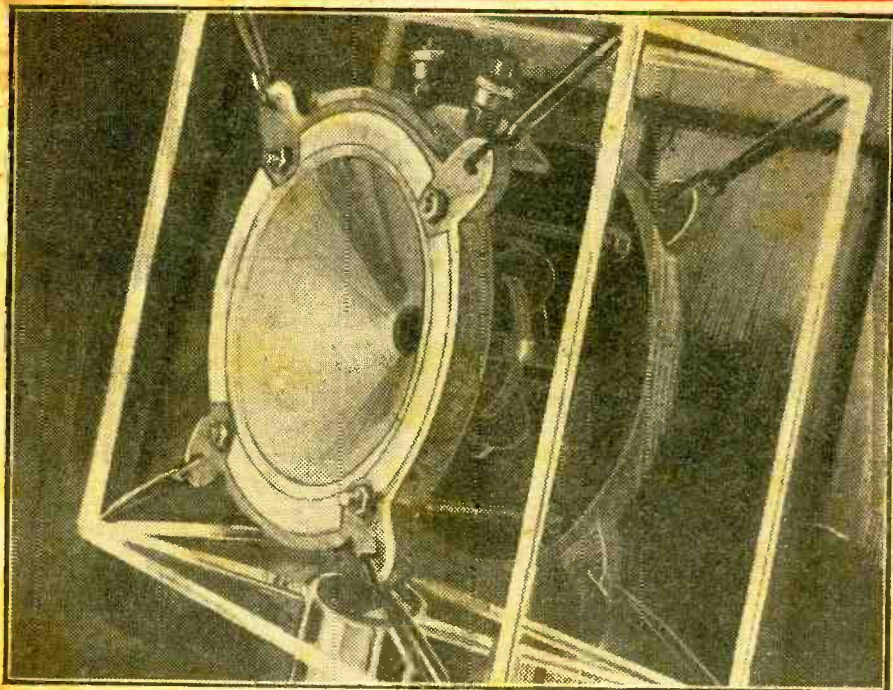


TEST INSTRUMENT DESIGN

Practical ^{9^D} EVERY MONTH Wireless

Vol. 24: No. 498. || Editor: F. J. CAMM || JANUARY, 1948

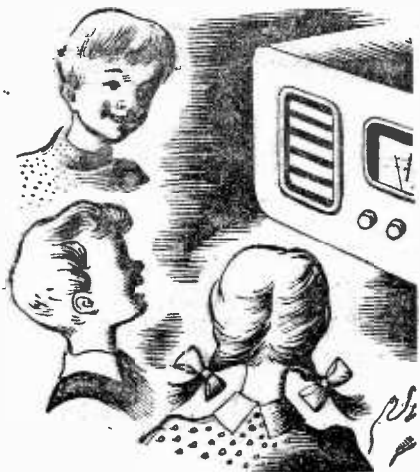


See Page 6

PRINCIPAL CONTENTS

Making a Moving-coil Microphone
Dual Speaker Networks
Practical Television Construction
Afterthoughts on "Radiolympa"

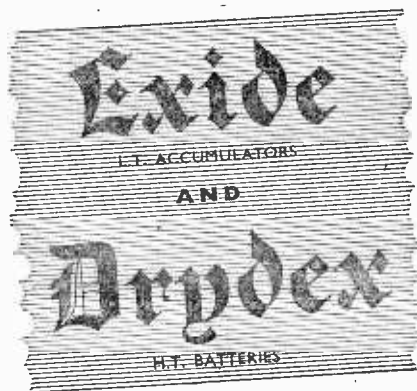
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Technical Notes
Using "Surplus" Coils



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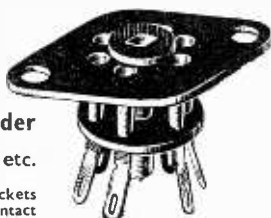
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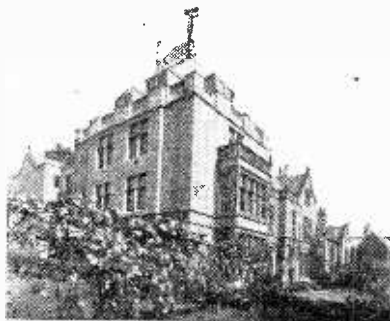
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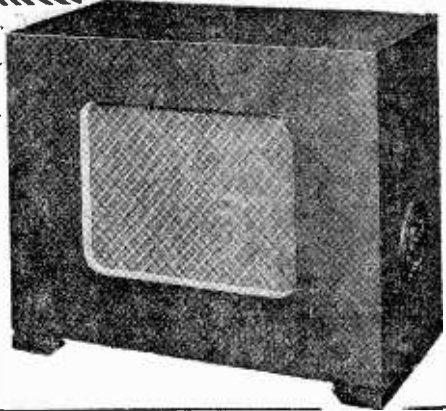
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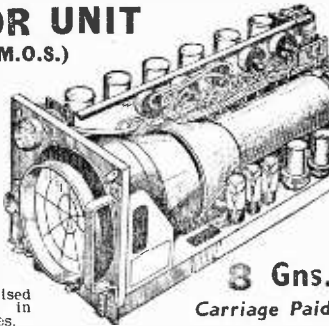
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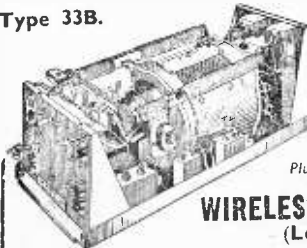


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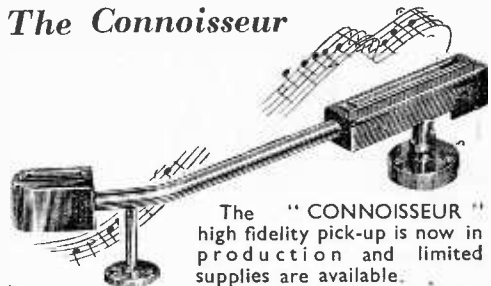
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Practical Wireless

16th YEAR
OF ISSUE

EVERY MONTH
VOL. XXIV, No. 498. JANUARY, 1948.

and PRACTICAL TELEVISION

Editor F. J. CAMM

COMMENTS OF THE MONTH

BY THE EDITOR

Inventors and Industry

A NEW link has been forged between inventors and industry by the formation of the Amalgamated Research and Development Company. Most large industrial houses possess their own research department, and many research associations have been established which confine their activities to particular industries or type of products. The new organisation, however, appeals to the small industrial firm irrespective of its trade and to the independent inventor of limited means who seeks an added return from the exploitation of his idea or invention. The new company fills this need and provides that connection between industry and inventors through which ideas may reach the production stage.

It does not limit its work to any one particular trade. Its main objects are to develop through the initiative of its own workers new products for industry, including the radio industry, which may involve the development of new processes and new designs and to obtain a more efficient use of scientific knowledge and endeavour by a co-operative effort between scientific workers, engineers and business men.

An inventor whose idea is developed and eventually marketed by this company is to be protected by an agreement assuring him of an agreed percentage of the eventual profits accruing from the exploitation of his inventions.

The Ionosphere.

THE work of Sir Edward Appleton in relation to the Ionosphere is deserving of recognition. Sir Edward went to Cambridge University to teach physics in the Cavendish Laboratory under J. J. Thomson, in 1919. It must be remembered that when Marconi succeeded in 1901 in sending wireless messages between England and Newfoundland this had been proved mathematically impossible, for it was thought that radio waves must fly off the earth at a tangent and be lost.

Heaviside in Great Britain and Kennelly in the United States had independently suggested that there might be a reflecting layer in the upper atmosphere which prevented the waves flying off uselessly into outer space, and returned them to the ground. There were many in Germany

who flatly denied the existence of such a layer.

In 1924, Sir Edward Appleton devised a method by which the existence of the layer could be proved, and of measuring its height above the ground. He asked for help from the Radio Research Board, which is controlled by the Department of Scientific Research. The Chairman of the Radio Research Board was Sir Henry Jackson, another experimenter in the field of radio, and the Board decided that Appleton should be given facilities which he needed in his work.

The important experiment took place in December, 1924, when the B.B.C. lent their transmitter, at Bournemouth, whilst the receiving station was set up at Oxford. The principle of the experiment was that if radio waves of a definite length were sent out from a station two sets of waves should be picked up on the receiver, one set should travel along the ground and the other should be reflected back to the ground from the layer in the atmosphere. If the two sets of waves arrived in step they would reinforce each other and give a strong signal. If, however, by slightly changing the wavelength the waves arrived out of step they would tend to cancel each other out and give a weak signal. Moreover, if the two stations were fixed and the wavelength was changed continuously, the signals received would wax and wane in strength, and artificial fading

would have been achieved. By counting the number of fades caused by a given change of wavelength it would be possible to calculate the distance of the reflected part of the ground path.

In the early days of wireless work a

12.15

1924

a

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with the latest developments, we can
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ROUND THE WORLD OF WIRELESS

Broadcast Receiving Licences

THE following statement shows the approximate number of licences issued during the year ended September 30th, 1947.

Region	Number
London Postal.. .. .	2,047,000
Home Counties	1,442,000
Midland.. .. .	1,558,000
North Eastern.. .. .	1,685,000
North Western	1,442,000
South Western.. .. .	940,000
Welsh and Border	623,000
<i>Total England and Wales</i>	<i>9,737,000</i>
Scotland	1,047,000
Northern Ireland	167,000
<i>Grand Total</i>	<i>10,951,000</i>

The above total includes 25,050 television licences.

Prosecutions in September for operating wireless receiving apparatus without a licence numbered 358.

Cosser at Olympica

NINE hundred people visited the radar studio on the Cosser stand at Radiolympia every day. By the sixth day of the exhibition they had worn a hole through the carpet. When Radiolympia ended there was a hole in the floorboards themselves. This represents 20 years' normal wear.

Radio Hire Purchase and Credit Sales

THE Board of Trade, in consultation with the Central Price Regulation Committee, have made an Order correcting three defects in the Hire Purchase and Sale Agreements Order (1947, No. 1194), by the citation of the new Order of "lawful" which the (ted) so include the

B.I.R.E. Meeting

THE London section heard a Paper by G. L. Hamburger on "An Automatic Frequency Response Curve Tracer," read at the London School of Hygiene and Tropical Medicine, Keppel Street (Gower Street), London, W.C.1, on November 13th last.

Glasgow "Radiolympia" ?

WE understand that the Kelvin Hall Committee of the Glasgow Corporation have appointed a deputation to discuss with the organisers of Radiolympia the possibility of bringing the exhibition to the Kelvin Hall, Glasgow, early in 1948.

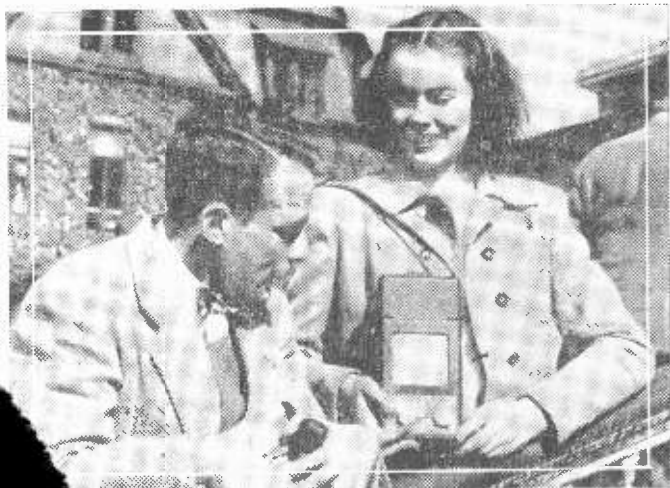
Pakistan Wireless Link . . .

IT is reported that a wireless link between Western and Eastern Pakistan is being established. A batch of naval officers is being flown to Chittagong to pick up the wireless equipment allotted to the Pakistan Navy. It is further reported that H.M.L.S. *Oudh* is being anchored at Chittagong to act as a wireless transmitting centre for contacting Karachi.

Factory Entertainment

ON the lines of the "Workers' Playtime" shows, operating during the war, a scheme to give similar entertainments in factories has just been launched by National Industrial Entertainments, 18, Charing Cross Road, London.

The first unit, made up of stage and radio artists, started work recently.



miniature radio developed in the U.S.A. which, in addition to a complete self-contained battery superhet, also incorporates a lens and takes colour pictures as well as black and white type. The entire unit weighs less than 4lb. with batteries.

A Wartime Underground Factory

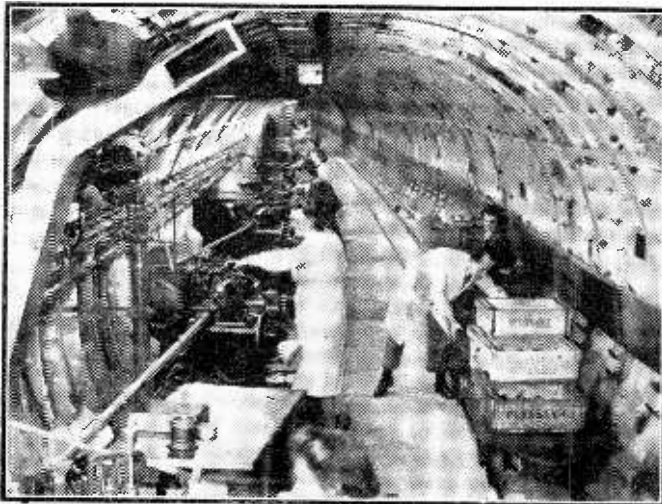
THE Eastern extension of the L.P.T.B. Central Line tube railway from Leytonstone to Newbury Park in its partially completed form was converted and used during the war by The Plessey Company, Ltd., of Ilford, for the manufacture of war equipment.

This air-conditioned factory consisted of approximately five miles of running tunnel (single 12ft. diameter tube) and included three partially-completed stations at Wanstead, Redbridge, and Gants Hill (Ilford), making a total factory floor space of 300,000 sq. ft. Intermediate points of entry at Cambridge Park and Danehurst Gardens were constructed so that no one had to walk more than a quarter of a mile to and from his or her work. Lifts were installed at these two points, while at two of the stations the normal escalators were used, and at the third, a short flight of stairs.

A miniature railway (18in. gauge), extended throughout the tunnels for the transport of raw materials and finished components. Where necessary this railway was also used for passengers.

R.C.M.F. 1948 Show

THE Radio Component Manufacturers' Federation announces that the fifth annual Private Exhibition of British Radio, Television and Electronic Components and Test Gear will be held in the Great Room at Grosvenor House, Park Lane, London, W.1, from Tuesday, March 2nd, to Thursday, March 4th, 1948.



A portion of a production line in the Underground tunnel utilised by the Plessey factory during the war. The miniature railway has a gauge of 18ins.

Post Office Appointment

THE Assistant Postmaster General has appointed Miss P. M. James to be his Private Secretary.

Pye O.B. Unit

PYE, LTD., Cambridge, have accepted from the B.B.C. a contract for a complete outside broadcast television van, including camera equipment. This installation, including pick-up tubes, is based on the design recently demonstrated on the Continent, and will be made in Cambridge.

Bermuda Phototelegram Service

CABLE AND WIRELESS, LTD., have opened a phototelegraph circuit with Bermuda, where the service is handled by Cable and Wireless (West Indies), Ltd.

The usual Empire charges apply: £5 commercial, £3 Press, for a phototelegram measuring up to 150 sq. cms. (24 sq. in.). For larger sizes there is an added charge for each additional 100 sq. cms. (10 sq. in.) or part thereof.

Our Query Service

WE are still receiving a large number of queries on general subjects, and must again point out that our Query Service has been temporarily suspended due to staff shortages. An announcement will appear in these pages as soon as it is possible to re-establish the Service.



Radio on trains was recently inaugurated on the Italian railway systems when the Italian Minister of Transport carried out the ceremony pictured above.

A Moving-coil Microphone

Design for an Efficient and Simply Constructed Accessory

By R. L. GRAPER

MANY amateurs will on occasion have used their moving-coil speakers as makeshift microphones. The sensitivity of these instruments does, in fact, enable them to put up a very good performance in this capacity. The quality of reproduction from the microphone is governed by several factors, however, and an instrument designed primarily for loudspeaker work can hardly be expected to give as good a performance from the input end, and they will rarely be as efficient as instruments designed for microphone use. One of the outstanding factors is, of course, the cone or diaphragm. In speakers, this must be sufficiently robust in construction and thickness to cause the necessary displacement of air under quite powerful vibrations. This is somewhat of a disadvantage when it is desired to vibrate the diaphragm from sound-waves, produced externally, which is, of course, what the microphone is required for. Commercially-made microphones are, however, the results of years of research and, where perfect quality reproduction together with maximum output is desired, there is a host of excellent models from which to choose.

The author having tried out the making of various forms of microphones, thought he would see what could be done regarding the dynamic or moving-coil instrument.

Main Details

The instrument finally produced is clearly seen in the drawings and photograph. True, its dimensions are somewhat on the large side, but considering the performance from it is extremely good, and as the cost was well under 15s., the small amount of constructive work was well rewarded. The main novelty in this home-made instrument is the actual assembling of the magnet system from the small

Eclipse pocket magnets. These are not toys and when six of them are combined as shown to form one magnet, an extremely powerful system is produced.

Another important feature is the cone and speech coil. This, being small and made out of thin brown

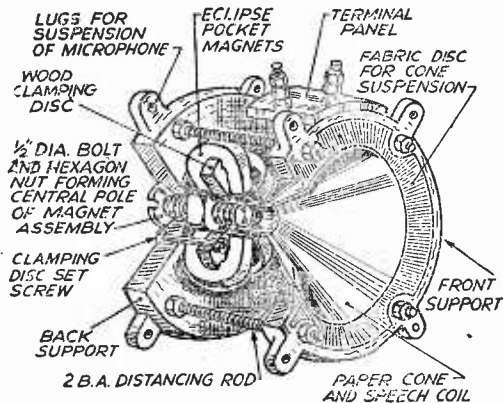


Fig. 1.—Detailed view of the complete microphone.

paper, is extremely light and well under $\frac{1}{2}$ oz. weight. The weight of the complete "heart" is about 17 oz., and the overall measurements are $6\frac{1}{2}$ in. over ribs by $3\frac{1}{2}$ in. wide, the circular form itself being 5 in. diameter.

Figure 1 shows the assembled microphone, with a vee-shaped section cut out to show the general assembly of the magnet system, one of the Eclipse pocket magnets being omitted for clearness.

It will be seen from this view that the magnet assembly is fixed firmly to a back wood support, whilst the cone and coil is carried by a similar wood support at the front, the two parts being set at the required distance by four lengths of 2 B.A. bass screwed rod.

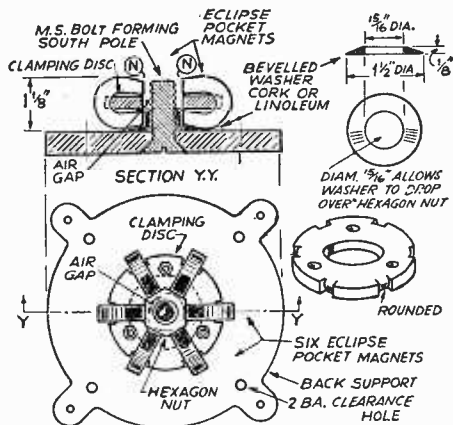


Fig. 2.—Details of the magnet assembly.

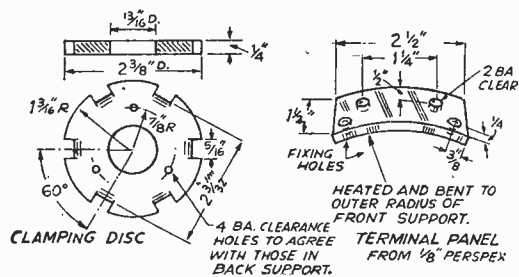


Fig. 3.—Details of the magnet clamping disc and terminal panel.

Magnet Assembly

Figure 2 shows this clearly. A standard $\frac{1}{2}$ in. countersunk headed M.S. bolt is used as a central pole piece, whilst the six Eclipse magnets are arranged equally around, one to each flat of the hexagon nut. The magnets are placed with similar poles uppermost, these being shown as north poles for convenience. In this manner it will be found that the bolt becomes the south pole of the system, and the thickness of the hexagon nut produces an air gap of approximately $\frac{3}{16}$ in. This is, of course, large, but an advantage is that the centring of the cone and coil is comparatively simple. It would be impossible to keep these powerful little magnets in such a position without some clamping device, and the simple clamping disc and bottom washer, finally devised, can be clearly seen in Fig. 2.

The disc is a push fit to the magnets and has six small cut-outs on the rim. These are slightly rounded, and of such a width and depth, that, when the magnets are pushed on, they are anchored, preventing both backward or sideways movement. Full dimensions of this disc can be seen in Fig. 3.

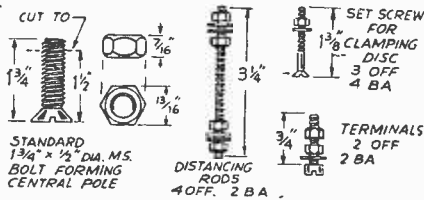


Fig. 4.—Pole-piece and distancing rod details

This was in fact the procedure of assembly, and when the magnets were assembled thus on the disc this was lowered over the central bolt, the bottom pole pieces of the magnets engaging firmly with its particular flat on the hexagon nut. Before assembling finally, however, the bolt and its nut should be brought to a dull red heat in a gas-ring or fire, and allowed to cool very slowly. When cold it can be fitted permanently and the cork bevel washer slipped on.

The three clamping bolts were then passed through from the bottom of the base, the nuts put on, and the whole magnet assembly tightened up. The magnets were found to bite into the cork bevelled washer in the process, and a very rigid job was obtained. A certain amount of careful filing of the slots in the clamping disc was necessary to give a firm grip to the magnets, and yet allow these to engage accurately with the flats of the hexagon nut. Perspex sheet might have been used for this disc, as the plywood used was found to split too readily. Metal was avoided for this part owing to possible effect on the magnetic flux.

The four distance rods were next fixed by the nuts and washers to the back and front supports, the distance between the supports being carefully adjusted to $2\frac{1}{16}$ in.

A terminal panel was made from $\frac{1}{8}$ in. Perspex as shown in Fig. 3. This was heated gently and bent to the same radius as the front support, and fixed to it by two small countersunk brass screws, as shown.

Several attempts were necessary before a satisfactory cone and speech coil was obtained.

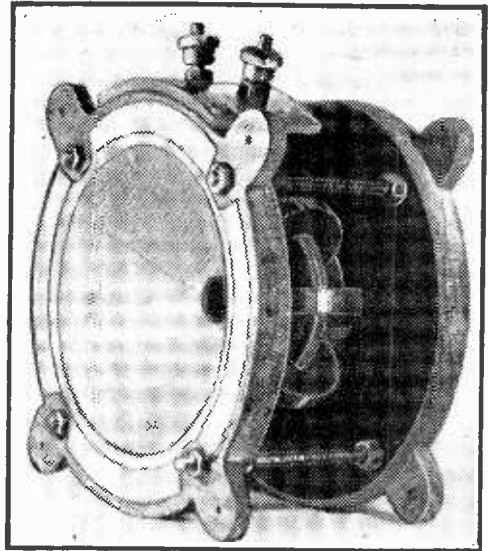


Fig. 6.—This photograph shows the neat appearance of the mike.

The final cone and coil is shown in Fig. 7. Both cone and coil cylinder were made from brown paper of good quality. The cylinder was merely a narrow strip wrapped twice round a $\frac{3}{16}$ in. tube or rod. This gave the necessary clearance from the $\frac{1}{2}$ in. diameter of the central pole, this being, of course, the $\frac{1}{2}$ in. bolt. The apex of the cone was sliced off before fixing the coil cylinder, a $\frac{1}{16}$ in. rim inside being allowed for final snipping round and gluing to the

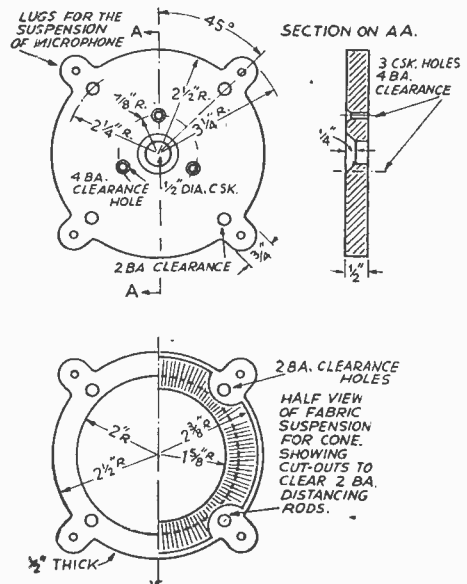


Fig. 5.—The magnet rear support, and front support for paper cone.

inside of the coil cylinder. The cylinder was wound at the end for $\frac{3}{16}$ in. with four layers of 40 s.w.g. enamelled wire, with finest tracing paper between the layers. The start and end of the winding was brought out to the rim of the cone as shown. A

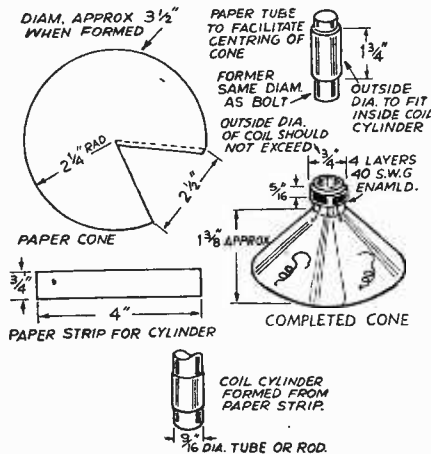


Fig. 7.—Details of the diaphragm and coil former.

touch or two of shellac was found helpful to secure the turns. The winding, being done by hand, it was found necessary to mount the cone on a rod temporarily during winding. The $1\frac{1}{4}$ in. long paper tube, also shown in Fig. 7, was found useful in final centring of the cone. This was formed from several turns of paper on a $\frac{1}{2}$ in. tube, this being the central pole diameter. The outer diameter was made to give a nice sliding fit to the inside of the coil cylinder.

A piece of thin fabric was next cut out as shown in Fig. 5. Only a half view of this is shown, but it is, of course, a complete circle with four circular cut-outs for clearing the 2 B.A. nuts of the distancing rods.

Fixing the Cone

The instrument was placed on the table and the centring tube placed on the bolt (pole piece). The

outer rim of the cone was treated with glue and then lowered carefully into position, the coil cylinder sliding down the centring tube. The top of the cone was then gently pressed against the fabric. When set, the tube was carefully withdrawn. The wire ends of the coil were then soldered to the two terminals.

As a sufficiently small step-up transformer which would fit inside the microphone was not to hand, although there is sufficient space available inside for a small component, tests were made with a normal step-up transformer of about 1-50 ratio.

The instrument was found to give really good output using only a two-valve amplifier, quality being very satisfactory for such a home-made instrument.

The instrument was also tested as a speaker, but the cone being so light was not quite effective in this capacity.

It is intended to fix a surrounding strip of sheet brass, with the necessary cut-out for the terminal panel. The eight suspension lugs seen are only half width of the wood supports for this purpose. It is also proposed to fit a gauze disc in front for cone protection. The eight lugs allow ample scope for effective suspension on various types of table or upright stands, which can be of quite simple form.

Selecting the Poles

As the Eclipse pocket magnet is not marked as to north- or south-seeking poles, to find the correct way round to bring all six "like" poles to the top the simple test of bringing two magnets near to each other is the easiest method. When the magnets tend to repel each other, the similar poles are opposite. Too much of this procedure is not good for the magnets, however, and the magnets should only be brought near enough just to feel the magnetic force. When assembled, test with a small screwdriver. The central bolt should attract it with equal strength, as do the six outer poles.

All sizes given for the clamping disc bottom washer are for the $\frac{1}{4}$ in. bolt specified. A $\frac{3}{8}$ in. one was first considered but the air gap produced of about $\frac{3}{32}$ in. would have made centring more difficult. The hexagon nut of the $\frac{1}{4}$ in. bolt used gives an air gap of just under $\frac{1}{16}$ in. and no difficulty was experienced when centring the cone.

Philco Radio Cuts

THE board of Radio and Television Trust Ltd., have amplified the short statement which was recently issued to shareholders, viz.: "That owing to a low home quota and restricted export markets, the board have decided to reduce considerably the radio part of the organisation, but home and overseas selling organisations will be maintained."

Airmec Limited, which is the radio manufacturing company of the group, is a mass producer of radio sets. It manufactures Philco sets for the home market, sold through Philco Radio and Television Corporation of Great Britain Ltd., and Airmec sets for export through Airmec International Sales Ltd.

The small size of the home quota and the closing

of many overseas markets, has brought about the need considerably to reduce the manufacturing organisation.

Philco radio products will continue to be available through Philco Radio and Television Corporation of Great Britain Ltd., and Airmec Receivers through Airmec International Sales Ltd.

The reduction of radio manufacture is to meet prevailing conditions.

MASTERING MORSE

By the Editor of "Practical Wireless"

3rd Edition.

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Test Instrument Design-1

The Fundamentals of Service Equipment Design and Construction Described

By P. E. TOOKE

Oscillators and Buffer Stages

OSCILLATORS suitable for test gear have to have above all else three fundamental properties, stability, good waveform and constant amplitude.

The most common types in use are the Electron-coupled Franklin Dynatron, and various forms using crystal control. The Colpitts and Hartley circuits are used, but mostly in the V.H.F. ranges.

As can be seen from Fig. 2 it uses two valves, in reality a two-stage amplifier with the final stage loosely coupled to the input, so giving the necessary feedback. A Franklin circuit properly built and adjusted can give an output almost as stable as a crystal controlled oscillator.

Two useful points to note in the construction of multi-range gear is the single coil, no coupling winding or taps. This is a great asset. Also a buffer stage is not so essential in this type, as the second stage is acting as a buffer to a slight degree.

In constructing, the coupling condensers should be as small as possible to afford even oscillation and constant amplitude over the whole band width. As far as test gear is concerned this type should only be used up to 5 Mc/s as it does not oscillate freely above this, and I would not really advocate its use.

So much then for the Franklin circuit. It should be remembered, though, that it is very well suited to almost all types of test apparatus.

The Dynatron is a good and efficient type. Its uses, I find, are at the H.F. end, and as the E.C.O. is much easier to adjust at low frequencies it is

preferable to use this type. In a later article I intend to go into the Dynatron more fully, so I will not go into it any further now.

The Crystal

The classic of all oscillators is the crystal. By replacing the usual tuned circuit with a piezo-

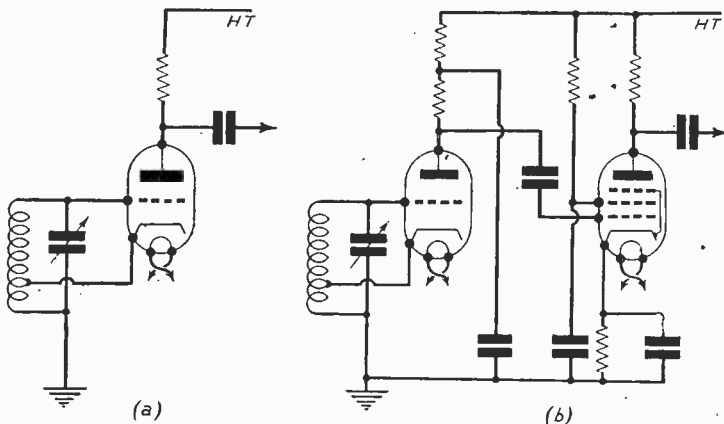


Fig. 1.—An E.C.O. circuit is shown at (a), whilst (b) shows an E.C.O. with R.C.-coupled buffer stage.

It is now proposed to run over the types mentioned above, and give a working diagram, with general advantages and disadvantages.

First and foremost the Electron Coupled, or E.C.O. This is a very reliable oscillator if care is taken in its layout and wiring. Stability is good, and assuming that the "Q" of the coil is reasonable the waveform is quite good enough for anything but a substandard piece of gear. It has the advantage that the coil needs no coupling winding, just a tap; this facilitates switching in a multi-range instrument.

Fig. 1 shows a typical E.C.O. circuit. The coil is tapped for the cathode connection at approximately one-third of the way up from the earthy end. It works equally well with the triode or pentode valves; I have always found, however, that pentodes tend to give more harmonics than a triode.

An E.C.O. with a R.C.-coupled buffer stage is shown at Fig. 1 (b). Although a buffer stage is not essential, it adds just that little extra to the stability of the whole instrument in which the oscillator is incorporated.

The Franklin Circuit

The Franklin circuit is a little less known and used, but if anything is superior to the E.C.O.

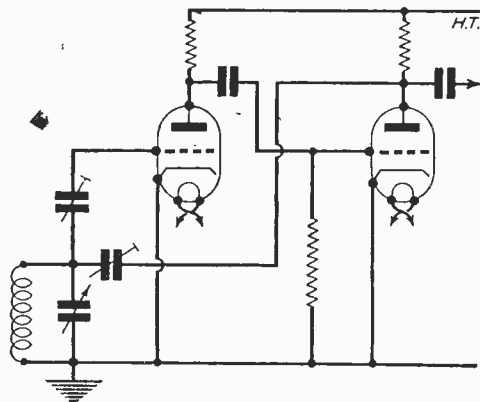


Fig. 2.—A typical Franklin circuit.

electric quartz crystal a very high degree of stability can be obtained, the frequency being determined by the cut of the quartz. An oscillator so built can be used as a locking source for a multi-vibrator, frequency substandards, etc.

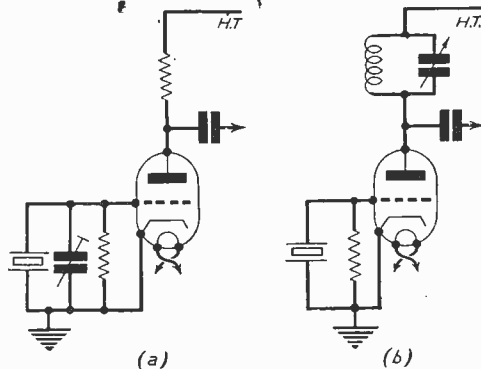


Fig. 3.—At (a) is a crystal oscillator circuit, and at (b) a tuned plate crystal oscillator circuit.

Crystals can be obtained for all frequencies, those common to test gear being 10 kc/s-100 kc/s-1 Mc. Some crystals are cut to give two frequencies, normally 100 kc/s and 1 Mc. With these you can "band switch" the oscillator without changing crystals. A crystal oscillator is simplicity itself to construct, assuming that care is taken as regards wiring and layout as in all precision gear.

Fig. 3 shows a conventional crystal-controlled circuit. A small trimmer condenser connected across the crystal gives a slight variation of frequency. This should be used with care, however, as too great a capacity can upset oscillation. Then all the advantages of stability expected from a crystal is lost.

This particular circuit is very rich in harmonics. If only the fundamental is wanted the plate should be tuned as shown in Fig. 3 (b). A buffer stage should be provided in any case, and if this is tuned harmonics should not be a great worry.

Now for a few general hints on construction and adjustment. The coil leads should be short and as rigid as possible. At least 18 S.W.G. wire should be used in wiring. If range switching is incorporated, the H.F. coils mounted on the switch is a good idea, and the L.F. as near as space permits.

The use of trimmers is often abused. A good ceramic type of the smallest capacity to do the job can't be beaten. They should be sealed when set to prevent vibration from shifting them. Mounted straight across the coil, they should be as rigid as a whole, and not "flop." Never use flexible or semi-flexible wire except for top cap

grids, etc. Also be very, very careful in the use of screened cable, as the capacity of it can upset the oscillation if not used prudently.

Leaving the heart of the instrument we turn to the next stage which is almost as important: "The buffer stage." First let it be said that a buffer stage is not an essential in any of these oscillators I have mentioned here, but if one proposes to build something to last and give accurate service it should be incorporated.

The object of this stage is not to amplify but to stop the impedance of the output, or next stage load, from "pulling" the oscillator off frequency. In fact, it does exactly as named, "buffers" the oscillator from the load.

A pentode is the best valve to use. With a low gain it can be tuned or R.C. coupled. If tuned it should, of course, be ganged with the oscillator's resonant circuit.

Care should be taken not to introduce any distortion into this stage, as an oscillator with a distorting buffer stage is worse than an oscillator without one at all.

Fig. 4 shows the two types of coupling, R.C. and H.F. Adequate decoupling should be used on the oscillator plate and buffer screen in both types.

Here then, briefly, you have the main circuit for any piece of gear using an oscillator, and really there are not many which do not.

In next month's issue I will describe what is probably the most important item of the service engineer's test equipment, namely the Signal Generator, and also the Beat Frequency Oscillator.

(To be continued.)

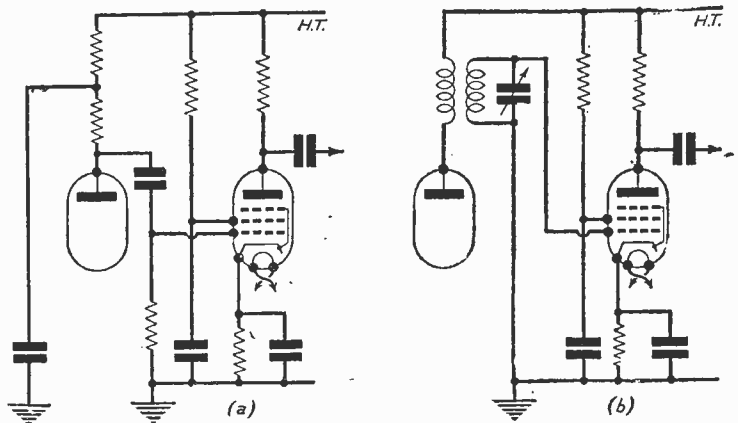


Fig. 4.—An R.C.-coupled buffer stage and a tuned buffer stage.

REFRESHER COURSE IN MATHEMATICS

By F. J. CAMM.

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Useful "Surplus" Coils

Details of Some Tuning Circuits and a Three-range Tuner Using Ex-Service Coils

By N. HERBERT

AIR-CORED tuning coils for the medium-wave band are, by modern standards, large components needing large screening cans and occupying much chassis space. With dust-iron cores coils for the same range are smaller and more efficient, having a higher Q. Moreover, by screwing the core further in or out of the former the tuning adjustment of the LC circuit can be transferred from the condenser to the coil. The disadvantage of this is that the frequency range covered with a given condenser is not so great as with the usual tuning condenser and the method is obviously not suitable for DX.

In some circumstances, however, these disadvantages do not arise; for example, in the construction of the high-fidelity tuner described in

This is insignificant compared with C3, which can be 0.0002 μF , and the arrangement amounts to having an aerial tap two-thirds of the way up the tuned circuit.

Band-pass Circuit

Such a circuit alone would not be very selective because of the load due to the aerial. A band-pass circuit will give increased selectivity and sensitivity and a suitable circuit is shown in Fig. 2

R1 C4 provides "bottom" coupling and suitable values are 20,000 ohms and 0.01 μF . "Top" coupling can be obtained if desired by twisting two pieces of insulated wire for a length of about one inch and connecting as shown in the sketch.

Similar tuned circuits will be required in the anode circuit of the R/F amplifier, giving a total of nine coils. This seems a somewhat formidable number and normally would be so. However, at the present time the radio dealers can supply a coil unit, Ref. 10D/380, originally for the 1155 receiver, which has 13 dust-iron cored coils together with a convenient switch and over 20 condensers from 25 pF. to 0.1 μF . This provides all the components required, except for a few resistors, at a total cost of 12s. 6d.

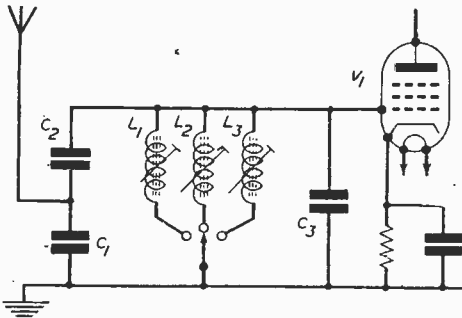


Fig. 1.—Aerial capacity coupling to a three-range circuit.

the May-June issue of PRACTICAL WIRELESS. If this is designed to receive three programmes, all on medium waves, the tuning circuits can consist of one fixed condenser of, say, 0.0002 mfd., together with three "permeability" tuned coils, one for each programme, and simple switching.

This means that the aerial cannot be inductively coupled to each tuning coil without complicating the switching, but this difficulty is easily overcome by using capacitive coupling as shown by the circuit in Fig. 1.

It will be noticed that this removes the necessity for winding an aerial coil. The main condenser of the tuning circuit is C3; C1 and C2 in series give only a small capacitance which is in parallel with C3. Suitable values are $C2 = 0.0002$ and $C1 = 0.0001 \mu\text{F}$ for the medium-wave band. This gives a capacitance in parallel with C3 of only $\frac{.0002 \times .0001}{.0002 + .0001} = 0.000066 \mu\text{F}$, i.e., 66 pF.

Final Design

The winding of nine coils could be tedious if they were all different, but this is not so in this case. Using a former from the above unit the writer wound a coil, located as shown in Fig. 3, having three layers of 34 s.w.g. enamelled copper wire. The layers have 25, 23 and 21 turns, close wound, counting from the bottom layer. With a 0.0002 μF condenser the circuit resonated from 950 kc/s with the core fully in the coil to 1,250 kc/s with the core fully out at the bottom of the former. Three coils, L1, L4 and L7, wound in this way will suffice for the "Light" programme on 1,149 kc/s. To cover the "Third" programme on 1,474 kc/s, three coils, L2, L5 and L8, each with one layer of

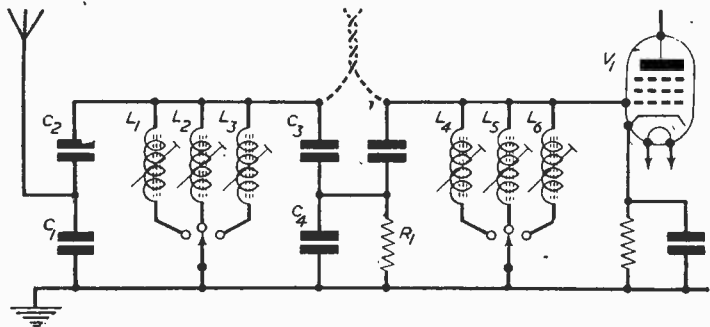


Fig. 2.—Band-pass tuning may be used as shown in this diagram.

25 and a second layer of 15 turns are required, again with the 0.0002 μF condenser. The coils L3, L6 and L9 for the Regional programme will depend on the particular one chosen. For the Scottish Regional on 767 kc/s, four layers of 25, 23, 21 and 19 turns respectively are required. These coils are easily wound by hand, but care should be taken with the soldering tags at the top of the formers, since these are easily broken off. However, only two of the four provided are needed.

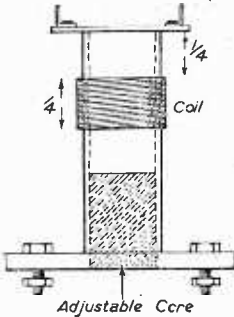


Fig. 3.—How the coil is made up.

The final circuit for the tuner is shown in Fig. 4. The circuit for V2 as an infinite impedance detector is as in the May/June number of PRACTICAL WIRELESS.

The whole tuner will go on a 9in. by 6in. chassis, which is quite small despite the relatively large number of coils. In aligning the various circuits without a signal generator start with the aerial on the anode of V1 and adjust the core position of L7 until the local regional programme, or the one particularly chosen, is received at maximum intensity. Then move the aerial one tuned circuit back each time, e.g., to point B adjusting L4 and readjusting L7 and finally with the aerial in its input socket, adjusting L1 and readjusting L4 and L7. The same procedure is then used for the other two selected programmes.

The total cost of the tuner, using the above coil unit and including the valves, will be less than £2.

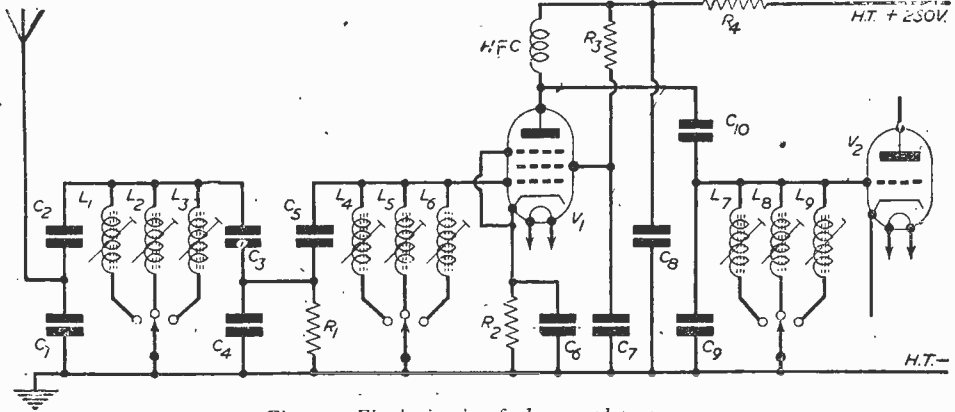


Fig. 4.—Final circuit of the complete tuner.

LIST OF COMPONENTS FOR FIG. 4

- | | | |
|---------------------------------------|---|--|
| L1-L9 as in text. | R1, 20,000 ohms, 1/2 watt. | condensers can be obtained; the values are not critical except that C3, C5 and C9 must be .0002 μF . for the coils described. |
| C1, .0001 μF . | R2, 500 ohms 1/2 watt. | |
| C2, C3, C5, C9, .0002 μF . | R3, 100,000 ohms 1 watt. | |
| C10, .001 μF . | R4, 5,000 ohms 1/2 watt. | |
| C4, .01 μF . | V1, EF39 or equivalent. | |
| C6, C7, C8, .1 μF . | From the coil unit given, close values to the above | |

Phototelegraph Expansion

PLANT which will enable the exchange of more radio pictures between Britain and overseas empire and foreign countries is being installed by Cable and Wireless Ltd., who handle all oversea phototelegrams in the United Kingdom. The company's picture room at Electra House on Victoria Embankment is being almost entirely re-equipped, now that new machinery is becoming available.

When completed the installation will provide for simultaneous transmission and reception on five radio channels.

In addition to several units designed for Cable and Wireless at the Post Office Dollis Hill Research Station, manufactured by General Electric and installed last year, the latest type of apparatus has been purchased from Edouard Belin, of

Malmaison, France, and further modern machinery is on order from Muirhead's of Elmer's End, Kent.

The two Belinograph units installed are each capable of simultaneous transmission and reception at the rate of four or more pictures an hour, according to size. This equipment is designed to operate at 60 and 120 revolutions per minute. The design permits of reception in normal lighting, the receiving cylinder being contained in a light-proof cylinder which can be loaded in a dark-room to reception, and subsequently unloaded for developing the film.

Transmission of a radio picture between any two countries takes about ten minutes. Press and other photographs, diagrams, charts, documents, letters and even cheques can be transmitted oversea by phototelegraphy.



ON YOUR WAVELENGTH

By THERMION

One for Me!

MR. C. W. F. Frier, of Herne Hill, London, S.E.24, writes to say that he does not like my comments in the September issue. One against! I have, however, received some dozens of letters from other correspondents agreeing with me. May I make it quite clear that I do not undertake to write words which are going to be acceptable to every reader. Moreover, if I did no one would want to read what I wrote. It is observed that those few readers who disagree with me evidently regularly read what I do write. I reserve the right to express my views whether you agree with them or not. The views of the Press, thank goodness, are not yet regimented or nationalised. I don't suppose for one moment Mr. Shinwell liked my definition of the Shinwell as the new unit of no volts, but then I don't like Mr. Shinwell's views either. Each individual in this country is entitled to his views. You are enabled to express yours on an equal footing with Mr. Shinwell or your servant Thermion. If you don't like mine, you can always turn to another page.

There are features in my morning newspaper which I do not like. I don't read them. I know that other readers do. I do not expect newspapers or periodicals to be run entirely to suit me.

As an ardent supporter of the wastepaper campaign such letters are welcome!

These remarks apply also to D. R. Taylor, of Hull.

Television at Radiolympia

I HAVE had a chorus of complaints concerning the television arrangements at Radiolympia. Here is a letter typical of many: "Television at Radiolympia was a disappointment, the organisation abominable. Not one in a dozen admitted to stand round the gallery of the Television Studio could see a thing, whilst the seats reserved for the privileged few were half empty.

"As for Television Avenue, I trust next year exhibitors will:

"(a) Illuminate their names.

"(b) Place their sets sufficiently high to be seen."

This letter comes from Mr. H. J. Phelps, of 30, Elmcroft Crescent, Brent, N.W.11.

I have already voiced my own criticisms of Radiolympia, much to the discomfiture of one member of the organising committee, who did not, however, have the courage to write to me direct, but fulminated about my comments to one of this journal's representatives. Apparently with the Radio Industry Council everything it does is perfect. A journalist must not criticise, which, I suppose, is the spirit of the times. So I wrote to this gentleman asking him to indicate where my criticism was unfair or unfounded. He could not, of course, do other than admit that he was annoyed

as a member of the organising committee to find criticism where he had expected praise.

Unfortunately, for such folk, I do not use my pen to puff unworthy products, nor to write praise where it is not due. What I think I write, or on a public platform I say. I do not care two hoots whether those views are palatable or not. My views are sincerely held, and they are written or spoken with helpful intent.

As far as the television arrangements at Radiolympia are concerned, I agree with the views of the correspondent I have quoted. Evidently the Exhibition Organising Committee think with me that matters could be improved, for in a circular letter to Exhibitors the Secretary has invited constructive suggestions and criticisms on Radiolympia while it is still fresh in mind. They feel that such suggestions will be valuable in planning future shows.

There are many people, of course, who can give criticism, but they cannot take it, and who regard suggestions as criticisms. I think we have all paid our tribute to the efforts made after a longish war to stage the Exhibition, but it was not faultless.

I do not like the way in which the industry has jettisoned the amateurs and the experimenters. There was very little at Radiolympia in the way of components. The industry was founded on the work of the amateur. I am glad to note that a number of new firms, however, are catering for this numerous section of the community, and I wish them well.

The fact is that the industry is not yet on its feet. It is floundering about between television and radio and exports. It seems to have forgotten about 1939, and that a vast army of people who prefer to make wireless sets and to experiment with them instead of buying a commercial receiver is in existence, greatly augmented by war training in the various Services.

The newer firms, however, seem to be more in touch with the public than members of the Radio Industry, who cannot be congratulated on any great show of originality at Radiolympia. The old goods in a new box seems to be the order of the day.

I would also repeat that it is wrong to invite vast crowds to pack Olympia, without securing adequate catering arrangements. It is also wrong from an exhibitor's point of view.

In vast crowds like this, matters are made easy for the predatory and light-fingered customers who lift so many hundreds of pounds worth of stuff from these exhibitions. Exhibitors go to Radiolympia to show their wares and to get orders for them. It is not a poppy show run for the benefit of the Radio Industry Council who, after all, take very little risk, if any. Perhaps next year they will remember this and not run the Show merely for its gate.

Practical Television Construction

In the First of a New Series, the Economics and Main Details of Television Receiver Construction are Dealt With by W. J. DELANEY (G2FMY)

IT has already been mentioned in these pages that the construction of a television receiver for present use is not a simple matter, and that in any case a large amount of ex-Government equipment which on the face appears suitable is, in fact, useless if worth-while picture reception is desired. Readers have made up equipment from ex-Service tubes, etc., and have obtained good results, but the risk of wasting money is very great. It may be mentioned here that the writer has built a most satisfactory receiver using at least 80 per cent. of Surplus equipment, but the construction and setting up of the receiver have proved that it is not a job for the ordinary amateur.

General Design

Before passing on to the main features which may be adopted by those who are prepared to speculate and spend the necessary time and patience in obtaining results let us run over the general points which interest every constructor. First of all, the cost. The complete equipment calls for a vision receiver, a sound receiver (and this could perhaps be left out if you have a really efficient 7-metre receiver available), the necessary pair of time-bases, a power pack and a cathode-ray picture tube and its associated scanning equipment. Before the war manufacturers of television receivers were divided as to the type of tube to be used—electrostatic or electromagnetic. To-day it is practically unanimously agreed that the electromagnetic type is best for the job. For normal domestic use, a 9in. tube is the smallest which should be used and, in fact, in the majority of homes a larger tube is hardly worth while, as one has to sit farther away to avoid the distraction of the scanning lines, and thus the ultimate *apparent* size of the picture is about the same as on the smaller tube viewed closer. These tubes to-day cost £9 each, to which is added purchase tax of just over £3. Our own experiments have been carried out with the Mullard 22-7, which gives a "black and white" image—actually a blue-white—and which is fairly short in the neck. The only scanning coil assembly at present available costs 34s., and a suitable line output transformer to match is 32s. These are made by Haynes Radio and so far as is known at present are the only home-constructor components of this kind available. They can be made at home, but as the final scan and efficiency from the point of linearity, etc., depend upon the design it is hardly worth while trying to make them. Furthermore, the line transformer has voltages of several thousand developed as the result of the line fly-back and this calls for good insulation and other factors in design.

Other Items

A focus coil is also needed and this is not a difficult item to make, but one has to weigh up the cost against the efficiency here, and a very good

magnetic field is required, together with a suitable form of adjustment, and thus it is probably preferable to purchase a ready-made article. Again, the Haynes Radio product may be obtained and costs 32s. So far, therefore, the "tube and assembly" (without mounting, which can easily be made) costs just over £17. For the power pack a special E.H.T. transformer is called for, delivering 4,000 to 6,000 volts at about 1 mA., together with a high-voltage rectifier. There are a few of these on the Surplus market at reasonable prices, but if a new one is purchased, again the cost is fairly high due to the high insulation demands. As an indication of price the Haynes product is 62s. 6d. and the valve 20s. plus tax. High voltage condensers, smoothing chokes and other apparatus in the power pack may be obtained very reasonably from the Surplus Stores and there is no need to go into prices here.

Receiver Design

For the receivers there is the question of superhet, or straight, but in any case at least six valves will be needed in the vision receiver and most of these will have to be of the special H.F. pentode type. The Mullard EF50 is most satisfactory and costs 17s. 6d. plus tax. Ex-Government VR91s, which are the war-time EF50, can be obtained new for 6s. each, whilst the necessary diode will cost about the same. If a separate sound receiver is built up, a similar figure will have to be considered for that.

The time-bases may use gas-discharge valves or hard valves, and although certain ex-Service valves may be used for the latter it is not apparently possible to obtain the former. The number of valves will depend upon the type of time-base built up and there is a very wide variety of circuits which may be used. To come down to the very simplest, a single gas-discharge valve for each base, with a pentode amplifier, may be used, and a hefty power pentode is called for. It is therefore obvious that, even obtaining a large percentage of Surplus equipment, the total cost of the complete receiver will be in the nature of £25 to £30, whilst if new apparatus is purchased throughout the cost may well be over £50. In addition to the expense there then arises the problem of getting it to work. A design was built up without the use of any test equipment (not even a multi-purpose meter) in order to see whether it was possible to obtain results on those grounds. Many hours of patience were called for, using hit and miss methods of lining up, and it was not found possible to obtain satisfactory results.

Test Equipment Needed

It was finally found desirable that a really good C and R bridge should be available, and that all condensers and resistances should be tested before incorporation in the apparatus. Ex-Service valves

were used and were all tested by substitution in other equipment to ascertain that they were satisfactory. As a matter of interest, of 15 VR91s purchased, two were unsuitable, although they would work at very low efficiency. To obtain the necessary bandwidth for the vision receiver, a signal generator had to be used. Trying to line up by eye was satisfactory only in so far as it was possible to "peak" all the circuits to obtain a picture, but to stagger the tuning to resolve even the 2 Mc/s bars on the test signal proved almost impossible without introducing other troubles,

and even then occupied many hours and called for extreme patience. An oscillograph *may* be dispensed with for lining up, using a meter inserted in a suitable part of the circuit, or using the picture tube itself as an indicator, but if the time bases fail to function properly locating the trouble will prove very difficult and probably impossible without the oscillograph.

No much for the general details of construction, and in future articles we will deal with such details as layout and suitable circuits, mentioning, where possible suitable commercial components.

Networks for Dual Speakers

Some Further Points on the Scheme Described in Our August Issue

By K. KEMSEY-BOURNE

IN the October issue of this journal there appeared an article dealing with the design of "Networks for Dual Speakers," in which details were given of a simple system for splitting the audio-frequency output from a set or amplifier so that all the low-frequencies might be fed to one speaker and the high-frequencies to another.

A Common Problem

Design data were given for networks to feed two speakers of the same impedance—that is, both speakers were either 3 ohms or 15 ohms, for example—and the amplifier output was assumed to give an impedance match to one such speaker. A number of readers wrote to say that they wished to construct such a network unit, but that the

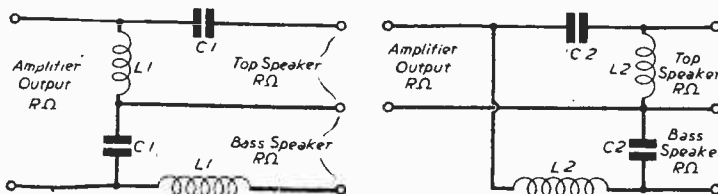
amplifier; if we put in Fig. 1 (below) the figures from the table, we have the state of affairs shown in Fig. 2 (page 16). In either case the inductances can be made or bought, the condensers may be built up by putting smaller values in parallel; it remains only to put in the 3 ohm speaker for top. Since this speaker has to present a 15 ohm load to the network, we match it with a transformer. Using the ordinary formula, exactly as we would for matching a speech-coil to an output stage, we have

$$\text{Transformer ratio} = \sqrt{\frac{\text{Impedance A}}{\text{B}}} = \sqrt{\frac{15}{3}} = 2.24.$$

Thus Fig. 2A is modified to the circuit of Fig. 3, and the network is complete; Fig. 2B would be exactly similar in modification. For small powers an intervalve transformer of approximately the correct ratio will serve, but if the network is handling more than a very few watts power output then a more ruggedly constructed transformer is essential.

Impedance Variation

It is worth remembering that speaker impedances are not constant over a range of frequency. The stated impedances are usually measured at 400 cycles, where a speaker probably has its lowest impedance. A nominal 15 ohm speaker may actually present a load of as much as 80 ohms at 75 cycles, 25 ohms at 1,000 cycles and 60 ohms at 10,000 cycles. That is why we do not need to be superlatively accurate in the ratio of the matching transformer. In the particular case above, the system might sound perfectly satisfactory if the additional transformer were omitted, particularly with low-powered outputs; it all depends on the speakers and cabinets used.



	L1	L2	C1	C2
R 3 ohms ..	340	680	75	37.5
R 15 ohms ..	1,700	3,400	15.6	7.75

Fig. 1.—The two basic circuits, and the values of capacitance and inductance for use in each. C in microfarads, L in microhenries.

speakers they had available were of different impedances; what could be done when there was a large 15 ohm speaker for the bass, but no 15 ohm smaller speaker for the top, while there was a suitable 3 ohm model that could be used for the top? Since this is likely to be a common state of affairs, we will deal with the method adopted.

The Problem Solved

For convenience the circuits for two types of network and the correct values of inductance and capacity are reprinted in Fig. 1.

Now, we have a 15 ohm speaker for the bass, and we will thus use a 15 ohm output from the

Choice of Circuit

If you have a 15 ohm speaker that you intend to use for bass, then work with a 15 ohm output

from the amplifier and make your other speaker fit the network as above rather than use a 3 ohm amplifier output, with the appropriate network values, matching the 3 ohm speaker directly and using transformer-matching for the 15 ohm speaker. It is easier and cheaper to get large inductances than large capacitances; also the bass speaker

It is obviously economical to choose the type of network that fulfils the impedance requirements and yet involves the smallest values of capacitance. Electrolytic condensers are avoided because they are polarised, and they draw more power and generate more noise than paper dielectric condensers.

The audio-frequency working voltage across the network condensers will not normally be more than 10 volts, so that 50-100 volt working components, such as are nowadays cheaply available, are more than satisfactory.

A Warning

One final point: you can choose either of the circuits shown basically in Fig. 1, whichever suits you best. You may use one or the other, but not a mixture of both. One reader who has a 15 ohm speaker and another of 3 ohm unit asked if he might connect them to the 15 ohm and 3 ohm tapings on his output transformer through a mixture of the two basic types of network. Perhaps he was disappointed to hear that that sort of thing would not work. If you work on the lines of the circuit of Fig. 3, or of Fig. 2B similarly modified, your results will be satisfactory.

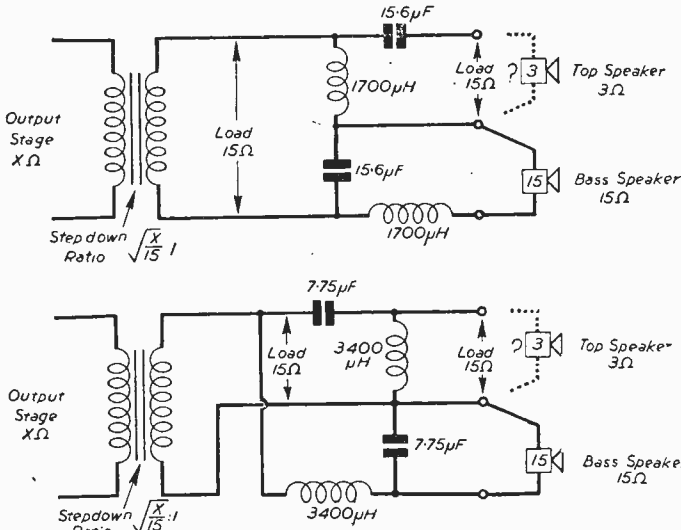


Fig. 2.—Practical application of the circuits shown in Fig. 1. The 3 ohm speaker is finally matched as shown in Fig. 3.

handles most of the power normally, and it needs to be the more carefully matched. Another point is that in adopting a 15 ohm output from the amplifier we use a maximum of the windings on the output transformer. There are more good reasons for using a 15 ohm output tapping, but those cannot be fully discussed here at present.

The Condensers

The original article included a reminder to would-be constructors that the capacity of a number of condensers wired in parallel is the sum of their individual capacities. In other words, two 8μF condensers in parallel have an effective capacity of 16 μF; thus 37μF can be built up by wiring in parallel any condensers such that the sum of their individual capacities is 37 μF, such as four 8 μF, one 4μF and one 1μF.

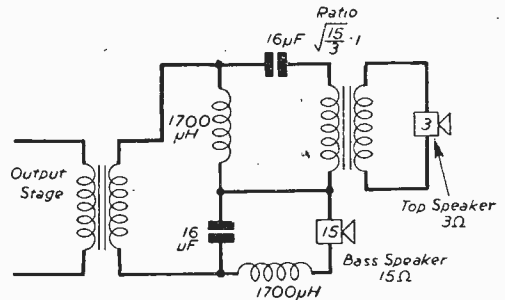


Fig. 3.—A 15 ohm speaker for bass, and a 3 ohm speaker for top finally matched to the basic network shown in Fig. 1 (left).

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Afterthoughts on Radiolympia

A Visitor Looks Back on This Year's Radio Show

By THE MARQUIS OF DONEGAL

OBVIOUSLY, the fact that far more people attended Radiolympia in 1947 than attended in the record year of 1934 leaves no room to doubt that people do not mind going to an exhibition where they are very doubtful whether they can buy something or anything.

This first post-war radio exhibition—15th since the first at Central Hall, Westminster, in 1922—divided itself into three categories. These were: Radio proper, television and what I would call offshoots or gadgets.

It is impressive that there were 20 more exhibitors than before the war—190 in all. Figures of attendance are difficult to compare, because the 1939 exhibition closed prematurely two days before the outbreak of war, when the military authorities requisitioned Olympia.

I think you would have been surprised, as I was, to see so great a proportion of high-grade timber employed, as opposed to the more readily available and attractive plastic materials.

A sensible and obviously consequential trend was the predominance of the table type of model as opposed to the pre-war trend to make the radio set a piece of full-length furniture.

Reception has improved, and so anxious was each maker's representative to prove to you that this was the case in his particular product that it is a wonder that even strict organisation was able to prevent the unwary citizen from being blasted out of the building.

This in itself was a technical achievement, because you could hear most of the sets that you wanted to hear and yet the entire noise seemed to blend into an harmonious whole wherever you happened to be listening.

There was emphasis on midgets, the smallest I saw being a four-valve battery superhet with

loudspeaker in a case hardly larger than a folding camera.

I did not notice any undue tendency towards press-buttons, except in automobile radio. It is obviously a good idea if the driver of a car can push a button and get his station, but the industry seems to have come to the conclusion that a great many of us fans still enjoy fiddling with knobs.

Television

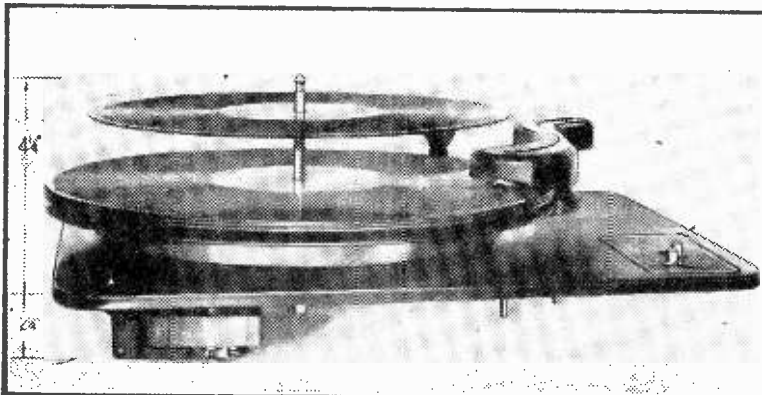
So far as television is concerned, it is definitely far better than before the war. The largest exhibit was a combined radio, television receiver and also radiogram: I did not even dare ask the price.

From the gallery of the National Hall you could look down into a B.B.C. television studio and see them rehearsing all kinds of television and sound programmes, including Itma, Merry-go-round and other favourites.

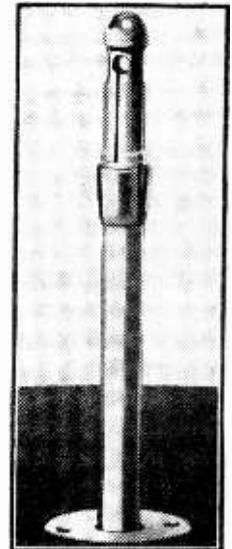
Along what they called Television Avenue you could go into a number of cubicles and view for comparison the results of 39 receivers manufactured by 24 different firms. Most of the viewing screens are designed for viewing from about 10ft., in an average room. The Technical Committee preferred female voices on the public address system and there we found our old friends Joan Griffiths and Barbara McFadyean, who, as many of you remember, announced Forces Favourites during the war.

"Gadgets"

Now we come to gadgets, as I call them. There was, for instance, a machine—I may say a rather disconcerting machine—which records the activities of brain cells. What will they plague us with next?



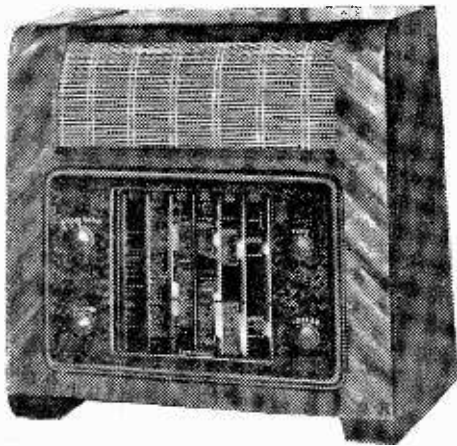
A new form of record changer and the "umbrella" type release, shown enlarged on the right.



Then there was "Rebecca," a working demonstration of the famous approach system for aircraft. In this a model aircraft was used which gave a very realistic simulation of actual working conditions. There was also a lightweight direction finder weighing only 16 lbs. to give instantaneous bearings to aircraft.

What was called the air-traffic control room was designed to show the non-flying public the care that is taken and the system used in plotting movements of aircraft in Southern England and round the coast in accordance with reports received by radio. I thought this a very good thing because the vast majority of visitors to Olympia never had the opportunity of seeing an operations room during the war, except in very censored form on the films.

Then there was what Field-Marshal Montgomery is alleged to have christened "the Number 10 thing"—in other words, Army wireless set No. 10. This was demonstrated by Royal Signals, who worked it in Normandy. It was the means by which Churchill and Montgomery could talk to each other without fear of breaking secrecy.



An "Ambassador" receiver in which special attention has been paid to the short-wave tuning ranges.

To be semi-technical for a second. No. 10 enabled Britain to lead in centimetre wavelength technique and was certainly the first apparatus of its kind to enable eight separate two-way telephone conversations to be carried on simultaneously.

The demonstration of this was a Ministry of Supply effort.

Being a bit of a horologist, I was interested in seeing the quartz crystal clock, said to be accurate to a ten-thousandth of a second, and now used at Greenwich Observatory.

Police Radio

Next we come to a fascinating demonstration of how radio has influenced Scotland Yard's entire system of crime detection. In other words, "dialling 999." This demonstration was a replica of part of the Information Room at the Yard.

Personally, I had not realised that, apart from being in communication with patrol cars all over London, Headquarters also contacts police launches on the Thames. Frequency modulation is, of course, the system used.

The Metropolitan Police apparently have not a monopoly. The system is used by a fleet of tugs on the Tyne and by a Cambridge taxi service that gives its drivers new instructions without the necessity of their returning to the depot.

Of course, gadget-minded, as I profess to be, I sometimes get a good laugh, because I think that there is a limit to what modern science should do for the fool. When you get to a set that incorporates an electric clock for the absent-minded listener, switches on the programme he has pre-selected and shuts itself off at the end of the programme in case he forgets to do so—well, I think we've about had it!

There is quite a thought there, you know, because if the machine is going to do everything for us there may come a time when, a few generations hence, Man will be incapable of doing anything for himself—even inventing something to give himself less trouble.

Quite frankly, I am not particularly interested in any of the "new models" which I saw at Radiolympia. I am interested rather as the purchaser and not as an expert, and I do not think that, until somebody produces something which is radically different from the 1939 models, I am prepared to spend my depleted pounds. And I think that is the attitude of most of the radio fans in this country. I am not going on to say what I think of the B.B.C. and how my opinion was confirmed when I went to America quite recently.

I can only say that I think that the B.B.C. is in the doldrums of adolescent know-all-ism. I have thought so since I first went to Savoy Hill when I was an undergraduate at Oxford. On the other hand, during my 17 days on a freighter from Glasgow to Galveston in Texas, I had with me a new British Double-Decca. I threw a string, as I call it, out of my porthole and hitched it up to the nearest mast, and from the day that I left Glasgow I received the B.B.C. Overseas Service on my battery portable until we were just coming into Galveston, Texas, where naturally the American network became too strong and I could no longer receive the B.B.C.

I regard the British radio industry as in the same position as most other industries in this country. Sabotaged! But there is no doubt that we can do it. And if Radiolympia proved anything, it certainly proved that.

There are several machines that will do the same as my Double-Decca, but the Americans were amazed at its performance. They had never seen a commercial machine running on batteries which would do short-wave, long-wave and medium-wave. They were also astounded that I had had the Overseas Service of the B.B.C. the whole way across the Atlantic and right into the Gulf of Mexico.

So, as far as I am concerned, it is the same old story. In other words, if anybody will let anybody get on with the job there will be no difficulty about radio in particular and about the future of this country in general.

Practical Hints

Unwinding Flex

IT is often necessary to unwind a long length of flex in order to use it in single lengths. Any amateur who has attempted this knows how involved and tedious the process can be after the first few feet or so.

The simple device illustrated will effectively do this work quite quickly. As will be seen, the arrangement is merely a length of wood pivoted at its centre on a short handle. A hole at each end of the strip is to take the two ends of the flex, the other two ends of the length being fastened to a suitable stout support.

The length of flex is then pulled taut and the wood strip rotated to unwind. This is usually clockwise, and the flex wires will separate after

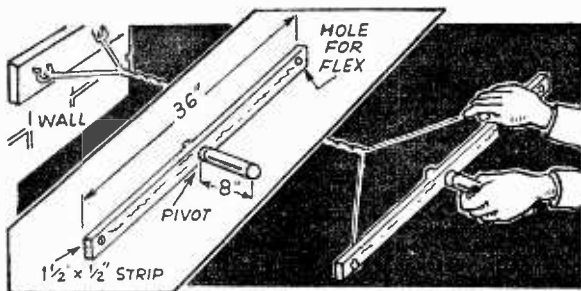
THAT DODGE OF YOURS!

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 113 of cover.

transfer the meter lead from anode to the H.T. side of the anode resistance (or decoupling resistance if this is the only one in the anode circuit). A higher voltage should be registered. If it is not higher than the anode voltage there is obviously either no anode current or the resistance is short-circuited. Next connect the meter direct across the resistance and compare this with the difference between the previous two voltages measured. It will be seen that the actual voltage drop is thus easily measured, and as already stated this will enable, by the application of Ohms Law, both the anode current and the resistance value to be checked without disconnecting any leads or components.—R. WATTS (N.W.9).



Unravelling ordinary lighting flex.

a few minutes turning, according to the length involved. It will be found necessary to move slowly backwards as the unwinding proceeds, as, of course, the individual wires are longer when unravelled.—R. L. G. (Chelmsford).

Servicing Hint

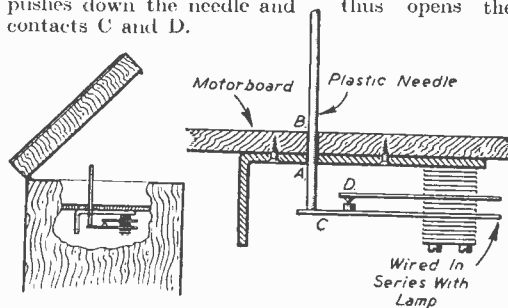
WHEN checking over a receiver it is often necessary to check the value of an anode resistance and/or the anode current of some particular stage. Normally, one would disconnect the anode or decoupling resistance and insert a good milliammeter in series with the circuit, but it is really unnecessary to break any leads or use any form of valve adaptor. The anode current flowing through any resistance in the anode circuit will cause a voltage drop across that resistance, and thus, if the voltage drop can be measured it is obvious that from Ohms Law not only the current flowing, but also the value of the resistance may easily be ascertained.

The voltage drop may be measured in the following simple manner: Connect a milliammeter between chassis and the anode pin of the valve. This will register a voltage which, although not exact due to the fact that the meter is in parallel with the valve, will suffice for our purpose. Then

Automatic Floodlighting Switch

AN automatic floodlighting switch for a radiogram which automatically switches the light on when the lid is open, and off when closed can be very easily made from one of the older types of phone jacks. A hole (A) is drilled in the framework of the jack to coincide with the end of the contact C. Also two small holes are drilled to allow for fixing to the motorboard. A small hole is also drilled in the motorboard close to one of the sides to coincide with the hole A in the bracket.

A piece of plastic or bone knitting needle a little smaller than the diameter of the two holes is then pushed through so as to rest on the bottom contact at C. The length of this should be such that when the lid is closed it just pushes down the needle and thus opens the contacts C and D.



A simple idea for floodlighting a gramophone turntable.

The two contacts are wired in series with a small lamp of mains voltage which is fixed in a convenient spot on the motorboard. If the spring of the contacts is too much for the lid to press down they can be filed a little thinner, also if they have not already got silver contacts, a small piece of silver can be soldered on and then filed to shape.—L. D. TONG (Rochester).

THE building of the converted MCR1 into a suitable case presents a mechanical rather than an electrical problem. However, with the 2½ in. miniature speaker now a standard product and the Batterymax Type B101 layer-built 67½ volt battery, which is only 3¼ in. by 2¼ in. by 1 5/16 in., it is surprising how little space is required. The miniature battery cannot be expected to have a very long life, but the writer has found that it will give some 30 hours on intermittent work. The U.2 cell for the L.T. has a shorter life—about six hours. These batteries are quite accessible, and the spare pocket beside the H.T. battery comes in useful for housing the aerial and earth leads provided with the original MCR1.

The first and perhaps most important consideration is the choice of a suitable material. The writer chose aluminium on account of its lightness, and after experimenting with various thicknesses it was finally decided to use 22 S.W.G. throughout. At first sight it may appear to be rather flimsy, but once it was bent to shape it was found to be quite strong enough. An advantage gained by this light gauge is that it can quite easily be bent by hand; and if a vice is not available the job can, at a pinch, be done by bending over a straight edge. As the gauge is so light it is not necessary to make any allowance for the bends, but it is essential that the sheet should be accurately marked out and bent exactly along the lines. It is very easy to make a mistake and turn a bend the wrong way, so each

The Shoulder

Constructing and Wiring the Upper Chassis

By R. E.

step should be carefully thought out and the job measured and checked by reference to Figs. 4, 5 and 6 after each bend is made.

In order to attach the upper chassis to the set two holes should be drilled in the top of the paxolin board holding the coil pins. These are drilled 7/64 in. to clear the No. 4 self-tapping screws used throughout the job; these screws being the same as those used on the MCR1. In the cases where these screws are holding the thin sheets of aluminium or screwing into paxolin it is best to use steel backing pieces of 18 S.W.G. sheet. These are shown in Fig. 8, two of the long strips being used for holding the outer casing to the coil box end of the upper chassis, while the short strip fits behind the holes in the paxolin mentioned above. Apart from these two holes the only other drilling for the chassis of the MCR1 is a hole about 3/16 in. diameter just beside V5, for the leads from the anode of V5 and the transformer T1. At this end the upper chassis is fitted to the set by means of the upper two of the four holes already existing in the end plate.

When the bending of the sheet for the upper

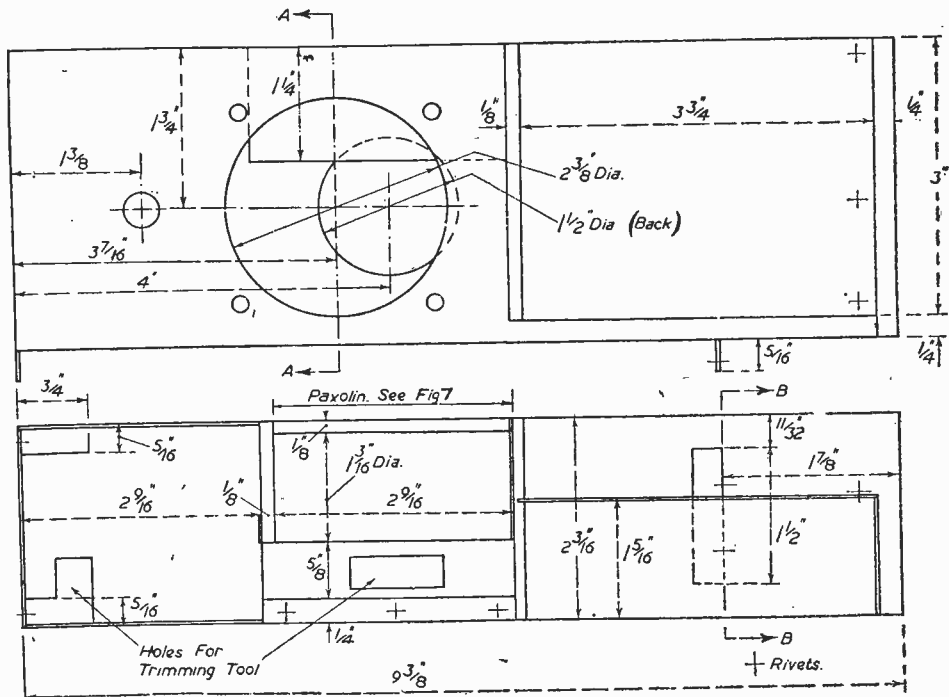


Fig. 4.—Cutting, drilling and bending details of the additional chassis. This should be studied in conjunction with Figs. 5, 6 and 7.

Shoulder Strap Five-2

Construction and Making and Fitting the Shoulder-strap ARTKOPF

When the chassis is completed the paxolin battery container ends should be fitted. These are shown in Fig. 7, and it will be noted that the saw cut in the panel for the H.T. battery compartment is designed to take the edge of the back sheet of this compartment to ensure rigidity. The rivets used for attaching these panels should be kept out of the way of the battery terminals, and a strip of spring brass fitted behind the U2 cell is required to hold the other end hard against the L.T. positive connection on the paxolin.

After the upper chassis is completed the outer casing should be made and fitted. A developed view of this is shown in Fig. 11, and the bottom half is exactly similar to the sheet steel casing originally on the MCR1. Thus, all the old fixing holes can be used together with the original bottom plate already drilled and marked for the controls; and the old casing is useful as a guide to marking off the holes for the screws, tuning window, A.E. plate, etc. Since the four fixing screws through the paxolin coil pin plate have to bite into the aluminium sheet, and there is little room for backing plates, the sheet itself was doubled over and this provided sufficient thickness.

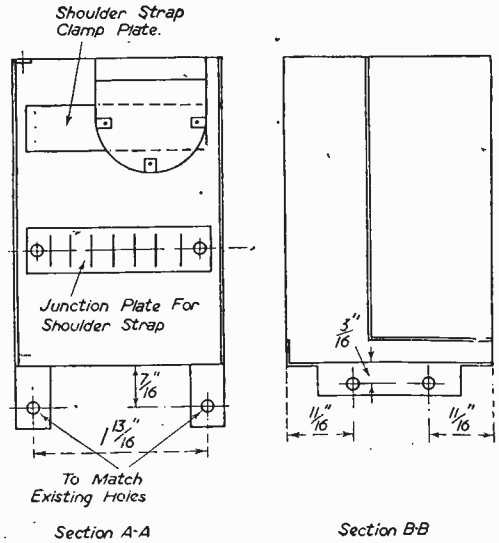


Fig. 5.—Sectional views of the upper chassis through AA and BB of Fig. 4.

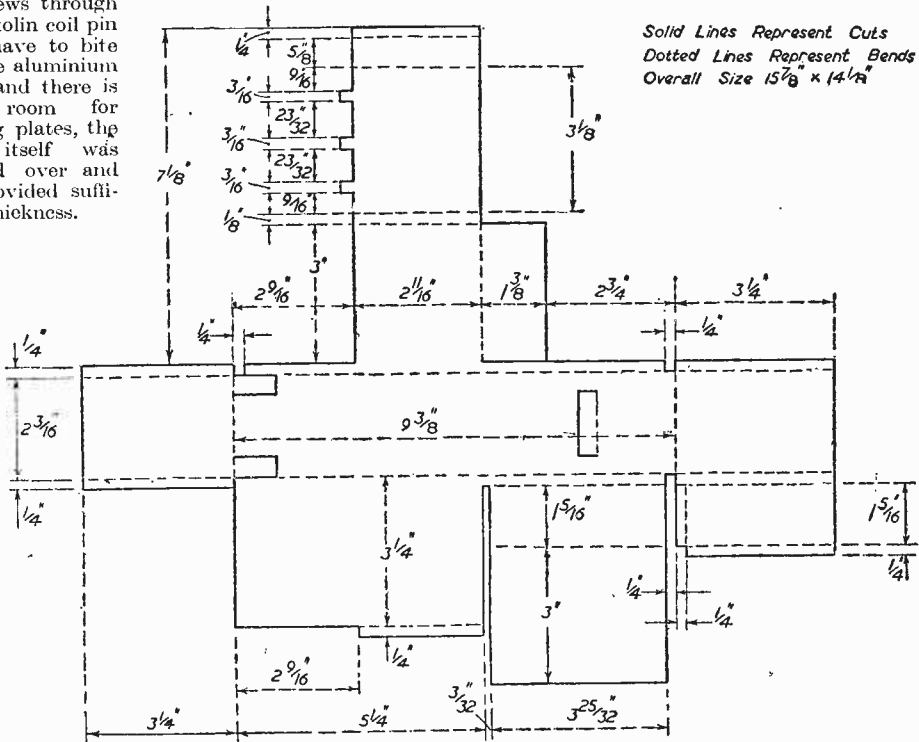


Fig. 6.—Cutting and bending details of the upper chassis. Take care to avoid confusion between bending lines and dimensional lines.

The upper part of the outer casing is drilled to correspond with the holes for the speaker, switch, etc., in the upper chassis; and although this means

The Aerial

The aerial is a shoulder-strap made of four lengths of flat twin P.V.C. covered flex moulded together. This was found to be very effective for local work, while for distance and short waves the original aerial plug was used. As the strap is some 5ft. long (this can be adjusted to suit the wearer's taste), Syds. of flex were bought and cut into two-yard lengths. From a piece of spare aluminium sheet a channel section about 12in. long by 1½in. wide and with flanges ¼in. deep was made up, and the four lengths placed side by side in it. A flat strip of the same sheet was placed on top, and it was found that when a hot iron was pressed over the whole, the outer covers of the flex melted, welding the four pieces together. This melting point is critical and care must be taken not to overheat the material,

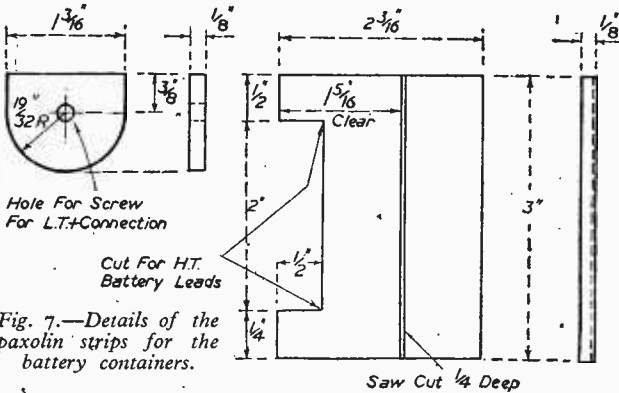


Fig. 7.—Details of the paxolin strips for the battery containers.

that the holding screws for the speaker, etc., must finally be fastened with the outer casing in position, it is the best way of making a solidly-finished job and enables a piece of wire gauze to be sandwiched in between to protect the speaker cone. The final part to be made and fitted is the top cover, shown in Fig. 13. This is not screwed on as the flanges are sufficient to hold it in position.

Although the external finish of the set is a matter which can be left to the individual taste the writer found that the crystalline lacquer as used on cameras, cash registers, etc., was particularly satisfactory. It is painted on in the usual way, and after the work has been stoved in a cool oven for about an hour it is dry and ready for use. This lacquer will adhere perfectly to any metal, and is ideal for hiding flaws, such as hammer marks and the like.

The transformer T2 is a standard midget type, size 1½in. by 1½in. by 1½in., and the three-way switch should be of fairly small dimensions.

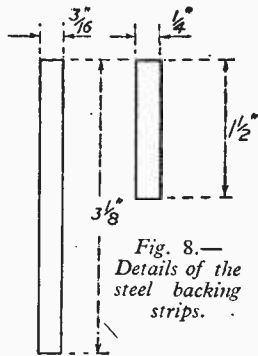


Fig. 8.—Details of the steel backing strips.

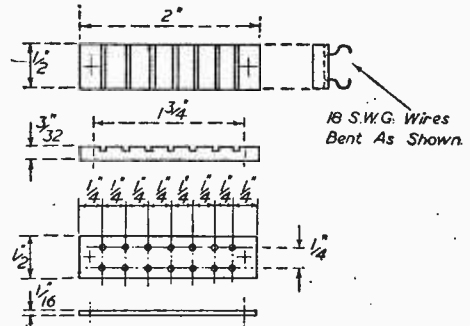


Fig. 9.—Details of the junction plate for the shoulder-strap.

for if this happens the whole will become a sticky mess and the wire inside will buckle and break out through the edge of the plastic covering. Only the part of the strap outside the set should be treated, and about 18in. should be left at one end for threading the four individual flexes down at the back of the H.T. battery container and along the floor of the upper chassis to the junction plate (see Figs. 4 and 9). Although a paxolin clamp plate (Figs. 5 and 10) is needed for the end of the strap which comes straight down to the junction

plate, it was found that one at the other end (which would be rather awkward to fit) is hardly necessary. Once the strap is adjusted for length, and in position, it can be connected to the junction plate, which is made up as shown in Fig. 9. This should be done so that the strap forms a continuous loop of eight turns, with one end of the first wire connected to the aerial tag and the other end of the last wire to

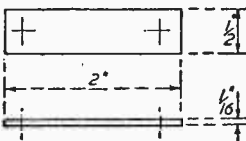
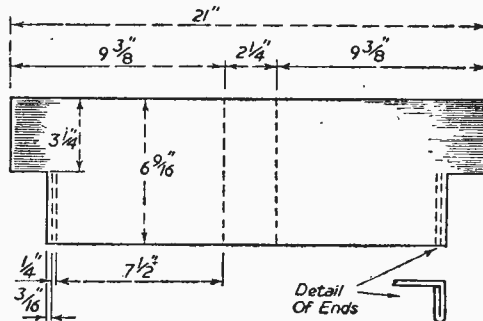


Fig. 10 (above).—The shoulder-strap clamping plate.

Fig. 11 (right).—Marking off details for the outer casing.



the chassis. It had been intended to fit a switch to break the aerial end of the loop when the external aerial was used, but experience showed the

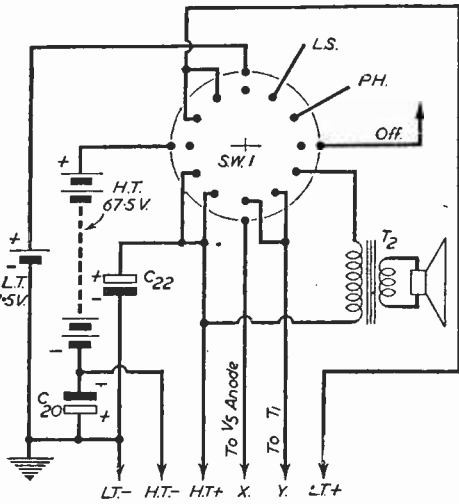


Fig. 12.—Upper chassis circuit wiring.

presence of the loop to be a slight advantage, for if a good earth connection was made to the aerial terminal the results were better than could be obtained with the same aerial and earth connected in the normal way without the loop being in circuit.

With the shoulder-strap fitted and the outer casing screwed up the set is now ready for use; but before really good results can be expected from the shoulder-strap aerial, it is necessary to do a little work on the coils covering the medium-wave band (i.e., those in the box marked "Range 1"). The writer, on first examining the scale on this coil pack and finding that it allegedly covered from 188 to 3,000 metres (a coverage of over 15 : 1), just refused to believe it. But experiment showed this to be a fact, and the explanation was found to be quite simple. From Fig. 14 it will be seen that in place of the usual tuned signal circuit, Range 1 uses a band-pass filter, and all the tuning is done by the oscillator. So, what really happens is that the tuning range is from 100 kc/s (3,000 metres) plus the I.F. (1,700 kc/s), i.e., 1,800 kc/s to 1,600 kc/s (188 metres), plus the I.F. (1,700 kc/s), i.e., 3,300 kc/s—a coverage ratio of less than two to one. While this wide range is very satisfying, it means that without the extra amplification which a tuned circuit gives, the set—on a small loop aerial—just doesn't get a chance.

It is, however, quite easy to make up a pair of

coils giving excellent amplification on the medium-wave band. A pair of "Denco" Range 2, Maxi Q coils (aerial marked yellow and oscillator marked red) were obtained and fitted by means of small brackets to a base of a spare coil pack. If this is not obtainable it is quite a simple matter to make a base out of paxolin, marking the holes very carefully and using the pins from a "Clix" type British valve base, as these are the same as those used in the original coil packs. Thirty turns were removed from the oscillator-tuned coil and 25 turns added to the tuned aerial coil. The coils were wired as shown in Fig. 14 (ranges 2, 3 and 4), with a padder of 350 pF. and trimmer of 75 pF. across the oscillator-tuned coil. By adjusting the cores, the tracking can now be

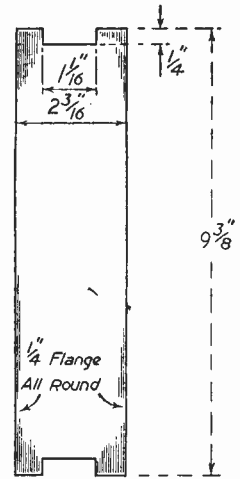


Fig. 13.—Top cover plate dimensions.

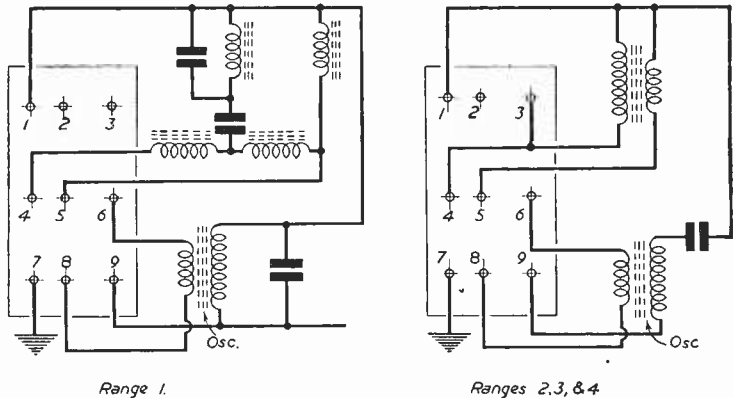


Fig. 14.—Details of the MCR1 coil packs.

brought within the tolerance allowed by the A.E. trimmer with very little trouble, and the increase in sensitivity over the original range 1 has to be heard to be believed.

While this range—some 200 to 400 metres—covers most of the medium-wave stations, it is possible to make a similar set to cover other sections of the medium- and long-wave bands. If the oscillator coil is fitted and padded and trimmed to cover the required range with the aerial connected straight through to the valve, i.e., coil pins 4 and 5 connected together, the difficulty of adjusting two coils simultaneously is avoided.

At the short-wave end, too, there are possibilities. A slightly modified Range 4 coil set has given excellent results down to 10 metres, and it is hoped it will be possible to go still lower.

Quality Radio Unit

A Tuner for Use with the Cathode Follower Amplifier

By M. G. SPARKE

THE keynote of this design is simplicity allied with components and valves that may usually be found in the amateur's store cupboard.

The receiver is built round an ACVP1 and a MHD4 with the diodes strapped.

As the tuner is for local stations only, there is ample signal voltage to allow for the efficient operation of a diode detector, i.e., the greater the signal voltage applied the less the distortion introduced.

The advantages of the R.F. stage are increased sensitivity giving an increase of signal voltage to the detector and consequently increasing the signal to noise ratio; also, that it is a simple matter to apply a gain control ahead of the detector.

As only two stations are normally required a push-button unit is used as the cost of a twin-gang tuning condenser is not justified under these circumstances.

Modifying the Switch

The modification to the push-button unit is quite simple and merely consists of moving several of the contacts to other positions, and in extending the moving contact.

Contact 1 is drilled out and fixed in position 2 (as shown in Fig. 1) by means of a small round-

headed brass bolt just a shade larger than the hole drilled in the paxolin panel, so that it will screw in firmly, eliminating the necessity of riveting or supplying a nut and washer.

The extension to the moving arm consists of a small piece of brass strip soldered to the original moving contact and at right-angles to it.

If contact No. 3, Fig. 1, is now earthed on depressing the button, contacts No. 2 and No. 4 will be made to earth, which is necessary to bring the relative grid tuning condensers across their respective grid coils when selecting a station.

The Circuit

The circuit calls for no great comment, except that the detector grid circuit has an apparent high minimum capacity, making the fixed condensers as used in the H.F. stage, C_1 , C_3 , Fig. 1, unnecessary.

This effect may probably be due to the fact that the coils are very simple and home-made, this apparent high minimum capacity being due to a mismatch in the coils themselves; this point should be watched.

The general construction should be rigid, and all top cap leads screened and the screening well earthed. The minimum lengths of inter-connecting

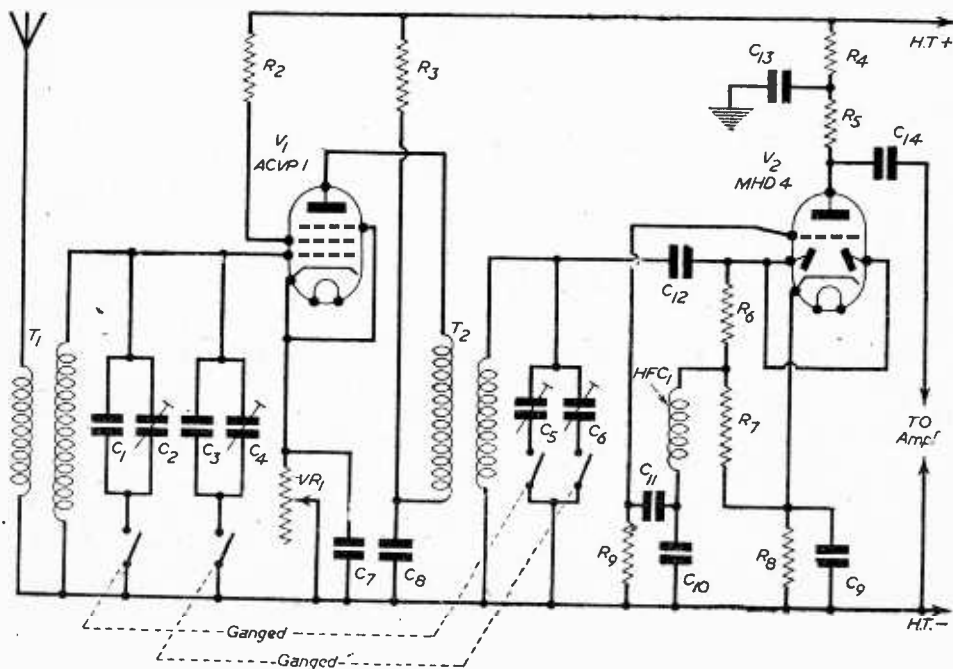


Fig. 1.—Circuit of the tuner unit described above.

leads should be used in the signal-frequency stages.

Avoiding Hum

If three units are to be built, namely, power pack, amplifier, and receiver unit, a common negative should not be used for carrying one side of the filament supply and H.T. negative.

If this is done hum potentials are prone to be set up on the various chassis, and these hum potentials will find their way through the amplifier and make themselves audible at the speaker.

The only proper cure for this is to run the filament supply as a separate circuit consisting of two leads throughout.

Alternatively a cure may be effected by very efficient bonding of the chassis and any screened

chassis inter-connecting leads, as a few inches more or less in the placing of a bonding wire can make a world of difference to the hum level. An alterna-

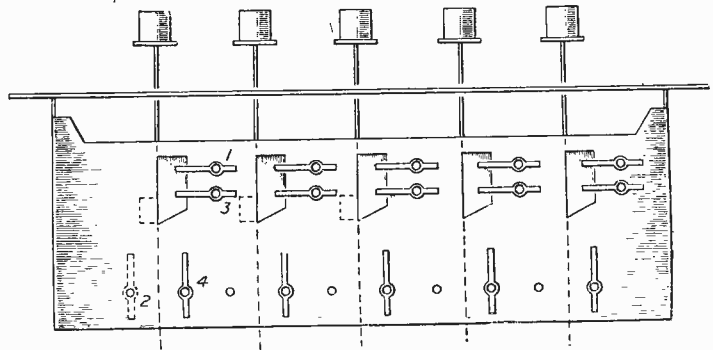


Fig. 2.—Details of the push-button switch modification.

tive which might be tried is to earth one side of each heater direct.

Underneath the Dipole

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

"ALL the world's a stage," said the Bard, "and all the men and women merely players." The line occurred to me, as I pushed and shoved my way through the dense crowds in Television Avenue, Radiolympia, trying to obtain fleeting glimpses of the rows of sets being demonstrated. Apart from the dozens of little miniature "stages" upon which we were all gazing, my feet were being trodden on by muling schoolboys and my neck breathed upon heavily by young couples, sighing like furnaces. But I survived, and, what is more, succeeded in actually seeing practically every one of the sets. Here, indeed, was a demonstration of the public interest in television, though the reactions of the slowly moving throng were not always complimentary. Transmission was, on the whole, good, but the type of material suitable for reproducing on such occasions is necessarily limited. Now that the phenomenally successful 1947 show is well and truly over, and manufacturers are beginning to turn their thoughts to next year's Radiolympia, we can sit back and weigh things up.

Television Draws the Crowds

I will not dwell upon the record breaking-crowds and the physical discomforts consequent upon its popularity; the exhibition has already been fully commented upon in the columns of this journal. What has interested me has been the amazing increase in inquiries about television sets at local and suburban radio dealers. While I felt that the huge Radiolympia crowds just "saw" television, without fully appreciating its true entertainment value, I have noted that very large numbers of that madling crowd have found their way to quiet demonstrations of individual television sets at their

local radio shops. On the whole, these shop demonstrations are more effective, though it does not give the viewer a true idea of just how easy-to-look-at good television really is, when competing with interior shop lighting and possibly motor car interference from the busy traffic outside. Nevertheless, I am assured that sets are selling like "hot cakes," and that sales are far ahead of supplies. One reasonably priced set has achieved tremendous popularity, and its own peculiar type of dipole, supported on a letter "X" can be seen, new and shiny, above hundreds of roofs.

The Purchase Tax

Dr. Dalton may have had his eye on Radiolympia, too. At the time of writing, there are rumours of impending increases in purchase tax, and the blow (if any) will have fallen ere these notes appear in print. In the meantime, orders are being placed feverishly, in the hopes of securing delivery before a prohibitive tax is imposed. And so, for the time being, political shadows descend upon yet another form of escape from the horrors of peace.

Big Screen Television

At the other side of the political front, at the Conservative conference at Brighton, television was put to practical use. Television images of the principal speakers were reproduced on a large screen, about 12ft. x 9ft. in an adjacent hall holding a crowded overflow audience. I am told that the quality and brilliance of the picture thus projected was a marked advance on anything previously demonstrated to the public. The transmission was, of course, "wired" television, and the definition 405 lines. The audience was

enthusiastic, and quite forgot the hundreds of electronic links between the speakers and themselves, and there were frequent bursts of applause and cheers. Surely, this is a foretaste of a new form of entertainment—television? The Rank group in the cinema industry, which controls Bush Radio and Cinema Television, is initiating research and development in this field, and the restriction of the importation of American films will speed up installations. I am of the opinion that wired, big-screen television will be fitted first of all into the small news-reel theatres, and that ordinary films will be transmitted from a central point, with very occasional "live" events added from time to time. Unfortunately, the home viewer will *not* be able to participate if the radio link is not used!

Television Programme Costs

Film producers have a lot to learn from the enterprising young men of the Alexandra Palace, who manage to turn out good entertainment at the average rate of about a hundred pounds or so an hour. Film producers in England find it difficult to make pictures of the "first feature" class at less than about £200,000 a time, and many British pictures are now costing half a million or more to make. With the American market now virtually closed to them, as a retaliation for the 75 per cent. *ad valorem* duty levied on American pictures coming here, the British films have to recoup themselves on the British and Colonial market, which yields less than £200,000 for even the best and most popular films. Naturally, film companies cannot go on bearing losses; and so several British studios have closed down to reorganise and adjust themselves to making a cheaper type of product without losing too much "quality." The making of a film is a slow and costly process, and the industry's trade paper, the *Kinematograph Weekly*, reveals some of the reasons for the tremendous rise in the picture-making budgets. Apart from huge salaries paid to the more important film stars, the employees' unions carry the "one-man to one-job" ideal to such fantastic extremes that there are actually cases of 20 men now being required to do work which was formerly adequately performed by one man! The final result of such short-sighted policy, is, of course, to put a lot of very good people out of work and reduce the number of British pictures. What stupidity! What folly!

Versatility Counts

In contrast to this "work not wanted" policy, it is pleasant to contemplate the versatility and keenness of the B.B.C.'s television technicians, who change their jobs around to obtain a good basic general knowledge of their craft. One day, for instance, a man may be found operating a television camera; the next day, he will be handling a sound microphone boom, or a tele-cine piece of equipment. Results occasionally suffer due to this policy, but the gradually improving technique and the high standards now achieved seem to justify it. I have heard film people pour scorn upon a few wobbly "tracking shots" in television plays, or upon focus or lighting faults; but I am certain that the same film technicians would find great difficulty in coping with the hundreds of transient difficulties which have to be dealt with during the actual

transmission of a television play. Once the B.B.C. Research Department get the idea of designing a machine which requires a hundred men to do the work of one, we're sunk! Fortunately, this apparatus has apparently already been patented by film technicians! The "A. P." boys are doing all right; we who watch underneath our dipoles are sympathetic critics, ever mindful of colossal difficulties being overcome nightly.

An American Development

During the past few months, there has been a great deal of publicity given in America to the "Image Orthicon," a type of television camera having an almost unbelievable sensitivity. The principle which makes it sensitive to very low light intensities is similar to that employed in the R.C.A.'s electronic multiplier for astronomic use, where it makes possible the measurement of starlight. This additional sensitivity enables lenses of smaller aperture to be used, giving a much greater depth of focus and a more stable picture. The output of the tube is said to be relatively high, enabling an improved gain control system to be used, and avoiding the fluctuations of picture caused by contrasting images, high lights and deep shadows which previously necessitated rapid manual correction or "knob twiddling" at the transmitting end.

If all this is true, then we ought to save up a few dollars and buy one!

BOOK RECEIVED

TELEVISION EXPLAINED. By W. E. Miller, M.A.(Cantab), M.Brit.I.R.E. Published by The Trader Publishing Co., Ltd. (distributed by Iliffe & Sons, Ltd.). 52 pages, with 56 diagrams and illustrations. Price 3s. 6d.

FOLLOWING the success of a previous book by the same author dealing with radio-receiver circuits in a step-by-step survey, this book has been published to cover the television field.

It is addressed mainly to knowledgeable members of the public who, having some acquaintance of radio circuits, are equally interested in their television counterparts; to radio service engineers as a grounding in the circuitry they will encounter in maintaining television sets; and to students in radio and television in technical colleges.

The book is non-mathematical, and is written in simple language. In addition to television reception circuits, acrials and aerial systems are fully explained, and receiver installation and operation is described and illustrated.

Contents include: Acrials—The Signal—The Receiver—The Cathode-ray Tube—Scanning Units—Deflection Amplifiers—Power Supplies—Receiver Installation and Operation—Picture Faults Illustrated—Index.

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Technical Notes-2

"DYNATRON" Here Discusses Problems of Resonance and Phase
(Continued from page 504, December issue.)

WELL, we needn't give the entire story. Because one machine is 100 volts higher than the other, a pretty large current would flow somewhere at the instant of closing the paralleling switch! Did I say a voltage-difference of 100 volts? At any rate, that is exactly what I meant.

But a "difference" implies that one E.M.F. is acting *against* the other. Somewhere in the circuit, the 200 volts and 300 volts are in mutual *phase-opposition*. We have not to search far to find where. The two arrows drawn against the respective alternators in Fig. 5 indicate E.M.F.s acting in the same direction, *relative to the external circuit*, i.e., over a given alternating half-cycle. You may say the E.M.F.s are *in-phase*.

In what sense, therefore, can they be said to be anti-phased? Surely, in the sense that the E.M.F. generated by one machine is acting as a *back E.M.F.* to the other—if the switch S were closed, 300 volts would "try" to pass current through the other machine, but it would be opposed by 200 volts. The net difference is 100 volts, which could cause a fairly hefty circulating current if the impedance was low enough.

When each is adjusted to give exactly 200 volts, the E.M.F.s are equal and *opposite* at every instant. No current can circulate between the machines on closing S. The phase relationship is precisely the same as that existing between an *applied* and a *back E.M.F.*, i.e., in the closed mesh ABCD which interconnects the machines.

If this is not *phase-opposition* of voltages, I give up in despair all attempts at exact terminology. And I choose the word "phase-opposition," not so much because of a passion to be precise or go contrary to other people! It is a term which conveys unmistakably the importance of adjusting the voltages to exact opposition, before attempting to close any switch. To talk of merely being "in-phase" is neither here nor there, as far as closed-circuit conditions are concerned.

When Are Voltages "In-phase" ?

In point of fact, is it strictly correct to say that the E.M.F.s are acting *in-phase*, as regards the external circuit ?

Two E.M.F.s *in-phase* are additive. By all vector rules, the resultant E.M.F. is their arithmetic sum. This is exactly what would take place in the closed mesh if we had 200 volts, and 200 volts, *in-phase*, and not in phase-opposition. There would be a resultant voltage of 400 volts, giving rise to a terrific short-circuit current between the machines which would burn-out everything in its path.

It is also exactly the condition we would want if using two alternators *in series* to give 400 volts. The E.M.F.s must be *additive* at every instant.

But we know that, when in parallel, the voltage

across the external circuit is not 400 volts, but 200 volts—that of *one* machine. How are we to distinguish between this case, and that of two machines truly *in-phase* and thus having their E.M.F.s additive ?

In other words, is it strictly correct to speak of the voltages of two things in parallel being "in-phase" in any sense of the term ? I will leave the question open, but will suggest that the two independent "parameters" as regards the external circuit are the *currents* supplied. The alternators are in *current-phase*, but in *voltage-opposition*!

While electrical engineers are fairly clear about their use of the word "phase," it seems to have caused more muddle in radio-technology than any other single term—especially when it comes to a question of "vectorising"!

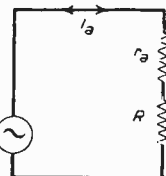
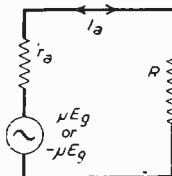
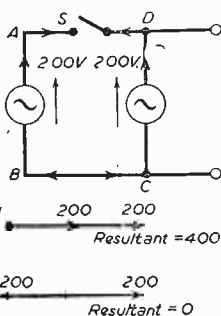


Fig. 5 (left).—Are the voltages of two paralleled alternators "in-phase," or in "phase-opposition" ? Which vector diagram is correct for the closed-mesh ABCD ?

Fig. 6 (Above).—Can a simple valve equivalent circuit of pure resistances represent 180 deg. phase reversal which occurs in a valve ?

Red-hot Anodes

Someone I talked to the other day was under the impression he was having his leg pulled when someone else had told him the anodes of certain power valves used in a rediffusion station "cooled down" as more subscribers switched-on their loudspeakers !

I suppose this is one of those things that sounds like a "tall yarn" ! The precise connection between the number of loudspeakers in a district and the temperature of valve anodes is not so very clear. If they have taken seriously what some government officials had to say about what happened in power-stations at peak-load periods, many people would no doubt expect the valves to get "hotter" !

Putting all jokes aside, there was really no leg-pulling. The statement is perfectly correct, though not so easy to explain simply.

What it amounts to is this: in a certain type of amplifier, *all* the D.C. "watts" which you supply from the H.T. will do nothing but heat the anodes if, for example, no A.C. signal is coming-in to be amplified. The stage is supplying no A.C. output. The power is all "input"; it is D.C. power, and remains exactly the same as if a signal was being amplified.

Well, what does it do ? "Watts" must be accounted for somewhere ! They simply cannot vanish into thin air, and, as you know, *Watts* =

Volts \times *Amperes*. As long as "amperes" are supplied from the H.T. at a definite voltage, "watts" are taken. Almost the full H.T. volts may be on the anode—a steady voltage, which accelerates electrons to pretty high velocities.

Another name for this is "work," or giving the electrons *kinetic energy*, just as a bullet receives kinetic energy from its propellant. What happens when the bullet strikes the target? The energy of motion reappears as heat. If you suddenly apply a brake to a heavy flywheel, or a moving vehicle, the kinetic energy there too may generate enough heat to burn your brake bands.

Electrons are not so tangible, but, believe me, they can reach prodigious velocities. Anyway, that is what happens to your D.C. input. The anode can become red-hot. If you removed the steady grid-bias, with the full H.T. "on," the anode current (and power input) may easily rise sufficiently to give you a white-hot anode, or even melt it before you have time to think of your error!

When the "Speakers" Come On

The same is true to an extent when you have the proper bias, and driving signal, but little or no A.C. load in the anode circuit. All loudspeakers in the district switched-off.

There can be no A.C. "output," so your D.C. power is dissipated; the anodes may show up cherry-red, or somewhat brighter. The rest of the story you can guess. "Load" means A.C. resistance transferred to the anode circuit—usually via an output transformer, and in that resistance the "swings" of anode current develop A.C. power. A proportion of your D.C. (or H.T.) is being converted into A.C. output. The anode has less power to dissipate, and so cools down.

These ideas—"output," "input," and "dissipation"—are quite important should you have

anything to do with valves handling considerable power. Of course, while the same considerations are true of small power valves, the amount of "dissipation" at the anode is so small as to be unimportant. If you remove the grid-bias, for instance, the current taken from the H.T. may rise to a very excessive value, but the whole of the available power is too small to generate any appreciable "temperature" of the anode. If the voltage-regulation of the H.T. source is poor, the overload will immediately pull-down the "volts," and so tend to keep the current within limits.

In the particular type of amplifier I have been talking about, the valve must be given a liberal rating: sufficient to dissipate the *whole* of the H.T. power supplied without excessive heat—and that power is about 4 times the greatest A.C. output available.

What amplifier has this "constant input," low-efficiency characteristic? If you are not sure, write to me—but I think you will be able to guess right.

Regarding " $-\mu Eg$ "

What is the reason for the negative sign before " μEg ," Fig. 6, in valve equivalent circuits?

Well, the idea is to indicate the phase-reversal which occurs in a valve. I have my doubts whether it is possible to make an equivalent circuit itself tell you anything about phase, nor is it clear why μEg should be given anything other than a positive sign! It is the *output voltage* of a stage that is phase-reversed. I have mentioned the matter before, but must defer it for detailed consideration until later.

Meanwhile, Fig. 6 should show that unless we decide to give μEg some sign to denote reversal, there is nothing in the circuit itself to act as a *cause*.

Radio in South Africa

THE necessity for broadcasting to be independent of control is stressed in the 1946 report of the South African Broadcasting Corporation, which was tabled in the House of Assembly recently. Referring to the decision of the Board of Governors to introduce commercial broadcasting, the report says it is believed this will be the means of providing alternate, more elaborate and better programmes at no additional cost to the listeners. The Corporation will gain additional revenue only by the sale of programme time, and private enterprise will be entirely responsible for productions, subject only to ethical control. Detailed reports by the Director-General, who had made a study of commercial broadcasting in Australia and New Zealand, confirmed that the systems operating there were not suited to South Africa and were not ideal even in those countries. The system contemplated for the Union would combine the best features of commercial broadcasts in other countries.

Inadequate Facilities

With the exception of the Johannesburg studio, broadcasting was being carried out with facilities which were hardly sufficient ten years ago and

were now quite inadequate. The broadcasting studios, particularly in Cape Town and Durban, were overcrowded, but owing to increased building costs the Corporation's funds would be overstrained if new premises were provided. During the year buildings or land had been acquired in Cape Town, Durban and Bloemfontein, but owing to delays caused by building restrictions the accommodation question was substantially the same as at the end of 1945, and was likely to remain so for a long time.

A listener research organisation was still under consideration and it had not been possible by direct means to ascertain the reaction of listeners to programmes and the Corporation's technical policies. Out of 8,345 letters containing opinions on programmes, however, 8,038 had been favourable. That might or might not be a useful guide.

Frequency Modulation.

Regarding frequency modulation a great deal of misunderstanding prevails in South Africa, according to the Board. Frequency modulation would greatly improve the quality of reception, particularly of music, but special receivers—or adaptations to ordinary sets—are necessary, and it is not a panacea for all the ills of the radio, as has been suggested so frequently in the lay press in South Africa.

Beginner's Guide to Radar-2

Continued from Last Month, This Article Explains How Friendly and Enemy Aircraft are Recognised by the Radar Operator and How Ground-controlled Interception of Aircraft is Effected

FIG. 3 shows the progress of a single pulse when a radar beam is directed on to two aircraft in flight, and also the "picture" produced on the screen of the C.R. tube. Although this picture is seen at any one instant, it represents a series of several hundreds of pulses. It will be seen that there is a large "blip" (as the deflections on the trace are called) at the zero end of the scale and also two smaller blips. The large blip is due to the transmitted pulse, while the smaller blips are the echoes from the two aircraft at different distances from the transmitting aerial. Measurements along the scale are made from the large blip.

When the transmitted pulse "strikes," the first aircraft is reflected. The echo is later received back on the receiver and applied to the Y plates of the C.R. tube, where it produces the blip. This is much smaller than that due to the initial pulses, for there is considerable attenuation during the two-way journey.

The transmitted pulse, apart from the small portion which is reflected, proceeds beyond the first aircraft, and is then reflected by the second aircraft, with the result that a third and still smaller blip is produced on the trace.

If both aircraft were close together a single echo blip would be produced, but this would be larger than that from a single aircraft at the same range, and might be split. If there were several aircraft in close formation the blip would be a multiple one, as shown in Fig. 4. An experienced radar operator would be able to make a fair estimate of the number of aircraft in company by studying the form of the echo blip, however.

The next point to consider is the method of differentiating between friendly and hostile aircraft represented as blips on the tube. This will be explained later.

We have seen how the range of aircraft is found, and it is pertinent at this point to inquire how the radar operator knows that the blips on the screen of the C.R. tube represent enemy aircraft. It might be dangerous to send up fighters to intercept our own machines.

Such possibilities were, naturally, foreseen and our own aircraft carried a small automatic receiver-transmitter known as I.F.F. (indicator friend or foe). This compact device is used in conjunction with a short wire aerial and takes its power supply from the aircraft accumulators. It has a motor-operated tuning condenser which sweeps the fre-

quency bands employed for both coast-watching radars and G.L.s (gun-laying radars). The bands are swept, say, once every 12 seconds and the receiver is so designed that when radar pulses are applied to it the super-regenerative detector "spills over" or squeggs, and so acts as a miniature transmitter. When the I.F.F. is in a transmitting condition the radiation from its aerial is far greater than the reflection of re-radiation from the aircraft. In consequence, the blip seen on the screen of the C.R. tube at the ground radar station is considerably elongated once every 12 seconds. As a result, the operator is immediately able to recognise a friendly aircraft. Similarly, the ground gunner can recognise the aircraft and will withhold his fire. If, however, the crew of the friendly aircraft should fail to switch on their I.F.F., the aircraft cannot be differentiated from a raider and is in danger of attack.

Finding the Bearing

So far we have considered only the method of ranging, or determining the distance of aircraft by the radar station. It is equally important that the bearing and altitude should be ascertained. There are various systems by means of which this can be accomplished, but all depend upon the fact that

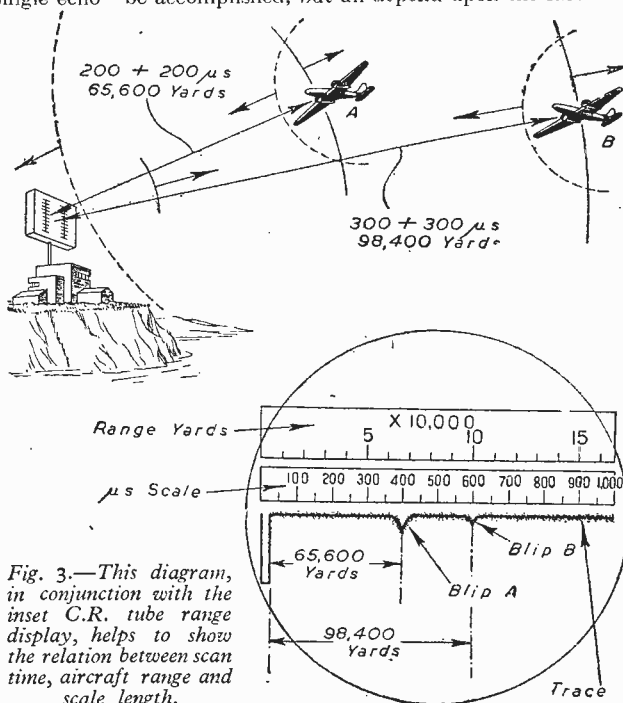


Fig. 3.—This diagram, in conjunction with the inset C.R. tube range display, helps to show the relation between scan time, aircraft range and scale length.

the echo has a maximum amplitude when the transmitting and receiving aerials are looking straight at the target. This is illustrated in Fig. 5, where it is assumed that a beam aerial system is employed and that the same aerial is used for both transmitter and receiver. In fact, it is customary

height above ground in feet by means of a graph which can be prepared by the application of simple geometrical principles.

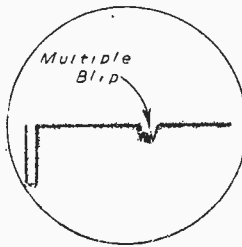


Fig. 4 (Left).—This is the form of multiple blip obtained on the range tube when there are several aircraft in company. The individual points generally show a tendency to "dance," due to "beating" of the echoes.

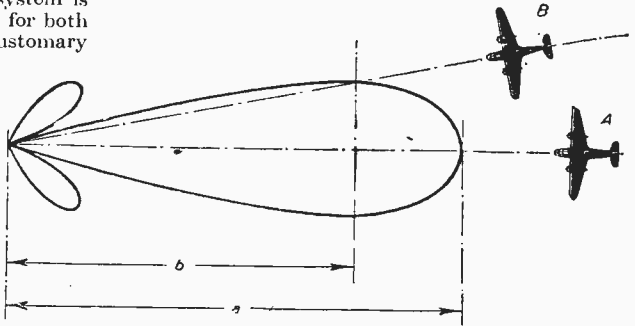


Fig. 5.—In radar direction-finding use is made of the fact that the horizontal polar diagram is in the form of a narrow lobe; there are a few small subsidiary lobes with even the best aerial, but these are not normally troublesome. The relative signal amplitudes from two aircraft in and out of line with the lobe are represented by the projected lengths marked (a) and (b).

to employ a single aerial for the dual purpose, as will be explained later. On the other hand, separate aerials can be and are used in some cases: both can be rotated together so that they always face in the same direction.

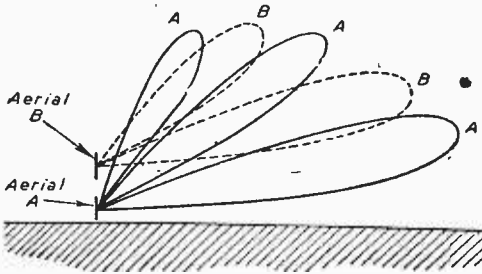


Fig. 6.—In one method of height-finding advantage is taken of the fact that there are gaps between the lobes in the vertical polar diagram of any one aerial. These gaps may be filled by using two aerials at different heights. For height-finding the receiver is switched from one aerial to the other and a note taken in the difference in the amplitude of the echo blip. The range being known, the height can then be read from calibration tables.

The aerial array is rotatable about its axis and can therefore be turned so that the centre line of the main lobe of the polar diagram runs through the aircraft. At this time the echo blip attains maximum amplitude. It will be seen that the accuracy of the bearing obtained is governed very largely by the narrowness of the beam, although a beam width in the region of 10 deg. may suffice. In other systems use is made of twin aerials which produce twin, and partly overlapping, lobes.

On the aerial mounting there is a pointer which moves over a scale marked off in degrees; the zero line on the scale represents true north. Thus, once the aerial array has been rotated for maximum blip amplitude, the bearing of the aircraft can be read off.

Height Finding

The height of the aircraft cannot be measured as such, but only in terms of the angle of elevation. It is an easy matter, however, to convert the angle of elevation and the slant range of the aircraft into

There are various methods of finding the angle of elevation, one of which is by using an aerial which can be tilted as well as rotated. In general, this is practicable only on frequencies above, say, 300 Mc/s, because a beam-aerial array is likely to be rather unwieldy at the lower frequencies. Another method makes use of the "hand of bananas" pattern of the vertical polar diagram. This is explained by Fig. 6, which shows that there are several radial lobes with gaps between them. The angles of the lobes can be varied by altering the height of the aerial. Thus, if two similar aerials were used, the two being mounted in the same vertical plane at different height, it would be possible to fill the gaps between the lobes. In practice, by the way, only the lower lobes are used due to the low angle subtended by aircraft even when flying at normal heights.

By switching the receiver from one aerial to the other and noting the ratio of the two amplitudes of echo blip, it is possible for the operator, who already knows the range of the aircraft, to determine the altitude with a high degree of accuracy. This can be done, however, only after charts have been prepared during calibration flights, when a test aircraft flies at various known altitudes and at different known distances from the radar station.

Aerial Arrays

The type of aerial employed depends principally upon the frequency at which the apparatus is to operate. Different radar devices operate on frequencies from 20 to 3,000 Mc/s. or more, but the frequencies used for ground radars (coast-watchers, gun-laying and searchlight control) are in the region of 200 Mc/s. It is not proposed to deal here with all the types of aerial, but to mention just two: that which consists of a number of stacked half-wave elements with a wire-mesh reflector and the Yagi type with parabolic reflector. Both have a narrow beam angle, and further details will be given next month of these and other aerials.

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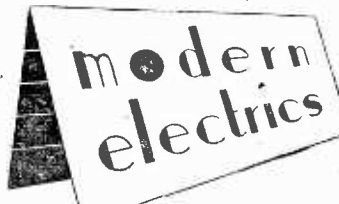
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Trade Notes

A New Mullard Leaflet

A NEW up-to-date leaflet entitled "Mullard Transmitting Valves for Amateur Communications," is now available for amateur radio enthusiasts. This contains abridged data and prices for Mullard transmitting valves and rectifiers, also diagrams showing base connections and dimensions.

Full information on any type of valve can be obtained from the Mullard Wireless Service Co., Ltd., Transmitting and Industrial Valve Dept., Century House, Shaftesbury Avenue, W.C.2, quoting reference MV.121.

The Fisk Solariscope

AN interesting and extremely useful radio accessory—the Fisk Solariscope, invention of Sir Ernest Fisk, Managing Director of Electric and Musical Industries, Ltd.—is announced by E.M.I. Sales and Service, Ltd. It was shown at Radiolympia for the first time.

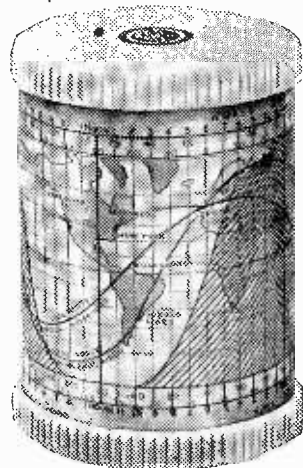
Invaluable to all interested in short-wave communication, the Fisk Solariscope is a novel instrument designed to show clearly and easily the areas of daylight and darkness over the earth at all hours in each month of the year.

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The instrument consists, essentially of a double Mercator projection map, on which the land boundaries are repeated, wound in cylindrical

form round a rigid former. Over this is fitted one of a series of four transparent shadow charts—depending upon the month of the year—supplied with the instrument. The three not in use may be kept inside the instrument, which is fitted with cream bakelite caps one of which is removable. By rotating the transparent shadowgraph until the appropriate time-line is over the receiver location, the areas of daylight and darkness may be instantly ascertained, together with the relative Mean Times of places throughout the world.



The neat appearance of the Fisk Solariscope may be gathered from this illustration. The cap is removable so that the shadow cut-outs may be changed.

The Fisk Solariscope is supplied with a comprehensive instruction book which includes a gazetteer of the principal short-wave broadcasting stations in the world and a table of waveband allocations with notes as to suitability for different times of day.

The price is one guinea post free from the Amateur Radio Division, E.M.I. Sales and Service, Ltd., Hayes, Middlesex, or through local dealers.

Multicore Booklet on Radiolympia

INTENDED primarily for Multicore overseas distributors, a 12-page booklet has been published by Multicore Solders, Ltd., as a record of the Multicore model factory at Radiolympia.

News from the Clubs

ROMFORD AND DISTRICT AMATEUR RADIO SOCIETY CALL SIGN G4KF

Hon. Sec.: Rowland C. E. Beardow, G3FT, 3, Geneva Gardens, Chadwell Heath.

AS from November 1st, the above Society resumed their meetings at the Y.M.C.A., Western Road, Romford, on Tuesday nights at 20.00 hours, and not on Mondays at the Mawneys Road Schools.

On the second Tuesday in the month a R.S.G.B. meeting will be held at 20.00 hours at the Y.M.C.A., Western Road, Romford.

BRIGHTON AND HOVE

Town Representative: J. R. D. Sainsbury, G8JIV.

AT a recent meeting, Mr. L. H. Thomas, M.B.E., G6QB, gave a much appreciated and highly entertaining talk on the earliest days of Amateur Radio. A Hamfest has been held which wound up the year's activities. Future meetings will commence on December 15th, at 7.30 p.m., at the Golden Cross Hotel, Western Road, Brighton.

WALWORTH MEN'S INSTITUTE RADIO CLUB

Hon. Sec.: P. Senechal, 92, Grove Park, Camberwell, S.E.5.

THE above club has been formed recently and any readers of PRACTICAL WIRELESS who may be interested in or near the Camberwell Area should write to the Hon. Sec., or call in person. The club meets on Wednesday, at 7 o'clock, for technical study and on Friday, at 7 o'clock, for practical work. All will be welcomed whether "old hands" or beginners.

SLADE RADIO

Hon. Sec.: C. N. Smart, 110, Woolmore Road, Erdington, Birmingham, 23.

VISITORS to the Society's meetings which are held at the Parochial Hall, Broomfield Road, Slade Road, Erdington, Birmingham, 23, and which commence at 8 p.m. sharp, are welcomed. The next meeting is on December 12th, and is a D.F. Night. Full particulars of the Society may be obtained from the hon. sec.

Programme Pointers

MAURICE REEVE Discusses December Music

MY "Musician's Diary" (a new edition for 1948 is now on sale) shows that December has been an exceptionally fruitful month for music, producing both great men and great works. Why should this be, I wonder? What possible analogy or relationship can there be between the stark realities and unpleasantnesses of the last of the months and the greatest of the arts? Two occur to my mind, neither of which is of any fundamental importance. Christmas has certainly inspired a few works of importance, though not in numbers sufficient to carry any weight. Of slightly more significance may be the fact that, being one of the most unpleasant months and the one containing the longest night of the year, composers would naturally have more chances to concentrate on their work under compulsion of the elements than at other times of more diversions and variety of interests.

But the truth is, of course, that there is no connection whatever between December and music. The fact that whether it is the composer or his work which has been "produced" in the month of scarcity is purely fortuitous. The important thing is that the inspiration which gave rise to either is what matters, and that took place a considerable while before! But let us see which of these labours came to fruition at this time.

First, and transcending all else that happened that month, the Master of Masters, the creator of the one and only "Fifth." The glass of musical fashion and the mould of musical form. Beethoven himself, was born, at Bonn, on the sixteenth.

Beethoven—Nature Lover

Now, if anybody ever liked anything, Beethoven liked the country with its enchantment of woods, trees, birds and Nature's kingdom generally. This was the greatest source of inspiration to him; life indoors an irksome necessity. Whole hours at a time would be spent wandering in the lovely country surrounding Vienna—much of it still preserved—followed by the grind and toil necessary if posterity was to be enriched.

He always had at heart great contempt for the salons of his legions of aristocratic patrons. Nothing could have made him a courtier, compelled to bow homage to nincompoops and idlers. All his attendance on them was in search of patronage of his music and commissions for new works. No, I do not think December and Beethoven had much in common.

Other notable composers born in December, were Sibelius, 1865; Franck, 1822; Berlioz, 1803; Cimarosa, 1749; Puccini, 1858; Mascagni, 1863; and Weber, 1786.

Saint-Saen's "Samson and Delilah" was first produced in December, 1877. Elgar's first symphony in 1908, Berlioz's "Damnation of Faust," 1846, and his "Fantastic Symphony," 1832. Constant Lambert's "Rio Grande," 1929. Beethoven's "Fifth and Sixth Symphonies," 1808. Bach's "Christmas Oratorio," 1734. Gluck's "Alceste," 1767, and Casals was born, 1876. A remarkable list.

Banned in England

The sensation which was caused by "Samson" when first produced in Weimar, under Liszt, is not repeated in this more sophisticated age. In fact, some subsequent Italian and French masterpieces surpass it in sensuous appeal. But at the time it was so great that it was banned in England where it first took the boards in 1909. Perhaps its Gallacism coming so close to the revolutionary Richard, himself no prude; had something to do with it. The subject certainly lends itself to exotic treatment, as does Salome and other Biblical subjects. Apparently this is what it received. To-day the Bachannal and other scenes are merely Hollywood, whilst "Softly Awakes My Heart" is beloved by cinema organ fans up and down the land.

Berlioz's "Symphonic Fantastique," or "The Fantastic" as Promenaders usually style it, was a landmark in symphonic construction, inasmuch as it was the first attempt to romanticise the hitherto classical symphony by imparting into it a "programme" as the nineteenth century masters were putting into most of their work. The romantic movement was at its height. Liszt, Schumann, Chopin, Balzac, Hugo, Lamartine, Belacroix and hosts of others in all lands were hot on the scent of the new freedom. So art, like everything else, had to be emancipated and its fetters torn from it. It certainly produced some masterpieces, of which the Fantastic is undoubtedly one. Its very subtitle "Scenes in the Life of an Artist," with its five movements headed, respectively: 1. Reveries—Passions; 2. A Ball; 3. Scenes in the Country; 4. March to the Scaffold; and 5. Dreams of a Witches Sabbath, would probably have caused Mozart, Beethoven and Schubert many liftings of eyebrows and cranings forward of necks. But didn't Beethoven point his finger towards the future, as in all he did; in his "Pastoral" and Seventh, not to mention the Third, the "Eroica"?

Sibelius, now over eighty and happily still with us, is already one with the acknowledged masters of all music. Making his name over one or two not unworthy pot-boilers, like "Finlandia" and "Valse Triste," his symphonies not only now number their worshippers in tens of thousands, but they command the critics' highest encomiums. The second is as glorious a work as can be found outside Beethoven. They are made of an amalgam—as wonderful as it is beautiful—of stern northern logic and dourness, with a lyricism and even a passion usually associated with much more southern latitudes.

But it is as a nationalist composer that his native Finland has chiefly honoured him. His setting to music of the Kalevala saga, and other Finnish legends, have enshrined in imperishable tones the deathless story of the early Finnish heroes and maidens. Concert audiences the world over are thrilled by them as by Wagner's tone paintings of the German Valhalla. The "Violin Concerto," too, is a masterpiece, and pianists can only sigh regretfully, they were not similarly honoured.

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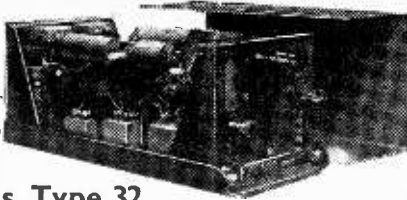
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Impressions on the Wax

Review of the Latest Gramophone Records

ONE of the highlights of the latest releases is a brilliant new recording of Tchaikovsky's "Symphony No. 6 in B Minor" (Pathétique), Op. 74, on five 12in. records—*H.M.V. C3630-34*. Few, indeed, are the musical works that have attracted so much attention at the time of their production as Tchaikovsky's "Sixth Symphony." It was begun in 1892, and occupied the composer's attention until the end of the summer of the following year. It failed to make a deep impression at its first performance (St. Petersburg, 1893), but a few days later the composer was dead. Officially it was announced that death was due to cholera, through imprudently drinking unboiled water, but rumour persistently affirmed that he had committed suicide, and these sensational events were in themselves enough to secure for the work tremendous publicity. Added to this sensation was the fact that the composer had, the day after the first performance, instructed his publishers to issue it under the title of the "Pathetic Symphony." It has been recorded by the Philharmonia Orchestra, conducted by Nicolai Malko.

The famous French 'cellist, Pierre Fournier, is heard this month in two very famous melodies which give him every opportunity for showing perfect control of tone and phrasing. "Le Cygne," from Saint Saëns' "Carnival of the Animals," was originally for massed 'cellos and harp, and Pavlova used it for one of her most expressive solo dances, "The Dying Swan." On the reverse side is Rubinstein's "Melody in F" specially arranged for 'cello. The record is *H.M.V. DA1868*.

Vocal

The Glasgow Orpheus Choir, under its conductor, Sir Hugh Robertson, specialise in old Scotch music and this month they have recorded "Crimond," a sacred melody, and "Sea Sorrow," which is an old Hebridean song on *H.M.V. C3639*.

Actor, playwright, producer, author, composer—these are the major rôles Noel Coward has filled with distinction during the past thirty years. For such theatregoers, and, indeed, for all who admire captivating tunes impeccably sung and played, the recording of "Noel Coward Vocal Gems," on *H.M.V. C3635-6*, will make a welcome addition to the music library. The singing is by Anne Ziegler and Joyce Grenfell, and by Graham Payn—who starred in Coward's Drury Lane presentation of "Pacific 1860." The accompanying orchestra is a 40-piece unit, conducted by Harry Acres.

Beniamino Gigli's concert and operatic appearances at the end of 1946 became a succession of triumphs which demonstrated once and for all that the great tenor is still one of the finest in the world. Among the popular songs of Italy none are more characteristic than those from the south, and the "a" means Naples and Campanian countryside. Two of them, sung in Neapolitan dialect, form Gigli's choice for his new recording this month on *H.M.V. DB6436*.

Light Music and Variety

Continuing his popular "Songs to Remember" series, Peter Yorke now turns to the melodious compositions of Ivor Novello. Peter Yorke's apt orchestrations display a representative selection of Ivor Novello showpieces in a most enchanting musical setting on *Columbia DB2348*.

To-day Eric Coates stands at the head of composers of British light music and his works are more widely played, both at home and abroad, than those of any other British composer. There is nothing shoddy in an Eric Coates score, nothing slapdash or skimmed over; the sheer merit of this composer's work has brought him to the high position he so amply fills. The "Dancing Nights" waltz is a typical example of his melodic fluency, excellently played by the London Symphony Orchestra, with Coates at the helm, on *Columbia DB2345*.

Britain's popular new vocal group, the Radio Revellers, have put their own distinctive musical stamp on "Peg o' My Heart," which may well prove to be a best seller in this country. The coupling aptly chosen, is another old favourite by Jerome Kern, "They Didn't Believe Me."—*Columbia FB3349*.

Frank Sinatra breaks fresh ground by leaving the dance-music field to borrow from the classics. He sings "I Love You"—Grieg's renowned ballad "Jeh Liebe Dich" on *Columbia DB2346*. The reverse shows him in more familiar vein singing "Stella by Starlight," the tune featured in the film "The Uninvited," which stars Ray Milland and Gail Russell (as Stella).

Broadcasting favourite Reginald Dixon, so long and successfully associated with the famous Tower Ballroom, Blackpool, has, for his latest recording, chosen two tunes of wide appeal. The first, "Jolly Brothers Waltz," will, to the older generation, revive nostalgic memories of the time when music hall was in its heyday, while "Moonlight Serenade" will make a specific appeal to their dance-music-minded sons and daughters. "Moonlight Serenade" is, of course, the same tune that the late Glen Miller made famous with an earlier band recording. Now, it receives a totally different, but nevertheless entirely attractive, treatment under the capable fingers of Reginald Dixon—*Columbia FB3350*.

Dance Music

One of Britain's leading sweet dance orchestras appropriately chooses two front rank numbers for its latest recording. Denny Vaughan, a featured singer with Geraldo's orchestra, displays dual talents in the band's version of "Chi-Baba Chi-Baba." Apart from singing this number with the Top Hatters in his usual impeccable style, he was also responsible for the intriguing arrangement which stresses to good effect clarinet, flute and muted brass. On the reverse side of this record, *Parlophone F2255*, is another top-selling tune, "Now is the Hour," which was originally a Maori song of farewell known as "Haore Ra."

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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).

Pirated Call-sign G2CNK

SIR,—I wish to report that some individual is pirating my call-sign, G2CNK, in the 7 Mc/s band, on 'phone.

I heard this pirate on Friday, October 17th, at 12.45 B.S.T., working P11KLM, on approximately 7140 kc/s. Insult is added to injury by the fact that I work only on C.W., never having been on 'phone, and not likely to be, so any "ham" working G2CNK on 'phone will be doing the genuine G2CNK a great service by branding the pirate as such over the air.—T. E. BATES (G2CNK), (Doncaster).

Amateur Components

SIR,—I was very interested in the circuits as outlined in a recent issue of PRACTICAL WIRELESS by Mr. C. Summerfield. I note that Eddystone four- and six-pin short-wave coils are specified. While the specified six-pin coils are available, the Eddystone people have not, so far as I am aware, made the four-pin type since the end of the war. In answer to an inquiry of mine some time ago I was informed that the six-pin type being the most popular they were manufacturing this type only. This may be, and I hope it is, only a temporary measure. As things are at present, when the four-pin type is required we must look elsewhere. Taking into account the excellence of this type of coil in pre-war years, I am of the opinion that to make them again available would be to the firm's advantage.—A. W. MANN (Middlesbrough).

R.A.F. Publications

SIR,—As a regular reader of PRACTICAL WIRELESS, I wrote to the Air Ministry address mentioned in Mr. E. Rouse's letter, published in the November PRACTICAL WIRELESS. In their reply they asked if I had already bought the apparatus in question (Rx unit 81B) as they can only supply Air Ministry publications where the apparatus has already been bought. They would not say if the book was in stock; also they did not state price.

I am sending this letter hoping it may be of interest to other readers who, like myself, would like to obtain full technical details before buying the apparatus, as in most cases the dealers are unable to help except by giving details of valve types, etc.

I think the Rx unit 81B is covered by Mr. James's offer in September PRACTICAL WIRELESS, this unit being communication gear 60-100 m. and not ex-radar.

The only retailer I know of who is selling this unit is Midland Instrument Co.—E. S. SYMONDS (Cambridge).

Station PNÖPM

SIR,—Regarding the query by John Greenwood (Hebden Bridge) on page 393 of the September issue of PRACTICAL WIRELESS, asking for information

on station "PNOPM" calling "PNPD" on the 7 Mc/s amateur band.

Mr. Greenwood believed that these stations were located in Mexico. I have also heard and contacted station "PNOPM", which is the Dutch station PAÖPM, the pronunciation of the A and Ö in Dutch being similar to our pronunciation of N and O. To clarify his call-sign, PAÖPM usually gives his call as PAÖ Portugal Mexico. No doubt that is why Mr. Greenwood believed this station to be located in Mexico.—C. J. MORRIS, D.F.M. (G3ABG) (Cannock).

Service C.R.T.s

SIR,—In reply to your request for information on Army C.R.T.s, I was a S./Sgt. Tech. Inst. of Radar in the Army and have pleasure in forwarding information regarding the Radar C.R.T.s used for the Radar Branch.

The ACR10 had a peculiar history: It was used for an indicator tube on S.L.C.; the max. voltage ever used was 450, but it was rated at 800, the lower voltage giving a much greater sensitivity. It is not a gas focus tube and as far as my experience goes the Army never used a gas focus tube; adequate focus control can be obtained with two-thirds anode voltage at 450 volts.

The early 1941 models of S.L.C. used the ACR9, which was the Mullard E40-G3, and these were replaced later with ACR10, which I thought was Mullard ECR30, but I stand to be corrected on this point.

I list below the other tubes used by the Army from 1939 until 1945, with as much information as is available now.—L. J. AVERY (Torquay).

ACR1 ZC0123	afterglow nil	green or blue indicators	6in.
ACR2 ZC0124	"	green or blue Tx pulse monitors.	
ACR2X	"	green or blue Tx indicators.	
ACR8 (Army) ZC3595	}	Commercial Prototype.	
VCR112 (R.A.F.) ZC3081		Mazda V1026.	
ACR11 (Army) ZC3595		Mullard E40-G3.	
ACR9 ZC3127		Mullard ECR30 (some	doubt about this).
ACR10 ZC3141			
ACR12 (Army) ZC1955	}	Cossor 3241/D/S.	
VCR131 (R.A.F.) ZC1955		G.E.C. E-4504-B-16.	
ACR13 ZC3596		nil afterglow green.	
VCR97		G.E.C. E-4102-B-7.	
VCR138 ZC3679		Mazda VCR140 (P.P.I.)	
VCR140 ZC8841		long afterglow.	
VCR516		(P.P.I.) long afterglow	

Cossor 23D

SIR,—I note that many of your readers are in trouble with service equipment that they have purchased, especially C.R.T.s.

Referring to the query of Laws, of Ealing, the tube he refers to is a 23D, made by Cossor, and if he

reads the article by Brown in the April issue, pages 188-9, he will see how to use this tube. Incidentally, referring to the November issue, the V.C.R. 139a is also a 23D. One of the tubes was Army and the other R.A.F.

Mr. Law is well advised to read the article by Brown, as he will see that his tube is not an old gas-filled job but an E.E. job with a top A3 voltage of 1,000. The working data is below:

Focus Screen Vh1h A3Max Sensmm/v X and Y
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Contacts are:

C,G,HH, A2-/Y2, X2, A3, X1, Y1.

—H. G. WEATHERHEAD (N.W.6).

Ex-Service Equipment

SIR,—I have recently procured an ex-Government receiver and I wonder if readers could give me some information regarding the power plug which comes out at the front of the set.

The set is No. 18, Mark III, four-valve S.W. receiver 6-9 Mc/s, and is battery-operated from two volt and 120 volt batteries.

The plug has five pins which I understand correspond to L.T.+ , L.T.— , H.T.+ , H.T.— and aerial, but owing to the compact nature of the set I am unable to trace which is which with the exception of the two filament pins.

The pins are numbered and from them the following coloured wires go into the receiver.

Pin No. 1, Blue.

Pin No. 2, Yellow.

Pin No. 3, Green, L.T.+.

Pin No. 4, Red.

Pin No. 5, White (earthed to chassis) . . . L.T.—.

I should be very pleased indeed to get the necessary information to fill the above blanks because, of course, I am unable to operate the receiver until I know to which pins the batteries and aerial are attached.—JOHN A. BROCKIE (77, Burns Road, Aberdeen).

Mr. P. B. Jones, of 4, Gilvach Cott., Six Bells, Abertillery, Mon, would like to correspond with any experimenter who owns an R.A.F. T1333 B transmitter.

Mr. H. Waddington, of Greengates, Long Preston, Nr. Skipton, Yorks, requires details of the German set, type EZ6.

T. Coates, of 4, Kirkliston Gardens, Belfast, wishes to know if any reader could supply him with diagram or control box connections for American Service receiver, type CRV46151, unit of model ARB.

T. Watt, 19, Willowbank Gardens, Belfast, requires valve data reception set R102.

M. M. Farooqui, Civil Hospital, Partabgarh, U.P., India, requires information about American transmitter-receiver type TR1430, for converting it for amateur use. He would also like to correspond with some other English and French radio amateurs (could correspond with their letter in French if they so choose) of his own age (16).

Mr. L. Brown, 145, Burton Road, Castle Gresley, Burton-on-Trent, Staffs, requires circuits of the following ex-Government receivers: R109 and the receiver contained in ex-R.A.F. transmitter-receiver T.R.9H.

SIR,—Regarding Mr. J. G. Dodd's letter in the December issue, I have for some time been using a model of the R1116-A communications receiver and possibly the following would be of some help to him.

The receiver uses a triode-hexode converting to 1.7 Mc/s, one I.F. amplifier at that frequency, a further triode-hexode converting to 100 kc/s, a second I.F. amplifier at that frequency, then a D.D. triode for detection, A.V.C. and L.F. amplification, followed by a double-pentode in push-pull. Second-channel interference is particularly noticeable on the 40 and 80 metre bands because of the 1.7 Mc/s I.F. The cure lies in constructing a well-screened R.F. amplifier with loosely-coupled aerial and interstage couplings. This can be tuned by means of a two-gang condenser, the single aerial-tuning condenser, with its coils, already in the receiver, being by-passed. This does not add further controls.

There being four valves controlled by the A.V.C., a good signal strength indication is obtained by connecting a meter in the high tension circuit to these valves. If a switch is included in the double-pentode filament circuit and phones operated from the first L.F. stage, this meter may be added in the H.T. minus line. It will be found that very slight variations in signal strength will be indicated. This meter, if a projection-mounting moving-coil instrument of 2-3in. diameter, can be mounted on the panel in the position originally occupied by the centre direction-finding control. A full-scale deflection of 10 mA. is suitable, or the meter may be shunted so that zero signal produces full deflection. The filament switch mentioned and a variable shunt (potentiometer or variable resistor) may be mounted in the panel holes normally occupied by the frame-aerial switch and loop phasing switch, now unrequired.

Trusting this may be of use to Mr. Dodd or other users of the R1116-A.—F. G. RAYER (London).

Contact Wanted

SIR,—Can you kindly put me in touch with amateurs of my own age (18) in either America or Holland? I am a keen DX listener and am very interested in 0-v-0, 0-v-1 and 1-v-1 "straight" sets.—G. J. FOWLE (Class 66e, Hut Y8, 3 Wing, No. 3 Radio School, R.A.F., Compton Bassett, Nr. Colne, Wilts).

R.A.F. TR9/D

SIR,—I would be grateful if I could get in contact with any reader in possession of an ex-R.A.F. Rx/Tx type TR9/D.

I recently acquired this model and would like to obtain circuit details, modifications for amateur use, etc. All letters will be answered.—P. LEATHLEY (Wigginton Lodge, Wigginton Road, York).

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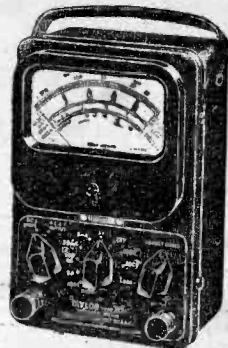
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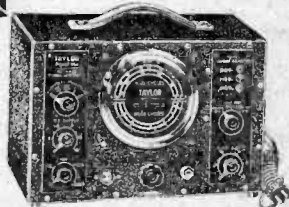


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