

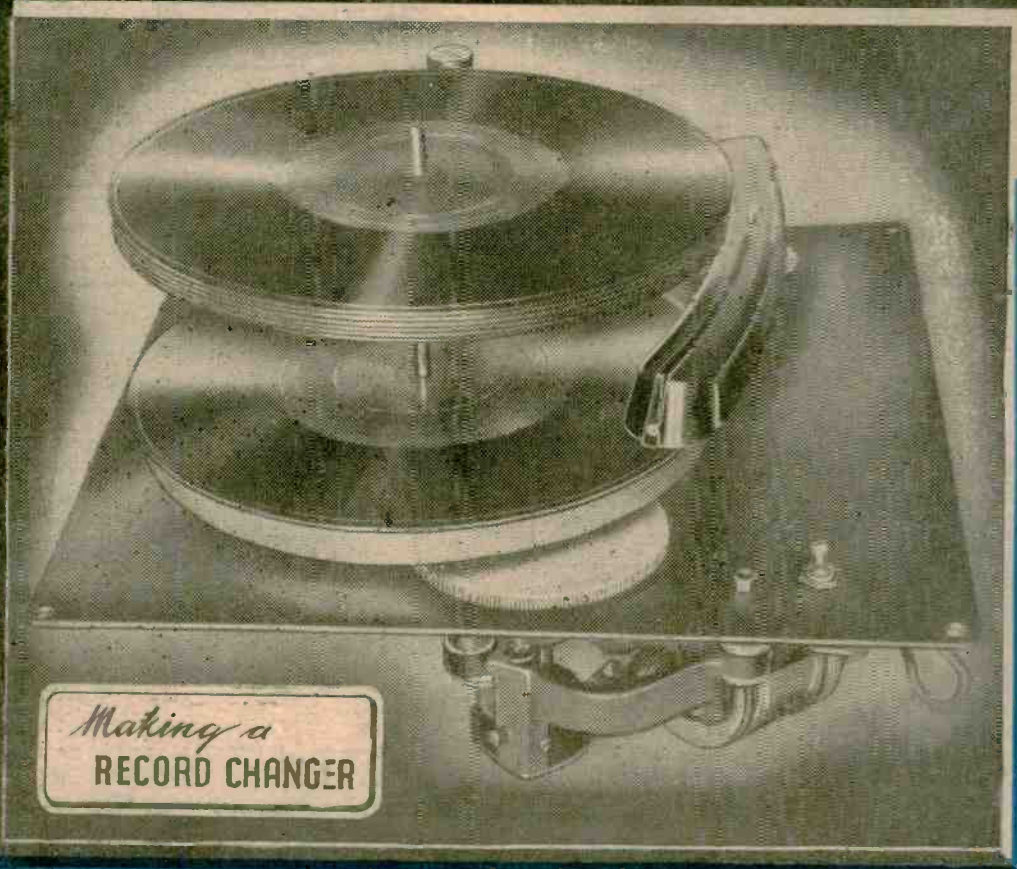
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Vol. 25. No. 520
NOVEMBER, 1949

EDITOR:
F. J. CAMM

PRACTICAL WIRELESS

AND PRACTICAL TELEVISION



Making a
RECORD CHANGER

CONTENTS

Improved Auxiliary Receiver
C.R. Tube Supplies

Making Transformers and Chokes
Radio Amateurs' Examinations

PREMIER RADIO

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Carriage 2/6		
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Carriage 5/-		
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Carriage 6d.		

The Instruction Book costs 2/6, but is credited if a Kit for the complete Televisor is purchased.

Any of these Kits may be purchased separately; in fact, any single part can be supplied. A complete priced list of all parts will be found in the Instruction Book.

20 valves are used, the coils are all wound and every part is tested. All you need to build a complete Television Receiver are a screwdriver, a pair of pliers, a soldering iron and the ability to read a theoretical diagram.

Modification Details for the Midland transmitter will be available a few days after the commencement of full power transmissions. For those wishing to commence construction the time base and power pack which are identical may be purchased immediately and an order placed for the balance to insure prompt delivery.

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"RD Junior" Corner Loudspeaker Unit. Range 35-18,000 c.p.s. Price **£19 10s.**

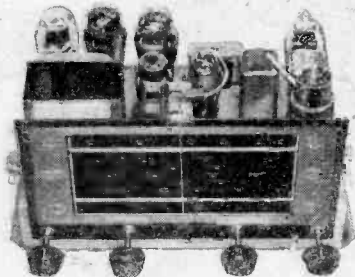
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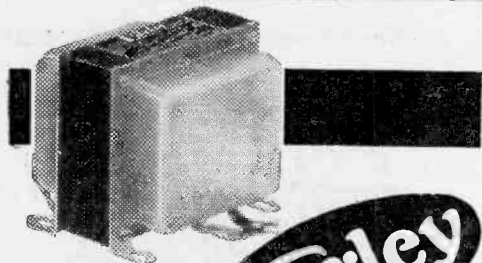
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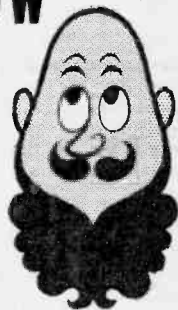
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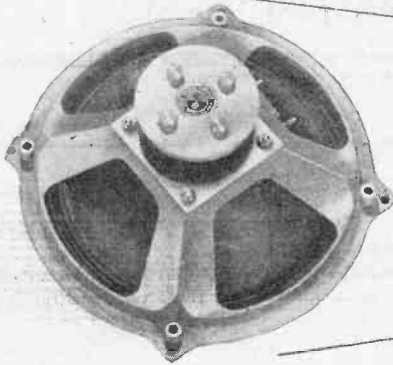
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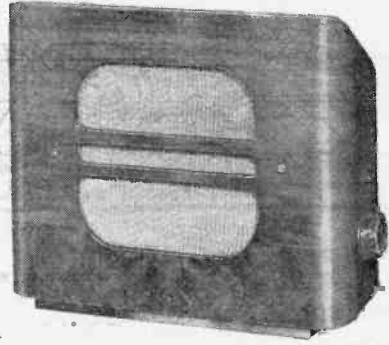
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"Bristol" (price 53/6), one of our new range of Baffle Speakers. All are complete with volume control and are finished in beautifully polished walnut-veneer. All except the 39/6 model incorporate a push-button for use with the "Long Arm" remote control. Leaflet gladly sent on request.

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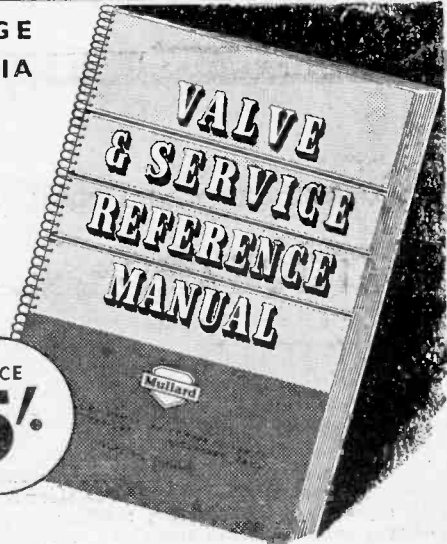
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17th YEAR
OF ISSUE

and PRACTICAL TELEVISION

EVERY MONTH
VOL. XXV. No. 520 NOVEMBER, 1949
COMMENTS OF THE MONTH

Editor F. J. CAHILL

BY THE EDITOR

The New Wavelengths

IT is time that manufacturers collectively made an official announcement regarding their policy concerning the new scales which will be necessary when the new wavelengths come into force next March. These new wavelengths will render existing scales obsolete, and the more knowledgeable members of the public are hesitating to purchase receivers because of the doubt that by next March they may be put to further expense. This may be one reason for the drop in sales recorded by dealers from all over the country.

The manufacturers are in duty bound to supply new scales free of charge to anyone who purchases a receiver between now and next March, and a plain statement to that effect would do something to encourage sales.

Many receivers used to-day will not, of course, tune below 200 metres on the medium-wave band, but manufacturers should make an early statement on the matter. It is suggested by some that a nominal charge should be made where the dealer is expected to carry out the replacement. The public is entitled to know where it stands.

Hire Purchase

A CORRESPONDENT in a contemporary had the temerity to express the view that half the world's ills are caused by the "pernicious system" of living beyond one's means. He was, of course, referring to hire purchase. This correspondent draws attention to some comments in a morning newspaper in which is reported a case of a theft by a married man with two children, whose outgoings included furniture and radio instalments of £1 a week and clothing club payments of £1 11s. a week out of a total salary of £5 10s. a week.

This is, however, a case of false reasoning on the part of the correspondent concerned. For hire purchase is not necessarily living beyond one's means. It may mean mortgaging one's spare money for several months to come, but that can hardly be called living beyond one's means. If one lives beyond one's means one builds up a debt which cannot be repaid, and as in most hire purchase agreements the initial debt is finally liquidated with the

payment of the last instalment, the correspondent's arguments fall to the ground.

We are aware of some of the disadvantages of the hire purchase system as well as its undoubted advantages. There have been many cases of dishonest people obtaining an instrument on payment of a first instalment, promptly selling it, and then absconding. That naturally makes manufacturers cautious, and to some extent it accounts for the difference between the cash price and the price paid on hire purchase terms. A business man must recover his costs and cover himself against normal business risks.

There is also the manufacturer or manufacturer's agent who unconscionably seizes goods still under purchase arrangements should the customer default in his payments due to unemployment or illness. In fact, there have been cases of dealers who want the customers to default in this way.

Apart from this, however, hire purchase has enabled many to enjoy the benefits of radio. It is a form of compulsory saving, for the money if not paid in instalments is seldom saved to make a cash purchase.

We see nothing against hire purchase systems as operated in this country.

Instruction Books

AN inspection of the instruction books issued with radio receivers to-day indicates that manufacturers still have a great deal to learn. The information given is of the scantiest, and little is stated which would enable an intelligent person to carry out the simplest tests. It may be the policy of the manufacturers to force every customer into the hands of his service agents, but this system will not work any more than it has done in the motor trade. Motor manufacturers to-day issue comprehensive and well-illustrated instruction manuals, explaining how to do the simpler adjustments and repairs.

Every radio-instruction book should contain a circuit diagram, a fault-finding chart, and a list of component values, and a table of current and voltage readings for the various stages. This information at present is supplied only to dealers.—F.J.C.

Editorial and Advertisement Offices:
"Practical Wireless," George Newnes, Ltd.,
Tower House, Southampton Street, Strand,
W.C.2. Phone: Temple Bar 4363.
Telegrams: Newnes, Rand, London.
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Canadian Magazine Post.

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

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

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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 July 31, 1949.

Region	Number
London Postal ..	2,248,000
Home Counties ..	1,610,000
Midland ..	1,672,000
North Eastern ..	1,850,000
North Western ..	1,545,000
South Western ..	1,027,000
Welsh and Border ..	705,000
Total England and Wales	10,657,000
Scotland ..	1,108,000
Northern Ireland ..	194,000
	11,959,000

This figure represents an increase of 47,400 over the June figure. The total includes 155,150 television licences—an increase of 7,250.

National Eisteddfod

PHILIPS ELECTRICAL, LTD., obtained a contract in conjunction with their agents in Wales, Messrs. G. Pentir-Williams, for the "sound" installation at the Welsh Eisteddfod.

The Eisteddfod was held this year at Dolgelley, and as the Eisteddfod Pavilion had a seating capacity of over 8,000 a good sound system was most essential to the success of the proceedings.

The installation was very similar to the one that Philips provided for the Olympic Games, and which brought so much favourable comment from sound engineers in many parts of the world.

E.M.I. Technical Papers

FURTHER to the announcement some time ago of the publication of technical papers read by members of the staff of Electric and Musical Industries, Ltd., to learned societies, one on magnetic recording is now available.

This is entitled "Some Fundamentals of Magnetic Recording," by E. W. Berth-Jones, B.Sc., of E.M.I. Studios, Ltd., and is based on a lecture given by Mr. Berth-Jones to the British Sound Recording Association, at E.M.I. studios some time ago.

This booklet, well illustrated and printed on art paper with a semi-stiff cover is available at the same price

as the others previously issued, namely 2s. 6d. per copy. Inquiries should be made to the Advertising Division, E.M.I. Sales and Service, Ltd., Hayes, Middlesex.

Australian Writ

A WRIT was recently issued in Australia on behalf of Pye Ltd., of this country, and Electronic Industries, of Australia, seeking an injunction to restrain the Australian Government from accepting tenders or making any contract for television equipment without calling for tenders "in the manner called for by law."

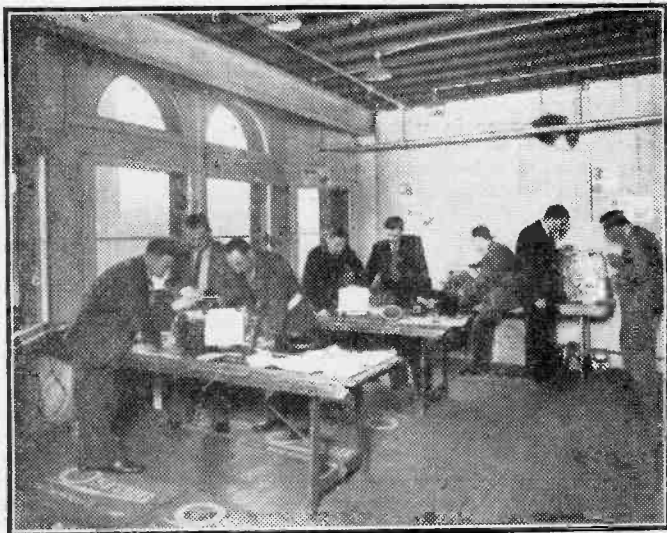
North Western Television Training School

THE first television manufacturers' training school in the Manchester area has recently been opened by the General Electric Co., Ltd., for the benefit of its Approved Radio Dealers.

The object of the courses, each of which lasts a week, is to show dealers how to demonstrate and service the company's television receivers.

Instruction is given to dealers from the Manchester, Sheffield, and Liverpool areas and special attention is paid to practical work in the diagnosis and rectification of faults.

At the conclusion of each course the dealers receive a certificate from the G.E.C., which can be displayed to customers as evidence of the dealer's competence to service the company's television receivers.



Dealers examining television chassis in the G.E.C. Television Training School in the Manchester area.

999 Emergency Telephone Calls

THE 999 emergency telephone service is an outstanding Post Office feature at Radiolympia. The public can see how the 999 service works by following the progress of a 999 call to the particular service required—Fire, Police or Ambulance. When they have seen how such calls are handled at post office telephone exchanges, officers from the Fire, Police and Ambulance explain how their respective services deal with these emergency calls.

The Post Office display illustrates the immense contribution made by the department to the development of the public telecommunications services.

Telecommunications Meeting

(London, 1949)

DELEGATES of the Government of the United States, led by Mr. Wayne Coy, chairman of the Federal Communications Commission, met in London recently with delegates of all the Governments of the British Commonwealth to discuss matters of mutual interest in the sphere of telecommunications. The last similar meeting was in Bermuda in 1945, the outcome of which was the Bermuda Telecommunications Agreement which, among other matters, established ceiling rates for wireless and cable communications between the countries of the Commonwealth and the United States. This year's meeting, which was held at the request of the Government of the United States, was to review the Bermuda Agreement in the light of present circumstances, and more particularly the possible repercussions of decisions taken at the recent International Telegraph and Telephone Conference in Paris.

Life Saving

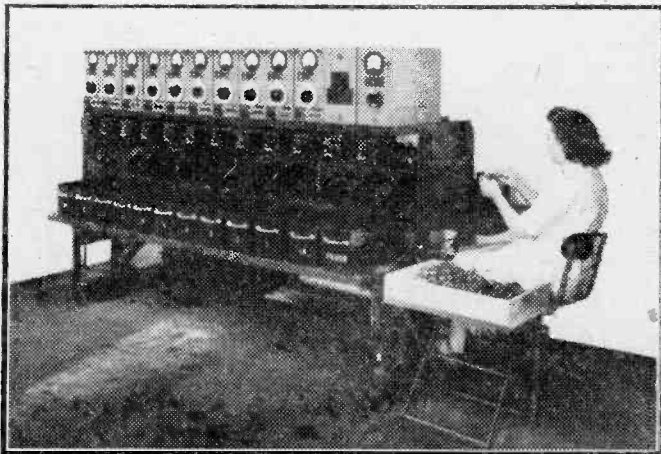
APPARATUS has been developed in the U.S.A. for use during an operation whereby the brain waves are recorded and show approaching death. By means of this indication the anaesthetic may be turned off and oxygen administered, thereby saving the patient's life. A recording machine stands by the side of the anaesthetist and makes a continuous record of the waveforms of both heart and brain, and tests so far indicate that it will work with any type of anaesthetic.

Car Licence Plates

LICENCE plates with amateur call letters instead of the usual numbers and letters are now available to car-owning Florida amateurs, due to a bill which took effect on July 1. In recognition of the valuable work done by amateurs in emergencies, State Senator Lloyd F. Boyle, himself an amateur, introduced the bill in the legislature; it was signed by the Governor on May 12. Each man wanting a call-letter licence plate must apply to the Motor Vehicle Commissioner and pay an extra \$1 fee.

Alan Knight Joins Philips

INTRODUCING the first car radio to Great Britain in 1932, Alan Knight, originally with General Motors of New York, has joined the Philips organisation as car radio manager.



A robot condenser testing machine which is exhibited on Stand No. 75 at Radiolympia.

American I. of R.E.

SIR ROBERT WATSON-WATT has been nominated vice-president of the American Institute of Radio Engineers for the year 1950.

Mica Directorate

THE Mica Directorate has removed from Horseferry House, Thorney Street, London, S.W.1, to Empire House, St. Martins le Grand, London, E.C.1. (Telephone: CLERkenwell 7931.)

A CHRISTMAS GIFT FOR YOUR FRIEND OVERSEAS

AT the present time, when so many of the good things of life are in short supply here at home, the Christmas gift season presents many problems, particularly for those who have friends or relatives overseas.

There is, however, a simple solution—you can send your friends subscriptions to PRACTICAL WIRELESS. These gifts are not only original, acceptable and free from all restrictions; they have also cumulative value in that every issue throughout the year serves as a reminder of your good wishes.

We shall be pleased to arrange as many overseas gift subscriptions as you may wish to send at the normal annual rate of 10s. 6d. In addition, an attractive special greetings card will be sent in your name with the first copy of each subscription.

Just write to the Subscription Manager, PRACTICAL WIRELESS (Dept. G.2), Tower House, Southampton Street, Strand, London, W.C.2, enclosing the addresses of your friends with remittance to cover, and we will do the rest.

Improved Auxiliary Receiver

Design for a Compact A.C./D.C. T.R.F. Broadcast Receiver

By G. T. EDWARDS

THE idea of having a subsidiary receiver, of a transportable nature, for use in the home is a commendable one, and this article is the outcome of a successful attempt by the writer to design and construct a receiver that could be easily connected up for listening in any room wired with a mains supply point. By careful choice of loudspeaker and circuit details the quality of reproduction obtained was considerably better than that usually associated with the average so-called "midget" radio receiver.

Circuit

A complete circuit diagram is shown in Fig. 1, and it will be seen that a simple A.C./D.C. T.R.F. arrangement is employed. V_1 (EF39) provides a useful degree of R.F. amplification, and the output from this stage is applied to one of the diode sections of V_2 (EBC33—double diode-triode). This diode acts as the signal demodulator, and the A.F. voltage developed across R_5 is fed via C_{12} to the volume control (R_6). C_{12} prevents the D.C. component of the detector from being applied to the triode grid circuit.

The reservoir condenser of the signal rectifier circuit is C_9 , and R.F. filtering is provided for by R_4 and C_{10} . Note that the lower end of the diode load resistor (R_5) is connected to the cathode of V_2 and not to H.T. negative.

The slider of the volume control is connected to the grid of the triode by a screened lead. A grid-

stopper of $47,000\Omega$ (R_9) is mounted within the shielded top-grid cap fitted to the valve.

Resistance-capacity coupling is employed between the anode of V_2 and the grid of V_3 . V_3 is a CL33 high-slope output pentode, and this provides enough output power for all domestic purposes.

Although a $22,000\Omega$ grid-stopper is included in the O.P.V. grid circuit, the author experienced parasitic oscillations at a supersonic frequency. This was indicated by a flashlight bulb connected across the secondary of the O.L. transformer; the bulb glowed at full brilliance, even when the volume control was turned to zero. This trouble was cured by fitting C_{11} , which causes negative voltage feed-back between the anode and grid circuit of V_3 . The degree of feed-back increases with frequency, and, therefore, a degree of treble attenuation is obtained. A degree of negative current feed-back is obtained by leaving R_{12} un-bypassed.

Coils

Coils are incorporated for M.W. reception only, but readers requiring medium and long-wave reception should not find it difficult to use a pair of dual-range coils, with an appropriate wave-change switch. Manufacturers' data on the method of connection, etc., should, of course, be adhered to. The writer used Weymouth coils DA3 (aerial) and DH3 (H.F.).

The coils are tuned by a two-gang .0005 μ F

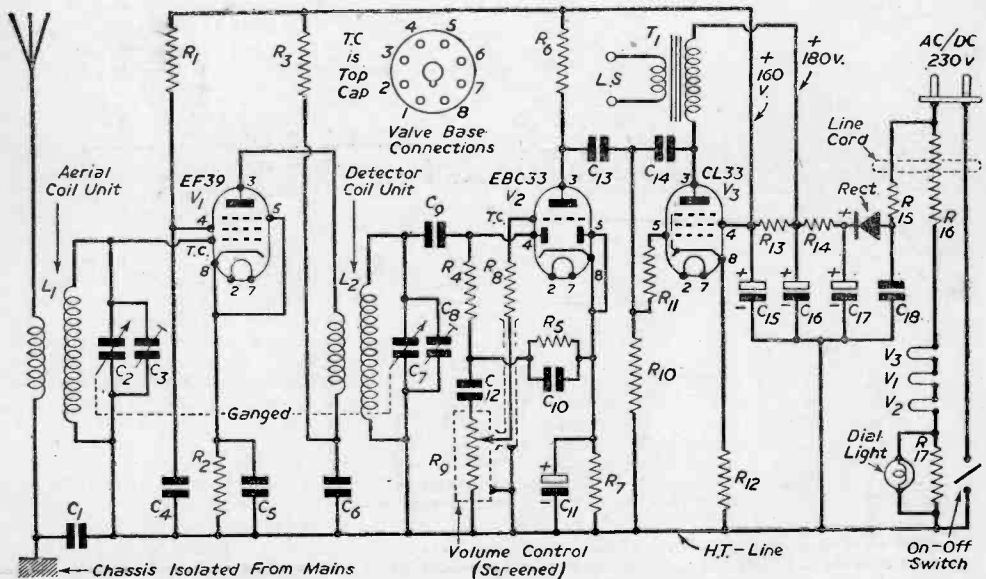


Fig. 1.—Circuit of the Improved Auxiliary Receiver

variable condenser. The trimmers have a maximum capacity of 50pF.

Heater Circuit

A series heater circuit is used with a line-cord "dropper." The method of calculating the required resistance is as follows.

$$R = \frac{V_m - V_h}{I_h}$$

where R=line-cord res. in ohms

V_m =R.M.S. mains voltage

V_h =total of valve heater and dial lamp voltages

I_h =heater current in amps.

With the valves used here (not forgetting the dial-lamp):

$$V_h = 2(6.3v.) + 35 + 3.5 = 51.1 \text{ volts}$$

and $I_h = .2$ amp

$$\text{If } V_m = 230 \text{ volts}$$

$$230 - 51.1$$

$$\text{Then } R = \frac{.2}{894.45} \text{ ohms.}$$

A value of 900Ω will be accurate enough in practice.

The actual length (ℓ) of the line-cord in feet can be determined from—

$$\ell = \frac{R}{\text{ohms per foot value of cord}}$$

It is advisable to check the resistance of the cord with an ohmmeter before it is fitted.

The dial-lamp is shunted by R_{17} to prevent burn-out of the lamp when the set is first switched on—the heater currents being at a maximum when the valves are "cold." This resistance also ensures that the set will still "play" even though the dial lamp may go open-circuit.

H. T. circuit

An ex-Government half-wave Selenium rectifier,

capable of working at 275 volts 60 m.A., was used by the author. The A.C. input to the rectifier is fed via R_{15} (surge limiter) from one side of the mains. C_{16} is an R.F. by-pass.

Smoothing for the output valve anode supply

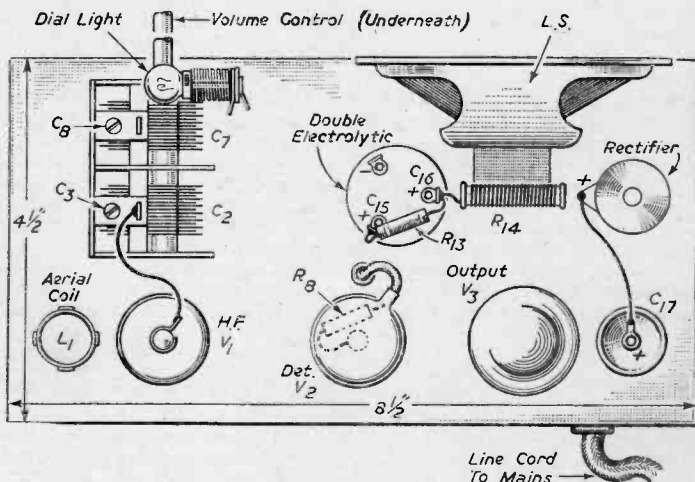


Fig. 2.—A Top view of the chassis

is by C_{17} , R_{14} and C_{16} . Additional smoothing for the O.P.V. screen grid and the supplies to V_1 and V_2 is provided by R_{13} and C_{15} .

Isolated Chassis

A somewhat unusual feature of this design is the fact that the chassis is not connected to H.T. negative except through a capacitor (C_1) of .01μF capacity. Consequently, risk of shock through the chassis being connected directly to one side of the mains is minimised.

The frame of the gang condenser has to be connected to H.T. negative and must not, therefore, be bolted down in contact with the chassis. In the original model the gang was mounted on a 1/4 in. thick paxolin platform supported above the chassis on small pillars.

The "cans" of the electrolytic condensers must also be isolated from the chassis by including two or three thicknesses of insulation (e.g., "Empire cloth") between the body of the condenser and the holding-down clip.

All connections going to H.T. negative are made to a length of 16 s.w.g. tinned copper wire stretched tight between two isolated terminal tags (see Fig. 3).

Chassis

A chassis from manufacturers' surplus materials was used: this was already drilled and fitted with valveholders. With the dimensions and details of layout given in Fig. 2, it should

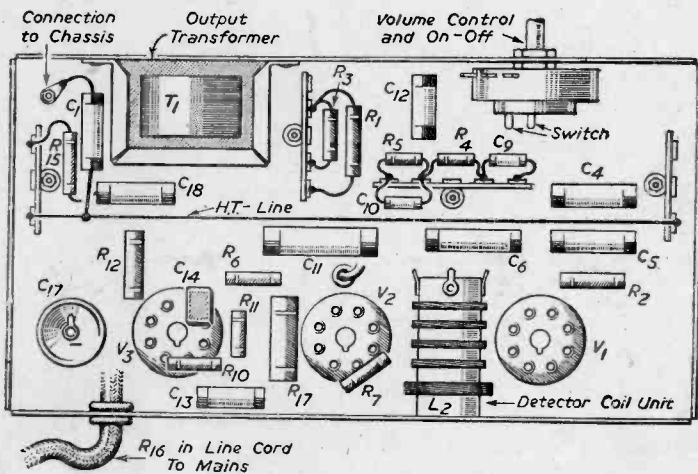


Fig. 3.—Under-chassis view, showing general lay-out

not be difficult to make a similar chassis (4½ in. × 8½ in. × 1½ in.) from aluminium. A midget radio cabinet was purchased. A number of radio parts dealers now stock these cabinets which are constructed from good quality plywood, and are, conveniently, already polished and fitted with a loudspeaker fret, etc.

Alignment

After construction and preliminary testing the tuned circuits should be aligned. The following procedure can be employed, no signal generator being necessary:

- (i) Insert a microammeter (F.S.D., say, 100 or 250 μA) in series with the lower end of R5.
- (ii) Fully unscrew the trimmers.
- (iii) Tune in a station at as high a frequency as possible, e.g., Third Programme (203.5 m.).
- (iv) Adjust C₈, then C₃ for maximum reading on

the microammeter. (This reading is proportional approximately to the peak value of the R.F. carrier voltage on the detector diode.)

- (v) If it is found that the trimmers do not "peak" properly—in other words, have to be screwed right out—screw them up a little, re-tune the gang for maximum response from the station and repeat the adjustment of C₈ and C₃.

Having obtained satisfactory alignment the trimmers should be "sealed" with wax, and the microammeter removed from the circuit.

A "throw-out" aerial (about 8 yds. of flexible wire) can be used with this set. In the writer's locality this was sufficient to obtain adequate signal strength on the 203.5, 261.1 and 449.1 metres transmissions. A few Continental stations can also be received in the evening.

LIST OF COMPONENTS

R1—68kΩ	(½ w.)
R2—330Ω	(½ w.)
R3—4.7kΩ	(½ w.)
R4, R8—47kΩ	(½ w.)
R5, R10—470kΩ	(½ w.)
R6—100kΩ	(½ w.)
R7—2.2kΩ	(½ w.)
R9—2 meg. Ω	(vol. control with s/p switch).
R11—22kΩ	(½ w.)
R12—180Ω	(½ w.)
R13—3.3kΩ	(½ w.)
R14—1kΩ	(3w. wire wound.)
R15—100Ω	(½ w.)
R17—50Ω	(2w. wire wound.)
Line Cord (R ₁₆)—900Ω .2 amp. 3-core	(see text).
C1, C18—.01μF	(1,000v. D.C. wkg., tubular paper)
C2, C7—500μF max.	(2-gang tuning)

C3, C8—50μF max.	(trimmers)
C4, C6—.05μF	(450v. D.C. wkg., tubular paper)
C5—.01μF	(350v. D.C. wkg., tubular paper)
C9, C10—100μF	(moulded mica)
C11—25μF	(25v. D.C. wkg., electrolytic)
C12, C13—.01μF	(450v. D.C. wkg., tubular paper)
C14—150μF	(moulded mica)
C15, C16—20-20μF	(350v. D.C. wkg.) (electrolytic (com. neg.))
C17—8μF	(450 v. wkg., electrolytic)

L.S.—4in. Rola (latest type).
 T1—O.P. Trans., 35 : 1 ratio.
 Valves—V1—EF39 ; V2—EBC33 ; V3—CL33.
 Rectifier—275v. 60 mA. Selenium.
 Dial Lamp—3.5v. 0.18 amp. M.E.S.
 Coils—L1—Weymouth DA3 ; L2—Weymouth DH13 (200-550 metres).

C.R. Tube Supplies From D.C. Mains-3

This Month's Subject is the Supply of E.H.T. for Television Equipment

By E. N. BRADLEY

WHILST the E.H.T. supplied by the R.F. power unit which has already been described is perfectly adequate for the normal oscilloscope, it is not sufficient for a 6in. tube such as the VCR97 used in small television receivers. The VCR97 and its equivalents, such as the ECR60, are rated to take up to 2,000 volts on the anodes, but excellent pictures can be obtained with anode voltages of the order of 1,000 and 1,500 volts—for some months the author had excellent television entertainment from an ECR60 tube with no more than 950 volts applied to the anodes.

The E.H.T. section of the generator unit shown in Fig. 6 is capable of an output of well over 1,000 volts if the current drawn is kept low. In the test circuit an E.H.T. of 1,500 volts was obtained across a load of 4 megohms, and with this supply a really

brilliant test raster was drawn on the screen of a VCR97 tube. Trial picture reception was impossible, since the tests were conducted far outside the service area of the transmitter, but experience showed that an excellent picture could have been produced.

The generator system employed is based on the ringing choke circuit, sometimes used in conjunction with the line timebase of a television. In the true ringing choke circuit a centre-tapped 133 milli-henry choke is connected into the anode line of a power pentode whose grid is driven from the line timebase. The sawtooth voltage wave cuts the pentode current off once per sweep, and the sudden interruption of the current through the choke causes the winding, tuned by self and stray capacitances, to oscillate, so that high voltages are

set up across the choke coil. These voltages are rectified, smoothed, and supplied to the anodes of the picture tube. Up to 7,000 volts or so may be produced in this way.

The drawback for the home constructor in this system is the provision of the centre-tapped choke, which requires an inductance not easily obtained commercially. Such a choke could be wound, but since the windings should be placed over a powdered-iron core if the choke is not to be inconveniently large the component could not be made in the home workshop and would be very expensive if made to order. To make the use of a more common component possible, experiments were conducted using lower exciting frequencies and normal chokes and iron-cored transformers in the pentode anode circuit.

The frame timebase has too low a frequency to be really useful in this connection, though the experiments show that there are possibilities in this direction, and the experimenter might well take up this line of research. The best results were obtained, however, by employing an ordinary intervalve audio transformer as the choke, and driving the pentode grid at a frequency of about 1,000 cycles per second.

This means that the timebases of the television cannot be employed to drive the E.H.T. generator, but a comparison of costs showed that it was preferable to use a separate driving stage rather than to build a choke coil which would work at the line frequency of 10,125 cycles. The driving stage is a simple Miller timebase circuit with a frequency control which enables the driving frequency to be suited to the transformer used in the pentode circuit, and it was with this arrangement that the E.H.T. of 1,500 volts was produced.

Oscillographic inspection showed that this circuit may more truly be described as a "kicking" choke rather than as a ringing choke, a single high voltage pulse being produced at each cut-off of the pentode, but as the high voltage is produced the method is of secondary importance.

Pentode Transformer

In the components list the transformer used in the pentode anode line is not specified by name, as it was realised that many constructors will have old inter-valve transformers which they will wish to test out in the circuit. The component used was of a cheap variety and was run for long periods at full voltage as a breakdown test, but no trouble from sparking or flashover was experienced. The only precaution necessary is to avoid the use of midget transformers, which cannot be expected to stand up to high voltages.

The ringing choke circuit cannot, of course, produce the heater current for the C.R. tube, and so the R.F. oscillator must be retained, L3 being wound between the two coils as before, although L4 is not now necessary. The EA50 cannot be employed to rectify voltages much above 800 volts, as flashovers occur within the valve, but since various high voltage metal and selenium rectifiers are available this is of small account. Such rectifiers work well at the relatively low frequencies at which the ringing choke system operates.

The generator unit of Fig. 6 should be built as a separate section of a television receiver and contained within its own screening box of brass or copper, ventilation holes being provided and covered with copper gauze to maintain the screening. The size and shape of the unit must depend on circumstances, but as the generator is non-critical the whole apparatus can be built up on practically any chassis. The tube heater supplies should now be carried via a coaxial cable to the C.R. tube, and the ammeter, which should still be used, should be mounted near to the tube.

The inclusion of the E.H.T. rectifier within the screened case will depend on the type of rectifier obtained. The Westinghouse 36EHT rectifier, rated to handle up to 2.5 kV. is very small and can easily be fitted within the chassis, but the S.T.C. H4/200, rated to handle up to 2 kV., is rather long, and will need to be mounted on the main receiver or

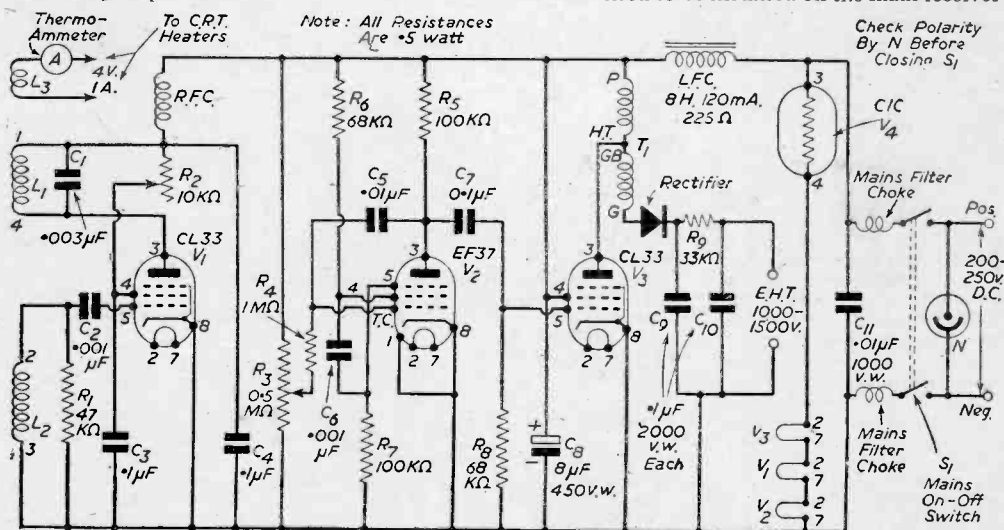
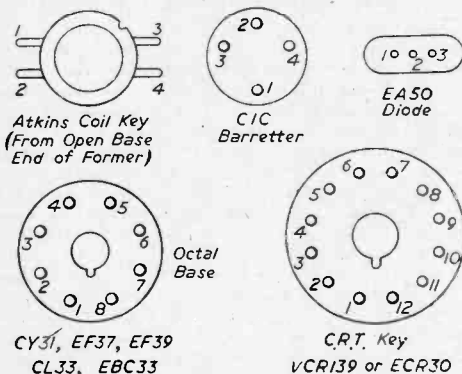


Fig. 6—Theoretical circuit of the D.C., E.H.T. Unit.

timebase chassis on standoff insulators. This latter rectifier may be found rather more readily available than the Westinghouse model, but on the score of efficiency there is nothing to choose, whilst mounting the rectifier outside of the generator case will cause no interference troubles, since this part of the supply system is working at audio frequencies.

Some transformer hum may be set up when the circuit is working. If this is the case the transformer core should be inspected for loose laminations and the component mounted on a block of rubber—the noise should not be obtrusive, however, and



CY31, EF37, EF39
CL33, EBC33

C.R.T. Key
VCRI39 or ECR30

Fig. 7—Coil and valve-base connection data

the test circuit gave very little sound. The transformer should not be operated without the loading of the rectifier and the tube resistor chain, for then very high voltages can be set up in the secondary winding and sparking is likely. The operating frequency should be kept as low as possible, consistent with good output.

It may at first sight seem that the pentode valve is working under very arduous conditions, but this is not actually the case. The peak anode voltage is low, the E.H.T. appearing almost totally across the transformer secondary, and the pentode cathode current is of the order of 30 mA. or less.

Definite operating current readings have not been given for any of the circuits described, as it is the writer's opinion that such data all too often cause nothing but confusion, especially when applied to D.C. apparatus working directly from mains supplies which might vary, in different areas, by as much as 50 volts.

Operation

As an electrolytic capacitor is employed for smoothing, the generator must be connected to the mains with the correct polarity. Once again a neon bulb is used as a polarity indicator, and should be checked before closing S1, the main on-off switch.

To set the unit in operation remove V3, whilst the heater winding on the oscillator coil is adjusted—when a valve is removed from circuit remember that its heater sockets, in the valveholder, must be bridged by a length of insulated wire.

The adjustments to L3 are exactly as already described, but since there is now only one winding to check, and the oscillator has not the task of supplying rectifier and driving power, there will probably be no need for adjusting the number of turns on L3,

and R2 should give an ample measure of control. As before, start up the circuit with all the resistance of R2 in, decreasing the resistance slowly as necessary.

Remember to check the true current required by the C.R. tube heater, and set R2 to supply this current with the heater up to operating temperature.

With the heater supply working correctly replace V3 after ensuring that the E.H.T. terminal is connected to the tube resistor chain.

Set the driving timebase control, R3, to the low-frequency end of its travel and connect a high-resistance voltmeter across the E.H.T. terminals. When the voltmeter registers increase the triggering speed and check for high-voltage generation.

Avoid taking shocks from this E.H.T. generator. A shock from a high-frequency source such as that of the oscilloscope is only slight, the extra loading on the source given by the contact causing the voltage to drop sharply, but extra loading on the television E.H.T. generator has considerably less effect and a shock from this source can be extremely unpleasant.

None of the apparatus described may be earthed directly to a physical earth. If for any reason an earth connection should be required it must be made

COMPONENTS LIST FOR THE TELEVISION POWER GENERATOR, FIG. 6.

- L1, L2, Atkins Labs. White No. 2 coil with L3 wound as already described.
- R.F.C. R.F. chuke, Eddystone 1066 or similar.
- C1, 0.003 μ F. 350 v.w. mica T.C.C. M3N.
- C2, C6, 0.001 μ F. 350 v.w. mica T.C.C. M2N.
- C3, C4, 0.1 μ F. 350 v.w. tubular T.C.C. 346.
- C5, 0.01 μ F. 750 v.w. tubular T.C.C. 645.
- C7, 0.1 μ F. 500 v.w. tubular T.C.C. 543.
- C8, 8 μ F. 450 v.w. electrolytic T.C.C. CE25P.
- C9, C10, 0.1 μ F. 2,000 v.w. tubular T.C.C. 2045.
- C11, 0.01 μ F. 1,000 v.w. tubular T.C.C. 2043.
- R1, 47,000 ohms, $\frac{1}{2}$ watt.
- R2, 10,000 ohms variable, wirewound.
- R3, 0.5 megohm variable. Frequency control.
- R4, 1 megohm, $\frac{1}{2}$ watt.
- R5, R7, 100,000 ohms, $\frac{1}{2}$ watt.
- R6, R8, 68,000 ohms, $\frac{1}{2}$ watt.
- R9, 33,000 ohms, $\frac{1}{2}$ watt.
- V1, V3, Mullard CL33.
- V2, Mullard EF37.
- V4, Phillips C/C Barretter.
- 3 international octal holders.
- 1 4-pin holder.
- L.F.C. 8 henrys, 120 mA. 225 ohms. Partridge C8-120.
- T1, interval transformer, 5 : 1.
- Rec. Westinghouse 36EHT or S.T.C. H4-200.
- N, small neon bulb with holder.
- S1, mains on-off switch.
- Thermo-ammeter, 0-1.5 or 0-2 amps.
- Mains filter choke, Weymouth MSC3.
- Chassis, output terminals or sockets, 2 control knobs, grid clip, wire, sleeving, nuts, bolts, etc.

through an 0.01 μ F capacitor of at least a 750 v.w. rating.

Remember that in some cases the D.C. mains may have the positive lead earthed, when the chassis and metal covers of any apparatus connected to the mains will be dangerous to the touch.

Remember that to cause interference to neighbouring receivers is a serious matter. Screen the units before use, and check for radiation.

Check polarity before switching on.

On your Wavelength

by THERMION

Radio Interference

THERE can be no doubt that radio interference is on the increase, and readers can do much to get it removed by adopting the methods employed by Mr. H. W. House, of Southampton. He has not only drawn attention to interference in his local paper, but he has written to his M.P. and also the P.M.G. He draws my attention to one area where severe interference has been experienced for many years past, but repeated attempts by Post Office engineers has failed to trace the source of the trouble. The power of the Post Office engineers is, of course, limited, and it may be that apparatus for the detection of interference is behind the times. Mr. House issued an appeal through his local paper to all readers to test all their electrical apparatus, including fires and switches. This can, of course, be done by first turning on the radio and then switching on, one at a time, each electrically operated article for a few minutes, when any defective apparatus will make itself heard in the radio. It is not generally realised that defective electrical apparatus can make listening impossible to dozens of your neighbours, among whom may be invalid and elderly people unable to enjoy other forms of entertainment. Equally, those who keep their radio in operation at full strength late at night may be causing interference of another sort—with the slumbers of other people, and that can be equally annoying.

A further suggestion made by my correspondent is that the Post Office should circularise an affected area, the circular to be worded as strongly as possible and giving the necessary instructions to listeners on the testing of their electrical equipment. There are, of course, difficulties in interference suppression; one source was traced to a house where several electric blankets were in operation; the owner refused to have the interference rectified, and stated that he did not use the blanket when listening to the radio!

If interference is not removed voluntarily, legislation may make it compulsory under pains and penalties.

Radiolympia Reflections

THE sparkle and the glamour is beginning to return to Radiolympia. It seems, however, an ill-fated exhibition as something always happens on the eve of it to damp public ardour. The talk of the devaluation of the pound was hardly likely to encourage buyers, although it will help in the export field. That is rather cold comfort, however, for those at home.

I expect to hear that record attendances have been broken and that the volume of business has increased over last year. Our stand as usual was the focal point from which many commenced their

tour of the exhibition. It has but two days to go by the time you read this, so final figures are not yet available.

I was glad to renew the acquaintance of many of my old readers, both in the trade and out of it. Some of the manufacturers expressed surprise that interest continued on such a vast scale in the experimental side of radio, and one or two are casting covetous eyes at the market they are missing. Some of the firms which originally catered for experimenters deserted that market and are now sorry that they did so. It is general knowledge that the shops are piled high with radio receivers which the public will not or cannot afford to buy. The steady stream of callers at our stand who wished to buy blueprints convinced many of these manufacturers that they had made a major blunder.

There was nothing at the exhibition which I considered a technical step forward. Too much attention is being given to the eye appeal, and too little to the technical features. The television receivers to me are ugly, and I still feel that there is a missing link with it somewhere. The tube looks wrong, and a thing that looks wrong usually is wrong. Let us regard the present television receivers as still in the cat's-whisker stage—interesting, but not final.

The Editor Televised

MY Sunday afternoons are usually given up to reading and to correspondence. The other Sunday I was so engaged and was awaiting the commencement of the television programmes, having switched on a few minutes before. I was not actually looking at the tube when I heard the announcer refer to the fact that Mr. F. J. Camm was to give a talk. Knowing him as well as I know my own face I am able to report that the transmission represented a faithful delineation of his scholarly physiognomy! His talk dealt with the educational value of models, and it tied up with the recent Model Engineering Exhibition whereat he exhibited one of his electric clocks.

Predicting Short-wave Radio Frequencies

EVERY hour of every day stations all over the world transmit radio waves to the ionosphere and record the echoes back to the earth's surface. The information obtained makes certain that broadcasting stations, ships and aircraft use the frequency bands giving the best reception at the right times.

In the same way as a mirror reflects light, the ionosphere, high above the earth's surface, reflects radio waves and makes long-distance short-wave radio possible. If the ionosphere did not exist the waves from a transmitter would fly off into space and the listener in South Africa or Australia would not be able to hear the B.B.C.

Transformers and Chokes-3

Design and Construction of Mains Transformers, Current Transformers and Chokes

By ERIC LOWDON

FIG. 10 should make clear the various points discussed in last month's issue.

Normally the inductance and D.C. current rating of the proposed choke will be known, leaving the core size, number of turns, length of air gap to be determined, and, as in the case of the mains transformer, some assumptions will have to be made to give a basis to work on.

There are a number of ways by which the problem may be approached, but the method due to C. R. Hanna is probably the simplest and it is this method which we will deal with here. It should be realised that the results of the following calculations cannot be very accurate because of the number of variable factors involved, but they will be sufficiently accurate for most purposes, and if care is taken in

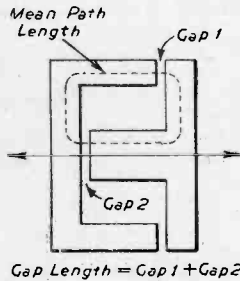


Fig. 10.—Essential details of an iron-cored choke core.

the design and construction the measured results will be surprisingly close to those calculated.

If the core size is known then all the necessary data is obtained direct from the curve in Fig. 13.

The first step then is to select what we think will be a suitable lamination and assume a cross sectional area for the core as a whole; the volume "V" of the core is then given by, mean path length " ℓ " \times cross sectional area A.

L and I are known by specification and a value has been assumed for V; $\frac{LI^2}{V}$ can therefore be calculated.

The figure obtained for this is selected on the appropriate axis, and from this point a path is traced in the direction of the dotted line till it meets the curve. The value of $\frac{a}{\ell}$ is noted, and at this point the path turns downwards till it meets the $\frac{NI}{\ell}$ axis. The value for this is then read off.

From the figures thus obtained it is now a simple matter to calculate the total turns required and the length of the air gap.

A practical example will illustrate the method.

Suppose we require a choke of:
Inductance = 20H and D.C. = 50.0 mA.

Laminations type 101 area = .56 sq. ins.

The dimensions of the laminations are given in Table I. From these the mean path length ℓ is measured.

$$\text{i.e., } \ell = 4.9 \text{ ins. and } V = \ell \times A = 2.75 \text{ cubic ins.}$$

$$\frac{LI^2}{V} = \frac{20 \times .50}{2.75} = 18,000.$$

This gives an approximate value of $\frac{a}{\ell} = .0021$.

$$\therefore a = \ell \times .0021 = 4.9 \times .0021 = .01 \text{ in.}$$

It must be remembered that there are, in fact, two gaps in the magnetic circuit, therefore the gap in each leg is $\frac{.01}{2} = .005 \text{ in.}$

Following the path down from the curve we find the value of $\frac{NI}{\ell} = 45,000$.

$$\therefore N = \frac{\ell \times 45,000}{I} = \frac{4.9 \times 45,000}{50.0} = 4,420 \text{ turns.}$$

The design now follows the same lines as for the transformer. The space available is checked to ensure that it will accommodate the winding, not forgetting to take into account the thickness of the bobbin and end cheeks or margin at the edges of the bobbin. The best results will be obtained when the winding space is completely filled, and the choice of wire will depend not only on the current rating but on the resistance where the volts drop is important.

It will be obvious in the check on space as to whether a smaller or larger lamination should be tried.

With regard to insulation in the winding, it is usually quite good enough with chokes to wind the wire at random and use paper insulation say every 2,000 turns.

The gap is made by entering the U laminations in one end of the bobbin and the Ts in the other, a piece of card of the requisite thickness is then slipped between the ends of the Us and the sides of the Ts as in Fig. 11; the core is then clamped together.

Where the calculated gap is very small, from about .003in. to .005in., the gapping strip can usually be dispensed with and the edges of the core butted together. Due to the imperfection of the magnetic contact this is, in itself, equivalent to a small gap. For calculated gaps less than .003in. it

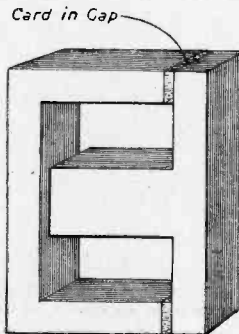


Fig. 11.—How an air gap is arranged in a choke core.

may be necessary to lace the core in the same manner as a transformer, if accuracy is required.

In general, however, great accuracy is not required, nor is it very easy to obtain without measuring equipment and intricate calculation, for the inductance of a choke varies with variation in D.C. current and variation in A.C. volts across it.

If a choke is required to have a fairly constant inductance, irrespective of D.C. current or A.C. volts, then it should be designed with a very large gap up to, say, .2in., that is, .1in. in each leg.

The Current Transformer

The current transformer is included in this series mainly for the benefit of readers who wish to add A.C. ranges to their D.C. multi-range current meters, but the design procedure applies, of course, to transformers for use with any type of moving-coil meter.

The D.C. method of using a shunt across the meter does not apply on A.C., because the resistance of the rectifier is not constant with change of voltage across it. If such a method were used, then, as the current through the meter changed, so also would the series resistance of the rectifier. The shunt resistance, if calculated for full scale, would not apply at lower ranges, and serious error would be introduced.

The design is based on the fact that neglecting losses, the primary ampere-turns of any transformer are equal to the secondary ampere turns; that is,

the primary turns \times the primary current is equal to the secondary turns \times the secondary current.

For instance, if the primary turns $T_p=5$ and the current $I_p=2$ amps., then the primary ampere-turns equals $5 \times 2=10$ ampere turns, and if the current in the secondary $I_s=.001$ amp., then the turns required $T_s = \frac{10}{.001} = 10,000$ turns.

Losses in the transformer, such as core loss or

Bound with Cotton Thread

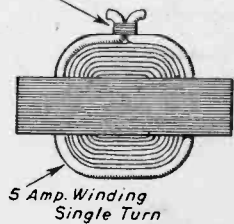


Fig. 12.—Method of making a current transformer where thick wire is used.

voltage drop in the windings, will introduce errors, because part of the primary ampere-turns is used to compensate for the losses, and the simple ratio will not hold unless steps are taken to keep the losses at a minimum.

These points will be dealt with in the following example.

Suppose we require a transformer to work in conjunction with a 1 mA. moving coil meter, and

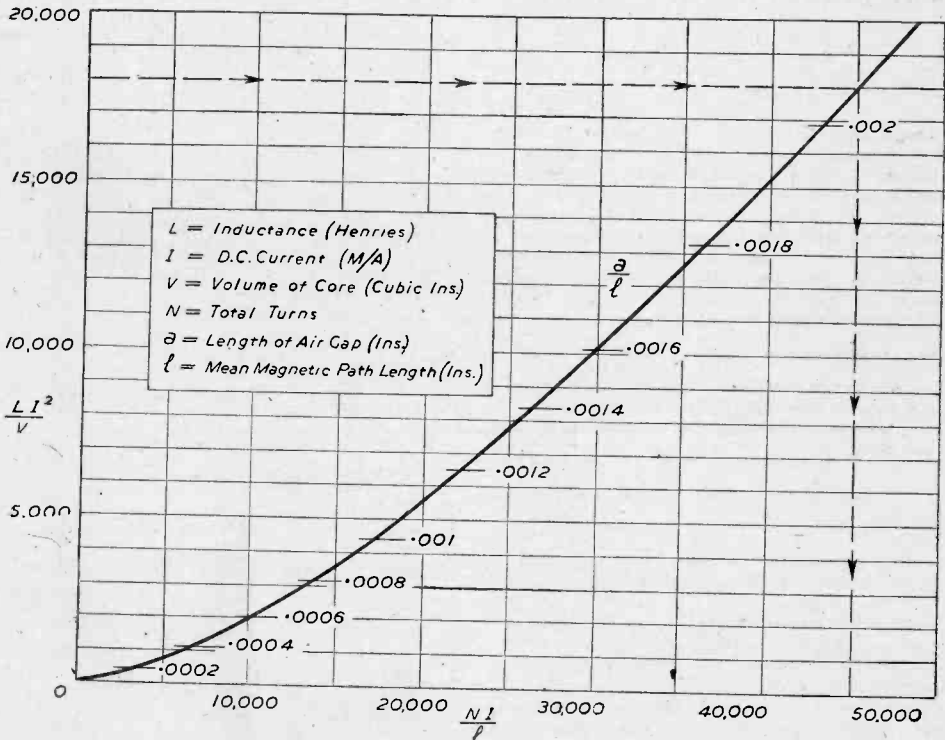


Fig. 13.—This chart simplifies the design of iron-cored components.

to cover ranges of—

- 0—100 ma.
- 0—1.0 amp.
- 0—5.0 amp.

The primary will obviously require to be of low resistance to avoid disturbing the circuit under test. It will also require to be wound with heavy gauge wire to carry the current without undue heating. The number of turns will therefore be kept to a minimum to comply with these conditions.

Beginning with the highest range, the primary for this can conveniently be 1 turn of heavy gauge wire. This makes the primary ampere-turns equal to $5 \times 1 = 5$ amp. turns = 5,000 mA. turns.

The meter is 1 mA. full scale, but it must be remembered that the A.C. load taken by the rectifier is 1.11 mA. This is due to the fact that the meter and rectifier give a deflection equal to the mean current which bears a ratio of 1.11 to the R.M.S. value.

As the secondary mA. turns must equal the primary mA. turns, it follows that the total secondary turns must be $\frac{5,000}{1.11} = 4,400$ turns.

The voltage across the secondary winding will be that appearing across the rectifier and will be in the region of .9 volt at full scale deflection. In addition there will be a volts drop in the winding, which should be kept as small as possible in order to avoid serious errors in the transformer.

If we assume that this can be kept to .1 volt or less, then the total voltage generated in the winding will be 1.0 volt.

In the current transformer the core loss must be kept to a minimum (this has already been mentioned); in addition, the permeability must be as high as possible in order to keep small that part of the ampere-turns which is used to establish the flux in the core.

For these reasons, silicon iron is not used as the core material. A much better material for the core is Mumetal, which is characterised by a high permeability at low flux density and has low loss.

Mumetal laminations can be obtained from the Telegraph Construction and Maintenance Co., Ltd., Greenwich, London.

This brings us to our old friend, formula (3).

$$\frac{T}{V} = \frac{10^8}{222 \times 1 \times Bx}$$

We have already calculated values for T and V, i.e., $T = 4,400$ and $V = 1.0$ volt. If we can now assign a value to Bx, A can be calculated by rearranging the formula thus:

$$A = \frac{V \times 10^8}{222 \times T \times Bx}$$

The flux density should be kept to a very low figure and 500 lines per sq. inch is a suitable value, this gives—

$$A = \frac{1 \times 10^8}{222 \times 4,400 \times 500} = .2 \text{ sq. in.}$$

This should be accepted as a minimum figure, and in most cases the area will be greater than this.

A good shape of core should be aimed at. This means that the cross section area will be more nearly a square than a rectangle and will make for greater efficiency and ease of winding. It follows, therefore, that the actual area used will depend on the size of the lamination chosen.

If Type 15 laminations are tried, then from the table it will be found that the length of winding space is 1.5 inches. Allow $\frac{1}{8}$ in. margins at each end, then available space is 1.25 in., and depth of window space is .7 in.

The turns to be wound on are:

Secondary: = 4,400 turns, say 34 s.w.g. enam.

100 ma. primary = $\frac{5,000}{100} = 50$ turns, say 26 s.w.g.

enam. 1.0 amp. primary = $\frac{5,000}{1,000} = 5$ turns, say

16 s.w.g. enam., 5.0 amp. primary has already been determined, i.e., 1 turn, say 12 s.w.g. cotton covered.

Turns/inch of 34 s.w.g. = 100, multiply by winding factor of .95.

Then turns/inch = $100 \times .95 = 95$ turns.

Turns/layer = $95 \times 1.25 = 119$ turns.

\therefore No./layers = $\frac{4,400}{119} = 38$ layers.

\therefore Total depth of copper for secondary = $\frac{38}{95} = .4$ in.

26 s.w.g. for 100 mA. primary will require 1 layer and will occupy approx. .02 in. depth.

16 s.w.g. for 1.0 amp. primary will require 1 layer and will occupy .064 in. depth.

And lastly the 5.0 amp. winding will occupy .104 in. depth.

Thus the primary will occupy a total of .186 in. bringing the total copper depth primaries plus secondary to .586 in.

If bobbin is say $\frac{1}{16}$ in. thick and insulation between primaries and secondary is .010 in. and between each primary .002 in., a further .010 in. for insulation round the outside of the coil makes a total insulation depth of .088 in.

Thus total copper and insulation depth is .674 in. leaving .026 in. to spare in the window space.

As the secondary winding is very low voltage it will not be necessary to provide insulation between layers.

The width of the centre limb of type 15 lamination is given as $\frac{3}{8}$ in., we would therefore use a stack of laminations approx. $\frac{3}{8}$ in. deep.

The order of windings counting from the bobbin will be (1) secondary, (2) 100 mA. primary. (3) 1.0 amp. primary, (4) 5.0 amp primary.

A check on the secondary winding is as follows: Mean length of turn = 4.25 in.

\therefore Total length of winding = $\frac{4.25 \times 4,400}{36} = 520$ yd.

Ohms per yard 34 s.w.g. = .3612 Ω .

\therefore Total resistance = $.3612 \times 520 = 188 \Omega$.

\therefore Volts drop in winding = $.0011 \times 188 = .2$ volt.

As .1 volt was specified as the maximum allowable volts drop it will be necessary if accuracy is required to modify the design in order to reduce this figure.

A slightly larger lamination and heavier gauge wire is indicated. The necessary corrections will provide a useful exercise in design for the reader, and serve to fix the main points in his mind.

Construction

The construction follows the same lines as the mains transformer with one exception. In the mains transformer it is normal (but by no means

(Concluded on page 458.)

Highlights of the Show

New Receivers, Designs, Components and Ideas
Worth an Inspection

NEW radio receivers by *Murphy Radio Ltd.* (Stands 56 and 160) include a mains-operated portable with the cabinet moulded in two identical halves, allowing the receiver to be used in a prominent position in a room without displaying an untidy back. Even the tuning scale is duplicated. This model is an advance on a similar model introduced in 1947.

A 21-VALVE television receiver with a 12in. cathode-ray tube designed for the American market is shown by *Romac Radio Corporation Ltd.* (Stand 88). It operates on the 12 American television channels, selection being made by a rotary switch. The sound receiver is FM.

A PICK-UP, claimed by the manufacturers to have an output between five and 20 times greater than any comparable magnetic type, is shown by *Cosmocord Ltd.* (Stand 7). The unit has a very slender arm and a tiny lightweight head, and needs no equaliser components, allowing it to be connected direct to any domestic radio or amplifier.

AN elliptical loudspeaker is among the exhibits of *Truxor Engineering Co. Ltd.* (Stand 18).

WHITELEY ELECTRICAL RADIO CO. LTD. (Stand 77) demonstrate a "home-made" television receiver which can be constructed by amateurs from parts supplied by named leading radio firms. Blueprints and full instructions cost five shillings.

TELEVISION receivers with independent chassis for the London and Midland frequency are shown by *Postogram Radio Electrical Industries Ltd.* (Stand 99) in some cases combined with push-button radio or radiograms.

MAGNETIC wire and tape recorders which can be made by amateurs for £16 are being demonstrated by *Judge Industries Ltd.* (Stand 206).

CLAIMED as the smallest British car radio is a model by *Masteradio Ltd.* (Stand 31), measuring 9½ in. by 5½ in. by 6½ in., and weighing only 10 lb.

A RECEIVER for use on board ship, covering the principal short-wave bands, the 150-metre shipping band and the medium waves, is among the exhibits of *Stratton and Co. Ltd.* (Stand 182).

A GOTHIC type loudspeaker specially designed for use in churches is shown by *Grampian Reproducers Ltd.* (Stand 90).

AN automatic monitor to indicate automatically by buzzer or signal lamp the occurrence or re-occurrence of an intermittent fault in a radio receiver is among the exhibits of *E.M.I. Sales and Service Ltd.* (Stand 67).

THE "Radio Sonde" meteorological transmitter is shown by *Whiteley Electrical Radio Co. Ltd.* (Stand 77). This device, in a box roughlyly 1ft. high, embodying measuring instruments and a complete radio transmitter, is attached to a balloon and parachute, and released into the upper atmosphere. It automatically transmits to base details of humidity, atmospheric pressure, temperature and wind velocity.

A PROJECTION television receiver with an FM radio has been produced by the *Decca Record Co. Ltd.* (Stand 41). The size of the picture is the equivalent of a 24in. cathode-ray tube. Three 12in. speakers are used.

PORTABLE automatic record changing and single record playing, electric gramophones are featured by *Collaro Ltd.* (Stand 61). The pick-up of one automatic record changing unit is muted in the rest position and only becomes "alive" when the needle reaches the playing groove of the record, eliminating any unpleasant noises during the changing operation.

A SHORT-WAVE six-valve car radio receiver on the *Romac Stand* (No. 88) has a power consumption of 2.9 amps. on 12 volts or 5.8 amps. on a 6-volt supply.

A HIGH fidelity table wire recorder with a running time of one hour, is shown by *Kolster-Brandes Ltd.* (Stand 65).

PROJECTION television is shown by *Ferranti Ltd.* (Stand 43). Their model uses the back projection system, giving a picture 16in. by 12in., with remote controls, allowing the picture to be adjusted at the actual viewing distance.

A NEW suppressor with a resistance value of 5,000 ohms, shown by *Frie Resistor Ltd.* (Stand 86), is designed to screw into the distributor head or coil. Totally enclosed potentiometers and a range of combined capacitor and resistance elements will also be featured.

A DEAF-AID shown by *Savory & Moore, Ltd.* (Stand 3) weighs less than 6 ounces, including the weight of the batteries, and measures 3½ in. by 2½ in. Instead of using wires, with the fear of noisy or faulty joints, the circuit has been printed in silver on a pliable plastic chassis. Automatic volume control enables the user to carry on a conversation in the most noisy surroundings.

RADIOLYMPIA—2

Further Details of Some of This Year's Exhibits

Ace Radio, Ltd.

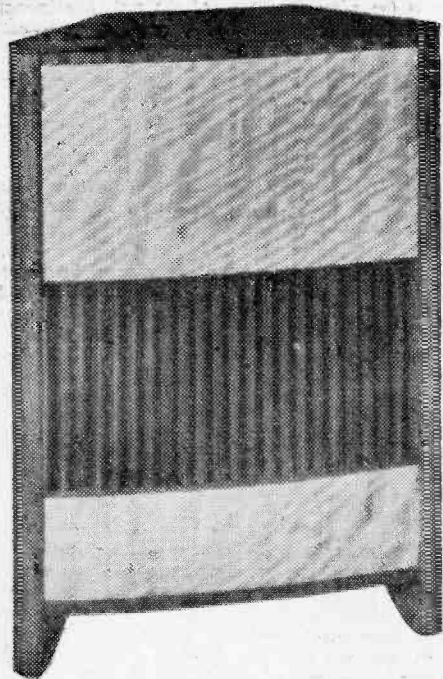
RECEIVERS for both home and export are to be seen on this company's stand, and include in the 600 range a 9-valve superhet with band-spread short-wave ranges with an equivalent of 54 inches of tuning track. These receivers include a radiogram with auto changer. In the Model 33 and 500 range will be found other receivers and radiograms, including a record player. Television equipment is being produced for both London and the Midlands. [Stand No. 21]

Advance Components, Ltd.

ON this Company's stand will be exhibited a range of signal generators, audio generators and constant voltage transformers. The signal generator exhibits will include the two wide-range models which have met such a great demand for the installation and servicing of television in both the London and Midland areas.

The Type B.4 is a sub-standard instrument made in two models, "A" covering 100 kc/s to 70 Mc/s and "B" from 30 kc/s to 30 Mc/s. These are priced at £48 net.

The Advance Signal Generator Type E.2, cover-



The "Prestige" Bafflette loudspeaker by Allan Radio.

ing 100 kc/s to 100 Mc/s on fundamentals, has already established its reputation as the ideal instrument for the T.V. service engineer. It is finished in the popular cream and black colours and has a reliable attenuator system. It retails at £23 10s. [Stand No. 209]

Air Ministry

AMONG the most interesting of the R.A.F. exhibits is a model of a typical permanent R.A.F. station, constructed to scale by R.A.F. experts.

It shows the siting on the station of various types of radio installations for providing radio flying aids for navigation, approach and landing, and radio communications. Also shown are the hangars, workshops, administration buildings, living quarters, and sports grounds and other recreational amenities of the station.

The item is of particular interest because it is so constructed as to give a complete bird's-eye view of an Air Force station. Owing to the size of many stations to-day their complete layout is often impossible to appreciate when visiting them.

The model represents the beginning of the general theme of the R.A.F. stand, which offers a representative collection of radio and radar equipment used by the Air Force. The equipment being shown is indicative of the extent to which the Royal Air Force relies upon the radio industry to produce dependable radio equipment able to withstand Service conditions at great altitudes and at very low temperatures and pressures.

[Stand No. 74]

Allan Radio, Richard, Ltd.

A MOST comprehensive range of extension speakers and record players may be seen here. The trade mark "Bafflette" is widely featured. Probably the most interesting exhibit is the Bonnie "Bafflette."

A new high-fidelity console (the "Bafflette" Prestige) has been specially produced for Radiolympia and has not previously been seen. Price £13 19s. 6d. [Stand No. 49]

Armstrong Wireless & Television Co.

IN line with the most recent T.V. developments the Armstrong Company have produced a television chassis incorporating a R.F. amplifier and three I.F. stages on both vision and sound, with a highly efficient interference limiter circuit and 12in. cathode-ray tube. Designed primarily for the export market, the latest standard range of Armstrong radio chassis now includes the following models: EXP 125/2—14 valve all-wave; RF 103/3 and EXP 103—10 valve all-wave; and EXP 83/2 (A.C.) and UNI 83/2 (A.C./D.C.)—7 valve all-wave. All chassis are supplied with either a 10in. or 12in. speaker of good design.

The whole chassis layout is most accessible for

servicing. As an example, all the coils, together with radio and gramophone switching, trimmers and padders, are made in one compact unit which can be detached and a spare unit fitted in a matter of minutes. Incidentally, for those who use a pick-up in conjunction with their radio receivers,

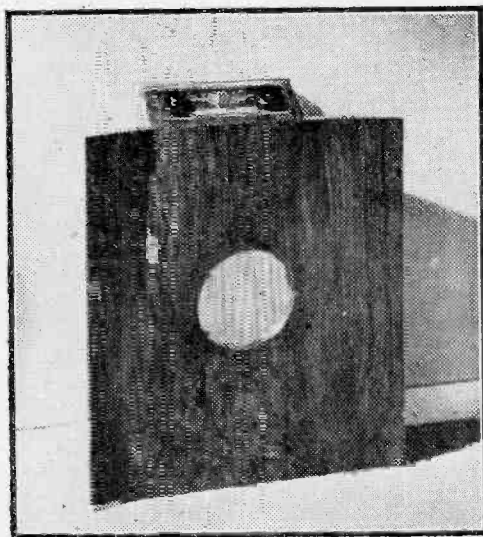


Model A.122.M. Murphy receiver designed for quality reproduction. Note the novel cabinet shape.

these chassis are particularly suitable for this purpose owing to the high-fidelity push-pull output. [Stand No. 92]

British Rola, Ltd.

THIS year's British Rola exhibit at Radiolympi includes a complete range of permanent magnet speakers from 3in. to 12in. diameter and also a completely new range of speakers—the

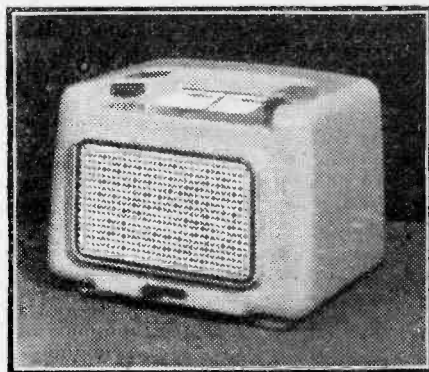


Another original idea in the Murphy range. This is Model A.146.

"K" series, employing a shrouded magnet structure. As a result there is virtually no magnetic leakage, which renders these models especially suitable for television receivers. Of particular interest is the new oval speaker Model K 46, a unit which fills a long-felt want in the television field. [Stand No. 87A]

Celestion, Ltd.

THE exhibit includes a complete range of permanent magnet loudspeakers from 2½in. to 18in. diameter. Several of these models are entirely new. All models are completely dustproofed and are especially treated to render them suitable for use in tropical climates. A range of extension speakers, complete in cabinets of attractive design and which are most pleasing to the eye, are also to be seen, the prices ranging from 39/6 to £6 15s. [Stand No. 87]



A neat table receiver in the Mullard range—Model MVS.271.

The Chloride Electrical Storage Co., Ltd.

THE Exide and Drydex batteries displayed are representative of the wide range available, which includes Exide accumulators of the "Mass" type, "Multiplate" type and "Hycap" ranges in glass containers, and unspillable and semi-unspillable cells in celluloid containers. Also on view is the new Exide JSP 2 non-spill radio accumulator in a moulded container made of polystyrene, a modern, transparent, acid-proof plastic.

Drydex high-tension and grid-bias batteries, suitable for every battery-operated radio set, are included in the range, which embraces plug-in types specially produced for all-dry radio receivers and the lightweight Drydex layer-type batteries. [Stand No. 19]

Collaro, Ltd.

WELL-KNOWN gramophone motors and record changers are featured on this stand, the latest model being the R.C. 500, which consists of a rim-driven turntable designed for simplicity and reliability at low cost. It is a non-mixing model with only three adjustable parts and accommodates either nine 10in. or nine 12in. records. It may be obtained with four types of pick-up. The price is £7 10s. with either crystal or high-fidelity pick-up with silent stylus needle, or £8 with high-fidelity pick-up

with permanent sapphire needle. Both these prices exclude P.T. [Stand No. 61]

Dubilier Condenser Co. (1925), Ltd.

IN addition to well-known condensers and resistors, some new items may be seen on the Dubilier stand. These include the new Type "Q" volume controls—only 15/16in. in diameter and rated conservatively at $\frac{1}{4}$ watt. At the moment these are available only to manufacturers. Miniature metalised paper condensers in a range up to .003 μ F.



This playing desk is by the makers of the popular Connoisseur pick-up.

with working voltages up to 350 and over .003 μ F. and up to .01 μ F. for 150 volts; a diode filter consisting of two condensers and a resistor in a single small case are also two of the new lines which may be seen. [Stand No. 82]

Dynatron Radio, Ltd.

AS manufacturers primarily of radiogramophones, the present range is planned to be continued with various small improvements concentrating on the Ether Conqueror. It is interesting to note that this company has been honoured with a further order from H.M. Ministry of Works for 24 Ether Conqueror radio gramophones for British Embassies and Consulates throughout the world. The previous 25 were extremely well received, and were selected by the Ministry after very careful tests. [Stand No. 2]

Edison Swan Electric Co., Ltd.

TELEVISION is the main theme of this exhibit, and, in support of this, pride of place on the stand is given to a large, semi-circular theatre, capable of accommodating 100 persons comfortably, in which demonstrations of the B.B.C. Television Programmes are given on 15in. cathode-ray tubes. An unusual feature of interest to technicians and laymen alike is that the control room of the theatre is open to view, so that visitors may see the apparatus—normally used for experimental and development work—which operates the cathode-ray tubes in the theatre.

As a comparison there are displayed chassis of modern television and radio receivers illustrating the compact current design and showing the functions of the various types of valves and tubes employed. As a further comparison chassis of electro-medical and industrial electronic equipment are displayed, together with a number of Mazda special purpose valves, including beam power

amplifiers, ionisation gauges, photo-electric multipliers, tetrodes, etc. [Stand No. 47]

Erie Resistor Ltd.

THE various types of resistor familiar to constructors and the trade are to be seen here, and amongst the new products is a stud potentiometer which has many advantages over the ordinary type of wafer switch with its attendant array of fixed resistors. Other new items are fully insulated ceramicons, combined components (resistors and capacitors in one case), and a new car suppressor intended to screw into the distributor head or coil. This component has a value of 5,000 ohms. [Stand No. 86]

Ferranti Ltd.

THIS exhibit is a comprehensive range of table, console and radiogram receivers for mains A.C., A.C./D.C. and battery operation. The receivers are in plastic and wooden cabinets and include a transportable model with built-in aerial, also models fitted with a switch selection pre-tuning device to give automatic reception of two stations, in frequent use, on the medium wave-band. [Stand No. 43]

Gramophone Co. Ltd.

THE H.M.V. exhibits include luxurious radio and television receivers and record reproducers embodying every possible modern refinement; a special combined instrument providing first-class entertainment from television, radio and records; a model for reception of F.M. transmissions; the Model 1807 television receiver, etc. etc.

The export market is exceptionally well catered for by "His Master's Voice" as is evidenced by the many models shown.

For the special convenience of those visitors



An amplifier to suit the Connoisseur pick-up, to be seen on Stand No. 207.

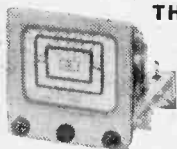
who are particularly interested in models for export, the "His Master's Voice" stand is so constructed as to have a top floor exclusively devoted to these instruments. This will enable such visitors to have an unhindered view of the H.M.V. export range. [Stand No. 57]

Hale Electric Company Ltd.

PRODUCTS of this company, under the name Etronic Radio, include three table models, a radiogram and television receivers. The radiogram
(Continued on page 439.)

FOR THE UTMOST REALISM FROM RECORDS & RADIO

LISTEN-IT'S A GOOD SOUND JOB



THE R.A. TUNING UNIT

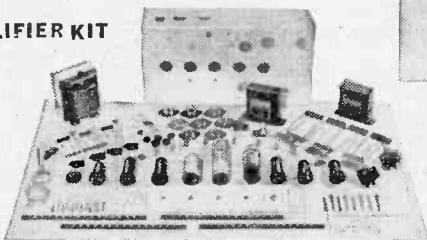
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THE K.I. AMPLIFIER KIT

The K.I. Kit is undoubtedly the best high fidelity amplifier kit available at the price. Absolutely complete, very simple to construct, the performance matches up to the high standard reached by moving coil pickups. We recommend either moving coil pick-ups or miniature moving iron types, such as the Connoisseur, which may be used without the transformer.

Price 13 Gns.

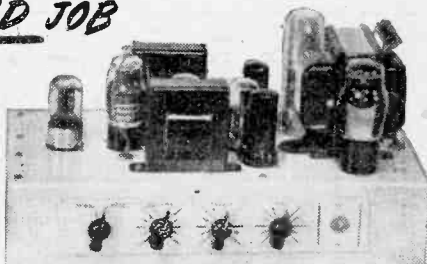
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THE K.I. AMPLIFIER

This seven-valve amplifier, designed for the lightweight high fidelity type pick-up, is proving the real answer for the music-lover who seeks a high standard of reproduction at a moderate cost.

Independent bass and treble controls permit compensation for recording losses and reduce needle scratch. Tetrodes with negative feed-back ensure negligible distortion.

Price Complete 17 Gns.

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(2 years guarantee)

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Don't risk failure and disappointment by using components of poor quality or of incorrect type. The "Somerford" range of Transformers and Chokes offers you the choice of 203 specialised types—a type for every need for radio and television receiver construction.

You should obtain this new catalogue which gives you complete details of every type, enabling you to choose just the component most suited to your needs.

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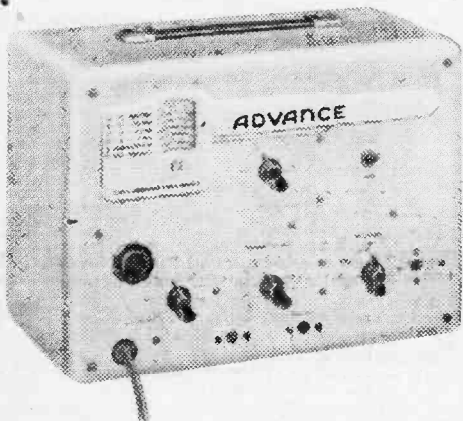
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Vision in Design

The ADVANCE Signal Generator

(Type E2)



The Advance Signal Generator Type E2 has been designed with an eye to future developments in the Radio and Television fields. Its wide range of frequencies—from 100 Kc/s to 100 Mc/s on fundamentals—caters for the rising frequency requirements of modern radio and communications. It is a fine example of 'Advance' design and manufacture.

This generator offers an instrument of laboratory standard at a price within the reach of moderate purses. The remarkably high frequency accuracy of $\pm 1\%$ extends over the whole range.

SEND FOR FULLY DESCRIPTIVE LEAFLET.



Range : 100 Kc/s-100 Mc/s in 6 bands.
 Frequency : Guaranteed within ± 1 per cent.
 Output : Approximately 1 volt unattenuated and variable from $1\mu\text{V}$ to 100 mV into a 75-ohm load through a matched transmission line.
 Stray Field : Less than $3\mu\text{V}$ at 100 Mc/s.
 Illuminated Dial : Total scale length, 30in.
 Power Supply : 110, 210, 230, 250 volts; 40-100 c/s.
 Dimension : 9in. high x 13in. wide x 8in. deep.
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ADVANCE COMPONENTS LTD., BACK RD., SHERNHALL ST., WALTHAMSTOW, LONDON, E.17.
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MIDGET MAINS TRANSFORMER. 3in. high x 2 1/2in. x 3in. Primary : 200/230/250 v. Secondaries : 250-0-240 v. at 50 m.a., 6.3 v. at 1.5 amps., 0-4.5 v. at 2 amps., 24/-.

HEADPHONES. S. G. Brown, type "F." High impedance, 31/-.

"BATHTUB" CONDENSERS. 0.1 mfd. 1000 vw. and 0.5 mfd. 600 vw. 9d.

OIL-FILLED CONDENSERS. Aerovox. 2 mfd. 600 vw., with mounting clip, 2/3.

VALVES. EF50, 7/6. VR75/30, VR150/30, 12/6. 5R4CY, 7/6.

C.R. TUBES. VCR97. Short persistence. Ideal for TV. Complete with base, 39/6, plus 5/- carriage and packing.

CRYSTAL DETECTORS. Permanent and semi-permanent types, 3/6. "Cats Whisker" type (less crystal), 3/-. Packet containing crystal and cats whisker, 9d. Silicon diodes, 3/-.

CRYSTAL-SET COILS. Boxed with circuit. M.W. only. 2/3.

MORSE KEYS. Practice type. All parts in brass on polished wood base. 3/3.

VARIABLE CONDENSERS. Midget. 75 pf., air-spaced, 2/6. 20 pf., air-spaced, with long spindle and knob. 3/-.

HEADPHONES. Balanced armature type. 600 ohms impedance. Ideal for crystal receivers. 5/9.

BAKELITE SHEET. 4in. thick. 6in. x 4in., 2/5; 6in. x 6in., 3/-; 8in. x 6in., 3/7; 10in. x 6in., 5/-; 12in. x 6in., 5/10; 10in. x 6in., 4/2.

ALUMINIUM CHASSIS. With reinforced corners and provision for fixing bolts. 8in. x 5in. x 2 1/2in., 6/2; 10in. x 6in. x 2 1/2in., 8/3; 12in. x 8in. x 2 1/2in., 8/11; 14in. x 9in. x 2 1/2in., 9/6; 10in. x 8in. x 3in., 9/8; 12in. x 8in. x 3in., 9/2; 14in. x 9in. x 3in., 11/5.

MULTICORE SOLDER (ERSIN). Small packets, 1/- each; 1lb. packets: Red, 14 S.W.G., 7/6; Green, 16 S.W.G., 6/-.

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6-VALVE SUPERHET

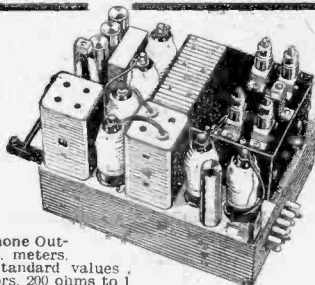
Receiving Unit of the TR1196 which covers 4.3 to 6.7 m.c.s. Among the many useful components are : 1 pr. standard I.F. Transformers (460 kc/s), Iron Dust Cores, 2.1 mfd. 500-volt working Condensers; 4.1 metal tubular Condensers; 1 MIC Transformer; 1 Phone Output Transformer; 2 Pot. meters, 10 Fixed Condensers, standard values, more than 2 doz. resistors, 200 ohms to 1 megohm; 6 International Octal Valve Holders; 2 tar Boards; 1 Yaxley Switch; 4 pre-set .0001 Condensers and Tuning Coil; Steel chassis, size 8 1/2in. x 6in. x 2 1/2in.

Less Valves, 10/-

EX - R.A.F. AMPLIFIER 1134. Ideal for use with a microphone, or can be used as an amplifier without modification. Complete with wooden transit case. Post free, 18/9.

NUTS, BOLTS, WASHERS, small sizes for model making. Three gross assorted, 7/6.

MAINS TRANSFORMERS, 350-0-350, 80 ma., 6.3v. and 5v. drop thru' type, 260-0-260 60/70 ma., 6.3v. and 5v. also drop thru' both types, 14/6 each, plus 1/- postage.



With Valves. Circuits and modification details for normal Broadcast 29/6 Receiver. Plus 2/6 packing and ins.

CHOKES, 10h. 70 ma. 4/6 each; 10h. 250 ma., 9/6 each. **1.4V. VALVES,** 1S1, 1S5, 1R5, 1T4, at 6/3 each or set of 4, 24/-.

8 MFD. CONDENSERS, 450 volt working. Post free, 1/9 each.

16 MFD., 450v., 2/8 each. **8 x 16 MFD., 450v., 3/6 each.** **25 MFD., 25v., 1/- each.**

H.V.U. 1 E.H.T. RECTIFIER. Post free, 8/-.

HT BATTERIES—super capacity. Made for Govt. Perfect HT 120 volts. Post free, 5/9

Write to Dept. "R" **INSTRUMENT CO.**
 244, HARROW ROAD, LONDON, W.2.

(Continued from page 436.)

covers a 15- to 50-metre band in addition to the normal medium and long waves, and has an internal plate aerial. The record changer is intended for eight 10in. or 12in. records.

[Stand No. 68]

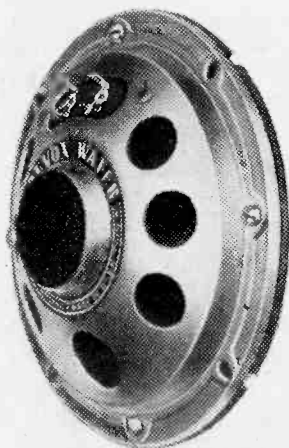
The Lowther Manufacturing Company

MAIN feature shown here is a moving coil pick-up fitted with diamond or tungsten carbide reproducing point. This pick-up has been described as "the pick-up of our age," due to its very many fine features and in particular its most outstanding performance, giving finesse of reproduction hitherto unknown, great reduction of record wear and the constant performance due to the polished diamond styli.

P.M.2 speaker drive unit is introduced on the stand, superseding the P.M.1, which is probably the highest flux density unit available, 19,500 lines average, fitted with the improved rematched Voigt light coil diaphragm for 15 ohm load.

P.W.1 corner reflector type speaker is maintaining its position in the place of the full Voigt corner domestic speaker (which is only available for export) and together with the P.M.2 offers an extremely high standard of electro-acoustic efficiency and fidelity at a very moderate price.

[Stand No. 165]



Modern loudspeakers are being produced with very small overall thickness. This "wafer" by Truvox is a good example.

Marconiphone Co., Ltd.

A WIDE and varied selection of high-quality products are exhibited by the Marconiphone Company.

These include television receivers incorporating the new aluminised Emiscope tubes for brighter pictures, autoradiograms, table radios and radiograms and, what is possibly the smallest set in the show, the Marconiphone personal radio, which weighs but 4 lbs. complete with batteries. In addition, a varied selection of Marconiphone export models are to be seen. These are specifically designed for efficient operation in all climates.

[Stand No. 48]

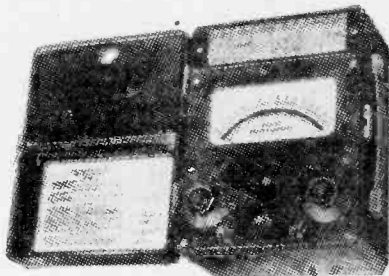
McMichael Radio Ltd.

HERE will be seen a comprehensive and outstanding range of models at prices which will attract considerable attention.

The Home and Light programme identification featured on Models 491AC and 492AC console will have good selling appeal, as will the twin speaker and frame aerial feature of Model 498U.

The success of the Model 485 radio gramophone and the general approval of the appearance of the cabinet with the double-lid feature has influenced the makers to continue this model for a further period under the new number, Model 495.

Model 493 all-dry battery portable receiver and



One of the Sangamo range of test instruments.

the electric record reproducing unit are recent introductions and will continue unchanged.

Models 491U and 494 battery aerial receiver call for special attention in D.C. and battery set areas and represent outstanding value.

[Stand No. 70]

Metropolitan-Vickers Electrical Co., Ltd.

AMONG the specialised equipment shown on this stand is the Seascan unit, comprising a transmitter-modulator box which consists of a magnetron unit giving a wavelength of 3 cm., an aerial unit which has been designed to withstand all climatic conditions, a motor alternator equipment which generates a special repetition frequency, and a main display unit or console from which the entire equipment is controlled.

By incorporating an auxiliary display unit the display can be reproduced in any other part of the ship, e.g., the chart room, or lounge for the interest of passengers. The ranges are the same but are infinitely variable between 50 yds. and 27 miles.

A film record has been made in the S.S. Empire Doric (by courtesy of Continental Line Transport Ferry Service) of a voyage from Preston, Lancashire, to Larne, Northern Ireland. This film will be played back through the display to enable visitors to see an actual radar picture.

[Stand No. 179]

Mullard Electronic Products Ltd.

ON Stand 36 Mullard are showing a comprehensive range of radio receivers for both the home and export markets, and two television receivers. Audio amplifiers for export are also included.

Stand No. 210 is devoted to the display and demonstration of valves, tubes and components for setmakers. These include A.C. and A.C./D.C. ranges on octal and B8A bases, and a range of 1.4-volt miniatures on the B7G base specially intended for use in battery-operated personal receivers and compact portables. Valves are also shown for use in car radio receivers.

Included in the group of valves for audio amplifiers is a new low hum input pentode EF37A. This valve, which retains the well-known high gain and low microphony characteristics of the EF37, should prove of particular interest in the design of sound-on-film and sound recording equipment and all other equipments in which the amplifiers are required to operate at low input levels.

Phase splitters and mixers, power amplifiers, rectifiers and photocells are also included in this group together with a selection of sub-miniatures having low filament currents specially designed for use in hearing aids. [Stands Nos. 36 & 210]

Oldham & Sons Ltd.

THIS exhibit includes a comprehensive range of batteries for use in home and outdoor broadcast receivers, V.H.F. communications, and aircraft radio, including lead acid accumulators housed in celluloid and glass containers; dry H.T. batteries of standard and lightweight construction; and dry L.T. and grid bias batteries. [Stand No. 218]

Philco (Gt. Britain), Ltd.

RECEIVERS on this stand will include a new all-dry battery portable of outstanding design and performance, two wavebands (medium and long), automatic volume control, built-in high-efficiency loop aerial specially designed to bring in the maximum number of stations. It is housed in a streamlined plastic cabinet with retractable handle, is extremely lightweight and the 5in. diameter permanent magnet speaker is specially engineered for higher output on less current. The medium waveband covers the proposed new wavelengths.

What is claimed to be a startling innovation in the development of A.C./D.C. receivers has been incorporated in Model B. 2,806—inasmuch as the dangers and disadvantages of "live" chassis have been eliminated. [Stand No. 39]

Pilot Radio Limited

AMONG the receivers on this stand are the "Pilot Jack" and new television console Models CV34 and CV35. These models are an addition to the range and do not supersede any particular models.

The latest version of the Little Maestro—the "Little Maestro" Model 10—was released last April and has now superseded the old Little Maestro. It has a new and improved cabinet design, and is manufactured in brown bakelite and in colours of powder blue, pastel green and peach at the new competitive price of £12 19s. 6d., tax paid for the brown model, and £13 5s. for the coloured versions. This receiver now features twin-scale tuning as against the single scale incorporated in the old Little Maestro, which is now out of production. The Little Maestro de luxe, of course, continues as before. [Stand No. 45]

Portogram Radio Electrical Industries, Ltd.

CONSOLE radiograms with automatic changer and playing desks are the main items here, in addition to television units as described elsewhere. Another feature of the exhibits are the

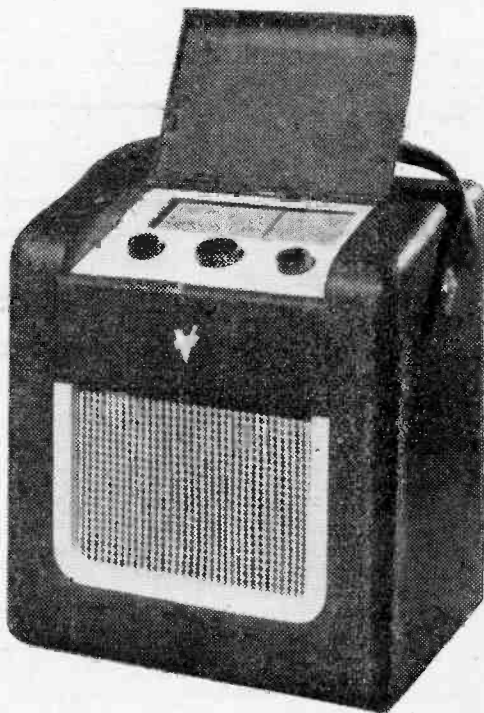
Portogram long life gramophone needles for standard pick-ups and high fidelity needles. [Stand No. 99]

The Telegraph Condenser Co., Ltd.

FEATURED on the T.C.C. stand are the various types of fixed capacitors as used in radio and television receiving and transmitting equipment, in paper, mica, ceramic and electrolytic constructions. Ranges of tropical and super-tropical pattern, many of which are miniaturised, bearing their by now familiar trade names, Metalmites, Metalpacks, Lectropacks, etc.; within the miniature range are capacitors for use in hearing aid equipments and personal portable type receivers. Recently developed "Plastopack" plastic film capacitors are shown, and these are for use in counting circuits and other allied computing devices where stringent conditions also demand long time constants. They have an I.R. in excess of 250,000 meg./ μ F at 20 deg. C., whilst their power factor being .0002 is equal to the best-quality mica. [Stand No. 75]

Wharfedale Wireless Works

HERE is a range of speakers from 3½in. up to 15in. A high-flux (13,000 lines on a lin. pole piece) model for high quality with horn loading is designed for use with crossover networks. A special reflex cabinet may also be seen and will appeal to the quality enthusiasts. [Stand No. 215]



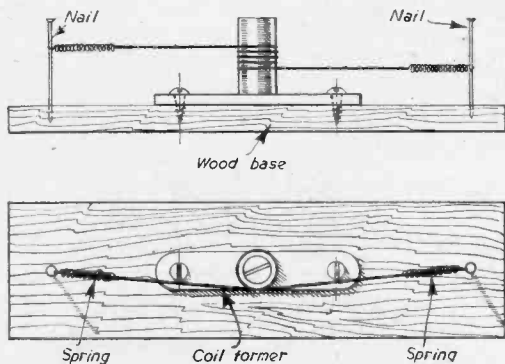
One of the new Vidor portables which can be seen on Stand No. 69.

Practical Hints

Coil Winding

SOME constructors find difficulty in winding coils for television on the small Aladdin coil formers, and I have found the following idea most useful in this connection—with even very thick wires.

The former is secured to a piece of wood as shown in the accompanying illustration, and two nails are fixed at a distance of approximately 2in. from the former. A weak spring is attached to each nail, and before



A simple way of winding small coil formers.

winding the coil the wire is tied to one spring. The coil is then wound with the spring in tension.

After the necessary number of turns have been wound on the coil, the wire is tied to the other spring which is first put in tension.

A coat of "Durofix," "Denfix," or similar adhesive is then painted on the coil and left to dry, after which it can be taken off the wood and mounted in the apparatus without fear of the wire slipping off.—R. C. HART (Croydon).

Rotary Aerial

A CHEAP and easily constructed 2-metre rotary dipole or beam may be made by using an old cycle pedal for the rotor mechanism. Welded electric light conduit or dural should make a tight fit, or be threaded to the cycle-pedal thread. Brackets of wood, or iron, are fixed to the window frame and to the gutter barge-board. Sizes will be those suitable to clear the gutter, but the lower bracket should not be more than 18in. horizontally.

Various methods of rotation will suggest themselves to constructors.

My own is a "Heath Robinson" arrangement

THAT DODGE OF YOURS!

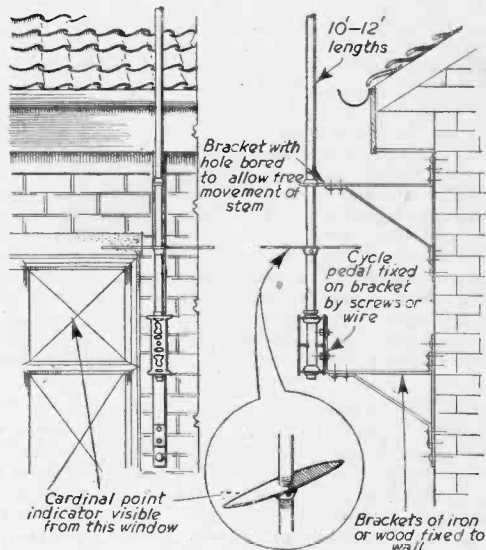
Every Reader of "PRACTICAL WIRELESS" must have originated some little dodge which would interest other readers. Why not pass it on to us? We pay half-a-guinea for every hint published on this page. Turn that idea of yours to account by sending it in to us addressed to the Editor, "PRACTICAL WIRELESS,"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

SPECIAL NOTICE

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

of right-angled electric light conduit that will turn approximately 180 degs. and can be clamped by sandwiching it between the bottom of the window sash and frame. This meets my case as the window is never closed. The lead-in will be individual taste. It can be taped to the stem and taken in via the barge-board, etc.

The two rough sketches of front and side elevation, make, I think, the fundamental idea clear.—W. T. ROWELL (S.W.19).



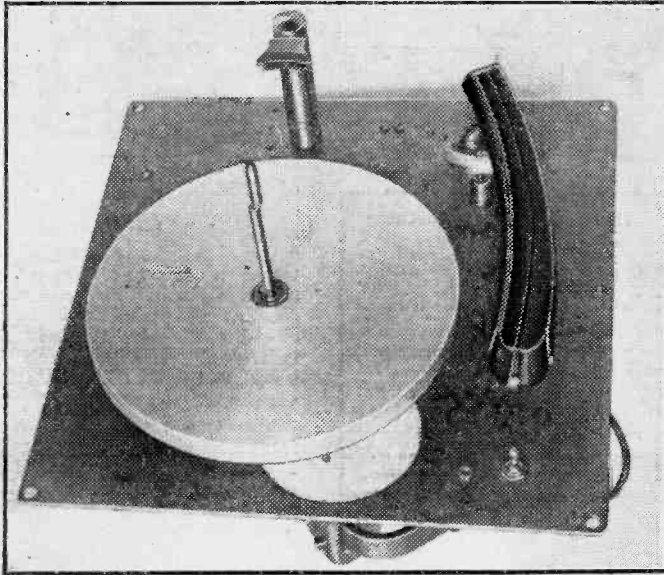
A rotatable dipole aerial hint.

Test-meter Tip

WHEN using a test meter—either home-made or a commercial model—misleading readings are sometimes obtained due to contact resistance. Most meters are provided with crocodile clips, and if these are just slipped over the ends of the circuit or component being measured they may make poor contact. A simple test will show what is needed. Take an ordinary (high accuracy) resistor, set the meter to read resistance values and clip the leads to the ends of the resistor. Note the reading. Now press tightly the ends of the clips so that the teeth pierce the copper leads on the resistor. A different value will be shown. So always make certain that the clips are tightly clamped on the leads or circuit under test.—J. FLOYD (Highgate, N.).

Making a Re

Constructional Data for an Automa
By H.



The completed auto-changer.

record on the turntable and replacing the pick-up in the starting groove.

When the automatic record changer here to be described was designed it was obvious that certain restrictions would have to be borne in mind if the design was to be sound. In the first place all the parts would have to be made in a small workshop without special equipment. Cost, reliability and a mechanism which would treat a fragile, expensive record with respect were also points of importance.

The plans were drawn up and the changer constructed and found to fulfil all these conditions. The tools available consisted of a small lathe,

WHEN the needle of a gramophone pick-up is placed in the starting groove of a record and allowed to play the record to its end a certain cycle of operations must be performed before another record can be played.

To do this by hand is a relatively simple matter, but when a machine must be designed to perform the operation it will be realised that a rather complicated device will be the result.

During the past 20 years or so various mechanisms have appeared on the market designed to perform the operation of lifting a gramophone pick-up off a record which has been played, placing another

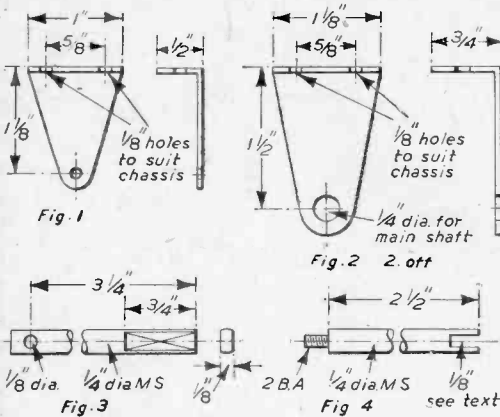


Fig. 1.—Lifting arm bracket. Fig. 2.—Bearing bracket. Fig. 3.—Lifting arm. Fig. 4.—Lifting spindle.

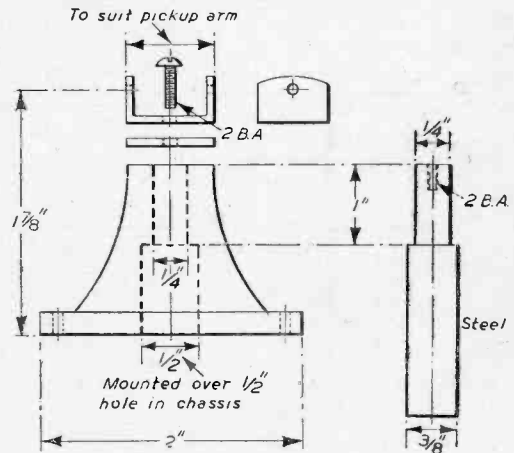


Fig. 5.—Pick-up arm pillar and spindle.

portable electric drill, bench and vice and a collection of various small tools.

The two most expensive items are the electric gramophone motor, used to drive the turntable and the changing mechanism, and the pick-up. In the writer's case both these items were on hand, being taken from an ordinary record player and modified as explained later. Nowadays all records are standard within limits. The average size of a 10in. record is 9.910in., with variations of plus or minus .015in., and therefore it can be said that if the mechanism is well made and adjusted to play one record then the cycle of events will be repeated

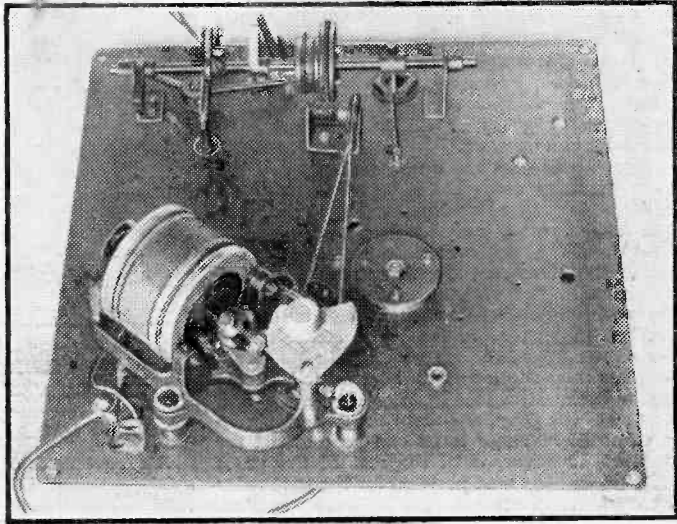
Record Changer

Changer for Eight 10-inch Records
 CK

indefinitely. Proof of the gentle treatment given to the records during the playing and the changing cycle will be seen from the fact that no records have ever been chipped, cracked or broken.

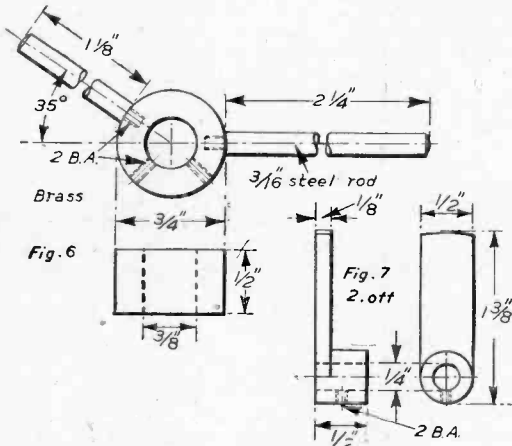
Operation

To understand the operation involved in playing eight records automatically a step-by-step description of the cycle will be given so that the constructor will be aware of the functions of the various components. When loading up the changer one record is placed on the turntable and seven others piled together and placed *en masse* on a pillar supporting the outer edge of the records and a spindle supporting the centre of the records at a distance of $2\frac{1}{2}$ in. above the turntable. At the



Underside view of the changer.

pick-up be allowed to swing to a point above the starting groove, and it will be realised that this can only be achieved by careful timing of the mechanism. This is not a difficult matter, however, and the design allows for this adjustment. If the adjustment is set correctly the pick-up will swing in to a point $\frac{1}{8}$ in. inside the outer edge of the record and will then descend into the starting groove. Immediately the needle point enters the groove the pick-up is completely disconnected from the changing mechanism and it is impossible for the mechanism to prevent the needle from following the groove and thereby damaging the record. The pick-up is now free to play the record until it once again enters the eccentric and the cycle is repeated. No provision is made for stopping the turntable automatically when the last record has been played, as it was felt that the addition of such a luxury was unnecessary where simplicity of design was one of the main considerations. If one remembers the uppermost record when the changer is being loaded one is aware when the programme is finished. If not, the last record simply repeats itself.



Figs. 6 and 7.—Swivel arms and swivel links.

centre of a modern record is an eccentric groove of approximately $3\frac{1}{2}$ in. dia. with a lead-in groove from the actual playing groove. Therefore as the turntable revolves the pick-up is led into this eccentric and it is this action applied to a trip mechanism which starts the changing cycle. Once the cycle commences it will not stop until another record is on the turntable and the pick-up is in the starting groove, but before this record can be allowed to drop on to the turntable the pick-up must lift clear of the former record and swing to a distance outside the record edge. Not until the next record to be played has dropped can the

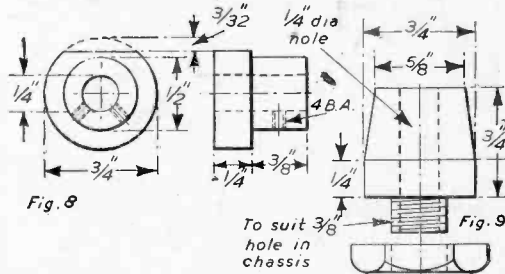


Fig. 8.—Lifting cam. Fig. 9.—Lifting spindle guide (brass).

The Chassis

All the components are mounted on a chassis of plate steel or sheet iron measuring 14in. by 14in. and at least $\frac{1}{8}$ in. thick. Strength is important here, for it must be remembered that the chassis must carry the weight of eight records at its centre without sagging or distorting when supported at the four corners.

Trim and square up the edges and prepare the surface for marking out. The dimensions given are for an Amplion pick-up measuring 7 $\frac{13}{16}$ in. from pivot to needle point, and if it is proposed to use a pick-up with a different dimension here the position of the pivot on the pick-up arm should be altered accordingly. Where an existing pivot pillar is used the holding-down holes can be drilled to suit, but the height of the pivot centre above the chassis must be 2in.

Two other modifications may be required to suit existing material, the motor mounting holes and the position of the gear drive from the motor spindle to the turntable. These holes can be omitted for the moment, however, until the rest of the parts are mounted and the best position for the particular motor used ascertained.

The Changing Mechanism

With the chassis so far drilled a start can be made on the parts for the changing mechanism. The bearing brackets can be made and bolted to what will be the underside of the chassis and a $\frac{1}{2}$ in. dia. mild steel spindle 9 $\frac{1}{2}$ in. long, polished

and trued up in the lathe, can be mounted between them, the brackets being lined up so that the spindle revolves freely. Make two collars to be used later to take side thrust on the spindle and prevent it "walking about."

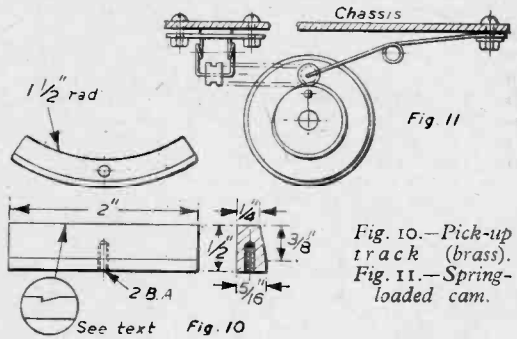


Fig. 10.—Pick-up track (brass).
Fig. 11.—Spring-loaded cam.

A start on the other parts to be mounted on the spindle which is the main driving spindle can now be made. The driving shaft makes one revolution to complete the changing cycle, the drive being through a friction drive which takes the form of a disc of rubber sandwiched between two brass plates. The back of one of the plates has a specially designed boss, which must be carefully made to the specifications given. This boss has a grub screw for attaching the unit to the spindle, as well as a cam and a stop, the purpose of which will be seen later. Four more items are mounted on exactly the right position in the final assembly, but at the moment it is only necessary to make sure they are a nice sliding fit on the shaft. These items are the record-release cam, pick-up lifting cam and two pick-up swivel links.

Modify the pick-up-arm pillar, or, better still, make a new one from suitable material. Mild steel will do, but brass is easier to machine and finishes better. The diagram is self-explanatory, but it is emphasised here that the centre spindle must be a free fit in the pillar but without shake or end play. The $\frac{1}{2}$ in. hole in the pillar should preferably be reamed out. With the pillar mounted on top of the chassis the centre spindle should be exactly over the main driving spindle. To complete this part a bush is needed to be a sliding fit on the centre spindle and having a grub screw and two arms mounted as shown. These arms connect the pick-up to the swivel links previously mentioned and cause the driving spindle to swing the pick-up out and in again during the changing cycle.

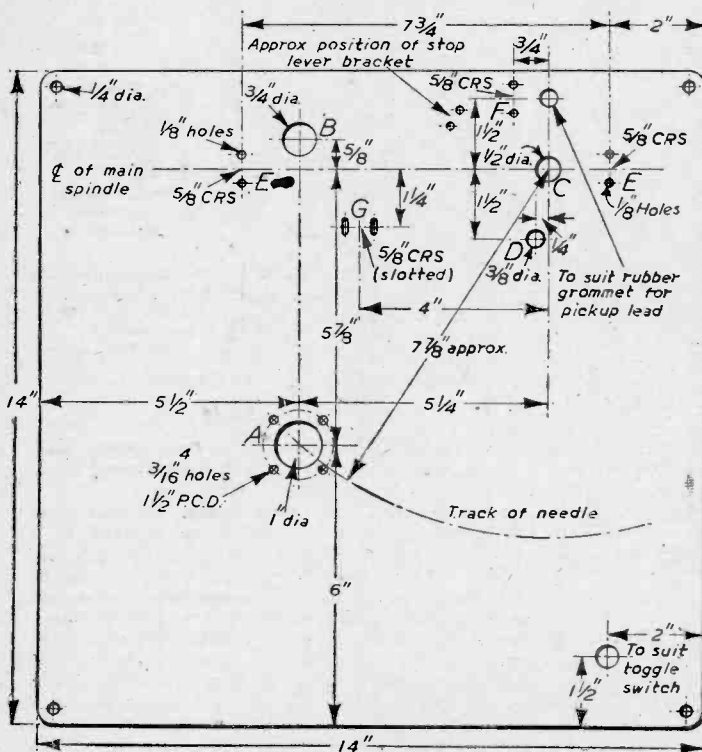


Fig. 11(a).—Base plate details.

Mention has been made of the pick-up lifting cam, and this mechanism can now be made and assembled. Start with the lifting spindle guide; machine as shown and attach it to the chassis with the nut underneath. Then make the lifting arm bracket and bolt this to the underside. The lifting spindle is a piece of mild steel $\frac{1}{16}$ in. dia. screwed 2 B.A. at one end and a sliding fit in the guide. This spindle supports the track upon which the pick-up swings, and a few remarks about the making of this track will perhaps be of interest here. The writer had on hand a piece of brass that would bore out to 3 in. diameter and turn up on top

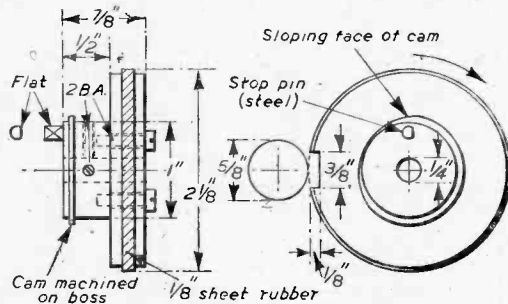


Fig. 12.—Friction drive and trip mechanism (brass).

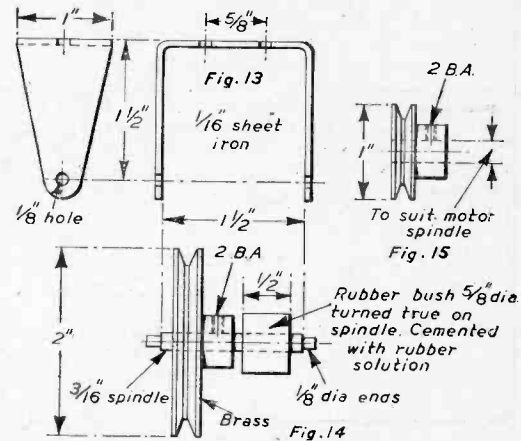
to $3\frac{1}{2}$ in., and when this was done and the ring thus formed faced off to $\frac{1}{2}$ in. a bevel was turned on the top diameter and a 2 in. portion of the ring cut out, thus giving the shape shown in Fig. 10. This method of making the track is rather wasteful of material, however, and a suitable track could be made from a piece of $\frac{1}{16}$ in. brass sheet $\frac{1}{2}$ in. wide and a little over 2 in. long and bent to shape. Instead of the track being screwed on to the lifting spindle a slot would have to be cut in the top end nearly $\frac{1}{2}$ in. deep and the track placed in the slot and riveted in position. To complete this part make the lifting arm as shown and attach it to the lifting arm bracket with a hinged joint. The easiest way to do this is to use a $\frac{1}{16}$ in. Whitworth set screw $\frac{1}{2}$ in. long with a small washer threaded on first, then the lifting arm followed by another washer and a nut screwed on just far enough to allow a little side play in the lifting arm. The rest of the screw can then be threaded through the $\frac{1}{16}$ in. hole in the bottom of the bracket and another nut screwed on and tightened up to the bracket. When the arm is swung parallel with the chassis the two flats at the opposite end to the joint should be exactly under the lifting spindle guide. If this is not so rectify by altering the position of the bracket on the chassis. If the misalignment is small there may be enough movement in the bolt holes to swivel slightly. If not, the only way is to elongate the holes in the bracket with a round file.

Assembly

The whole of the pick-up operating mechanism is now ready for assembly. With the pick-up pillar mounted on the chassis slide the bush with the two arms on to the centre spindle, which will be protruding from the underside of the chassis. As the arms on the bush are not opposite each other it will be obvious that it can be mounted two ways. The correct way is with the short arm pointing

towards the nearest main driving shaft bracket and the long one pointing towards the outer edge of the chassis. If the long arm points towards the centre of the chassis the bush is the wrong way up. Slide the bush up the centre spindle so as to keep it out of the way for the moment and tighten the grub screw. Now mount the pick-up swivel links and the lifting cam on the main driving spindle. The correct order for the items is shown in Fig. 31, but before placing the spindle through the bearing bracket swing the lifting arm so that it is between the chassis and the spindle. With the shaft in position the lifting arm will now be resting on and at right-angles to it. The lifting cam can be set in its position under the lifting arm and tightened on to the spindle so that as the spindle is rotated the lifting arm rises and falls. The action of the arm is conveyed through the lifting spindle to the track, and as the track is directly under the pick-up arm at all times it is clear that the pick-up will also rise and fall. A slot is cut in the bottom of the lifting spindle to correspond with the two flats on the lifting arm to prevent the track turning in the guide, but this must not be cut until the turntable has been mounted and the correct level to which the track must drop ascertained.

The action of the swivel links can be tested if desired. As a trial tighten the links on the driving spindle at points about $1\frac{1}{2}$ in. either side of the pick-up centre spindle and at 180 deg. to each other. Rotate the spindle so that one link is straight up and the



Figs. 13 and 14.—Secondary motion spindle and bracket. Fig. 15.—Motor pulley (brass).

other one down, and then lower the two arms previously mounted on the centre spindle to a point about $\frac{3}{16}$ in. below the top of the link and tighten. If the spindle is now revolved it will be seen that as one link pushes against an arm the centre spindle, and therefore the pick-up hinge mounting, will turn until the link slides under the arm. As the other link is carried round it will also come against the other arm, and the centre spindle will turn in the opposite direction. This action will occur once for every revolution of the driving spindle, and at the same time the lifting arm will be elevated and lowered.

(To be continued)

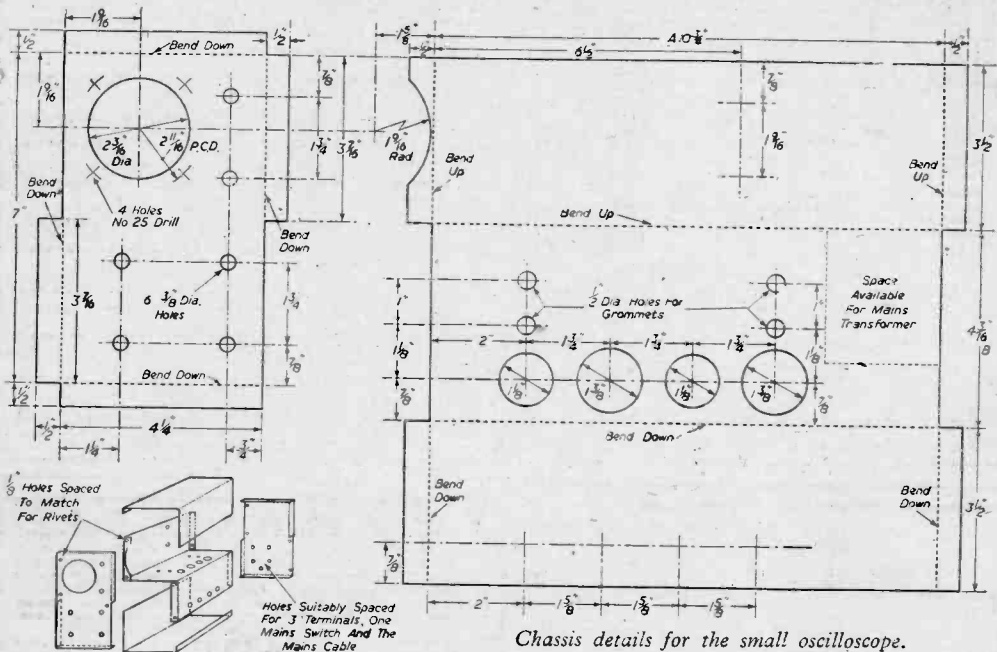
A Small Oscilloscope

Further Details of This Test Instrument, and Chassis Construction Data

By P. D. BETTERIDGE

A NUMBER of requests have been received for more details of the test instrument described in the September issue under this heading. Several readers have pointed out a circuit defect in the theoretical diagram which apparently leaves

required. The front and back have the same overall dimensions. The holes, of course, are different and the flanges bent the opposite way. The position of the holes in front is quite critical in order to make the oscilloscope as small as possible, and



Chassis details for the small oscilloscope.

the final anode without H.T. The line which comes from the junction of the two 100 k. resistors and goes down to the two 1 MΩ resistors feeding the X and Y plates should be continued on to the line running from the final anode to the switch. In other words, the final anode is joined to the junction of the two 100 kΩ resistors across the H.T. supply.

Chassis

Quite a number of readers have asked for details of the chassis and cover. A study of the photographs gives the general shape of the chassis and the size depends very much on the components available, especially the mains transformer which must go immediately behind the cathode-ray tube. However, to help those who wish to construct this piece of apparatus, the dimensions of the chassis used in the prototype are given in the accompanying drawings. If the transformer is larger than that shown in the photographs, the dimensions labelled A and B may have to be increased. It is therefore advisable to have all the components to hand before constructing the chassis.

The piece of 18 gauge aluminium quoted in the list of components is used to build up all the parts

they are placed to take the medium-sized potentiometers. The front mounting and the Mu-metal screen for the C.R. tube were purchased with the tube. The Mu-metal screen is essential for good results and also serves to support the tube; the front mounting is very neat but other means can be adopted if it is unobtainable. The front carries, as well as the tube, the coarse and fine frequency controls (underneath the tube) and brilliance, focus, Y shift and X shift, from top to bottom and to the right of the tube.

The back carries three terminals and the on-off switch. The mains lead also comes out at the back. The position of these items depends, to some extent, on the size of the mains transformer and the choke, and should be decided in conjunction with these components.

Layout

The main part of the chassis carries the valve holders, etc., and reference to the photographs will show the disposition of the various components. All the resistors and capacitors, with the exception of the electrolytics and 2 μF, are mounted on a

(Continued on page 449.)

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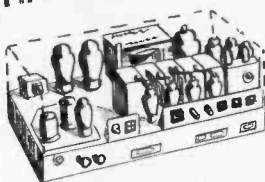
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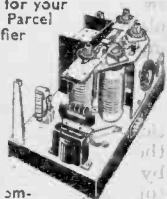
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T.V. AERIALS can be made from ex-R.A.F. DINGHY MASTS. These measure 9ft. when extended and 3 in. diameter at thick end; each section tightens up to make perfect electrical joint. Ideal for indoor or portable T.V. aerials. Price 8/6 each, 15/- for two.

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CONVERTERS AND FREQUENCY CHANGERS
VALRADIO LTD., 57, FORTRESS ROAD, N.W.5 Gulliver 5185

(Continued from page 446.)

suitable tag board which is fixed in the orthodox fashion to the underside of the valve platform. On the side bent down from this valve platform is mounted, from front to back, the sweep synchronizing potentiometers, the two-way three-pole switch to select from direct connection to the Y plates to the grid of the amplifying valve, and the input gain potentiometer. On the side bent up from the valve platform is mounted the C.R. tube by means of the Mu-metal screen.

The front and back are riveted to the main portion with $\frac{1}{16}$ in. aluminium rivets countersunk on the outside for neatness. The top cover is fixed by means of round-head screws tapped into the top flanges of the back and front. The bottom is

fixed in a similar way. The best screws to use for this are the self-tapping variety because of their depth of thread, but if these are not available 6 B.A. round heads are quite satisfactory. When the case is complete and before the components are assembled get it sprayed with a coat of cellulose to match your other apparatus. If you cannot get it sprayed, paint it carefully with a brush. It is possible to get labels engraved at such places as jewellers, instrument makers, etc. If this is not possible print the titles carefully on the back of a visiting card, cover them with clear model aeroplane dope and stick them in position. A strip of leather attached to the top with 2 B.A. screws, washers and nuts makes the apparatus reasonably portable.

Extension Viewing Units

A SURPRISE at Radiolympia was provided by A. C. Cossor, Ltd., who introduced a device to enable extension viewing screens to be fitted to any make of television set.

In 1946 it was realised that some means of extending the number of viewing positions would be a desirable feature of television. Originally it was intended only that the new receivers should work from one particular domestic set, but later a large amount of development work was undertaken to enable the extension unit to operate from any form of domestic receiver.

Further, in order that any television service engineer could easily install the system without modifying the parent set, consideration had to be given to developing a device which could be fitted without alteration to the master receiver. Basically this requires the transference of the vision and sound signal to the remote point. The sound transference could follow the well-established technique of extension loudspeakers with the proviso that the sound level should be adjustable at the remote point.

There is only one common point of connection that contains the full video information in any make of television receiver, and that is the electrode of the cathode-ray tube which modulates the electron beam, and therefore this is the source that feeds any extension system. Unfortunately there is no universal method of modulating the tube and some manufacturers choose to modulate the cathode, and others the grid. As the phase relationship of these two electrodes is different by 180 degrees it is essential to provide some means of introducing this phase shift in the extension device. Further problems arose with the relative sensitivities of the various C.R. tubes in current usage. Some require a modulation voltage of only 8 volts to produce a fully modulated picture whilst others require as much as 40 volts.

Due to manufacturers' desire to reduce the price of television sets to the public, some firms produced receivers that were A.C./D.C. operated which eliminated any possibility of obtaining power from the parent set to operate any part of the supplementary unit. This also introduces the possibility of the A.C./D.C. chassis being live to earth and

therefore any extension of either sound or vision must be completely isolated from the parent set.

Obviously one criterion was that the introduction of an additional receiver should in no way affect the quality of the picture presented on the parent set, and that the two or more screens should be individually controlled.

The Solution

The extension receiver consists of the following units:

1. Permanent magnet loudspeaker with manual volume control.
2. Power supply circuits for the time base valves, video stages, cathode coupling unit, and cathode-ray tube.
3. Line and frame scanning generators.
4. Synchronisation separation circuits.
5. Video and phase reversal valves.
6. Cathode coupling unit that is attached to the back of any domestic receiver.

Items 1-4 inclusive follow normal television technique. Item 6 demands the use of one valve and as this stage must be as close as possible to the parent receiver, so that it does not alter the picture quality of the parent set, its power supply must be provided over the connecting cable to the extension screen. Further, the unit must be capable of accepting signal amplitudes varying from zero to 40 volts to deal with the various makes of receivers, together with the synchronising pulses. This necessitates a frequency compensated device that will not introduce any frequency distortion or phase shift over a band some 3-4 Mc/s wide.

Readers may be interested in trying to work out some solutions to these problems, and fuller details of the new unit will be given in our next issue.

REFRESHER COURSE IN MATHEMATICS

By F. J. CAMM

8/6, by post 9/-

Radio Amateurs' Examinations

The 1949 Test Paper and a Report on the Results

IN order that prospective transmitting amateurs may gain some idea of the standard required by the G.P.O. Examinations, we again give the full Test Paper set in May last. The City and Guilds of London Institute have reported on this Examination and their report follows the paper:

All questions should be attempted. Use should be made of diagrams where applicable. The maximum possible marks obtainable is affixed to each question.

1. What steps should be taken in the design of a transmitter to minimize the risk of interference to broadcast and television reception?

Indicate what special precautions can be taken to reduce radiation of harmonics. (20 marks.)

2. What types of message may be exchanged with other amateur stations? For what purposes is the use of the station prohibited? (15 marks.)

3. An alternating voltage of 10 volts at a frequency of $\frac{5}{\pi}$ Mc/s is applied to a circuit of the following elements in series:

(i) A capacitance of 100 pico-farads.

(ii) A non-inductive resistor of 10 ohms.

(a) What value of inductance in series is required to tune the circuit to resonance?

(b) At resonance, what is the current in the circuit? (15 marks.)

4. Discuss the advantages and disadvantages of a tuned radio-frequency and a superheterodyne receiver for amateur reception on the 14 Mc/s band. (10 marks.)

5. State the essential difference in the operation of a triode valve as a detector and as an amplifier. Explain the meaning of the terms "amplification factor" and "impedance" of a valve. (10 marks.)

6. Describe three methods commonly used for coupling transmitters to aeriels and discuss the relative merits of each type of coupling. (10 marks.)

7. Describe a method of obtaining the high-tension supply for an amateur transmitter from alternating current mains. Include particulars of the smoothing circuit. Illustrate your reply with a diagram. (10 marks.)

8. What do you understand by "over-modulation"? Describe a simple modulation meter and explain how it is used to indicate depth of modulation. (10 marks.)

Report on the Papers

The following general report is given on the papers as a whole and is not necessarily applicable to the work from individual schools.

Year	No. of Candidates	No. of Passes	No. of Failures	Percentage of Failures
1949	Home 885	628	257	29
	Overseas 13	8	5	38.5
1948	Home 685	519	169	24.5

The general standard of candidates' work in the 1949 Radio Amateurs' Examination, both technically and the manner in which the questions were answered, was fairly high. Practically all questions

with the exception of No. 3 (calculation) were attempted by the candidates. The fact that a large number of candidates did not attempt this question accounted for the slight percentage increase of failures this year as compared with 1948 when the percentage was 24.5. A report on the questions follows:

Question 1 (transmitter interference): Fairly well done by most candidates.

Question 2 (types of messages): Very well done by practically all candidates.

Question 3 (calculation): This question was attempted by approximately 60 per cent. of candidates, a small number of whom obtained correct answers to part (a) while a fair number answered part (b) correctly. It was observed that some candidates who attempted part (a) did not use the indices method of calculation and became confused with the handling of unwieldy quantities.

Question 4 (receiver): Well done by most candidates.

Question 5 (valve): The first part of this question was well done by most candidates while the second and third parts were fairly well done. With regard to the latter part of the question, a number of candidates gave the D.C. instead of the A.C. resistance of the valve.

Question 6 (aerial coupling): Fairly well done by most candidates.

Question 7 (H.T. rectifier): Very well done by all candidates.

Question 8 (modulation): First part of question fairly well done by most candidates. Very few answered the second part correctly.

Voice of America

VOICE of America broadcasts in Europe were strengthened beginning on September 1st with the addition to their relay facilities of a new high-powered, medium-wave relay station, located at Munich, Germany.

The new station is designed to provide a powerful medium-wave relay for Voice of America programmes into all parts of Europe, including European Russia and the satellite regions. It thus augments the present coverage of these areas by the short-wave relays of the "Voice."

The new transmitter started its schedule by relaying "Voice" programmes for 12½ hours daily during the peak listening hours in Europe. In other hours, it will be used to supplement the broadcasts of the Armed Forces network in Europe which has a large local audience in addition to its G.I. listeners.

The new station has a power of 150 kilowatts, which is considerably increased in terms of effective radiated power through use of special aerial and other technical improvements.

The new transmitter operates on 1,195 kilocycles, 251 metres, and relays Voice of America broadcasts each day from 3.30 p.m. G.M.T. to 4 a.m. G.M.T.

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TRANSFORMERS. Foster 100 watt for soil warming, 230 volts, 50 cy. input 50 volts 2 amps., output double voltage, 151-. B.T.H., 230/250 volts 50 cy. input 2 volts 20 amps. and 75 volts 6 amps., with 15 taps, 451-.
Lighting Plants. Villiers 550 volt 18 volt 30 amps. with switchboard for direct lighting or battery charging, £22 10s. Chore Horse, 12 volt 300 watts, with Switchboard, £17. Send for list of Lighting Plants, A.C. and D.C.

Suds Motor Pumps, 400/1440 volts 3-ph. 50 cy. 116th h.p., 240 g.p.h., 15ft. head, £4. 112th h.p. 10ft. head, 600 g.p.h., £3. 1/2 h.p. 200 or 400 volts 3-ph. 50 cy., 1,425 r.p.m., 10ft. head, 600 g.p.h., £8 10s. 1/2 h.p. 200 volt A.C. Motor Pump, 10ft. head, 1,425 r.p.m., £10.

Compasses. Binnacle Boat Compass, Liquid Model, in housing with glass window, 40/-, carriage 3/6.

Meter Movements. D.C. moving coil; two movements in iron case, two 5in. scales 0-2,000 and 0-2,500 or 0-2,000 and 0-4,500 amps. without shunts, 75 millivolts, 15/- each, carriage 5/-.

PARCEL OF BRASS. Instrument Parts, pillars hex. stop, pins, and tubes, 1 gross each, 5/- per parcel.

Telephone Dials, 10 piece G.P.O., as new, nickel finish, 7/6. Selector Units, 2/6.

Motor Blowers. Keith Blackman, 24 volt D.C. 1/2in. motor with blower, 5in. inlet and 5in. outlet, 55/-, carriage 5/-.

MAGNETS. New Swift Levick S.L.S. 36 instrument type, machined and drilled, circular horse-shoe 1 1/2in. x 3/4in. thick, 3in. polar gap, drilled pole pieces weight 2 oz., lift 3lb., 2/6 each or 12/6 for six. Aln Disc Magnets 3/4in. dia. 3/8in. thick, 3/16in. centre hole, 3/6. Flat Bar Magnets, 2 1/2in. x 1in. x 3/4in., 1/- pair.

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Illustrated leaflet of these cabinets is available.

AMPLIFIERS. 12-watt Universal Kit at £8/5/-. Components for our 4 1/2-watt A.C. and 5-watt Universal amplifiers are available separately if desired. Full details and illustrations upon request.

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BLUEPRINTS of the following receivers are available at 2/6 each:

T.R.F. RECEIVER, A.C./D.C. mains, 3 valves, plus rectifier, medium and long waves.

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PERSONAL PORTABLE RECEIVER. Three midget valves, T.R.F. design, medium wave.

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MOVING COIL MILLIAMMETERS. 2 1/2in. square case, flush fitting, 0-50 mA., 7/6. 2in. round flush fitting with panel fixing ring, 10/6. Postage either type, 9d. New Radio Publications, Television Servicing Manual, 4/9 post free. Radio Valve Encyclopaedia: a right-up-to-the-minute work containing data on over 14,500 U.S.A. British, Services and European Receiving, Transmitting, C.R. Tubes, etc. Price, 42/- Post 1/-.

POWER UNIT TYPE 3. A high-grade unit operated from 200-250v. A.C. Mains, with outputs of 220 v. at 70 mA. D.C. and 6.3v. at 4 A. (A.C.). Designed for use with the R1132 or 1481, but quite suitable for most communication receivers. Made for rack or bench mounting. Panel size 19 x 7ins. Depth over dust cover, 11ins. Fitted with 0/300 voltmeter and 0/150 milliammeter. Two section filter gives high degree of smoothing. In good condition and perfect working order. Price, 24 4s. Carriage, 6/-.

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9in. television masks (Sorbo) rubber manufacturers type, 4/6 each. 4 mfd. 1,000 v. working condenser, 2/9 each or 3 for 7/-. Pye plugs and sockets, 9d. per pair.

Resistances assorted 1/4, 1/2, and 1 watt, 50 for 7/6.

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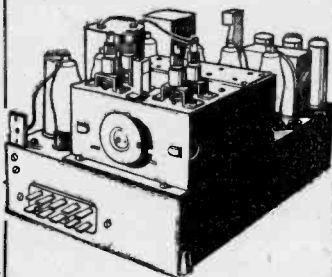
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CO-AXIAL CABLE 75 OHMS. Suitable for all Television purposes. 8-12 yds.

NEW EX-GOVT. AMPLIFYING PANELS, with 3 IT4 valves. 15/- Extra Valves, 5/- each.

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Programme Pointers

Our Critic, MAURICE REEVE, This Month Discusses the Signature Tune and Some Third Programme Items

BEING, perhaps, the only person who not only loathes the signature tune but also considers them, with an exception or two here and there, quite redundant and nothing but a nasty effusion of noisome, noxious notes. I was interestedly optimistic when I saw Mr. Sam Heppner's article, "This Business of Signature Tunes," in the *Radio Times* of August 5th.

Apart from making the shattering statement that the signature tune is now "an integral part of radio, developed from a variety of sources," Mr. Heppner did little but catalogue famous signature tunes, past and present, giving the origins of some and the reasons for others. As to the reason why they should be "an integral part of radio" he fails to touch on. Stating that he "is sure many listeners are frequently exasperated by hearing the same tune again and again without being able to fit a name to it," it should have been perfectly easy for him to find a name collectively suitable to the whole lot of them, followed by the case, unanswerable, and in a tenth the number of words he actually used, for their immediate and irrevocable abolition.

"Wagner had something to do with it; and so had Albert Whelan," is the opening sentence of Mr. Heppner's article. I know naught of Mr. Whelan, but quite a deal about Mr. Wagner, who had quite a lot to do with many things, but, I can assure Mr. Heppner, nothing connected with signature tunes. Mr. Heppner, who knows this, of course, as well as I do, refers to the famous Wagnerian "leitmotiv," the device by which the entry of the characters or the recurrence of the subjects, such as the Rhinegold or Wotan's magic spell, etc., in a Wagner music drama, are preceded by a theme of such pregnancy and character that they are of equal fame and potency in the concert hall, entirely divorced from their verbal and scenic context, as they are in the operas themselves.

But I do suggest, with all respect, that few things on the radio, especially in the Light programme, carry the weight or dignity of the events and characters of a Wagner opera; consequently they cannot require the same importance attached to their entry on to the boards. However, lest Mr. Heppner should consider I lack a sense of humour, I hasten to add that I see the funny side of his clever simile.

The signature tune of "Woman's Hour" is, of course, charming, and in a class of its own (by the way, it wasn't specially written). So is the little fantasia on the Bells of St. Clement's—of which I notice a new version is now being used—which ushers in the Light programme at 9 a.m. But of most of the others, let us say with Bottom: "I have a reasonable good ear in music, let's have the tongs and the bones."

Third Programme

THERE was a magnificent concert by the Vienna Philharmonic Orchestra, with Edwin

Fischer, solo pianist and conductor, from the keyboard in two concertos, and from the rostrum in Mozart's Prague Symphony. The concertos were Mozart's in C Minor and Beethoven's in G. What a programme! Not all of Mr. Fischer's playing was of equal excellence; the slow movement sounded more like a catchy, jumpy little tune, so short were the semiquavers, rather than the ravishing melody it actually is. But he was ideal in the Beethoven. As conductor he brought out all the nobility of the symphony.

Another excellent Third item was a fascinating and well-delivered talk on the "Sources of Shakespeare's Plays," by Mr. G. Isaacs. Leaving Bacon out of it—Mr. Isaacs never mentioned his name—it is amazing the number of sources Shakespeare did have recourse to, not only for whole plots, but for scenes, characters and even words. As a layman on the subject, it was entirely news to me that he actually re-wrote large sections of other peoples' work. Thus, in "The Troublesome Reign of King John"—printed in 1591, author not named—occur the lines:

Let England live but true within itself,
And all the world can never wrong her state.

* * *
If England's peers and people join in one,
Not Pope, nor France, nor Spain can do them wrong.

Re-written by Shakespeare they read:

This England never did, nor never shall,
Lie at the proud foot of a conqueror,

* * *
And we shall shock them. Nought shall make us rue.

If England to itself do rest but true.

Lines of talent substituted for lines of genius. The former unknown to all but the bibliophile and the Shakespearean scholar; the latter known to all and sundry. This was one of many examples Mr. Isaacs gave; another was how he wrote "As You Like It" from Lodge's novel, "Rosalynde;" and all about his delvings into Plutarch, Holinshed, etc., and, above all, of his debt to Marlowe, "his rival and his master." "... had it not been for the Jew of Malta there would have been no 'Merchant of Venice'—and no balcony scene from 'Romeo and Juliet': had there been no mad scene in 'Tamburlaine' there would have been no madness in Ophelia." The magic of Shakespeare cannot be dimmed by this sort of analysis, it lies in his incomparable choice and use of words, unmatched by any other master.

"Celestial Fire"

THE play "Celestial Fire," by Gerald Tyrell, and adapted by the author, is an interesting story of the matrimonial entanglements and other affairs of the heart of a group of people engaged in crucial operations against the enemy in the Battle of Britain. But its powers of conviction

were rather deflated by some glaring errors of military etiquette. Commanding officers do not "strafe" and personally insult their subalterns in the presence of "other ranks"—at least there are plenty of means of redress should it so happen. Neither do officers offer to pay their mess bills by cheque or cash, whichever's most convenient, old boy. This is a bad habit with English films. I have often had the excitement and tension of a thriller completely deflated by being told that the villain, say, is escaping to Scotland, but being shown him, by the camera, furtively boarding a train at Waterloo. Or, perhaps, scenes will show the movements of people, whose actions, according to the story, have taken place within seconds of each other, photographed by the camera with the shadows of high noon and evening respectively, and, in at least one instance, completely different clothes as well. In the film "I Lived in Grosvenor Square," the villain's escape journey was in three entirely different trains on different systems, though his journey was only from somewhere in Hampshire to London.

Chopin's F Minor Concerto

I SO ELINSON is a very brilliant pianist and he showed up to the highest advantage in Chopin's F minor Concerto with the Northern Orchestra under Charles Groves. On the other hand, Maura Lympny was very ill advised to essay the Brahms in B flat at the Proms. She was clearly out of her

depth, which was all the more pity as she had scored a notable success only the previous week in the Saint-Saëns in G minor.

"The Planets"

I WONDER how Gustav Holst's suite, "The Planets," will fare at the hands of posterity. Its brilliance and effectiveness are beyond question. Personally, I enjoyed it immensely, on records in a Sunday morning Prom, magnificently recorded by Sir A. Boult and the B.B.C. Symphony. One marvels at the dazzling virtuosity of the orchestration, and Holst's ability to paint tone pictures is amazing. The work could well take the place of Tchaikovsky's Fifth for five years. Anything these days which grows on us rather than palls is welcome for that reason alone, if for nothing else.

"Nights in the Gardens of Spain"

ANOTHER Sunday morning Prom record I cannot forbear to mention is Clifford Curzon's "Nights in the Gardens of Spain," by de Falla. What a beautiful pianist Curzon is, easily our foremost native product. He has everything.

"The Guinea Pig," Chetham-Strode's very successful educational poser, was effectively adapted and produced by John Richmond. Should we prefer 'Arrow to Heton? Or ought we to remain content at 'Ammersmith. Mr. Chetham-Strode interestingly discusses the problem without actually solving it.

News from the Clubs

THE BRIGHTON AND DISTRICT RADIO CLUB

Hon. Sec.: L. Holden, 17, Hartington Road, Brighton.

THE club transmitter (G3EVE) should be on the air by the time this appears in print. Members will be looking for 'phone and C.W. QSO's on 40 and 80 metres. Activity will be confined to club meeting nights (Tuesdays). Several outside visits have been paid by parties of members to such places of interest as the G.P.O. and R.N.V.R. H.Q. More visits are planned. The October programme includes a talk and demonstration on television by Mr. R. Moores, and an account of 70 cms. activity by G3BEX.

LUTON AND DISTRICT RADIO SOCIETY

Hon. Sec.: E. Radford, 37, Wilden Avenue, Luton, Beds.

THE club is now in its third year. Membership, 40. Meetings every Monday night, 7.30 p.m., at Surrey Street School.

SDLHULL AMATEUR RADIO SOCIETY

Hon. Sec.: G. Haling, 121, Bradbury Road, Olton, Birmingham.

ALTERATIONS and decorations are almost complete at the new headquarters, and an all-wave transmitter is now in course of erection. The Programme Committee are now drawing up a record programme for the coming winter, hoping to cater for all tastes. A workshop, complete with all tools, is now at the disposal of members.

New members and visitors are welcome at S.A.R.S., c/o Tucker Switches, Ltd., King's Road, Tyseley, Birmingham.

STOURBRIDGE AND DISTRICT AMATEUR RADIO SOCIETY

Hon. Sec. (G8GF): W. A. Higgins, 28, Kingsley Road, Kingswinford, Staffs.

MR. BUTCHER, of R. and A. Laboratories, Wolverhampton, recently gave an excellent talk on "Moving-coil Loud Speakers."

Mr. Butcher described and illustrated how responses were altered with various diaphragms. Members are visiting Daventry B.B.C. station early in October.

It is proposed to hold an amateur radio exhibition in December.

READING RADIO SOCIETY

Hon. Sec.: Mr. F. Hill, G2FZ1, 997, Oxford Road, Reading.

RECENTLY Mr. Shaw, of the General Electric Company, Ltd., gave a talk on the subject of Plastic Tape Recording. Considerable insight was given into the method of manufacture of the recording tape, and into the design of the recording and play-back apparatus. A demonstration of a new commercial model recorder concluded the meeting.

At the Instructional Section of the Society, Capt. Benbough talked on the subject of Circuit Draughting, after which Mr. F. Ruddle gave a practical demonstration of metal working for radio constructors.

Later Dr. Lemon gave a description of the method of operation of super-regenerative receivers, in connection with a talk on the design of receivers for a V.H.F. D.F. Field Day to be held on October 2nd.

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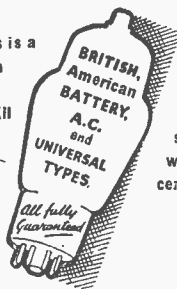
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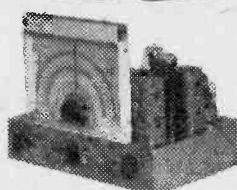
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The Editor does not necessarily agree with the opinions expressed by his correspondents. All letters must be accompanied by the name and address of the sender (not necessarily for publication).

Disc Recording Equipment

SIR.—I was interested to read your article on Recording Equipment in the August issue of PRACTICAL WIRELESS.

On page 318 you state that "in this country only one main type of direct-cut disc is available. This is the M.S.S.-Watts disc. . . ."

You may be interested to learn that E.M.I. Sales & Service, Ltd., Domestic Recording Equipment Division, market a large range of lacquer recording blanks, under the trade name of "Emidisc."

As the marketing policy of these products has only recently been finalised, I have not yet had an opportunity of issuing this information. I should, however, like to assure you that you will be kept informed of any developments in connection with these or any other of our new products.—P. O. WYMER, Press Relations Officer, E.M.I. Sales & Service, Ltd.

Peculiar Faults

SIR.—Recently I came across a set with a peculiar fault. The set behaved quite normally, and would have continued to do so had there not been lightning about. It was a three-valve, plus rectifier, and the fault took the form of an unwontedly vigorous reaction to the static of the lightning discharges. It literally coughed when a burst of static came along, the speech coil of the speaker moving a full half-inch backwards and forwards, and causing the speaker fret to vibrate violently. As there was imminent danger, of the speaker doing harm to itself I immediately switched off and put on my thinking cap.

The set had no reaction control, and to do the designers justice it picked up the stations quite well. But the conclusion I came to was that the set was working just below the oscillation point, and that a burst of static caused it to spill over for the duration of the static. I substituted the voltage-dropping resistor to the detector valve for one of higher resistance and increased the value of the decoupling condensers. This I accomplished in about an hour, and as the static was still about, as shown by another set, I switched on the troublesome one. It now behaved normally as regards static, and its distance-getting qualities were only slightly reduced. I wonder how it would have behaved in its former condition with a really close thunderstorm.—WM. NIMMONS (Belfast).

Small Oscilloscope

SIR.—Your article on a small oscilloscope prompts me to write to you about the design.

The mains transformer which is used could, I believe, be simplified. My suggestion is to use 4,000 turns only on the H.T. and E.H.T. winding with a tapping at 2,000 turns. The extra load on the H.T. winding would be very small and much time would be saved. I also feel I should pass some comment on the trouble experienced by G. P. Jones. I also had the same sort of trouble. I found, too, a small condenser in various positions extremely useful in improving quality, etc. After a little thought I put the trouble down to R.F. instability and I bypassed it with a small condenser across the speaker transformer primary. This is not the only position it can be used in, though—a small condenser wired across the detector anode to earth, works wonders in removing whistles in many T.R.F.s. Another addition is a small resistor (say 4.7 K.) in series with the anode load—the output being taken from the junction of the two resistors.—J. HOLMES (Pontefract).

Home-made Television Receiver

SIR.—I am a newcomer to the television field. Six months ago I purchased a R1355 unit with RF26 and RF25 units. At my distance, which is 185 miles from A.P., it looked hopeless, and people thought that I was mad in trying to get pictures. With the help of several friends and loads of patience I succeeded. The RF26 will tune in to A.P. if all the trimmers are screwed in bar the oscillator. The RF25 unit is used as a pre-amplifier. The time bases are Miller integrator feeding into a VCR97 tube, all made up from a 184A unit.

Very often it is a week before I obtain any picture or even hear any pulses, but even an intermittent picture is better than none at all. My aerial is a standard H 40ft. above sea level. There are several amateurs around here and most are getting results. So I would say to all intending constructors "Have a bash."—NORMAN A. HOUGH (Widnes, Lancs).

SIR.—Reference the letter from Kenneth A. Peel, of Sevenoaks. I can explain the difficulty with the VCR97 which gives a "cut off" each side of the picture.

This defect is confined to one particular make of VCR97 which has a narrow neck and it seems that the deflector plates are not far enough apart to give a complete raster.

This unsatisfactory make of tube can be identified by the fact that it has two very thick rubber bands round the neck, no doubt so that the mu-metal screen will fit.

I am using a converted R3170A and am getting excellent results with a wire-cage dipole in my loft.—J. A. SMITHERS (S.E.9).

"A Peculiar Fault"—G. P. Jones (E.17)

SIR,—May I submit the following explanation of the fault experienced by your correspondent as described in your September issue.

From the diagrams it would appear that the 6J5 is used as a detector as such there will be a R.F. component of anode current producing a R.F. voltage on the anode. This is giving rise to feedback through the inter-electrode capacity between anode and grid of the 6J5.

The feed-back current is finding the lowest impedance to earth through the tuned grid circuit of the detector. In taking this path a PD is produced across it the phase of which is such as to tend to damp out the signals.

Including the condenser C in the output circuit, in both cases shown, provides a lower impedance path to earth for R.F. than that which is presented by the inter-electrode capacity for the valves.—J. FLINN (Whiston).

Condenser-type Speaker

SIR,—Some time about 1935 I purchased a condenser type speaker called the "Primustatic" which was about 2ft. wide and about 18in. high, made of pleated metal foil with a backplate of perforated sheet metal with a waxed paper insulation between. This was fairly sensitive and had a very fine top-note response, but as I allowed frequencies too low for it to handle safely to reach it, the metal foil gradually broke away at the connecting points. This, as far as I know, was the only snag.

In view of the fact that most fans are now "high note conscious," I feel that this type of speaker would form the subject of some interesting experiments and have been surprised not to have seen any reference to it for many years. It is possible, of course, that there are very sound reasons why this type of speaker is not used but I have not seen any quoted, except lack of sensitivity. The type I had was sensitive and would be very easy to make at home (patents permitting).—S. BECKER (Bushey).

BC454

SIR,—I have purchased a BC454 receiver which I have converted to operate as a car radio, using 12-volt dynamotor for H.T. The set works well, but only if the chassis is connected to H.T. positive.

As my car body is connected to H.T. negative the receiver must not touch the car body or a direct short takes place.

As I wished to bolt the receiver in the luggage compartment and use a metal remote flexible drive

for tuning, etc., the amount of insulating which I will have to do seems rather excessive.

Can any reader tell me whether it is normal for this receiver to operate with a positive chassis and also whether it is feasible to alter it to work with a negative chassis.?—J. R. MURCH (Horley).

Pentagrid v. Triode-hexode

SIR,—I have gained a lot of useful information and tips from your pages, and should like to pass on the results of some experiments with a view to finding other constructors' reactions. I have a home-made superhet, built on rather experimental lines, but with an efficient circuit. The frequency-changer stage is efficiently wired and was originally fitted with a triode-hexode. During the course of some tests I replaced the valve with a pentagrid which had similar base connections. With the particular valve used there was a remarkable increase in short-wave performance, but medium and long waves remained unaltered—at least no noticeable change in volume or selectivity. Being interested, I found some more valves in my spares box and plugged in a pentagrid of another make but with similar base connections. With this the results were just the opposite—the short-wave performance was markedly inferior, but I could get more stations on the medium waves. Can any reader explain this, and has anyone tried out the interchangeability of pentagrids and triode-hexodes, etc.?—J. LOCKE (Edgware).

Correspondent Wanted

SIR,—I would like to correspond with any short-wave enthusiast of my own age, which is 15, either in this country or abroad.

I would like to take this opportunity of congratulating you on producing such a helpful and useful magazine.—C. LAVIOLETTE, 4, Borthwick Castle Place, North Middleton, Midlothian.

TRANSFORMERS AND CHOKES

(Continued from page 432.)

necessary) to wind the primary first and the secondaries on top, but due to the fact that the primaries of the current transformer consist of so few turns it is more convenient to reverse the order and wind the primaries on top.

The construction shown in Fig. 12 and the method of fixing the single 5.0 amp. turn is clearly shown in the diagram. It is important that the beginnings and ends of all windings come out at the same side of the transformer, otherwise there will be an error of half a turn, which in the case of the 1 amp. winding would be 10 per cent.

The core is placed in the same manner as the mains transformer, but even greater care should be exercised here to ensure that there are no air gaps in the core.

Warning

A current transformer should never be left with the secondary open circuited and current passing through the primary. In this condition the secondary voltage will rise to a very high and even dangerous level, with consequent risk to life and limb; in addition, the transformer insulation may break down.

Impressions on the Wax

Review of the Latest Gramophone Records

THE FORGOTTEN RITE," by John Ireland, was given at a Promenade Concert some seven years ago and was deeply appreciated: since then its appearances in concert programmes could be counted on the fingers of one hand. Its recording under the auspices of the British Council, on *H.M.V. C3894*, by the Hallé Orchestra, conducted by Sir John Barbiroli, is exceedingly welcome. Composed in 1913, this piece was inspired by a visit to the Channel Islands. The title is only a vague indication of the music. Every note of "The Forgotten Rite" is an essential part of the design. The composer has recently celebrated his 70th birthday, and this issue does something to remind us of the high quality of his achievement.

Eugene Goossens' "Oboe Concerto" was composed for his brother, the famous oboist, and published in 1929. The work is in one movement and, after a few preludial bars, the soloist enters with a graceful theme over sustained harmonies for the orchestra. Designed especially to show off the brilliant playing of the composer's brother, Leon Goossens, the concerto should be heard with the great oboist himself in the solo part. This satisfaction is now to hand in the two excellent records—*Columbia DX1578-9*—made by Leon Goossens, with Walter Susskind and the Philharmonia Orchestra providing the richly-scored background.

Of interest this month is a complete recording of Verdi's "Un Ballo in Maschera" (The Masked Ball) on 16 double-sided and one single-sided record—*H.M.V. DBS9075-81, DBS9082, DB9083-91*. This important issue gives a complete version of an opera which counts as one of Verdi's most successful efforts. Sung by soloists of international reputation—Gigli, Pasero, Ribetti and Caniglia are included in the impressive cast—supported by the orchestra and chorus of the Rome Opera House, this production of *Un Ballo* may be confidently accepted as a definitive one.

Kai Mortensen's "The Laughing Violin" is a humorous instrumental piece from Scandinavia that has been spoken of as one of the finest violin novelties of recent years. On *Columbia DB2544* Reg Leopold, the celebrated violinist, plays its solo passages with the necessary *bravura* against a witty orchestral support. "Pas des fleurs," intermezzo from the Les Delibes ballet "Naila," on the reverse side, is presented in the Aubrey Winter arrangement published in 1943. Charles Williams and his Orchestra are featured on both.

Light Music and Vocal

Sidney Torch and the Queen's Hall Light Orchestra have given us film music before, and for their latest recording Sidney Torch has written an excellent arrangement of the "Song of Capri" which presents this delightful piece in a colourful new setting. "Pale Moon," on the reverse, is one of the best-known of "Indian" love songs. Here, in an arrangement by Cecil Milner, it is interpreted with just the right touch by Sidney Torch and the Queen's Hall Light Orchestra—*Columbia DB2564*.

Josef Locke, who is now appearing in the show "Latin Quarter," at Blackpool, has won recognition as one of Britain's foremost tenors. This month he sings two songs that are known to everyone. "Beneath thy Window" is the English version of di Capua's world-famous "O Sole Mio." For his other song he sings Toselli's Serenade (Serenata) for which the English words were penned by R. H. Elkin—*Columbia DB2556*.

The Melachrino Orchestra present new and old melodies for their latest record on *H.M.V. C3891*. "Festival" was written by Richard Addinsell (of "Warsaw Concerto" fame) for the Emlyn Williams stage play "Trespass," which ran at the Globe Theatre, London, some two years ago. Melachrino's arrangement of Yradlier's "La Paloma" (The Dove) is delightfully played on the other side.

"Parlez-moi D'Amour" and "Gipsy Carnival" are the two titles chosen by Tom Jenkins and his Palm Court Orchestra for his second recording for *H.M.V.* Jean Lenoir's "Parlez-moi D'Amour" (Speak to me of Love) has been a firm favourite since 1930, when it swept the Continent and Britain. The coupling *Gipsy Carnival* is a selection of Roumanian airs.

Variety and Dance Music

Two attractive girl vocalists this month make their recorded debut with Geraldo and his famous dance orchestra. "Carnival Time," a Wally Stott foxtrot arrangement of the popular "Carnival in Venice" introduces Diana Coupland and "Again," also arranged by Wally Stott, introduces Eve Boswell—*Parlophone F2376*.

A new vocal team make their debut this month—The Four Troubadours—that do not conform to the strict rules of "close harmony" but sing to make you believe they are gathered round your own piano having an impromptu sing-song. Their first record is "I'm not Going Home" and "Careless Hands," on *Columbia DB2562*.

"Church Bells on Sunday Morning" and "Twenty-four Hours of Sunshine" are the latest Donald Peers titles on *H.M.V. B9801*, whilst the new singing star Clive Wayne has recorded "Again" and "How Can you Buy Killarney," on *H.M.V. B9802*.

All the latest tunes have been recorded by popular dance bands, giving the dance band enthusiast a wide choice from which to make his selection.

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Certainly, if you build the W.D. Mk. IIA Television. This Television has already been built by hundreds of satisfied constructors, and as the result of advantageous buying in the past few weeks we are able to pass the resultant saving on component parts to the public. The employment of ex-Govt. Radar Gear with the VCR97 C.R. Tube, which most constructors are using, anyway, ensures that the minimum of work is done and the maximum results obtained. Two radar items are used, an Indicator Unit which contains the tube and the majority of the valves and components, and a Vision Receiver I.F. Strip which, in effect, is a ready-made Vision Receiver requiring only slight alteration for the Television Frequencies. These two units now cost only £6, and if desired we can supply every other item required to finish the job. A detailed list is available—which shows the total cost to be a few coppers under £15 5s. 0d. COMPLETE CONSTRUCTIONAL DATA is supplied gratis with every order for the two radar items or, alternatively, can be purchased for 7s. 6d., and the cost will be allowed against the resultant purchase of the two units within the ensuing 14 days. If you are considering building a Television this winter, why not invest 7s. 6d.? Remember, the Vision Receiver is the "heart" of any Television, so why not use a Precision Factory-made item instead of attempting it yourself? When ordering the two Radar Items, please add 12s. 6d. carriage costs, plus 10s. deposit on returnable packing case. If in doubt, come along and let the demonstration model make up your mind.

C.W.O., please.

S.A.E. brings Television Lists.

U.E.I. CORP.

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(Near Scrubs Lane) Tel.: LAD. 1734.
AMPLIFIERS.—College General Purpose Amplifiers. Model AC10E. 10 watt 4 valve Amplifier. N.F.B. Separate mike stage and separate mike and gram inputs. 2 faders and tone control. £8 18s. 6d. Model AC15E. 6 valve P.P. Out. 15 watts. N.F.B. Over 3 stages. Separate mike stage and separate mike and gram inputs. 2 faders and tone control. £13 18s. 6d. Model U10E. 6 valve 10 watt. For A.C./D.C. mains. Spec. as AC15E. £11 11s. All match 3.8 or 15 ohm speakers and are complete with cases, ready for immediate use. Chassis models available slightly cheaper. Stamp for list (state whether A.C. or D.C. mains). Gramophone or Radio Amplifier Chassis. AC4C or U4C. 3 valve. 4 watt. Output to 3 Ohms. £4 18s. 6d.
RADIO CHASSIS.—B/SW2. 2 valve battery Receiver. 10-180 m. Bandsread. 2 v. valves, covers all amat. band. £3 15s. Model AC/51. 5 valve superhet. 3 waveband with tone control and 8in. speaker. Input 200/20/40 A.C. Large coloured dial glass. Q coil pack. N.F.B. etc. £10 10s.
SPEAKERS.—Truvox. 5in. 10". 10in. 23". 12in. (3 ohm). 45". Goodman. 5in. 14/6. 12in. 130/- 8in. 15/6. Teleductor. 8in. 12/6. Rola. 5in. 11/6. (All P.M. less Transfer). Rola. 5in. 13/6. Teleductor. 8in. 15/6. (P.M. with Transfer).
VARIABLE CONDENSERS.—2 gang. 0005. 4/6; 3 gang. 6/11. Both with feet and long shaft. Dielectric, solid. 0001. 4/002. 0003. 3/4. 0005. 3/6. Presets. 50 pf. 4d.; 100 and 500 pf. 1/3.

TRANSFORMERS.—Mains. 2 x 350 v. 6 v. 5 v. 80 m.a. 18/6. Porthminster. 2 x 250 v. 6 v. 5 v. 80 m.a. 25/9; 2 x 350 v. 100 m.a. 4 v. 4 v. or 6 v. 5 v. 28/6. Filament Transformers. Input 230 v. Output 6 v., 21 a., 7/6; or Input 230 v. Output 100 v., 2 amp. 7/6. E.H.T. (for VCR97). Output 2,500 v. 4 v. 4 v. 28/6. 2,000 v. Output only 21/9. Output Transformers. 30 watt. 10 G.O. 23/9; 5 watt 6 ratio. 7/6. Ultra Midget for IC5. 3 45 3/11.
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CONDENSERS.—Plessey Midget. 8-8 x 450 v. 3/6; 16+8 x 450 v. 3/9; 8 x 350 v. 1/11; 32 mfd. 350 v. 1/11. T.C.C. 25 mfd. 25 v. 1/6; 2 mfd. 350 v. 1/2. B.I. Carb'd blocks 8x550 v. 3/3; 8 x 8 x 550 v. 4/9; 8+16 x 550 v. 6/-; T.M.C. 8 x 450 v. 2/3. Hunts. 16+16 x 450 v. 4/6. Plessey. 25 mfd. 25 v. 1/-.
MISCELLANEOUS.—Chokes. 60 m.a. 20 hy. 6/6; 90 m.a. 10 hy. 180 ohm 10/6; 150 m.a. 10 hy. 200 ohm 14/3. Volume Controls. less 5 v. 2/9; with Switch. 4/8. Dropers. 2 a. 1,000 ohms, or 3 a. 750 ohms. 4/6. Valve bases. Brit. 4. 5. 7 pin. U.S. Octal. 4d. each. Jack-plugs and sockets. 2/6 complete.
VALVES.—Practically any valve available. Ex-stock, at List and Tax. New Valves. Unused. S24. G35. 6V6. 6P6. 6K8. 6K7. 6Q7. 6J7. 5/11 each; 6L6. IRS. 18S. 354. 1T4. 6/8. C.O.D. or C.W.O. Stamp for List. Postage Extra under £1.

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ALL NEW AND UNUSED FULLY GUARANTEED VALVE SETS

Set No. 1:	6K8. 6K7. 6Q7. KT32. 25Z4	Price 35/- the set
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Set No. 4:	ECH35. EF39. EBC33. EBL31. R3	Price 39/6 the set
Set No. 5:	ECH35. EF39. EBC33. EBL31	Price 30/- the set
Set No. 6:	ECH35. EF39. EBC33. CL33. R3	Price 35/- the set
Set No. 7:	12K8gt. 12K7gt. 12Q7gt. 35L6gt. 35Z4gt	Price 37/6 the set
Set No. 8:	12K8gt. 12K7gt. 12Q7gt. 35L6G. 35Z4G	Price 35/- the set
Set No. 9:	5U4. 5Z4. 6X5. R3	Price 26/- the set
Set No. 10:	6X5. 84. 41	Price 18/- the set
Set No. 11:	42. 18. 75. 6A7	Price 39/6 the set
Set No. 12:	DF33. DAC32. DL35	Price 21/- the set
Set No. 13:	VP23. TP25. PEN25. HL23DD	Price 28/- the set
Set No. 14:	VP23. TP25. QP25. HL23DD	Price 29/6 the set
Set No. 15:	18S. 1R5. 1T4. 354	Price 29/6 the set

Postage 1/6 extra per set.

SPECIAL.—2 volt American tetrode type 32. Price 3/6 each. 4 volt H.F. pentode type SP41. Price 3/- each.

These are just a few of the thousands of valves we have in stock. Let us quote you for any valves you may require. Send for our complete valve list. Special prices for 5 or more valves.

THE IDEAL UNIT FOR A MINIATURE OSCILLOSCOPE INDICATOR UNIT TYPE S/LC No. 4

Consists of a chassis, size 11in. long, 6in. wide, 3in. high, complete with a mounting bracket and holder for a VCR130 cathode ray tube, and at the side 2 pot metres one 100,000 ohms and one 25,000 ohms. Underneath a group board with 3 resistances and 3 condensers. The unit is completely enclosed by a detachable metal cover, with a hinged front glass viewing window for the cathode ray tube. Overall dimensions, with the cover on. 12in. long, 6in. wide, 9in. high.

LASKY'S PRICE (less the c.r. tube) 3/6 Postage 1/6 extra.

Send a 2d. stamp with your name and address for a copy of our "Bulletin" giving full details of our stocks of ex-Government gear.

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THE "ADCOLA" SOLDERING INSTRUMENTS.

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Designed to comply with the requirements of Radio Assembly, Maintenance, Instrument Makers, etc. Working time reached 1 1/2 mins. Consumption 25 watts. Weight, 2 1/2 ozs. Cool Handle. Supplied in voltage ranges from 5/7 v. to 230/250 v.

3/16in. diameter copper bit Standard Model, 22/6 each.

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Replacement Unit Bit Elements available.

British and Foreign Patents. Sole Manufacturers.

ADCOLA PRODUCTS, LTD., ALLIANCE HOUSE, CAXTON HOUSE, S.W.1.

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ALLEN & GOULD

MINIATURE MOTORS.—1/24v. D.C., reversible. Dimensions: 2in. x lin. x lin. 10/-.

MOTOR ALTERNATORS.—Input 220v. D.C., output 80v., 2,000 cps., 500 watt. £2 (plus 10/- carriage).

AUTO TRANSFORMERS.—150 watt, 0-110-150-200-230-250v. 16/- each.

CONDENSERS.—2 mfd. 500v. Flat paper condensers, 9d. each, box of 10, 6/-; .01 mfd. 5 kv. wkg. tubular Ali. can, 1/9 each.

TELEVISION AERIAL RODS.—lin. diameter Duralumin, length 5ft. 2 1/2in. 3/9 each.

FOLDED DIPOLES.—1 1/2 metre, with co-ax. 7/6 each.

RECEIVER TYPE 71.—100-155 Mc/s. With four EF50, two EF39, EBC33 and EL32; 9 Mc/s IFTs, tuning, etc. 19/6 (plus 3/6 carriage).

ALLEN & GOULD, 5, Obelisk Parade, Lewisham, S.E.13

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Practical Television

Vol. 1. No. 9

NEW SERIES

NOVEMBER, 1949

Televiews

THE B.B.C. during 1950 has been granted the sum of £1,750,000 for development, and of this sum most of it has been earmarked for the development of ordinary sound radio.

It is well known that the equipment at the television studio at Alexandra Palace is out of date, and in fact is little different from what it was in 1936 when Great Britain started the world's first regular television transmissions.

The B.B.C. answers that sound radio serves the whole country, and therefore must take the lion's share of the amount of money they are permitted to spend. They say that at least £500,000 is needed to bring the London Television Station up to date, and at least another £250,000 for each new regional station. The Government viewpoint is that it does not care how the B.B.C. spends the money, whether on sound or television or both, but certainly no more will be available for television development until national recovery is more advanced.

The staff representatives who have raised the objection to so little being spent on television are pressing also for a self governing television service, operating as part of the B.B.C. but under an entirely new charter. They are of the opinion that new television stations could be opened quickly to bring pictures and sound of news and entertainment into almost every home in Great Britain. It is obvious that if this could be brought about we should have mass produced television receivers of improved quality and lower price. The cinema exhibitors want facilities for large screen television in our theatres, either through the B.B.C. or through a separate corporation operated under private enterprise.

Television developments undoubtedly are being unnecessarily held back, and we feel that at least half a million pounds should

be spent next year, and each year thereafter until the country is covered with a chain of television stations. Sound radio can be left alone for a while, whilst television makes up some leeway, and bridges the hiatus caused by the war. Indeed, some change of policy on the part of the B.B.C. is vitally necessary in view of the strenuous efforts which America is making. Manufacturers can do little since they do not control television transmissions, and if the B.B.C. feels that it cannot spend the money on developing them, we suggest that a solution could be found by the Government handing over under a ten years' charter with a reversionary interest the whole of the television transmissions to a new corporation whose money would be provided by private enterprise. Private enterprise developed sound radio before it was taken over.

The staff at Alexandra Palace are operating under an unnecessary handicap which should be removed.

We Challenge the U.S. Markets

DURING the Canadian National Exhibition in August at Toronto a British television manufacturer demonstrated for the first time in that country British television receivers, working on American transmissions. This British manufacturer has opened a factory at Ajax, Ontario, to make television receivers operating on 525 line definition, with frequency modulated sound, and negative (black instead of white) interference. The sets exhibited received transmissions from the U.S. station at Buffalo and from a projector working in a different hall of the exhibition.

Canada is undoubtedly making rapid strides in the television field. She has not a transmitter of her own up to the present, but four million dollars have been voted to enable the Columbia Broadcasting Co. to build two stations, and commercial tele-

vision has been sanctioned. If commercial television were similarly sanctioned in Great Britain there would be no shortage of money for television developments.

It is good that a British manufacturer should compete with America for the Canadian market. Undoubtedly America has initial advantages.

It is, of course, economically impossible to manufacture television sets in Great Britain working on the American system, solely for export. Hence the opening of the factory in Canada. This country is, of course, supplying the transmission equipment.

Extension Television Receivers

AN innovation at Radiolympia is the production by one manufacturer of extension television units which may be coupled to existing television receivers, so that those in other rooms may look in. This is a decided step forward, for it will enable viewing to be undertaken more comfortably until picture sizes increase.

The extension instruments are, of course, much smaller, and cheaper than the main instrument feeding them. Otherwise there was nothing startlingly new in the television line at Radiolympia, and certainly nothing to encourage the hope that prices are likely to be reduced in the near future.

An encouraging thing is that all makers report good sales, and this is borne out by the steadily rising numbers of television licences taken out.

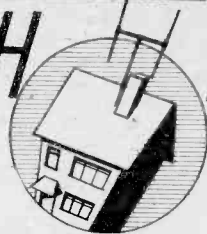
Telenews

New Television Company

IT is now confirmed that the English Electric Company (associated with the Marconi's Wireless Telegraph Co.) are to enter the domestic television receiver market. The Company announces that the Marconi Company have been responsible for the technical design, but the receivers will be marketed under the name "English Electric."

TELEVISION PICK-UPS AND REFLECTIONS

UNDERNEATH THE DIPOLE



By "Scanner"

"THE play's the thing!" said the Bard, and the B.B.C. television planners seem to have the line written on their hearts. The popularity of television plays has not yet waned, and the names of a few of the producers at the Alexandra Palace have now become household words. Veteran viewers don't bother too much about the title of the play or even the players in it—but experience has taught them to become vitally interested in the name of the producer. Unfortunately, the recently appointed television critics on some of the newspapers have also become aware of the excellence of some of the plays and the importance of the producers, and are now proceeding to deal with them in the same patronising manner with which some of them condescend to notice films.

The Critics Criticised

UNFORTUNATELY, long practice in dipping their pens in vitriol, coupled with a pernicious weakness for Continental and foreign-language films, has left them in an advanced state of enervation, with jaundiced taste and dyspeptic reflexes. Rumour has it that many of them graduated at "Narkem College," an imaginary institution where the critical instinct is encouraged by bayonet practice on effigies of well-known film-producers, and a perpetual sneer is regarded as a sign of beauty! The critic graduates of "Narkem" are unwelcome to television, a medium in which the measure of success has been the warm letters of appreciation from viewers. But now, under the baleful stare of these highbrows of the Press, some of the TV producers are forgetting their duty to entertain the masses in a feverish attempt to gratify the satiated tastes of these ex-gourmets of the cinema.

Not for the Family!

GEORGE MORE O'FERRALL, one-time ace television producer, has not lost his grasp of the drama, his clever directorial touches, or his sense of humour.

But he has sadly strayed in his judgment of material which makes good entertainment for home audiences, or lines of dialogue suitable for the family circle. One feels that some of his more recent efforts have been intended primarily for the eyes of one or two acid-witted women critics, whose rose-coloured spectacles are usually reserved for documentary films from France or Italy. The vast and growing TV public did not appreciate the sinister gloom of "The Death of a Rat," however polished the production and acting might have been, and those who sat through it one Sunday evening went to bed thoroughly depressed. Until the B.B.C. devise some easy method of advising audiences in advance of the type of entertainment to be expected, they should keep off experimental dramatic subjects of limited appeal, "daring" dialogue, and arty-crafty surrealistic nonsense. As previously mentioned in this column, the "A," "U" and "H" classifications of the film censor are already well-known and accepted, but the B.B.C. have occasionally stepped outside these classifications into fields which might have induced a red rejection slip.

Box Office Appeal

THE other extreme from the somewhat "precious" outlook of a few of our television producers is the point of view of the commercial radio "sponsor" in the United States, which is the name given to the advertiser who pays big money to have the name of his firm or his company's products mentioned during the progress of specially attractive radio programmes. The larger concerns spent hundreds of thousands of dollars annually on radio advertising, and are now turning their attention to television. The

cost of half-an-hour's hook-up to several television stations is enormous, and only three minutes of this time is permitted to be used for advertising announcements. Questionnaires and market research have proved that the impact of television advertising is three times as effective as sound radio upon an individual. But unless the sponsored programme is of sufficient interest to rivet the attention of the viewer, it is certainly of little use to a would-be advertiser, in spite of the thousands of television receivers being sold each week in the U.S.A. Lucky Strike cigarettes, one of the most successful users of television, favour high-quality advance filming of their programmes on 35 mm. film, with a production style which simulates in every possible way the technique adopted for direct television studio transmissions. The usual cinema film editing and cutting methods are avoided, as it has been found that film that is obviously "film" spoils the fascinating illusion that the viewer is seeing something that is actually happening. And the commercial "sponsor" cannot afford to risk anything going wrong, which is always likely to happen with "live" transmissions. Hence the growing use of film. And as the quality of picture and sound must be as good or better than direct studio shows, 35 mm. film is used by the more ambitious sponsors, who take very considerable trouble with lighting, developing and printing to achieve results suitable for reproducing on small television screens under home conditions. Much less expensive is the 16 mm. film, which is also used in America a great deal for TV; but the regular viewer is quick to detect the slightly inferior technical quality.

U.S. Television Programmes

OF course, many of the programmes have the high-pressure appeal of top grade variety of film stars, while others have built up a following of viewers with seasonal or strik-

ing ideas and some kind of serial ending, to induce the audience to view that particular item at the same time next week. Lucky Strike's "Bookman" series, the Kraft Television Theatre, or the weekly adventures of Eddie Drake, each have their following and presumably show the advertisers a good return for their quite considerable investment. Competi-

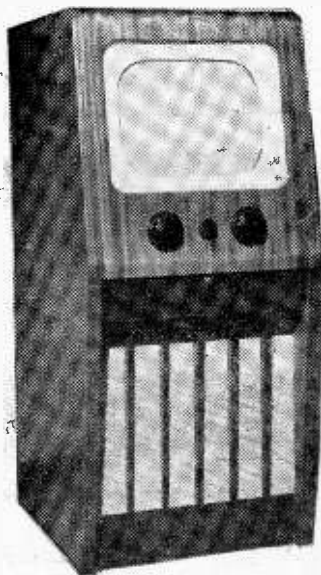
tion between the various hook-ups' sponsors and producers is keen, giving an incentive to enterprise which is sadly lacking in British radio. And yet, the never-ending flood of comic-strip mentality must surely pall on the viewer in the long run. I think that, apart from some of the arty-crafty lapses mentioned at the beginning of this article, the B.B.C

television programmes strike a pretty good average appeal. Most viewers have acquired their sets for amusement only, a medium of escape from this era of austerity. And the kind of entertainment that makes them forget their troubles is something that makes them laugh! Leslie Henson's face in *Bob's Your Uncle*, for instance.

Television at Radiolympia-2

Ferranti Ltd.

TELEVISION receivers shown in operation, are the console models T138 and T129 together with the latest projection television models. The T138 and T129 models, including their Midlands area versions, are highly sensitive and suitable for any part of the television service areas, making the additional cost of an external aerial amplifier unnecessary. Receiver controls are all conveniently placed at the cabinet front, considerably simplifying operation. The Ferranti cathode ray tubes employed are virtually free from "ion spot" trouble, and in the case of the 12in. tube successful efforts have been made to give an unusually flat picture.



Model T.129 in the Ferranti range.

The projection television receivers employ the back projection system and give a large 16in. x 12in. picture on a screen contained within the cabinet. A feature of the models is remote or armchair control, which enables the large picture to be adjusted at the actual viewing distance.

[Stand No. 43]

Gramophone Company Ltd.

CONSOLE model 1805 provides a picture, approximately 9in. x 7in., of such brightness that satisfactory viewing may be achieved in normal room lighting. Both sound and vision receivers incorporate special interference suppression circuits to ensure undisturbed reception and there is a pre-set sound sensitivity control to enable a correct balance of vision and sound levels to be obtained in all reception areas.

Model 1806 gives brilliant, natural toned pictures on a 15in. aluminised Emiscope tube. The generous picture size (approx. 12½in. x 10in.) allows comfortable viewing by a large number of people and there are doors to conceal the screen when not in use. New circuit developments ensure picture and sound quality of the highest order and the exclusive 10½in. elliptical loudspeaker provides wide sound diffusion and realistic quality. Four other models are on view.

[Stand No. 57]

Houghton & Osborne

A television pre-amplifier, with built-in power pack, is shown by this firm. It is totally enclosed in a metal case, and fitted with co-axial input and output sockets. Television components include deflection coils,

line output transformers, and focus coils for both series and parallel connection. Of special interest to the home constructor, especially the non-technical man, will be a television receiver available in kit form, suitable for use with full size commercial magnetic C.R. tubes.

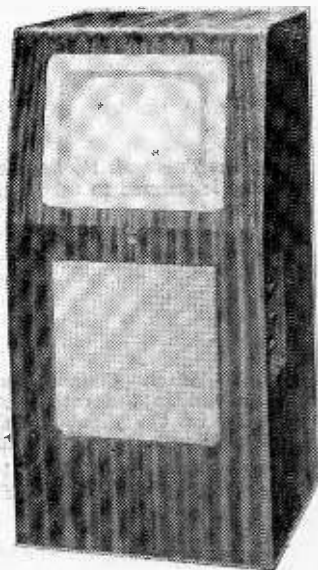
[Stand No. 93]

Marconiphone Co. Ltd.

AN attractive combined instrument for providing complete vision and sound entertainment in the modern home. Model VRC52A has the following outstanding features:

Television pictures of great brilliance on the new 10in. Emiscope tube.

Automatic interference limiter



Ekco Model TSC.93 with 9in. tube.

on television sound and vision interference limiter.

Interlocked "brightness" and "contrast" controls for greater simplicity of operation.

Five-valve superhet radio receiver, wide-ranged and of great selectivity.

"Spot-on" tuning of two pre-selected medium-wave stations, in addition to manual tuning.

[Stand No. 48]

Mullard Electronic Products Ltd.

A SELECTION of Mullard projection television components is displayed, comprising an optical system complete with deflection and focusing coils, and a compact E.H.T. unit for the necessary 25 kV supply. By means of these components, manufacturers are able to produce an efficient large-screen television receiver, using as a basis the chassis of their existing direct-viewing set, but fitted with a Mullard type MV6/2 2½in. picture tube.

In addition there are standard television receivers.

[Stand No. 36]

Philips Electrical Ltd.

PERHAPS the most noteworthy in its scope is Model 520A,

which combines 12in. television with an all-wave radio. It is housed in a very compact but, nevertheless, attractive cabinet, which will make it an acquisition for any home. In television-only models Philips show both table receivers and consoles with either 9in. or 12in. tubes.

Model 493U is a definite advancement in the direction of "big picture" television enclosed in a small cabinet, and should have an instant appeal for those who are rather limited in space. The same circuit is duplicated in 12in. Console Model 485U, whilst the 9in. tube models are 385U table model and 683U console model.

An interesting exhibit on the stand will be a floor-model projection television set combined with radio. The screen size is 16in. by 12½in. This model is housed in an attractive light walnut cabinet. [Stand No. 34]

Portogram Radio Electrical Industries Ltd.

A CONSOLE television receiver fitted with a 12in. tube, comprising 16 valves, 8in. speaker, figured walnut cabinet, approximate size 38in. x 21in. x 21in., independent chassis, manufac-

tured for London and Midlands, may be seen on this stand. Other models are a console 12in. television with four push-button radio receivers comprising 19



Mullard Model MTS.521.

valves, 8in. speaker; console television radiogram comprising 12in. tube with six-push-button radio, automatic changer, 8in. speaker, 19 valves.

[Stand No. 99]

New Television Aerial

A HIGHLY efficient indoor television aerial, developed recently in U.S.A. by Hugo Gernsback, editor of *Radio-Electronics*, will no doubt interest our television experimenters.

Called the *Transpole Variotenna* the device is claimed to take full advantage of wave reflections indoors. The aerial operates on the principle of inductive coupling. It consists of two metal loops mounted on a lucite rod. The inner loop revolves through a 180 deg. arc, permitting unusually accurate orientation for each individual channel. Connections are made not in the orthodox manner as in the dipole, but from opposite ends.

Matthew Mandl and Edward Noll, television aerial experts of Temple University, tested the Variotenna. They reported very satisfactory results.

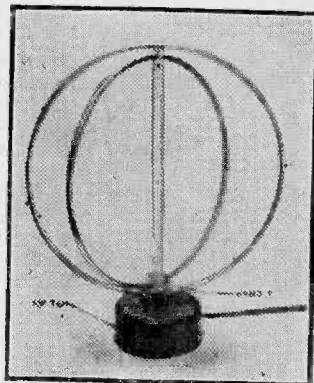
Commenting on the theory of the Variotenna, their report

states: "... on low-frequency channels, inductive linkage occurs between the two loops effectively giving them the required length of resonance. The fact that each loop can be swung at an angle independent of the other means that full advantage can be taken of the many reflections existing within a room. . . . On high-frequency channels the capacitive reactance between the two loops becomes low and affords coupling. This unifies the loops and they act as a short aerial. . . . Gain for this aerial seemed to be higher than an ordinary folded dipole. . . ."

Mr. Gernsback emphasised that his *Transpole Variotenna* is not being manufactured or sold commercially. He presents it as a step in the advancement of television. However, he believes that some variation of this aerial will soon become standard equipment for all television sets.

It will be of particular advan-

tage to those whose landlords object to cumbersome outdoor



General appearance of the new aerial.

arrays. Its simple and attractive design will not mar interior decorating schemes in the home.

Practical Wireless BLUEPRINT SERVICE

PRACTICAL WIRELESS

	<i>No. of Blueprint</i>
CRYSTAL SETS	
Blueprints, 1s. each.	
1937 Crystal Receiver ..	PW71*
The "Junior" Crystal Set	PW94*

STRAIGHT SETS

Battery Operated	
One-Valve: Blueprints, 2s. each.	
Beginners' One-valver ..	PW85
The "Pyramid" One- valver (HF Pen)	PW93*
Two-valve: Blueprints, 2s.	
The Signet Two (D & L F)	PW76*
Three-valve: Blueprints, 2s. each.	
Selectone Battery Three (D, 2 LF (Trans))	PW10
Summit Three (HF Pen, D, Pen)	PW37*
The "Rapide" Straight 3 (D, 2 LF (RC & Trans))	PW82*
F. J. Camm's "Sprite" Three (HF, Pen, D, Tet)	PW87*
Four-valve: Blueprints, 2s. each.	
Fury Four Super (SG, SG, D, Pen)	PW34C*

Mains Operated

Two-valve: Blueprints, 2s. each.	
Selectone A.C. Radio- gram: Two (D, Pow) ..	PW19*
Three-valve: Blueprints, 2s. each.	
Double - Diode - Triode Three (HF Pen, DDT, Pen)	PW23*
Four-valve: Blueprints, 2s. each.	
A.C. Fury Four (SG, SG, D, Pen)	PW20*
A.C. Hall-Mark (HF Pen, D, Push-Pull) ..	PW45*

SUPERHETS

Battery Sets: Blueprints, 2s. each.	
F. J. Camm's 2-valve Superhet	PW52*
Mains Sets: Blueprints, 2s. each.	
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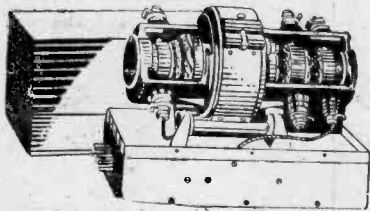
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