have increased, but there is no need to use a low resistance. If Mr. Thomas employs, in his method, a 120-volt H.T. battery with a series resistance consisting of a fixed 100,000 ohms and a variable 50,000 ohms, and shunts his meter with a resistance such that the reading does not fall below the three-quarters scale mark, he will obtain a value for his meter resistance with a very small error indeed—the final error will depend almost entirely on the accuracy with which the scale can be read. The above battery voltage and resistance value refer, of course, to the circuit for a 0-1 mA. meter; a more sensitive instrument will require a higher resistance in series and up will go the accuracy yet again.—EDWIN D. BRADLEY (Cornwall).

Home Recording

SIR,—The remarks expressed by your correspondents on Home Recording are very true, and Mr. J. Law's experiments are very interesting. But may I add a rider to request some enterprising manufacturer to produce an electro-magnetic recording tape. The building of this type of recorder is a comparatively simple and cheap job for the average enthusiast. The draw-back is, however, the tape.

I have carried out many experiments along this line using a tape made of steel filings between self-adhesive cellulose tape, with workable though far from satisfactory results.—"TAPE EDGING" (Aspley).

Five-metre Converter

SIR,—Having read the article by Messrs. I. S. Robertson and W. J. Wheeler, giving instructions for the modification of R.F. Unit Type 26, in your April issue of PRACTICAL WIRELESS, I purchased a brand new unit. My intention was to use it in front of an 1155 receiver which I have modified for mains and speaker. First of all, however, I decided to try the unit as it stood without modification of the oscillator and using the "lining up" adjustments given in the article.

Having tuned the 1155 to 7.5 Mc/s, I tuned throughout the range of the unit repeatedly without any success. At various points on the unit's dial, however, my 1155 oscillated with a loud "hiss," the oscillation being present even when the output from the R.F. unit was disconnected from the 1155. Otherwise there was no indication of a signal whatsoever.

Similarly, after having modified the oscillator circuit by following the article, there was still no signal and not even a loud "hiss" as previously.

I had the three valves from the unit tested for emission, etc., and checked through the wiring using the circuit in the article but I could find no faults. My H.T. and heater voltage was tapped from the power pack to the 1155, by the way, being 275 v. and 6.3 v. respectively.

Maybe a fellow reader of PRACTICAL WIRELESS can come to my aid and suggest what could be wrong. I would be sincerely grateful if I received some advice concerning my problem.—W. M. LEE, "Dolcoed," Merthyrmawr Road, Bridgend, Glamorgan, S. Wales.

Glass and Metal Cement

SIR,—Further to the very excellent suggestion of C. F. Mason's *re* glass and metal cement, I have had occasion in the past to experiment with a great many types of adhesive compounds for the purpose of repairing loose valve bases and grid tops, but the most successful results so far have been obtained by using "Balsa" cement (as used by model enthusiasts).

Apart from its ability to weld firmly together glass, metal and plastic materials, etc., it has the advantage of setting hard in a matter of minutes.—JACK SMITH (Sheffield).

Line-cord Substitute

SIR,—May I add this warning to those who may use an electric lamp for a line-cord substitute, as suggested in Practical Hints, July issue. I have used lamps as droppers for many years and find them kinder to valve heaters than line-cords, but their wattage rating is not easily worked out by Ohms Law. On the contrary, it is very difficult, due to the resistance of the lamp varying with the temperature, which in turn is proportional to the square of the current flowing, giving us three variables.

Here is a simple example :—

Set working from 230-volt mains, valve line-up 6K8, 6K7, 6Q7, 25L6, 25Z6.

First three are 6.3 volts, and last two are 25 volts, giving us a total P.D. across heaters of 68.9 volts. ∴ Voltage to be dropped is 230−68.9=161.1 volts and current=.3 amp.

$$\text{Resistance required}=\frac{E}{I}=\frac{161.1}{.3}=537\Omega.$$

Wattage of 230-volt lamp which has a resistance of 537 ohms which we will need is theoretically

$$P=\frac{E^2}{R}=\frac{230\times230}{537}=98.5 \text{ watts.}$$

Nearest standard lamp is 100 watts.

Now if we take a standard 230-volt 100-watt lamp and measure its resistance with an Avo we find it is 40 ohms. The same lamp when working from 230-volt mains has a resistance of

$$\frac{E^2}{\text{Power}}=\frac{230\times230}{100}=529\Omega.$$

Thus we have in circuit a very variable resistance operating between 40 ohms and 529 ohms depending upon its temperature. As we have in series with the lamp a resistance due to the valve heaters of $\frac{68.9}{.3}=229.6$ ohms when hot, it can be seen that the temperature of the lamp will be much below its operating point and therefore its resistance will be well below 529 ohms, causing an increase of current in circuit and would, in the example given above, soon lead to a breakdown in the heater chain.

Trial and error is by far the safest, starting with a lamp that is obviously *too low* in wattage, and gradually increasing the value with a voltmeter across the heaters until voltage is correct. It will be noticed that the voltage of heaters rises as they become warm, therefore it is essential to wait until the needle remains steady before taking the reading, or disconnecting supply should it threaten to rise too high.

I hope this may enlighten anyone who may have overlooked this point.—W. GIBSON (South Shields).

Ex-service Tv Equipment

SIR,—After reading in the June PRACTICAL WIRELESS of the experience of your correspondent R. G. Howe in the successful construction of television sets from surplus parts and the bad luck of R. Watts in other surplus components, I should like to record my own experiences.

After several months' easy working a TV receiver was completed from modified surplus units, but on testing nothing happened. Three immediate troubles are :—

1. The line time base, a single EF50, has approximately 450 volts on the plate and although the raster forms, soon the valve gets very hot and the line goes ; so far three valves have been ruined in this position.
2. When anode of first valve (EF54) is connected through its coupling condenser to next grid the plate current of the second valve rises to over 16 mA.
3. Several valves have cracked and broken glass round the pins.

In the first two cases all coupling condensers have since been changed with no effect.

In the meantime I am starting again by separating the power pack and using the PRACTICAL WIRELESS recent TV sound set.—J. T. CORCORAN (Barnes).

Building a Television Receiver

SIR,—There are one or two points regarding the televisor described recently in PRACTICAL WIRELESS which, judging from general enquiries that have reached me over the past month or so, may need some clarification.

First, the use of EF50 (VR91) in place of the SP61 (VR65) valve. The coils are designed for use with the latter type of valve, and so these must be used if the receiver is to work as intended. Second, the range of the receiver—the writer can, of course, give no "guarantee" about this ; the set is giving consistently good results in this district which is about 65 miles from London, always working on much less than full gain (contrast), synchronising being rock steady. No doubt good results will be obtained, given a reasonable situation, up to 100 miles, but the writer can make no claims for distances beyond this. A signal of the order of 30 μV. per metre is possibly the safe minimum for this receiver, but at extreme ranges fading will be troublesome. Third, modifications for Sutton Coldfield—here, in view of the single sideband requirements and the fact that the vision sideband retained is the one adjacent to the sound channel, some modified I.F. tuning procedure will no doubt have to be adopted, and some small changes *may* have to be made in the I.F. coils. Also, some sort of sound channel trap will almost certainly have to be coupled to one or more of the vision I.F. stages. The vision oscillator will probably require tuning to 13 Mc/s *below* the vision signal instead of above as at present to preserve oscillator stability, but the existing circuit will cover this new frequency without change.

I trust the above will not deter those who are preparing for the new transmissions, for it is not expected that any drastic alterations will be necessary to the vision receiver so far described, and full details will be given as soon as the new station is operating.—S. A. KNIGHT (Wellingboro').

Impressions on the Wax

Review of the Latest Gramophone Records

THERE is a substantial issue of records by the Philadelphia Orchestra to herald their first visit to Europe. This splendid orchestra, comprising a personnel of 110 players, began a tour of Britain in the latter part of May. Such a very special musical occasion is well marked by the recording of three masterpieces. The Toccata and Fugue in D Minor by Bach on *Columbia LX*1181, Die Fledermaus' Overture by Johann Strauss, Jnr., on *Columbia LX*1182, and the Suite from "Der Rosenkavalier," by Richard Strauss on *Columbia LX*1183-5. Eugene Ormandy, who has been conductor of the orchestra since 1943, gives a first-rate interpretation of these three pieces. The Philadelphia Orchestra, in spite of its size, is never heavy-handed; this is very noticeable in the execution of the springy rhythms Johann Strauss introduces into his capital *buffo* overture.

A splendid new version of Moussorgsky's "Pictures at an Exhibition" by the Orchestre National de la Radiodiffusion Francaise, conducted by Paul Kletzki, is another highlight in the recent recordings, and appears on *Columbia LX*1186-9. The pictures concerned in this suite were part of a memorial exhibition held by Moussorgsky's friend Hartmann, a painter and architect. Though originally written for solo pianoforte, the Pictures has been orchestrated by Ravel so appositely that the orchestral version is the one most widely known. The orchestra corresponds to our own B.B.C. Symphony Orchestra in its official broadcasting function.

To hear a Mozart piano sonata played as it deserves one must seek out a pianist of the first water. Such a player is Artur Schnabel and his recording of Mozart's Sonata in B Flat, K570 on *H.M.V. DB*6839-40, should certainly not be missed.

Ballet Music

Constant Lambert is shown in the double role of conductor and composer with his recording of Horoscope by the Philharmonia Orchestra on *Columbia DX*1567. Horoscope was first produced at Sadler's Wells in 1938. The music of this ballet deals with the emotional significance of the signs of the Zodiac. Constant Lambert's connections with music are very wide, but it was in ballet that he rapidly achieved a unique standing. From 1938 his activities with the Sadler's Wells Ballet, both as conductor and composer, have done much for the cause of English ballet. The orchestra have also made a recording of Liszt's Apparitions ballet, arranged by Constant Lambert, on *Columbia DX*1568.

Beniamino Gigli's spring tour of Britain was extremely successful. Everywhere his audiences greeted him with the greatest enthusiasm, and everywhere Gigli responded as only Gigli can. For his latest record he sings "Mattinata Siciliana," which is a labourer's song as he goes to his work in the morning, and "Carrettieri," which is a typical song of the Sicilian wagoner, on *H.M.V. DA*1912. Gigli, who, as a farmer, understands the Italian workman, sings these arias with feeling and warmth of tone.

Light Music

"Dream of Olwen" is undoubtedly Charles Williams's most famous work—to date the sheet music of this impressive piece has sold over a quarter of a million copies—but this celebrated conductor and composer has written many other intriguing tunes. "Jealous Lover" is his latest composition, and he conducts his own orchestra through this piece on *Columbia DX*1569. As the title implies, this is a descriptive piece depicting a lover's quarrel, scored for piano and orchestra. The pianist is Arthur Dulay, whose brilliant playing was heard in Charles Williams's recordings of "Dream of Olwen" and Quebec Concerto. Manuel Ponce's "Estrellita," arranged by Cecil Milner, is on the reverse side.

"Vienna, City of My Dreams," and "Two Hearts in Three-quarter Time," are the two titles of the latest Andre Kostelanetz recording on *Columbia DX*1571. Throughout these pieces Kostelanetz maintains a sparkling level of playing in his orchestra, exactly suited to the material before him.

William Hill-Bowen, featured soloist in George Melachrino's recordings of Warsaw Concerto and "Dream of Olwen," is again heard with the orchestra in "Ante El Escorial" on *H.M.V. C*3877. "Ante El Escorial," a mood piece in sombre vein, was written by Cuban composer Ernesto Lecuona, whose "Sibony" brought him fame in 1929. The performance by William Hill-Bowen and the orchestra, to George Melachrino's arrangement, emphasizes the moving quality of this piece. "Dance Mexicaine," a bright number in 6—8 time with an attractive beguine movement, is on the reverse side.

Two other records that should not be missed are "The Laughing Violin" and "By the Sleepy Lagoon," by Tom Jenkins and his Palm Court Orchestra, on *H.M.V. B*9768, and "Cherubini" (The Water Carrier), by Rudolf Schwarz conducting the Bournemouth Municipal Orchestra, on *H.M.V. C*3865.

Dance Music

Four contrasting sides by Joe Loss and his Orchestra this month are "Hamtramk" and "Russian Rag" on *H.M.V. BD*6045, and "I'm Not Going Home" and the "Windmill Song" on *H.M.V. BD*6046. A new coupling by Vaughn Monroe and his Orchestra is "Riders in the Sky" and "Red Roses for a Blue Lady," on *H.M.V. BD*1247. Other notable records are supplied by Harry Davidson and his Orchestra, who continues his old-time dance series with "Gay Nineties Veleta" on *Columbia DX*1570, Ray Noble and his Orchestra with "Down by the Station" and "It's a Most Unusual Day," on *Columbia FB*3494, and finally Felix Mendelssohn and his Hawaiian Serenaders play "Let Me Whisper I love You" and "The Blue Lagoon" on *Columbia FB*3491.

R.S.G.B. TECHNICAL PUBLICATIONS. "R.S.G.B. Bulletin" Monthly Journal; current issue 1/6, five recent back issues 2/6. "Valve Technique," 104 p.p., 3/9; "V.H.F. Technique," 96 p.p., 3/9; "Microwave Technique," 68 p.p., 2/3; "Transmitter Interference," 32 p.p., 1/6; "Service Valve Equivalents," 32 p.p., 1/3; "The Transmitting Licence," 32 p.p., 1/-. All prices include postage. **Radio Society of Great Britain, 28, Little Russell St., London, W.C.1.**

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CHASSIS, Panels, Racks and Metal Cabinets, stock sizes or made to specification in steel or aluminium; wrinkle finishes available. Reosound Engineering & Electrical Company, Coleshill Road, Sutton Coldfield.

TR9 TRANSMITTER-RECEIVERS, these were formerly sold at £6 each, the remaining few to be cleared at 25/- carriage paid. The Stamford Radio Co., 199, Stamford St., Ashton-under-Lyne, Lancs.

CARBON MIKE with switch and lead, 2/-. 3-wave multi-colour Dial, 1/-. Assorted Resistors, 9/- a 100. R.F. Choke, 1/-. Vibrator Trans., 12v., 4/-. H.F. Chokes, 1/-. 12v. Vibrators, 4/-. 20,000 ohm. Attenuators, 3/-. Yaxley Switches, 4B.6W.8P., 4/-. Knobs, 6d. Condensers, 8s 1/6; 4s 1/3; 2s 9d.; .5 + .5 9d. Assorted small Condensers, 3/- a doz., 24v. D.C. Selsyn Motors, new, in tins, 6/- each. 230v. 50 c.p.s. single-phase Selsyn Motors, type SJ2512, 45lbs., ins., £4/10/- each. Just arrived: new stocks of our brand new M/C Headphones and Mike with press to talk switch, 5/6. Logan, West Alley, Hitchin, Herts.

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I.F.T.s, 465 Kc/s, ½c. 6/- pair; .0005 twin gangs, 5/6; 25 mfd. 25 v., 1/-; 4 mfd. 500 v., 1/3; O/P trans., 2/6; 2 amp. droppers from 1/9. List from T. G. Howell and Co., 29, McWilliam Road, Brighton, 7.

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FRITH RADIOCRAFT, LTD., Leicester, offer: Enamelled Wire, 14, 16, 18, 20, 22, swg. ¼lbs. 3/-, 1lbs. 6/-; 24, 26, 28, 30, swg. ¼lbs. 1/9, ½lbs. 3/6, 1lbs. 7/-; 32, 34, 36, 38, swg. ¼lbs. 2/-, ½lbs. 4/-, 1lbs. 8/-; all prices include reels, postage extra under £1; 25% trade discount to bona fide Traders and Servicemen, minimum trade order £1 net. Ebonite Rod, asstd. sizes, 5/16in. to 1in. 12 x 1ft. lengths, 5/- plus 6d. post, or 12 x 3ft. lengths, 15/- plus 1/3 post. Telephone Hand Sets, latest streamline type, brand new in makers' cartons, with 4-way cord and plug, 10/6 plus 6d. post. Moving Coil Headphone and Mike Sets, new conditions, 5/- plus 6d. post. U.S.A. make luxury Headphones, HR type, 2,000 ohms, brand new in makers' cartons, 10/6 plus 6d. post. Brass Terminals, 4 BA medium size, captive head, 24 for 5/- plus 6d. post. Hook-up Wire, 72 yds., asstd. colours, 5/- plus 6d. post. Telephone Wire, twin 7/36 conductors, 36 yds., 5/- plus 6d. post. Lacquered DCC Instrument Wire, 7/36, red, green, black, yellow or asstd., 60 yds., 5/- plus 6d. post. Sleeving, 1, 1½ and 2 m.m., 72 yds., asstd. colours, 5/- plus 6d. post. I.F. Transformers, 455 kc/s adjustable dust cores, 5/- per pr., plus 6d. post. Rheostats, U.S.A. make, 100 ohms or 350 ohms, 25 watts, wire wound, 2/6 each, plus 3d. post. Satisfaction guaranteed or cash refunded without question.—Frith Radiocraft, Ltd., 69/71, Church Gate, Leicester.

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TWINGANG .0005, 5/-; Dual-range Crystal Coil, w/circuit, 2/6; Midget S.M.L. Superhet Pack, 20/-; Midget Components. List 2½d. Carter's, 67, Bell Lane, Marston Green, Birmingham.

TELEVISION! The leading Midland Depot for all your requirements. Complete kits of parts to "WW," "Inexpensive" and "EE," etc., and all other popular receivers. All goods post free to any address in Great Britain. We specialise in all high-grade ex-Service equipment and invite your enquiries. Send S.A.E. to-day for our latest lists. Special! A limited number of Television Aerial Masts, 11ft. long, in two sections, approx. 2in. dia., the ideal chimney mast for your Di-pole, 12/6 complete; 22ft. Mast in four sections, 20/- complete. 15ft. Wooden Poles, 5/-, min. order of 4. Co-axial Cable, complete with Pye Plugs each end, 72, 80 or 100 ohms, all lengths supplied at 3d. per ft., plus 1/- for end fittings. Brand new boxed 3½in. Speakers, 9/6. Mains Transformers, new, 22/6.—Walton's Wireless Stores, 203, Staveley Road, Wolverhampton. Callers only: Walton's Wireless Stores, 48, Stafford Street, Wolverhampton.

RADIO SUPPLY CO. offer the trade: ELECTROLYTICS. 8mfd., 450v., midget metal cased tubulars, 2/1 ea. Can; 8-16mfd., 450v. 2/11; 16-32mfd., 350v., 2/10; 32mfd., 350v., 1/9; 32mfd., 275v. 25mfd., 25 v., T.C.C. Micropack, 10/- doz. CHASSIS (Receiver), 16 s.w.g. undrilled Aluminium, 10-5½-2ins. 2/9, 11-6-2½ins. 3/3, 12-8-2½ins. 3/9, 16-8-2½ins., 4/9, 20-8-2½ins. 5/11; MAINS TRANSFORMERS, fully interleaved and impregnated, all with 200-250v. screened primaries, 425-0-425v., 200m.a., 0-4-6.3v., 4a, 0-4-6.3v., 6a., 0-4-5v., 3a, fully shrouded, chassis mounting, 37/6; 350-0-350v., 100m.a., 0-4-6.3v., 3a, 0-4-5v., 2a, fully shrouded, chassis mounting, 19/9; 350-0-350v., 80m.a., 6.3v., 3a, 5v., 2a, half-shrouded, 14/9; midget 250-0-250 v., 50m.a., 6.3v., 1.5a, 0-4-5v., 2a, 12/9. UNIVERSAL 5 watt, 30:1, 45:1, 60:1, 90:1, Class B, push-pull, 3/9. SMOOTHING CHOKES, 80m.a., 15h., 350 ohms, 4/9. P.M. SPEAKERS, Plessey 5in. with trans., 10/6; 8in. R. & A. with trans., 14/9; 10in. Plessey with trans., 21/9. All preceding goods brand new stock, not ex-Gov. Following items unused ex-Gov. VALVES, Boxed, VP4B, 807, R3, 6V6M, 6/9; unboxed, 6J7G, KT33C (26v.), 6SL7GT, 6/9; KTW61, 12SQ7M, 12SR7M, 5R4, 5/3; EF36, 3/9; 6C5G, 4/9; SG215, 3/3; HL210, 2/3, SP41, 8D2, 4D1, 1/9; D1, 9d.; boxed 5Z4, 6J5M, 5/6. SELENIUM RECTIFIERS, 500v., 80m.a., 4/11; 250v., 65m.a., 3/-; 1/6; 120-0-120v., 40m.a., 1/3; 12v., ¼a, 1/6 ea., 12/6 doz. All goods guaranteed. Full list 2½d. C.W.O. or C.O.D. over £1; add 1/6 carriage under £3. Radio Supply Co., 15, Queen Square, Leeds, 2.

SUPERHET COILS, 3WB, 465KC, with diagram, 2/6 pair; Kit of Parts for L.M.S. (iron cored) coil pack, 465KC, 9/6; 8MFD 450 Electrolytics, 2/-; Droppers, 1/-; Assorted Eyelets, Eyeletags and Solder Tags, 6 gross 6/-; 50PF Trimmers, 4d. Send for cheapest list in England.—Sussex Electronics, Ltd. (P), Riley Road, Brighton, 7. (Tel. 4446.)

NEW "QUALITY" Radio Tuners, suit any standard amplifier. **Constructional Manuals:** No. 1, L. & M. wave, T.R.F., with illuminated dial, glass and escutcheon, Radio/Gram. switch, 3/6; No. 2, 3-waveband Superhet, with large, elaborate horizontal dial assembly, exceptional range combined with quality, suitable for hi-fi amplifying equipment, R/G switching, gain control, 3/6. Absolutely **Complete Kits** with valves: No. 1, 75/-; No. 2, 135/-. **Ready Built and Aligned Tuners:** No. 1, £4/10/-; No. 2, £7/10/-. New "Quality" **Audio Amplifiers:** No. 1, 4-watt, pick-up and tuner inputs, volume, tone and feed back controls, valves: 6Q7, 6V6, 5Z4, operation A.C. 100-250v.; No. 2, 15-watt, twin inputs (pick-up and mike or twin turntables), also tuner input, volume mixing, tone control, valves: 6SN7, 6SN7, 2 x 6V6, in push-pull: 5Z4, A.C., 200-250v. **Constructional Manuals:** No. 1, 2/6; No. 2, 4/6. **Complete Kits with valves:** No. 1, 110/-; No. 2, 9 gns. **Ready-Built Amplifiers:** No. 1, 119/6; No. 2, 10 gns. **Bargains in Gramophone Equipment:** Collaro AC47 motors with variable speed, 12in. turntable, £5; Collaro RP49 combined Motor/Pickup/Autostop Unit, A.C., £5/10/-; AC47 ditto with 12in. plate, var. speed, £7/10/-. Collaro new super A.C. Mixed Autochangers in black and chrome, with hi-fi crystal pick-up —our special offer—only £14. N.A.S. 3-wave band superhet iron-cored Coil Packs with circuit, complete set, 21/-. Send 2½d. stamp for bumper bargain list. **Terms:** C.W.O. or C.O.D. any amount.—Northern Radio Services, 102, Parkhill Road, London, N.W.3. (Gulliver 1453.)

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TUNING UNITS. Full range of Denco, Lowther and Eddystone goods available. 5 to 10 wave-band gram. chassis covering 3 to 60 mc/s, 150 to 1,500 kc/s. Amplifiers for every use. Television kits, radio kits. TELEVISOR, £51, working at 150 miles range with good results. S.A.E. for leaflet of single items or illustrated 54-page catalogue, price 9d., to Mason's (P.W.), Wivenhoe, Nr. Colchester.

CERAMIC AIRSPACED TRIMMERS, 5-50 pfd., 5/- doz., 37/- per 100; 3-25 pfd., 2/9 doz., 20/- per 100. Jackplugs, 4/6 doz., 33/- per 100. W/W resistors, 1K, 4OW., 1/4 each, 12/6 doz. Prices include postage.—J. T. Anglin, G4GZ, 233, Welholme Road, Grimsby.

5-CORE CABLE, 9/012 tough rubber sheathed, tinned copper screened, 10d. yard. Armes, 37, Birchwood Drive, Leigh-on-Sea.

8 WAY High Voltage "Jones" type Plugs and Sockets, with crackle covers, 1/6 pair complete, 12/- dozen pairs, £3/10/- per 100 pairs, carriage paid.—Jack Porter, Ltd., College Street, Worcester.

AVO OSCILLATOR, £10; Ferranti Multi-meter £6/10/-; parcels spares: bargains. J. Brown, High St., Boston Spa, Yorks.

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WIRELESS, Television. Postal Courses for Amateur Radio Transmitting Licence also Television for Radio Trades diploma. Apply British School of Telegraphy Ltd., 179, Clapham Road, London, S.W.9. (Forty years' experience in training students in Wireless and allied subjects.)

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Practical Television

Vol. 1. No. 6 NEW SERIES AUGUST, 1949

Televiews

The C.R. Tube Guarantee Amended

READERS will recall our criticism of the guarantee relating to cathode-ray tubes. Under this, a replacement within the period of the guarantee, namely, six months, is only effective for the remainder of the period. So that if a tube broke down in the last week of the guarantee the replacement would only be covered for one week.

We expressed the view that this was unfair, for a cathode-ray tube is an expensive item in the construction of a television receiver, and a guaranteed period of only six months is short enough. It is so short, in fact, that it does not convey to the public that confidence which a manufacturer should feel in the reliability of his products.

Largely as a result of our criticism that position has been amended, and as from June 1st last. and for a trial period of twelve months, the guarantee is amended to provide that each free replacement tube will carry the full six months' guarantee. In all other respects, however, the guarantee remains, and it is stated that any extension of the basic guarantee period of six months is not economically justifiable. It may not be at the present time, but if television is to become really popular the guarantee period will have to fall into line with other radio apparatus. Money is not so plentiful to-day that a purchaser can view with equanimity the outlay of from £40-£100 on a television receiver with the tardy assurance that it will only be backed by the manufacturer for twenty-four weeks. Such a short period is likely to give rise to the impression that television receivers are being marketed which are unreliable. We know this to be untrue, but many thousands of members of the public may not.

We welcome the concession, but suggest that it would have had full effect in establishing public confidence had the overall guarantee period been extended to twelve months. We suggest that the tube manufacturing members of the B.V.A. reconsider this matter. The guaranteed period in America is in most cases of greater duration than ours.

The P.W. Televisor

THE technical staff of this journal has for a long time past been experimenting with a television receiver suitable for home construction. Many snags have had to be overcome. The alignment difficulties need to be eliminated as far as possible, for few amateurs have expensive test equipment such as signal generators. Also the cost question has needed careful study, for it would be pointless to describe the construction of a receiver the components for which will be more costly than a commercial product. We have arrived at a stage where these difficulties have been overcome, and it is hoped in an early issue to commence publication of the articles and diagrams.

Although television to-day is really a local service with distant prospects of a nation-wide network, interest in it continues week by week, as is indicated by our correspondence and the call for back issues containing our television articles. Newcomers to television should study our "Newnes Television Manual," which deals with the elements of television technique.

Government Surplus

WILL readers please note that we cannot undertake to modify the ex-Government C.R. equipment now being sold through the stores at attractive prices. A great deal of this equipment represents good value for money, and large numbers of readers have successfully converted it to successful television receivers. Those are the skilled readers, however, and those with modest equipment should pause before they spend a sum of money which is considerable even at bargain prices. A thing which turns out to be useless is dear at any price. Most of this surplus equipment is useful in some form or another if broken down and used as a source of supply for odd condensers, resistances, etc.

Telenews

Portable TV

IT is reported that a British manufacturer has succeeded in producing a portable Tv receiver which needs no external aerial, may be used on A.C. D.C. mains, and which is light enough to be carried from room to room. It may appear on the market by the time this issue is on sale.

TV in Canada

THE *Toronto Star* forecasts that television will begin in Canada in 1950. Progress has been made in the discussions between commercial, technical and C.B.C. groups and an official statement is expected soon.

French Components

AT a recent radio exhibition in Paris components for home-constructed television receivers were on show—in spite of the fact that there are, as yet, no regular programmes.

Colour TV

AT the annual meeting of the American Medical Association in Atlantic City, surgery and other procedures at the Atlantic City Hospital were scanned and transmitted in colour to 20 receivers in the Convention Hall. The C.B.S. colour-disc system was employed.

Underneath the Dipole

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

NOTWITHSTANDING the success of the television newsreel, many viewers had come to look upon the use of film in television programmes as a kind of makeshift stop-gap. The technically poor quality of the film transmissions compared unfavourably with progressive improvements in studio and other transmissions, especially the relayed outside broadcasts. Picture flares and blemishes accompanied by sound recording which was not entirely satisfactory had become the accepted standard so far as film production was concerned. Now, at long last, the whole position has changed. The ancient tele-cine equipment which has done honourable duty at the Alexandra Palace since about 1936 has been scrapped (or sent to a museum) and replaced with the very latest tele-cine pick-up equipments of two manufacturers —E. M. I. and Cinema Television, Ltd. The new equipments are used entirely separately, usually alternatively, and in the case of multi-reel screenings, change-overs will be made from one to the other. The improvement in quality is startling, and now it is the turn of studio transmissions to become "bottom of the class!" But not for long! Further improvements in the television cameras of several manufacturers will be seen in due course, and have already been seen on the outside television relays.

16 mm. on Television?

There is no doubt in my mind that the sudden great improvement in film transmissions will lead to the more extensive use of film all round. Trade difficulties place an artificial restraint upon the number of complete films available for television, and these may not show much of an increase. But producers of radio plays will no longer be hesitant about including lengthy film sequences, and film will be employed more for small individual items in magazine programmes. And then there is the possibility of the filming of complete productions, for relaying at provincial stations.

So far, the B.B.C. is equipped only for the transmission of 35 mm. film. In America, 16 mm. is used in addition to 35 mm. at many television stations, particularly those with limited production programme facilities. The introduction of 16 mm. equipment here would probably widen the scope of the B.B.C. for obtaining film product, at present restricted by the policy of the British Kinematograph Renters Society in banning films for television. This powerful society includes all the 35 mm. distributors of film, but not many 16 mm. specialists, and in any case, the latter have their own particular grievances with the main group. Further complications arise in the interpretation of various kinds of agreements between the 16 mm. film libraries and the major film renting companies. In some cases the television rights are jealously guarded, whereas in others there are practically no restrictions.

Fellow Travellers

Apart from these trade agreements and disagreements, however, which, after all, only affect the films which were made in the first place for public cinema exhibition, the B.B.C. do not always seem to make the best use of their own home-made film material. The newsreel excepted, most of the films attempted seem to take the form of the stodgiest of documentary stuff. The original B.B.C. film report on Germany, for instance, performed the phenomenal feat of presenting a cross-section of life in Germany with hardly a mention of the then newly imposed Soviet blockade of the capital. This fantastic performance was eclipsed by the B.B.C.'s film report of the end of the Berlin Blockade, a light-hearted piece of musical-comedy reporting which once more soft-pedalled Soviet aggressiveness. These B.B.C. films contrasted strangely with the cinema newsreels' treatment of the same stories, particularly those of Paramount, Movietone and Gaumont British News. Unfortunately, the report of the end of the blockade was entirely premature; but the unpleasant treacle-and-bromide flavour of the B.B.C. film lingers on. Strangely enough, no particular complaint can be levelled against the B.B.C. Newsreel for bias in its reporting; it rears its ugly head in a few of the important (and self-important!) documentary features. Who are the fellow travellers? We don't want them on television. They should be sent back to the Third Programme Department.

River Interludes

While the outside broadcast equipment was in the neighbourhood of Kingston, it was a happy idea to spend a half-hour at the riverside, sending out a series of delightful shots of rivercraft, bathers, anglers and scenic shots. Mercifully uncommentated, the scenes were fitted to a musical treatment and an occasional natural sound, and the overall effect was one of a serenity which is rarely attained in any amusement form.

Censorship Classifications

Not so serene as the river trip series have been some of the television plays which have been coming our way lately. It is true that the announcer prefaced J. B. Priestley's play, "I Have Been Here Before," with the warning that it was not suitable for children, as was done on the following night for Terence Rattigan's "The Browning Version," and for many other plays lately. All of this warning as to suitability would be much more conveniently handled if censorship classifications of "U," "A" and "H," as mentioned in this column many months ago, were utilised. The classification would then be reproduced on all advertising or Press announcements of the television play concerned, and the embarrassing situation of having to disappoint a home audience of youngsters would be avoided. "I Have Been Here Before" was said to be the ninth play by Priestley to be televised, and so now we can thank him very much and give him a long, long rest. This particular play was pompous and dull, with an ending with which no churchman could

possibly agree. In an entirely different class was Rattigan's schoolmaster story "The Browning Version," in which the original West End cast from the Phoenix Theatre played their parts again. In this play, the dialogue had brilliancy and the playing was superb, particularly by Barry Jones and Mary Ellis.

A recent survey of the trend of films as regards censorship revealed that five out of every six British films of first-feature class are given an "A" certificate by the Censor, compared with one out of every ten in the second-feature class. The remainder were all "U" certificates—suitable for children and family audiences. Television is primarily an entertainment for the home and family, and the B.B.C. would do well to watch this trend towards "A" entertainment. But first it should establish classifications and a self-imposed censorship. The percentages of "A" and "U" plays would then be readily revealed.

Round or Rectangular

Mathematics Applied to the Television Screen Controversy

By DAVID WAYNE

A POINT which always arises when one is making a television receiver from ex-W.D. parts, and using a V.C.R.97 (or 517) tube, is whether it is better to have the usual oblong picture and waste part of the tube-face, or use all of the tube-face and waste part of the picture area. This problem has been neatly presented in a material form by the latest of American gadgets—the *electronic* picture magnifier. Here we have a convenient method of comparing the two types of picture presentation—rectangular or round.

Optional picture magnification is incorporated in certain receivers manufactured in the U.S.A., and a home-constructor scheme described in the May issue. On pressing a button, or throwing a switch, circuits are altered so that the picture size jumps from the normal rectangle to a circle completely filling the round face of the cathode-ray tube. It is claimed that the magnification so obtained is equivalent to a picture area two and a half times larger; and that the circular picture does not suffer through having the corners and sides cut-off, as nothing of interest happens in these parts. The original rectangular picture may be instantly restored by again pressing the switch or button. The facility is designed to enable the viewer to obtain special "close-ups" at will.

Some Calculations

Let us now consider the details a little more closely, and imagine we have one of these picture-magnifying receivers employing a 12in. tube. We are receiving an American transmission, and consequently the picture aspect-ratio is 4 : 3. Diagram one illustrates the relationship between picture area, and tube-face area.

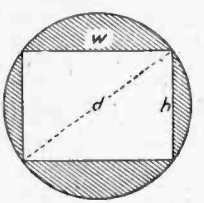


Fig. 1.—Relationship between tube end and picture area at the American 4 : 3 ratio.

The area of the tube-face is given by πr^2 or 36π and is, to the nearest digit, 113 sq. ins.

Picture area is given by height times width, which may be determined quite simply by Pythagoras:

$h^2+w^2=d^2=144$, where the ratio of w to h is 4 : 3.

This gives width as 9.6in. and height as 7.2 in. However, this can be stretched a little by allowing for some corner clipping, so, adding 0.4in. and 0.3in. on to the width and height respectively, we obtain:

w = 10in., and h = 7.5in.

Picture area then is 75 sq. in.

The amount of tube-face which is wasted when the normal rectangular picture is displayed is 38 sq. in., or 33.6 per cent.

Now let us press the enlarging switch. The situation is illustrated in Fig. 2:

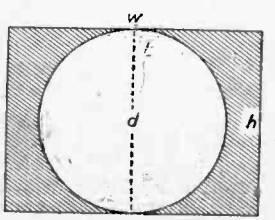


Fig. 2.—Increased picture area (at the same ratio) when tube end is filled.

The entire tube-face is filled, giving a viewing area of 113 sq. in. But what of the total picture area? Once again this may be easily calculated.

h = d = 12in., and w = 4/3 × 12 = 16in.

Area = 192 sq. in.

Thus the amount of picture area wasted is 192 − 113 = 79 sq. in. In other words, 41 per cent. of the picture is not seen.

Summarising: A rectangular picture wastes 33.6 per cent. of the tube-face. A round picture wastes 41 per cent. of the picture-area. Overall magnification is $192/75 = 2\frac{1}{2}$ approximately.

In view of the fact that nearly half of the picture is cut off, the electronic enlarger hardly seems to justify its existence, though it would be of limited use in providing close-ups of artistes already in close-up—a rather redundant function.

British Proportion

With the British aspect ratio of 5 : 4, picture loss is slightly less, being about 37 per cent.—just over one-third. Even so, it is still objectionable. In using a V.C.R.97 tube for television purposes I have found that a rectangular picture is definitely preferable, even though one can hardly afford to waste any of the tube-face. A plastic enlarging lens provides a convenient solution to the problem, and gives a picture size that may be viewed from a comfortable distance.

The theory that little of interest happens in the corners and sides of the picture is, I think, something of a fallacy, as a study of an evening's television programme will reveal!

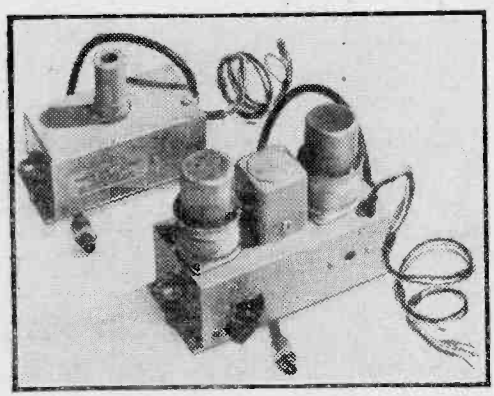
Trade Notes

"New Look" Filter

COMPLAINTS are sometimes made that eye-strain is experienced after seeing a television programme through, and various suggestions have been made to overcome this, and also to increase the apparent contrast in the received picture. Leaving room lights on relieves eye-strain, but usually causes difficulty due to light reflections from the tube end, or cover glass. A light behind the television receiver gives relief also, and at the same time seems to add to the contrast in the picture. A scientifically-designed filter is now available, however, which removes all of the difficulties and in our opinion gives a very much improved result. This is a light-blue filter of very thin plastic material provided with adhesive-tape edges. It is available in various sizes and in use is merely stuck on the glass covering the tube, or at the back of a lens if one is employed. It reduces the intensity of reflections, and although when first switched on the picture appears blue in colour, this effect disappears after a very few minutes and gives the picture a real black and white tone. A slight increase in brilliance is generally needed over that normally used without the filter, but room lights may be left on, and there is no feeling of eye strain, even after the longest period of viewing. It is a worthwhile addition to any television receiver, and its effect may be judged by sticking the screen temporarily to a separate sheet of glass which may be supported in front of the tube, and the first half of a programme viewed through the screen. The makers are New Look Products, Cranleigh, Surrey, and the price varies from 15s. to 40s., according to the size of the screen.

Television Pre-Amplifiers

THE illustration below shows two of the model amplifiers produced by Boscombe Radio and Electric for use with standard television receivers in localities where some additional gain is required. The models are available in two types, one fitted with EF50 valves (or equivalents) and the others with 6F12 or equivalents. Each unit is totally enclosed and fitted at one end with a standard coaxial socket and at the other with a length of coaxial feeder provided with a coaxial plug. Three leads are provided for H.T. and L.T. supplies. To use, the aerial is removed from the receiver, plugged into the unit and the unit coaxial plugged into the receiver. The three other leads are connected to suitable points in the receiver to provide the necessary 6.3 volts for L.T. and 200 volts for H.T. The single valve units are intended for use outside the 40-mile radius and the two-valve units beyond 70 miles, and the EF50 models provide slightly more gain than the others. A variable adjustment on the two-stage units enables the user to adjust for maximum reception on either sound or vision.

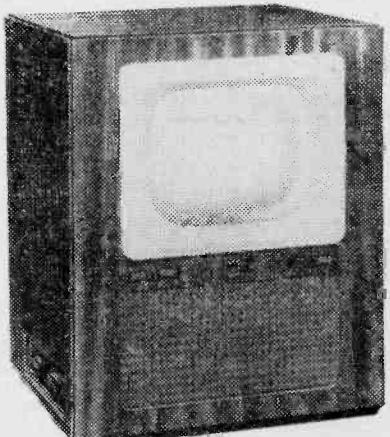


Two of the Boscombe Pre-amplifiers.

We have tested the four units and find them very efficient, introducing no instability and giving substantial gain. The only criticism we would offer is that the models which we tried were peaked at approximately 43 Mc/s. and there was insufficient adjustment to enable them to be used on a certain receiver which was adjusted for upper (single) side-band reception of the A.P. transmission. The units are very well made, and cost £2 12s. 6d. for the single-valve model and £3 12s. 6d. for the two-valve model, with either the 6F12 or EF50 valves. The makers' address is: 595, Christchurch Road, Boscombe, Bournemouth.

EKCO "Eighty-Eight" Range

ONE of the new Ekco vision receivers designed for use in London or Midland regions is shown below. Wide-band R.F. stages are used, with P.M. focussing. A pre-set variable control is provided to counter mains voltage fluctuations on focus, and there are three main side controls. These provide for contrast, brightness with on/off switch and volume. A radio unit is fitted to some models and provides for four pre-set stations on either the medium or long wavebands, and illuminated panels are provided below the tube mask to show which station is being received. There are two controls for this part of the receiver, and these provide volume and on/off switch (common to radio and television) and a five-position rotary switch selecting television or any one of the three medium and one long-wave stations. The price of this combined receiver is 45 guineas, plus P.T., and Model TS105 is for the London area and TS1105 for the Midlands. Model "88" (that is without the radio unit), costs 30 gns., plus P.T.



Ekco's new Model TS105 with 9in. tube.

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