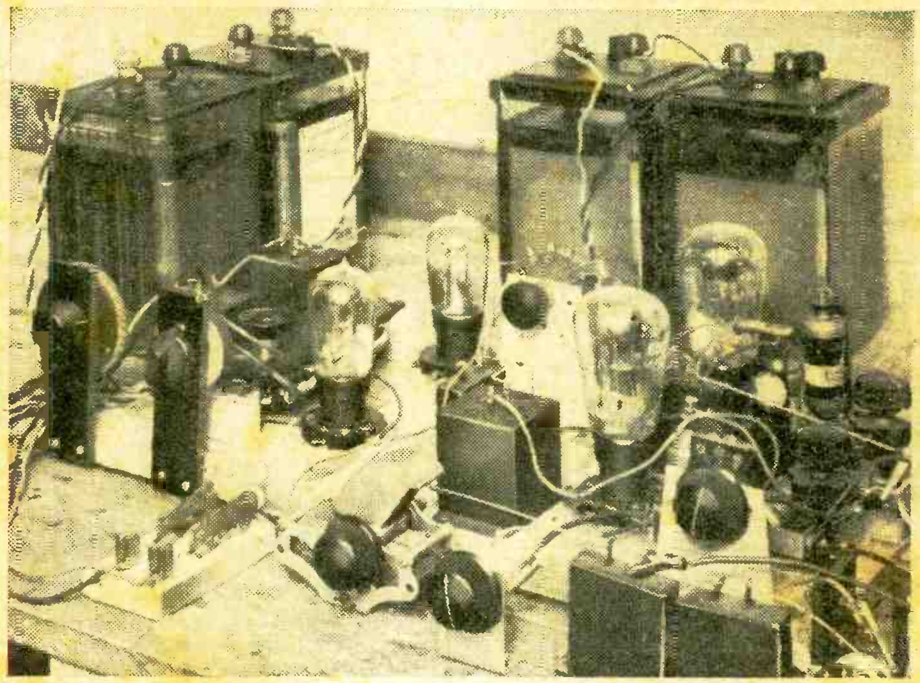
HIGH-FIDELITY TUNER

Practical Wireless

9D EVERY MONTH

Vol. 23. No. 491. || *Editor*: F. J. CAMM || MAY-JUNE, 1947



25 Years of Experimental Radio—See Page 249

PRINCIPAL CONTENTS

PREMIER RADIO CO.

MORRIS & CO. (RADIO) LTD.

MIDGET RADIO KIT. Build your own Midget Radio. A complete set of parts, including valves, loudspeaker and instructions. In fact, everything, except cabinet, necessary to build 4-valve Medium and Long Wave T.R.F. Radio operating on 200-250 v. Mains, A/C or D/C. Valve line-up, 6K7, 6J7, 25A6, 25Y5. Wavelengths covered 200-557 and 700-2,000. Size 10 x 6 x 6in. Completely drilled chassis. Price, including tax, **£7 7s. 6d.**
An attractive bakelite cabinet can be supplied at **25/-** extra.

ALUMINIUM CHASSIS. Substantially made of bright aluminium, with four sides.

7 × 3½ × 2in.	4/6	9½ × 4½ × 2in.	5/6
10 × 8 × 2½in.	7/-	10 × 9 × 2½in.	7/9
14 × 9 × 2½in.	8/3	16 × 8 × 2½in.	8/6
20 × 8 × 2½in.	10/6	22 × 10 × 2½in.	13/6"

MOVING COIL METERS. By famous makers. 2in. diameter, flush mounting, calibrated 0-500 microamps., 21/-.

TYPE 103. Rotary Transformer. Normal rating is 19 v. D/C input. Output 300 volts 30 m/a and 6.5 volts 3 a. D/C. By applying between 200 and 250 volts D/C to the H/T output side, the two low-tension windings may be used to charge accumulators. The 19-volt side will charge a 6-volt accumulator at 2-3 amps., the 6.5 side a 2-volt accumulator at 1-2 a. With a 12-volt input to the 19-volt side, 180 v. at 30 m/a and 4 v. at 3 a. may be obtained. With a 6-volt input to the 6.5-side, 140 v. at 30 m/a may be obtained. By extending the spindle which is flush with the frame and applying 200 to 250 v. D/C mains to the 300-v. side, the unit becomes a powerful high-speed electric motor, suitable for small drilling machines, etc. Similarly, it may be used with 6 or 12 v. input to the 6.5-v. or 19-v. side. It employs a powerful ring magnet and is of substantial construction costing originally over £5. A fortunate purchase enables us to offer these fine units at 10/-.

COLLARO PORTABLE RECORD PLAYERS. Consist of a super quality induction type gramophone motor 200-250 v. A/C with autostop and high-grade magnetic pick-up. Mounted in a leatherette carrying case. Price **£11 5s.** A few only. Delivery from stock.

SUPERHET MIDGET RADIO KIT. A complete kit of parts for a 5-valve superhet. Covers 16-50 and 200-557 metres. AC/DC 200-250 v. 6K8, 6K7, 6J7, 25A6, 25Y5. Size: 10 × 6 × 6in. Completely drilled Chassis. Price, including tax, **£8 5s.**
An attractive bakelite cabinet can be supplied at **25/-** extra.

2-VALVE SHORT-WAVE BATTERY KIT. A complete kit of parts for a 2-valve receiver, covering 15-600 metres, including valves, coils, drilled chassis, H.T. and L.T. dry batteries to last approximately 6 to 12 months. A pair of double headphones and full instructions. Price **£3 10s.** An extra coil can be supplied, covering 600-1,900 metres at **4/-**.

PERMANENT MAGNET HORN LOUD-SPEAKERS. Handle 8 watts. Weatherproof. Complete with fixing bracket, horn mouth, 33 × 13½. 33in. deep. Soiled but unused. Usual price £12. To clear at **£3 10s.**

CRYSTAL SETS. With permanent detector in neat bakelite case, complete with aerial wire and 'phones, 21/-.

SPECIAL OFFER. P.M. Loudspeakers. 5in., 15/-; 6½in., 17/6; 8in., 20/-; 10in., 30/-.

OUTPUT TRANSFORMERS for any of above, 5/-.

MICROPHONES. Military surplus Hand Mikes (carbon type), 5/-. Transformer, 2/6 extra.

MANSBRIDGE TYPE CONDENSERS. Military surplus Condensers. Super quality, oil filled.

Capacity	Working Voltage	Size	Price Each	Per Doz.
2 mf.	1,000	4¼ × 1¾ × 1	2/6	20/-
2 mf.	600	3¾ × 1¾ × 1	1/9	14/-
1 mf.	600	2¾ × 1¾ × 1	1/-	8/-

PHILLIPS' AMPLIFIERS. Military surplus, soiled condition, consist of Metal Case containing complete output stage for Mobile Amplifier. Push-pull EL35 (similar 6L6) valves. Vibrator Pack giving 230 v. 80 m/a incorporated includes Output Transformer. Only requires addition of pre-amplifier: no circuit available. Can be supplied for 6- or 12-volt operation, price 35/-, or with two EL35 and one OZ4, 70/-. Also available with ECC31 Phase Inverter Stage, 45/-, or with 4 valves, 92/6.

RADIOGRAM CABINETS. Good appearance and workmanship, size 34½in. high × 19in. deep × 36in. wide. Veneered and polished light mahogany. Cabinet only, £26. With Motor and Pick-up, £32 16s. With Autochanger, £42 16s. 6d.

1947 MODEL AC/DC AMPLIFIERS. 5 watts output. Super quality three stage push-pull. Suitable for mike or pick-up. In steel cabinet, £8 8s.

GRAMOPHONE PICK-UPS.
Rothermel Senior Crystal Pick-up, £2 16s. 3d.
Cosmocord Crystal Pick-up, £1 17s.
Goldring Magnetic Pick-up, £1 10s. 6d.

Send 2½d. stamp for our September, 1946 list. Terms of business: cash with order, or C.O.D. over £1

ALL POST ORDERS TO 167, LOWER CLAPTON RD., LONDON, E.5.
'Phone: Amherst 4723
ALL CALLERS TO 169, FLEET STREET, LONDON, E.C.4. 'Phone: Central 2833

R1116 COMMUNICATIONS RECEIVERS

(EX R.A.F.)

Complete with 8 valves, power supply required (H.T. 120 volts, L.T. 2 volts). Made by famous British manufacturers e.g., Philco, S.T.C., etc. Frequency coverage 142 kc/s-20 mc/s, in 7 wave-bands (band-switching). Limited quantities only available! ONLY **£3/10/0**
(Carriage and packing, **10s. 6d.**)

MCRI A.C./D.C. POWER PACKS

In response to many requests by purchasers of the receivers only, we have obtained the complete power pack (97-250 volts, A.C./D.C. input) at the very low figure of **£3** (carriage **1/2**).

MUIRHEAD SLOW MOTION DRIVES

3½in. Precision-made drives calibrated 0-180. Ideal for instruments and communications sets. **10/6**

TELESCOPIC AERIALS 102"

American made, collapsing to 15in., as used on "Walkie-Talkies." **15/-**

EDDYSTONE FLEXIBLE COUPLINGS

Low-loss insulated type. **1/9** each or **18/-** doz.

Add postage under £2.

MAIL ORDER SUPPLY

STEPNEY GREEN 2760 — 24 NEW RD. LONDON E.1.

Choose your Extension Speaker

FROM THE

Stentorian

RANGE

Prices from 39/6

	£	s.	d.
SENIOR MODEL			
Type SC with Universal Transformer	5	15	6
„ SX Minus „ „	5	2	6
JUNIOR MODEL			
Type JC with Universal Transformer	5	0	0
„ JX minus „ „	4	10	6
BABY MODEL			
Type BC with Universal Transformer	2	19	6
„ BX minus „ „	2	13	6
MINOR MODEL			
Type MC with Universal Transformer	2	5	6
„ MX minus „ „	1	19	6

W B **Stentorian**

THE PERFECT EXTRA SPEA[KER] FOR ANY SET

WHITELEY ELECTRICAL RADIO CO. L[TD.]
MANSFIELD, NOTTS

Practical Wireless
15th YEAR OF ISSUE
and PRACTICAL TELEVISION
EVERY MONTH
VOL. XXIII. No. 491. MAY-JUNE, 1947.
Editor F. J. CAMM

COMMENTS OF THE MONTH

BY THE EDITOR

The Position of Television

LORD HANKEY'S Television Committee Report published as long ago as March, 1945, made specific recommendations for the development of television. The main proposals were that television transmissions should be resumed from Alexandra Palace on the pre-war standards, that these transmissions be extended to provincial centres with all possible speed, that research should be encouraged to continue without interruption and should be put into service side by side with the existing 405-line system in such a way as to merge one system into the other without rendering useless the 405-line sets purchased by the public in the intervening period, and that a Television Advisory Committee should be set up to be responsible for and to supervise the development of the service.

The report was accepted by Parliament in September, 1945, and the Advisory Committee was set up under the chairmanship of Mr. Garro-Jones (now Baron Trefgarne of Cleddau).

After having been shut down for nearly seven years the service recommenced on June 7th, 1946, and it operates on the same basic standards as before the war but with improvement in brightness, clarity and reliability.

The next step is the extension of the system to the provinces. The first provincial station is planned for the Birmingham area, and Manchester and Glasgow may follow, but the establishment of the Birmingham Station has been delayed because of economic and industrial difficulties.

Mr. Burke, speaking in the House of Commons on January 23rd, stated that the Government were anxious that the service should be put into operation at the earliest moment, and mentioned the difficulties of carrying the coaxial cable from London to Birmingham and of getting a site for the amplifying station. Arrangements have been made to run a two-way link between London and Birmingham so that programmes can be sent in either direction, either by cable or by radio link, which will serve equally well for 405-line and for 1,000-line definition—even for colour definition when commercially possible. Readers should remember, however, that it is not the intention to supersede the present system for many years, and we have the assurance of the Postmaster-General that the public need have no hesitation in acquiring 405-line television receivers.

The picture quality of the new sets is a great improvement over pre-war receivers.

Research into Listening Habits

A TRADE organisation has recently received an order to conduct an inquiry into the listening habits of certain markets overseas. We do not think that these inquiries do anything more than provide a snapshot of what the listening public like at a particular time. Interesting though such analyses are it must not be forgotten that public taste is fickle, as is shown by the Gallup surveys.

Our own B.B.C. conducts inquiries from time to time into the habits of the listening public, and they have a shrewd idea as to the number of people listening in to the particular programmes. Certain other matters, however, impinge. An excellent programme which would otherwise command the attention of a high proportion of the listening public may lose attention because of some great crisis or because a film star is visiting the premiere of her latest film.

Notice to Subscribers

OWING to the time lost in production during the recent fuel crisis we have decided to omit one issue of PRACTICAL WIRELESS and this issue is therefore dated May-June. All subscriptions will be extended by one month to cover the loss of the May number.

Exhibition of Components

THE annual private exhibition of radio, television, and communications components and test gear at the Horticultural Hall, Westminster, was of special interest in view of the important part which electronic devices will play in the future of mankind.

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.
Registered at the G.P.O. for transmission by 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.

ROUND THE WORLD OF WIRELESS

Big Expansion of Philips Hamilton Works

A LARGE scale extension which will almost double the size of the factory is planned by Philips Hamilton Works, Ltd., Lanarkshire, Scotland.

Designed for completion by 1950, this extension, itself taking about 240,000 square feet on a 15-acre site, will bring the total area occupied by the factory to 405,000 square feet.

Employment will ultimately be found for approximately 2,500 workers in the proportions 40 per cent. male and 60 per cent. female labour. By the end of 1947 it is estimated that the number of workers on the payroll is likely to exceed 1,200.

The projected extensions will comprise three new factory buildings and a large store, and a tunnel will connect the main factory with these additions, which are planned to occupy a site on the other side of the road. The new factories will stand well back from this road to facilitate any widening operations that may become necessary.

The Hamilton Works are turning out radio components and radio receivers, many of which are for Britain's export drive.

Wireless Interrupted : Cables Carry On

THE unique advantage of flexibility enjoyed by the Empire's integrated network of cable and wireless telegraph circuits was recently vividly demonstrated.

One of the two pairs of wireless stations in the United Kingdom which together handle the whole wireless telegraphic traffic to, from and through Britain were virtually paralysed by severe damage caused by the weather. Their load was, however, taken up by the cable system.

The two stations are Cable and Wireless' transmitting station at Dorchester and receiving station at Somerton. At each station ice formed suddenly on aerials and masts. Aerials encased in cylinders of ice 3ins. in diameter crashed to the ground. Hugh icicles forming on the cross-bars and stay wires of the 100ft. masts caused many to collapse.

At one time all the beam aerials supported by the array of sixteen 300ft. masts at Dorchester were on the ground with six 100ft. masts and many more aerials. It has not yet been possible fully to repair the damage at either station.

So effectively was the telegraph traffic taken up by the cable system, however, that the effects of the interruption of wireless circuits did not go beyond some delay to traffic with South Africa, India and the Far East.

Ekco Chief Engineer's Broadcast

A. W. MARTIN, M.B.E., Chief Engineer, E. K. Cole, Ltd., was on the air from B.B.C. Midland Regional (296.2 m.) in the programme "The Crown of the Road," on March 11th last. He spoke to motoring listeners about car radio, on which he is an acknowledged authority in both the motor and radio trades.

P.M.G. and P.O. Eng. Union

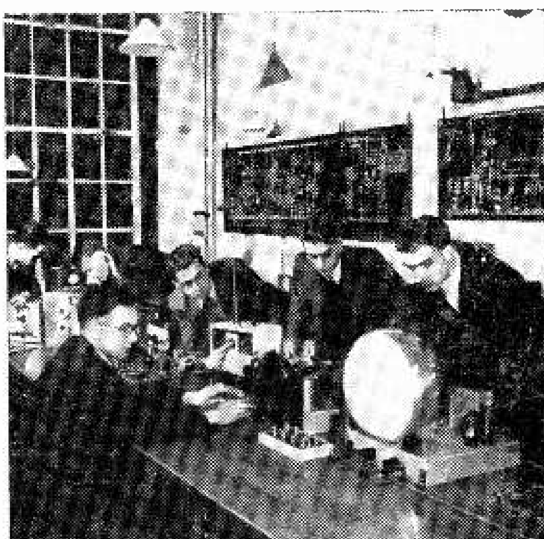
THE Postmaster-General has concluded an agreement with the Post Office Engineering Union on behalf of the grades it represents for the introduction of a 44-hour-net working week, on a five-day basis so far as the public service allows. The agreement has been reached in the light of the Government's White Paper on economic policy, and various devices are being adopted to increase output, including the working of longer hours during the summer than in the winter on outdoor jobs. The Post Office Engineering Union has pledged itself to do its utmost to ensure that its members give increased output where possible, and joint production councils are to be set up throughout the country so that all means of improving output can be thoroughly explored.

New Cable Restoration Programme

C.S. *MONARCH*, 8,500 tons, the world's largest cableship, sailed from Greenwich recently for St. Vincent, Cape Verde Islands, on charter from the Post Office to Cable and Wireless, to carry out important repairs and renewals of the Empire's cable system in the Atlantic.

This work is part of a new post-war programme of restoration and modernisation of the cable system estimated to cost several millions of pounds.

Eight cableships in addition to c.s. *Monarch* are already engaged on the work. They are *Cable Enterprise*, *Lady Denison-Pender*, *Mirror*, *Norseman*,



A television servicing course has been introduced at the South-east London Technical Institute, and students are seen above examining some equipment stripped down to bare essentials.

Recorder and *Pacific*, and two chartered ships—*Cyrus Field* and *St. Margarets.* Two more ships will be sent to join this fleet as soon as their services can be acquired.

Broadcast Receiving Licences

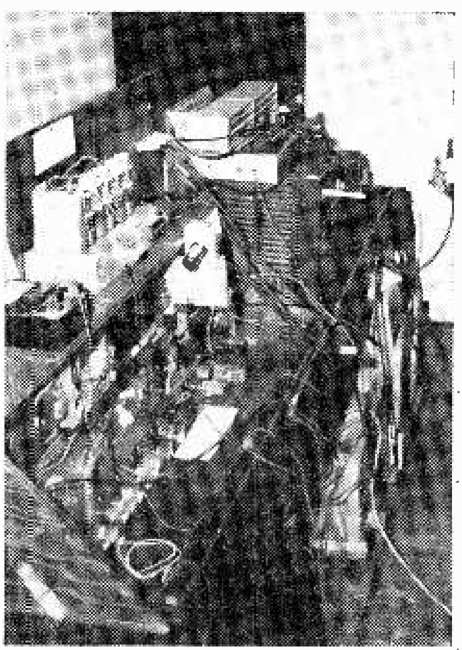
THE following statement shows the approximate number of broadcast licences issued during the year ended January 31st, 1947.

Region	*Number*
London Postal..	1,984,000
Home Counties	1,412,000
Midland..	1,530,000
North Eastern	1,644,000
North Western	1,421,000
South Western..	910,000
Welsh and Border	607,000
Total England and Wales ..	9,508,000
Scotland	1,030,000
Northern Ireland	154,000
Grand total ..	10,692,000

Prosecutions in January for operating wireless receiving apparatus without a licence numbered 280.

Frequency Modulation Transmissions

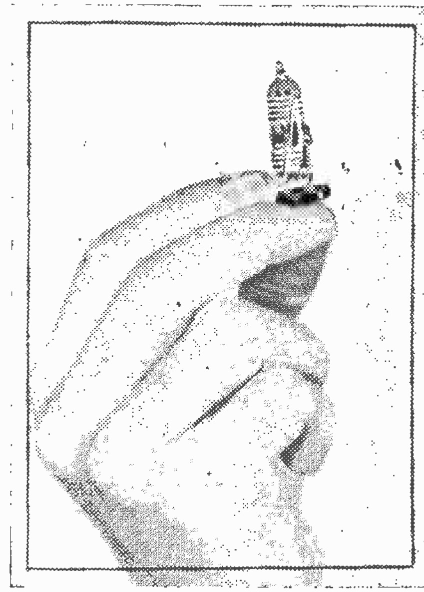
FOR listeners who are anxious to carry out experiments with F.M. receivers or adapters, it may be pointed out that the B.B.C. are at present carrying out transmitting tests with this system of modulation on 90.3 Mc/s. The signals (which are radiated from the Alexandra Palace station), may be heard most evenings from six o'clock onwards.



This rather untidy-looking assembly is actually a radio robot. Known as the EDVAC (Electronic Discreet Variable Calculator), and developed by the U.S. Army, it can multiply whilst it adds, divide whilst it works out interest rates, and work out the total and give change.

One-valve Transmitter

AT the recent Convention of the Institute of Radio Engineers in New York City, Dr. Cledo Brunetti, chief of the Ordnance Section, National Bureau of Standards of Washington demonstrated a novel one-valve transmitter. This is shown above, and it will be seen that it is really a miniature piece of apparatus. The external circuit of the set is printed and baked on the outside of the glass bulb of the valve, thus resulting in a great saving of space. The microphone is attached by small wires to a terminal near the tip of the bulb. In operation a battery is used and is attached to the valve by a plug arrangement. It is reported that the companion receiver is scarcely larger than the transmitter.



The midget transmitter referred to below.

Broadcasters Exchange

THE recent arrival of Mr. John Proud, O.B.E., from Australia, is the fruit of an agreement reached by the organisations which participated in the Commonwealth Broadcasting Conference of 1945, that the exchange of staff would be of mutual benefit to British and Dominion broadcasters.

Mr. Proud, who is the Assistant Director of Talks at the Australian Broadcasting Commission, is seconded to the B.B.C. for six months, during which time he will have opportunities to study the general working of the corporation. He will be attached to the Talks Department.

Plans are now being made for a member of the B.B.C. staff to be seconded to the A.B.C. for six months in exchange.

High-fidelity M/L-Wave Tuner

Details of an Add-on Unit for Use With the 10-watt Quality Amplifier Described in Our Last Issue.

By C. SUMMERFORD

THE average commercial receiver is of necessity a compromise between station-getting ability and quality, with the accent on the former; and to the listener who has a rather critical ear and a desire for purity of reproduction it is, to say the least, most unsatisfying.

Naturally it is the higher frequencies that suffer most through the side-band cutting that is done in an endeavour to obtain adequate selectivity.

Although the majority of listeners tune to the local station for 90 per cent. of their listening time, the demand, strangely enough, is nearly always for a receiver that will pull in a large number of stations.

It has often been said that high quality reproduction can be obtained with a superhet if variable selectivity I.F. transformers are used, but this is only true in part, because with this system the I.F. response curve is almost bound to be uneven or "peaky." Probably the best way to get good quality from a superhet is to shunt all I.F. transformers with resistors of fairly low value. But assuming that we can by good design (and complicated switching) get a good I.F. curve, it will in all probability be found that true quality, or realism, is still absent.

This, at least, is the writer's experience, and the reason is a matter for conjecture—probably something to do with transients.

The above remarks are not meant to imply that *good* quality cannot be obtained from a superhet, but rather that quality of the *superlative* kind is extremely difficult to obtain with one of these receivers. Ideally, of course, two receivers should be used, one for distant stations and one for the high quality reception of the local stations. Those readers who built "The Ten Watt Quality Amplifier" described in the April issue, or who possess an amplifier of similar quality, are in a position to build a high-fidelity unit very simply and cheaply.

The Circuit

The circuit diagram (Fig. 1) shows how this may be done, and it will be seen that by no stretch of imagination could this be called a complicated or elaborate circuit.

An aerial transformer couples the aerial in the usual manner to the first valve, which is an EF39, and a second transformer (H.F. type, this time) in turn couples this to the infinite-impedance detector—an L63.

If a diode detector had been used in this circuit there would have been insufficient gain, except for those readers who live almost under the shadow of a transmitter, but the infinite-impedance detector chosen can be made to give as much gain as a normal R.F. amplifier; and to have gain to waste is a much better fault than not having enough.

By taking the output from the cathode circuit, very heavy negative feedback takes place at audio frequencies and thereby ensures that harmonic distortion shall be almost entirely absent, even at high modulation levels.

To take the circuit in more detail: The medium- and long-wave input coils L1 and L2 are Wearite types PA2 and PA1 respectively, whilst the R.F. intervalve transformers L3 and L4 are types PHF2 and PHF1 of the same make.

A large amount of R.F. gain will be obtained with the two valves used, and unless the damping resistors R1, R2, R6, R7, are connected as shown, there will be a decided droop in the response curve above 5,000 cycles.

The variable condensers VC1, VC2, VC3, VC4 in the original model take the form of compression type presets having a maximum capacity of .0005 mfd., and a reasonably low minimum. However, there is no reason why ordinary mica dielectric tuning condensers should not be used if it is so desired. Alternatively, a two-gang condenser may be used, in which case it should be connected directly between grid and earth of either valve.

One Waveband Only

It may be that many readers are unsuitably located for the reception of both medium- *and* long-wave stations at local station strength, and in such cases a saving in cost may be made by omitting tuning coils, condensers and damping resistors of the unwanted circuits.

If it happens to be the medium-wave components that are omitted, the wave-change switch may also be dispensed with as one station only may be received at sufficient strength on the long-wave band. Two stations on the medium-wave band may, however, be receivable at local station strength by many readers, as, for instance, those residing in the London area who have alternative programmes

LIST OF COMPONENTS

L1	Wearite PA2.
L2	Wearite PA1.
L3	Wearite PHF2.
L4	Wearite PHF1.
Ch. 1	Any decent R.F. choke.
VC1, 2, 3, 4	.0005 variable condensers (see text).
C1, 2, 3, 10	.1 fixed tubular condensers.
C4	.01 fixed tubular condensers.
C5, 7, 8	.0003 mica condensers.
C6	8 mfd. 350 volt electrolytic.
R1, R6	50,000 ohms. ½ watt.
R2, R7	250,000 ohms. ½ watt.
R3	500 ohms. ½ watt.
R4	90,000 ohms. 1 watt.
R5	3,000 ohms. ½ watt.
R8	25,000 ohms. ½ watt.
R9	80,000 ohms. ½ watt.
S1, 2, 3, 4	Single bank, four-pole, two-way switch.
V1	Mullard EF39.
V2	Marconi L63.

available on "Light" and "Home." Where these conditions exist, and where also the long-wave transmitter is not strongly received, the long-wave tuning components may be left out, and the spare contacts on the wave-change switch used for switching in a second variable condenser. To accomplish this the following alterations will have to be made: S1 and S3 short circuited by soldering short lengths of wire across their contacts; S2 and S4 and their associated circuits modified as shown in Fig. 2.

Incidentally, the extra variables used in this modified circuit can be of .0002 or .0003 mfd. maximum capacity, as one of the local stations is bound to be on a National wavelength which, as everyone knows, is tuned in at the high-frequency end of the medium-wave band, and condensers of the size mentioned will be entirely adequate here.

The V1 anode decoupling circuit of C3 and R5 is included as a purely precautionary measure against instability, and may be quite unnecessary if a well smoothed H.T. supply is available.

The Response Curve

In spite of the fact that V1 is slightly overbiased and the tuning inductances are shunted with comparatively low value resistors, the response curve will still show a small droop above 7,000 cycles. True, this droop only amounts to about 4 to 5 decibels at 10,000 cycles and may be considered good enough by the majority of listeners, especially so to those who have a variable treble lift control in their A.F. amplifier.,

However, for the sake of the somewhat more critical listener who may not be quite so well placed as regards tonal compensation, the detector has its load resistance split into two parts as shown in Fig. 1 to give compensation in the unit.

The larger part of this load (R9) presents an impedance to all frequencies impartially, while the smaller resistor (R8) used in conjunction with a suitable capacity (C4) discriminates in favour of the higher frequencies. An over-all response curve is thus obtained which lifts very gently from about 1,000 cycles to reach its maximum at 8,000 cycles, and then gently falls again until at 10,000 cycles the output is at the same level as at

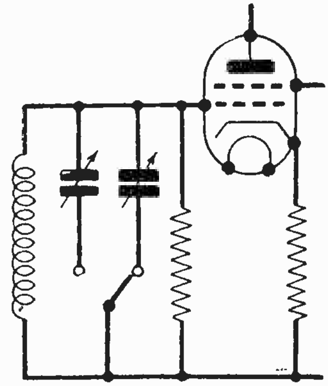


Fig. 2.—Method of arranging switching for medium-wave reception only.

1,000 cycles. Actually, the maximum deviation from straight line response of the whole unit is plus or minus 2 decibels between 20 and 10,000 cycles.

It would, of course, have been possible to have obtained a similar response curve without the treble compensatory circuit if smaller value damping resistors had been used across the tuned circuits. But the danger then would have been of mutual interference between the two local stations on the medium-wave band, and a possibility that insufficient gain would be obtained to give efficient detection.

The total cost of the unit, taking an average figure, and assuming that all components will be new, should not exceed the sum of £3, and will in all probability be considerably less.

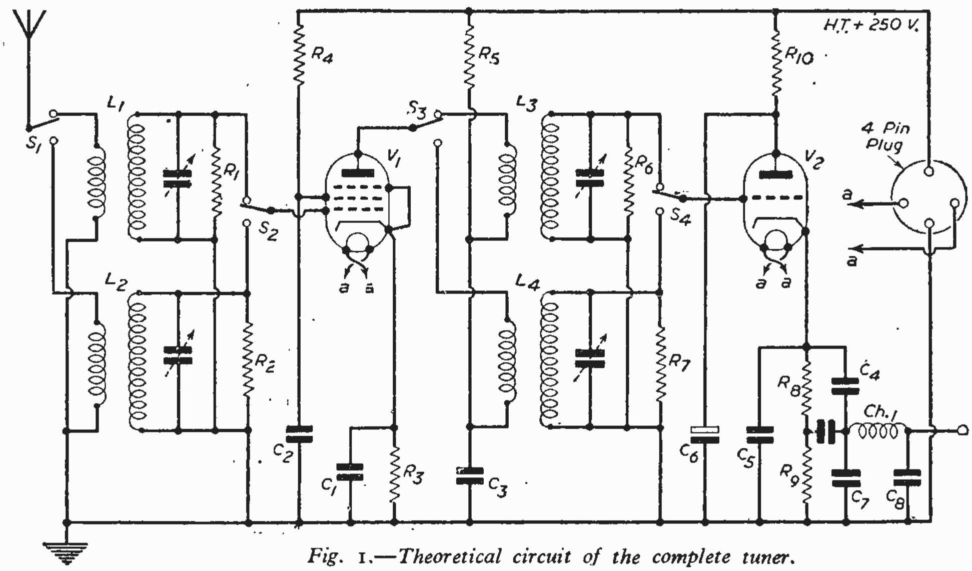


Fig. 1.—Theoretical circuit of the complete tuner.

Quality *and* Volume

A Discussion With a View to Combining the Merits of Class A and B in One Amplifier

By L. MILLER

THE problem of designing a good quality amplifier or the audio frequency end of a receiver is by no means easily solved. The constructor who decides to use a couple of 6L6's in

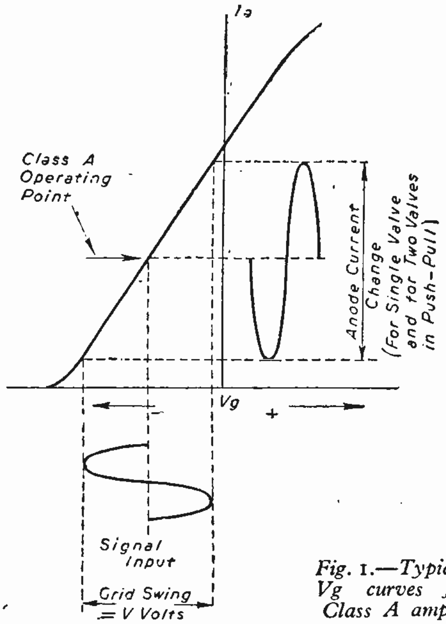


Fig. 1.—Typical Ia-Vg curves for a Class A amplifier.

push-pull and thinks he will get very good quality on low volume because the amplifier will handle large inputs without distress, may well find when the job is completed, that the reproduction on low volume sounds no better than did his previous set which perhaps used a modest three-watt pentode.

True, he can turn the volume up and note with pride and satisfaction that his 12in. speaker overloads before his amplifier does, or pull the coil right away from the cone of his 7in. speaker (rather an expensive hobby !).

But if he wants really good quality he will invariably turn to triode output valves. Admitted, this is rather a bold statement to make, as there are many "pentode" enthusiasts who claim they can, by employing negative feed-back, get results *equal* to that of triodes.

Note that I have underlined the word "equal." They do not claim to get *better* results using pentodes, but use pentodes to overcome certain disadvantages inherent in triodes (low efficiency, high anode voltages, etc.).

The efficiency (ratio of undistorted power output to power dissipated) of a triode is low compared to that of a pentode, but it is generally accepted that it is usually easier to design a high-quality amplifier using triodes than it is using pentodes. So let us leave it at that !

Why a Large Output is Needed

When one studies the typical Ia-Vg curve with input signal volts and consequent anode current changes superimposed, as shown in most text-books, and illustrated in Fig. 1, the uninitiated may well assume that if a certain valve has a permissible grid swing of, say, 20 volts either side of its mean grid-bias voltage, that that valve can handle an audio-frequency signal of 20 volts without distortion (i.e., the anode current will only vary within the straight portion of its characteristic curve).

However, in Fig. 1, and most textbook illustrations, a voltage of sine waveform is invariably shown, for the sake of clarity. It cannot be over-emphasised that the signal voltage from the receiver (or gramophone record) is *not* of sine waveform, but is very complex in shape, possessing peaks much in excess of its mean value. For quality reproduction these peaks have to be handled on the straight part of the valve's characteristic curve ; in other words the output voltage developed across the anode load must be a replica in wave-shape of the input voltage. Consequently the output

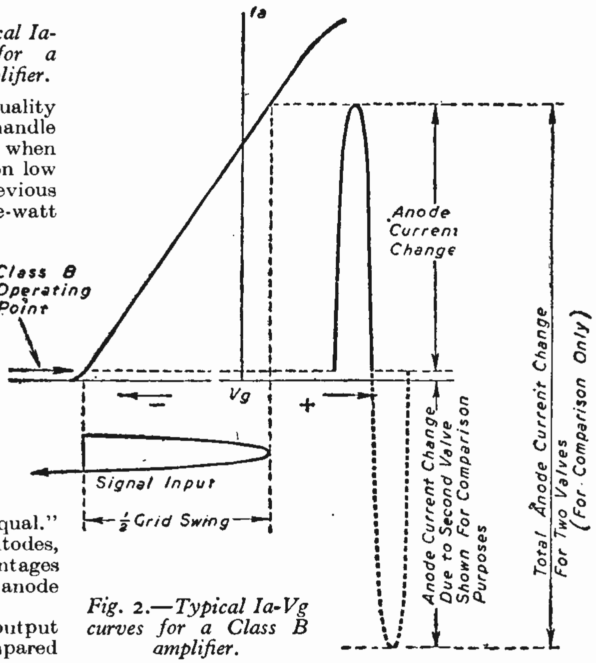


Fig. 2.—Typical Ia-Vg curves for a Class B amplifier.

valve must be capable of handling, without distress, far heavier current changes than those produced by the *average* voltage of the input signal.

Power Outputs Required

For ordinary "quiet room" listening, using a reasonably efficient speaker, the volume produced by an average output of 100 milli-watts could be very safely handled by a two-watt output valve, say a PX4 with a lowish grade voltage. However, there are occasions when louder volume is needed, and the PX4, excellent as it is, would reproduce a distorted wave-form long before the power *averaged* two watts.

Rather than use a large output valve—which involves expense in the form of a higher supply voltage, apart from the cost of the valve, two small triodes would be used, either in parallel or push-pull. The push-pull arrangement is usually preferred, because of the cancellation of even harmonics, and the fact that the output transformer, having two equal and opposite voltages impressed across its primary, has a higher effective inductance, all other things being equal. (For further explanation, refer to any textbook dealing with "core magnetisation or saturation.")

Using two triodes preceded by one or more stages of audio-frequency amplification, resistance-capacity coupled, together with the necessary phase-changer, extremely faithful reproduction can be obtained and the output from two PX4 type of valves would be ample for most domestic requirements.

However, when even larger outputs are required, one invariably juggles with the idea of going in for some kind of Class B amplification. The essentials of Class B is to operate two valves in a push-pull circuit, but to bias the valves well down towards anode-current cut-off (i.e., little or no standing anode current).

Although the schematic diagram of a typical Class B amplifier would *look* the same as one of a Class A amplifier, there is one very important difference; that is, in the Class B circuit, each valve (in theory, at least) is only operative during one half of each cycle. One valve (once again, in theory) gives a faithful replica of the first half-cycle during which time the second valve is inoperative. The second valve becomes operative during the second half-cycle, providing a faithful replica while the first valve is now inoperative. As the two anodes are connected in opposite phase to the primary of the output transformer, it should be evident that the complete cycle appears across it.

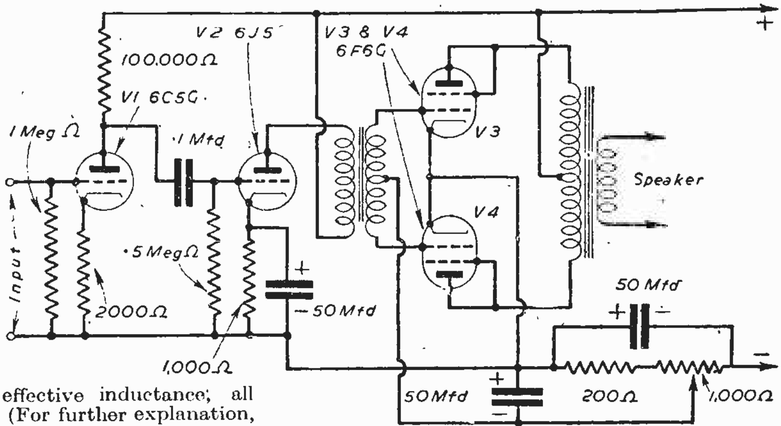


Fig. 3.—The completed dual-purpose amplifier.

What is probably not quite so evident is that by biasing the output valves for Class B operation a very much larger input voltage may be applied with a consequent greater variation of anode current. This, of course, results in a larger signal voltage across the output transformer which means more volume from the speaker. This is shown graphically in Fig. 2, which indicates the maximum permissible input voltage and anode current change. Only one half-cycle is shown as the second valve accommodates the other half-cycle. Incidentally, the graph in Fig. 1 shows the maximum input voltage and anode current change of the valve under Class A operation, so that Figs. 1 and 2 may be used for comparison.

It will be seen, therefore, that the amount of anode current consumed by a pair of Class B valves is proportionate to the strength of the input signal, and that for a given input, less anode current is taken by the Class B system; therefore, the efficiency is higher.

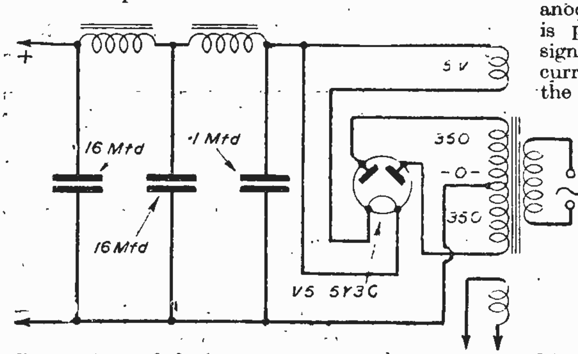


Fig. 4.—A choke-input power supply.

The Disadvantages of Class B

The chief disadvantage is that owing to the fact that the valve is operating over the bottom bend of its characteristic curve as well as the straight portion, a certain amount of distortion is inevitable. This can be proved by careful study of the input and output waveforms in Fig. 2. The *percentage* of distortion gets less as the waveform is increased in amplitude (i.e., at increased volume), due to the fact that the ratio of "straight" to "curved" portions of the characteristic curve being used is greater at large inputs.

Here then is one very important disadvantage of Class B amplification—poor quality at low volume. As the volume level is increased the quality quickly improves, and at any reasonably loud volume, quality can be exceedingly good—very much better than that obtained by a Class A amplifier working anywhere near its rated maximum output. In fact, a Class B amplifier can really *handle* peaks!

Other disadvantages are practical ones and can be overcome without a great deal of trouble. The grids draw current during part of each half-cycle, making a low-resistance conducting path to earth imperative in order to avoid excessive damping. This means transformer coupling. A high-quality intervalve transformer is capable of faithful reproduction even when compared with R.C. coupling.

A certain amount of power must be drawn from the preceding stage to make up for the grid current losses, and as the preceeding valve has to supply that current to the grids of the output valves, it is pointless to use a step-up transformer, because this would, in stepping up the voltage, step down the current, which is just what we do not want to do. It is common practice to use a unity or slight step-down ratio transformer.

Class AB

As the only essential difference between Classes A and B is the potential at which the grids are biased, it follows that some suitable bias point between the two extremes could be used with advantage. This is referred to as Class AB, and we now have Classes A, AB1, AB2 and B (although AB2 and B are considered the same). It all depends upon how far back we bias our valves, as to what class we are working under.

The nearer we get to Class A the further away from the unwanted "bottom bend" we get, and in turn the maximum undistorted output gets less.

The nearer we get to Class B, the greater is the distortion at low volume levels, and the maximum undistorted output increases. Rather conflicting, is it not?

Class A or B at Will

With all of these pros and cons in mind, the writer built an amplifier capable of employing any class at will by simply making provision for varying the grid bias on the output valves.

This was not intended to be a constructional article, and the schematic in Fig. 3 should serve as a guide to those wishing to experiment along these lines.

The requirements are as follows: a good regulated H.T. supply is essential. Avoid using cheap, small, high-resistance smoothing chokes. A choke input H.T. supply (so often neglected these days), is ideal for the purpose. Refer to Fig. 4. With a 350-0-350 transformer and, say, two 250 ohm chokes, a steady H.T. voltage of about 320 v. can be expected, with very slight variation due to varying loads. If something really "big" is required, use 400-0-400 or more.

The main amplification is dealt with by V1, which can be the detector in a straight receiver, or the triode section of a double diode triode in a superhet, or the "pre-amplifier" in a gramophone amplifier. The second valve V2 must be a low-impedance triode (such as a 6J5 or ML4), as it will be called upon to supply a certain amount of power to drive the output valves when approaching Class B conditions. This is, of course, the "driver" stage. When the amplifier is being used strictly Class A, this valve is simply a voltage amplifier.

The intervalve transformer is any good quality "Class B Driver" transformer, as used in the good old battery set days, and can usually be picked up for a song from the local radio dealer's "junk" shelf. The writer used a Varley with tapped primary providing ratios of 1-1 and 1.5-1 step down.

The choice of output valves depends entirely upon the constructor's requirements. As an illustration and guide, the writer used 6F6's as triodes (screen-grid connected to anode). When ascertaining the output transformer ratio for correct matching to the speaker it is advisable to get the matching correct for Class AB conditions, details of which can be obtained from any comprehensive valve data chart, or can be found by experiment, using a multi-ratio transformer. In the case of the 6F6's, triode connected, the anode to anode load should be about 6,000 ohms for Class AB, and 8,000 ohms for Class A. By adopting 6,000 ohms as the optimum, the mis-match under Class A is not serious, as we will only use strict class A for "quiet room" listening.

Under these conditions, it was estimated that the maximum undistorted output under Class A to be 1.5 watts, with grid bias −12 v. and a steady anode current of 50 mA. Quality was extremely good, and a pleasure to listen to.

Still leaving the amplifier at "quiet room" volume, the grid-bias potentiometer was adjusted to apply more negative bias to the grids of the output valves, and the deterioration in quality was noticeable, and got worse as the bias was increased.

With the bias control set about half-way, i.e., operating under approximately Class AB1 conditions, the volume was increased, and the quality greatly improved. Leaving the volume well on, the bias control was turned back to its original Class A condition, and, as was expected, the output valves were hopelessly overloaded, and the distortion was serious.

It is suggested that the bias potentiometer be treated as a "sub-control" and located out of the reach of the less technical inclined members of the family, and set to such a value as required for the occasion, i.e., in the ordinary way, possibly Class A will be sufficient. For a noisy party, well down near the Class AB2 end, and so on.

With the circuit as in Fig. 3, true Class B or AB2 cannot be quite reached, as "self" bias is used.

To get really true Class B operation, fixed bias is essential. Incidentally, larger outputs can be obtained with fixed bias, but the self bias method as shown in Fig. 3 should give ample output for most requirements.

The Accurate Alignment of a Superhet–2

Conclusion of Hints on Servicing Without a Signal Generator.

By J. R. DAVIES

Trimming the R.F. Circuits

TO start with, let us give a definition of the term "tracking."

Let us take the case of a superhet with no H.F. stage and 465 kc/s I.F.s. We then have a two-gang condenser to tune the set. One portion of the two-gang will be connected to a coil and will tune that coil to the frequency of the station being received. We can call this the signal, R.F., or aerial tuned circuit. The other portion of the two-gang will be connected to another coil (the oscillator coil) and will tune that coil so that it always resonates at (in this case) 465 kc/s *above* the frequency of the signal tuned circuit. Tracking consists of so making and adjusting the oscillator and signal tuned circuits, that the oscillator tuned circuit resonates at the frequency of the I.F. circuits above that of the signal tuned circuit(s) at any and every position of the tuning condenser.

As it can be seen, to achieve perfect tracking is something of a tall order, as different ranges of frequency have to be tuned continually at the same time. In practice, a compromise is struck, and it is usually sufficient to see that the set tracks at the top and bottom ends of the bands, and that there is very little deviation between these points.

To assist us in tracking the set, the usual practice is to connect trimmers across the coils, and a padder condenser in series with the oscillator coil. (See Fig. 7, which gives the circuit of a typical frequency changer.) In Fig. 7, L_1 and L_2 are the signal and oscillator coils respectively. C_1 is the signal, and C_2 the oscillator portion of the ganged tuning condensers. C_3 is a low-capacity trimmer across the signal tuned circuit. C_4 is a low-capacity trimmer across the oscillator tuned circuit. C_5 is the padder condenser, usually of large capacity, in series with the oscillator tuned circuit. With a little thought it can be seen that the trimming condensers, being of small capacity, have the most effect when the main tuning condenser is at its least capacity (all vanes out). At the same time, the padding condenser, by reason of being in series with the main tuning condenser, will have the greatest effect on the oscillator tuned circuit when the main tuning condenser is at the maximum capacity position (vanes all in). Thus, on all bands, we trim with the tuning condenser vanes all out, or nearly all out (the high-frequency end) and "pad" with the vanes all in (at the low-frequency end).

With some sets the manufacturers work out the optimum value of the padding condenser and fit a fixed padding condenser. These are usually made to a tolerance of plus or minus 1 or 2 per cent. Unless they should go faulty (and very rarely does this happen) these condensers save the serviceman a little trouble, as there is no padding to adjust.

As mentioned above, perfect tracking does not occur all over the band being tuned. Most tuning condensers have the end vanes split into segments so that, by bending these vanes slightly small changes at different positions of the tuning can be effected. This has to be done carefully, and it is not worth while to bother about them on medium- or long-wave bands. It sometimes helps on the

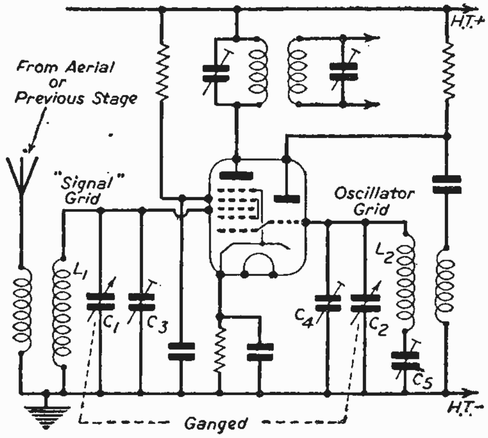


Fig. 7.—Circuit of typical frequency-changer, illustrating various condensers used for tuning, trimming and padding.

short-wave band(s), as small changes in capacity make quite a difference on the higher frequencies. The slight differences incurred will not make any noticeable change to the medium- or long-wave bands, but if the set has several short-wave bands, the end vanes are best left alone. Adjustments made on one band might throw another out and so on. Personally, the writer very rarely finds need to touch them.

Tracking can be checked by tuning in different stations around the dial. On each station the signal trimmer should be checked. It should be at, or very near, its optimum position at all frequencies. Sometimes the last five degrees or so of rotation at the high-frequency end of the band (condenser vanes all out) will not track. In this case it is best to trim at the high-frequency end with the condenser vanes slightly engaged.

If, as the vanes are more and more engaged, it is found that more and more signal trimmer capacity is needed for optimum reception, the padding condenser should be made smaller in capacity, and vice versa. This is explained by the fact that, as the padding capacity is made smaller, it is then necessary to put in more capacity on the oscillator tuning condenser to tune in the same station. This automatically puts in more capacity in the signal tuned circuit as, of course, the two tuning condensers are ganged. Therefore we don't need to put the extra capacity into the signal tuned circuit by means of the trimmer.

An H.F. Stage

The case of a set with an H.F. stage before the frequency changer has not been considered as this introduces no extra troubles. It simply means that there are two signal trimmers to adjust instead of one.

Another factor liable to cause trouble is the capacity and resistance in the aerial-earth system connected to the set. These are "reflected" into the aerial tuned circuit via the aerial coupling coil. For this reason the coupling is usually made as "loose" as possible consistent with good signal strength. However, a set trimmed up on one aerial and earth may be quite a way out of adjustment when connected to others of different characteristics. If the set is being trimmed on the aerial-earth system with which it will be finally used, it is a good plan to trim the aerial coil with this connected. Weak signals should be used for trimming purposes for reasons stated above.

Perhaps a better plan is to construct an artificial aerial load for use with all sets. Fig. 8 gives a circuit. In Fig. 8, R is between 50 and 100 ohms (carbon type resistance), C_1 has a value of 100 pica-farads, and C_2 is a trimmer with not more than 25 pica-farads capacity. The set is earthed normally, and a good aerial is connected via the trimmer C_2. The circuit RC_1 represents the load offered by an average aerial, and C_2 is introduced to give just sufficient coupling for the set to receive local stations for trimming purposes.

Before trimming up, ascertain that the dial and pointer are not out of true, or in any way damaged. If the dial is calibrated in wavelength or frequency, it is worth while trimming the set to make the dial accurate. The dial can also be of use when padding the oscillator coil. It may be found that for "top" results the dial has to be made slightly inaccurate. Whether to have an accurate dial or better reception depends on individual tastes. Some dials have slotted mountings which permit of slight adjustment.

Trimming the Long-wave Band

We can now get on with the actual lining up of the R.F. circuits. We should start with the long-wave band, then the medium and finally the short-wave bands. This is because the short-wave tuned circuits are most susceptible to small changes in capacity, and adjusting other coil circuits in close proximity to the short-wave components might introduce slight discrepancies.

The first thing to note about the long-wave band is that the R.F. trimmers will be found to make little difference. In other words, the trimming will be rather flat. It is also rather difficult for those without signal generators as there are few stations to "trim up on." Still, this shouldn't worry us too much. If it is impossible to find a suitable signal at the high-frequency end of the band, an artificial source of signal may be used. A buzzer, or small electric motor, running in the workshop will provide this. This will generate a continuous noise over practically all the bands covered by the set. The high-frequency end can then be trimmed (using the R.F. trimmer only) for maximum.

The use of the buzzer or motor is intended by the writer as a hint and not as an example of what he would call "good practice." The use of an untuned signal is liable to cause trouble, as both first and second channel frequencies are radiated at the same strength. It is only advisable to use such an untuned signal on the long-wave band where the second channel is a proportionately long way from the required signal.

Tuning the set over the long-wave band should ensure that Droitwich and any other signals received turn up on their correct places on the dial. Padding should be done with the condenser vanes all in, or nearly all in. If there are no stations at these frequencies, simply adjust the padding for maximum noise using the buzzer again. (The writer will describe how to pad on a fixed station in the paragraph on medium-wave trimming.)

The reason why we can pad so easily on an untuned signal is that the R.F. tuned circuit is fixed by the tuning condenser to resonate at a certain frequency, and by padding we are changing the oscillator frequency until it is the frequency of the I.F.'s away from that of the R.F. circuit.

A small change to the padder capacity on the long-wave band will make quite a substantial change to the dial reading without affecting the signal strength very much. So the dial calibration should be checked after this process and the correct position ascertained.

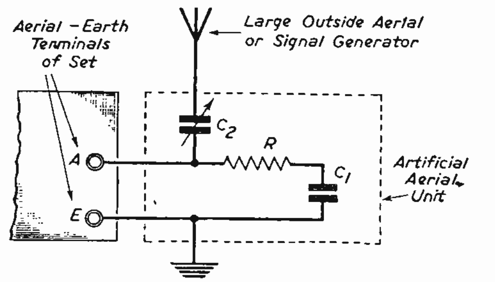


Fig. 8.—Circuit of artificial aerial to represent load imposed by average aerial. R is between 50 and 100 ohms (carbon). C_1 is 100 pFd. C_2 is not more than 25 pFd. R and C_1 represent the load and C_2 is intended to inject just sufficient signal into the set without materially affecting the values of R and C_1.

After padding, the tuning condenser should be swung to the high frequency end again, and the R.F. trimmer readjusted, if necessary. This R.F. trimmer should then be correct for all positions on the band and this point can be checked.

In trimming up a set with an untuned signal like this, we are taking a lot for granted. We are, amongst other things, assuming that the oscillator coil circuit is serviceable, and that the oscillator trimmer is already correctly set. If a signal of known frequency can be obtained at the high-frequency end of the band, the oscillator trimmer should be adjusted to have the dial read correctly with this signal.

If sufficient signals can be found, the writer very much advises not using the buzzer at all, and advocates trimming as described in the paragraph on medium waves. It certainly is not sufficient to say, as quite a few servicemen do, "oh, they'll only use the long waves for the Light Programme, anyway!"

Trimming the Medium-wave Band

This is very much easier as there are plenty of stations on this band. Tune to a known signal at the high-frequency end of the band, and adjust the oscillator trimmer to make the dial calibration correct. Don't forget that any adjustment of the oscillator trimmer or padder means that the set has to be retuned to receive the same signal again. Then tune to a known signal at the low-frequency end and adjust the padding condenser for correct dial reading. Tune to the high-frequency end again and adjust the R.F. trimmer or trimmers for maximum signal. This setting should then hold over the band. Check the tracking by tuning in signals over the band and seeing that the R.F. trimmer is at maximum setting on all signals.

If the R.F. trimmer appears to be more and more out of adjustment as the tuning condenser vanes engage, the padding is at fault. To remedy this it is necessary to pad the set using a fixed signal. This is done as follows: Find whether the R.F. trimmer needs more or less capacity with the tuning condenser vanes engaged, and adjust the padding condenser accordingly. (See paragraph above.) Retune the station and check the R.F. trimmer. Do this several times until the correct position of the padder has been found. Another method is to swing the dial backwards and forwards over the station continuously, at the same time adjusting the padding condenser, the R.F. trimmer having been set at the high-frequency end of the band. This last method is much quicker, but may need a little practice.

After padding, go to the high-frequency end of the band again and, if necessary, adjust either the oscillator or signal trimmer or both, as padding may have put them slightly out. Check the tracking again and it should be found perfect. If the set has no calibrated dial the procedure is a little simpler, as one need not worry about getting the dial accurate. Sometimes, with calibrated sets, it may be necessary to sacrifice the accuracy of the dial slightly for optimum results. This choice is left to personal tastes, as mentioned above.

With a few old-fashioned sets it might be possible to tune a signal above the oscillator frequency at one end of the band, and below the oscillator frequency at the other end. Tracking would, of course, be impossible under these conditions. This point should be checked, if the general performance of the set is poor.

Short-wave Trimming

The short-wave band circuits fitted to most commercial "all-wave" sets are sometimes something of an afterthought. Some sets have really good coils and are a pleasure to use. Whereas other sets have a short-wave band where insensitivity is the criterion and second channel reigns supreme!

Second channel interference will be found very troublesome on the short-wave band. It will show itself as a series of whistles beating with most stations received. The whistles will change their note as the set is tuned through the station. If the set has no R.F. stage it may be very difficult to eradicate *all* the second channel interference, but if the set is accurately trimmed, quite good results should be obtained.

Always let the set warm up for at least 10 minutes before tackling the trimmers. This is because the oscillator is pretty certain to "drift" a little as the elements of the valve expand.

Padding is nearly always fixed on the short-wave band. Otherwise the procedure is the same as for medium waves. One point to watch is the necessity for making absolutely certain that the oscillator is always at a higher frequency than the signal tuned circuit(s), whatever the position of the tuning condenser. If a strong signal can be tuned in at two places at the high-frequency end of the band, select the position with the vanes most "out," and trim the R.F. circuit at this setting. Tracking may fall off a little as the vanes become more and more engaged. This is because the efficiency of the signal tuned circuit becomes less and less as more capacity is applied to it.

If it is necessary to adjust the end plates of the tuning condenser slightly, do so only on the short-wave band. The small changes in capacity should not appreciably affect the medium- and long-wave bands, as mentioned above.

Trimmer Location

To save time in finding which trimmer is which in the circuit, the following hint may prove useful. Hold a screwdriver in your hand with your finger touching the metal blade. Touching the "hot" side of a signal trimmer on the band to which the set is switched will cause a crackle and a probable diminution of signal. Touching the "hot" side of an oscillator trimmer will cause the set to go slightly "off tune," or stop it working altogether.

The padder will usually be of a high-capacity type and circuit tracing will find it. It is useful to remember that the higher the frequency the larger capacity will the padder have. Adjusting the padders in turn will soon show which is which, but they should be returned to their original position again immediately afterwards. It is very advisable to "sort out" the trimmers before commencing to align the set.

Iron-cored Coils

If a receiver is found which is fitted with fixed padding condensers and adjustable iron-cored coils, it is easiest to treat the iron cores as though they were padders, and adjust them accordingly. Theoretically, of course, this treatment is not accurate, but in practice, it will suffice. Iron-cored coils very rarely fall out of adjustment, and only small changes should be necessary.

Conclusion

This article has been written with an eye to the constructor who does not possess a signal generator. With a calibrated signal generator, the procedure is almost exactly the same with the exception that the signal generator provides the various signals needed without the necessity of searching for them with an aerial. When aligning the I.F.'s the signal generator would, of course, be used at the intermediate frequency proper.

56 Megacycle Transceiver

An Interesting Two-valve Combined Transmitter and Receiver for the Licensed Amateur, Described by JOHN COBHAM

DURING the war the chief radio marvel that the public heard anything about was radio location, or "radar," as it was afterwards renamed by the Americans. But an ultra-short-wave device of which very little was heard was the transceiver, and yet these little sets in varying forms were used by the Allied armies in almost every theatre of war: on the beaches of Normandy, in the African desert, and in Italy.

The set about to be described follows the general design of those used on active service. With it it is possible to establish reliable two-way communication at R.9 over a distance of from 10 to 12 miles.

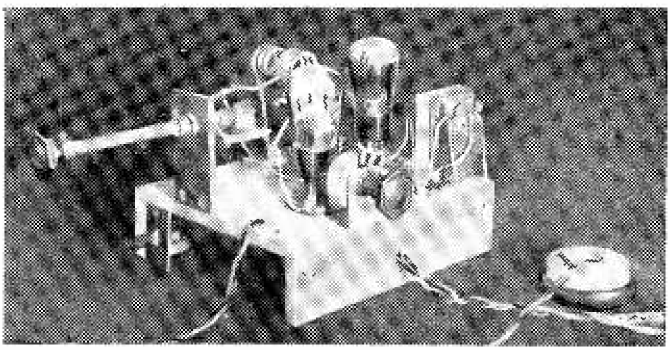


Fig. 1.—A view of the completed Transceiver. Note the extension handle.

The set was designed to operate in the five-metre band, but, of course, the frequency may be varied by altering the values of the coils, tuning condenser, etc. A wooden chassis was used, and in spite of this the set will be found to be perfectly stable provided an extension spindle is used on the tuning condenser.

It should be pointed out that it is against the law to carry out experiments with transmitting apparatus without first obtaining a Licence from the G.P.O.

The Circuit

The whole of the switching is accomplished by means of a single multi-contact switch, except for the L.T. on/off switch, which is incorporated in the 50,000 ohm potentiometer.

The set operates as follows: in the receive position the first valve works as a self-quenching super-regenerative detector, and the second as an L.F. amplifier and output. In the transmit position the first valve becomes the power generating oscillator, and the second the modulator.

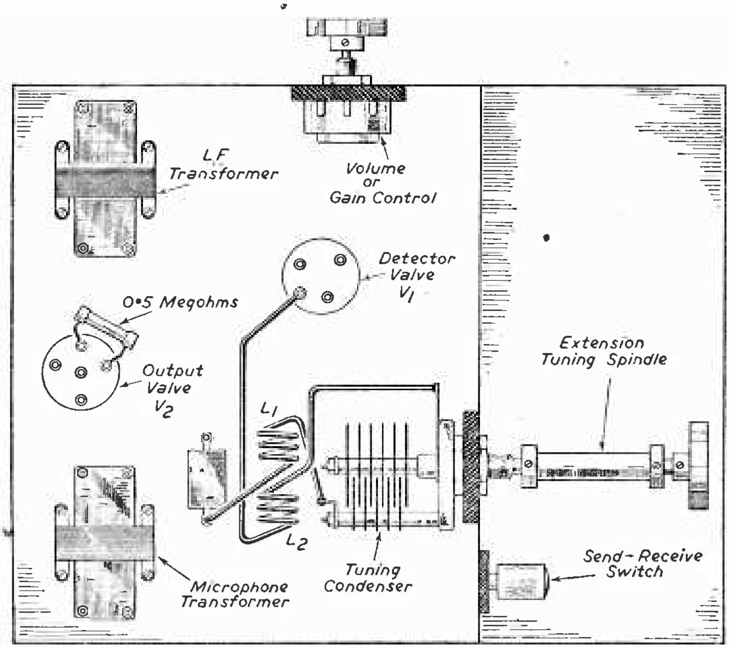


Fig. 2.—A plan view showing the main components and coil positions.

The grid and plate coils consist of three turns of No. 10 gauge copper wire ¾in. in diameter. The 50,000 ohm potentiometer is incorporated to provide a means of controlling regeneration.

A separate microphone transformer was used, but it is possible to obtain an L.F. transformer with a special microphone winding, which would enable the set to be built into a smaller compass. For the L.F. transformer a 5-1 ratio is about right.

The modulation choke should be 2,000 ohms, or thereabouts. The H.F. choke may be a commercial one of the short-wave variety, or may be made by winding 100 turns of No. 30 gauge wire on a ½in. former, spaced as in the illustration.

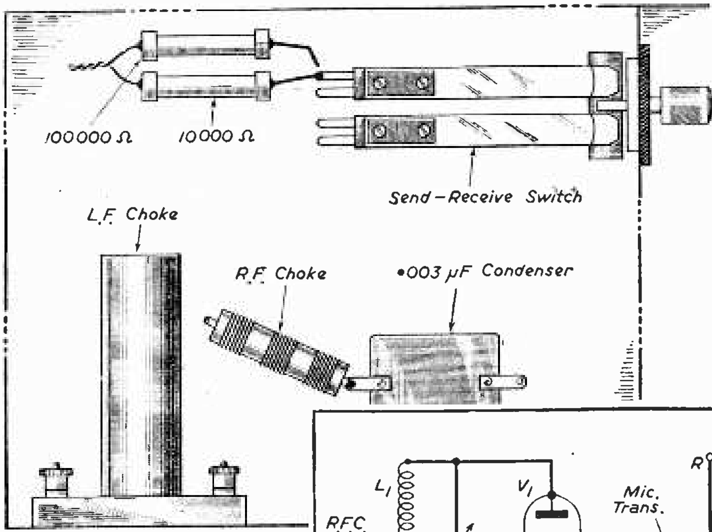


Fig. 3.—An under-chassis view of the set.

The valves used are of the 2-volt type, the first being a small power valve, such as a P.M.2, and the second a small output pentode. A single headphone unit is used so as to economise in space.

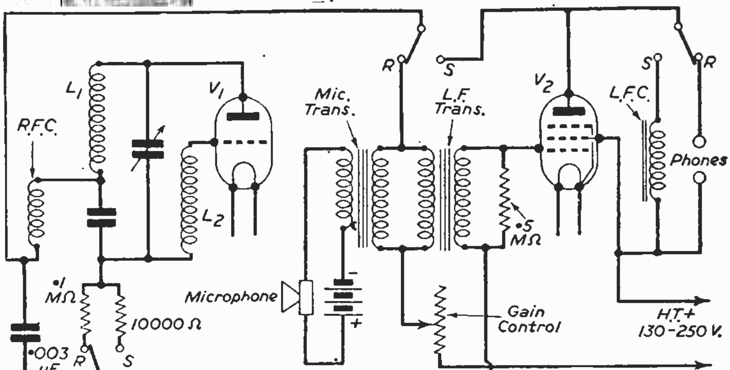


Fig. 4.—Theoretical circuit showing the send-receive switching.

The Aerial

As regards the aerial the best results were obtained by using a single wire approximately 8ft. long, with the feeder tap about 13in. from the centre. The feeder is clipped on to the "cold" end of the plate coil direct, but better results might be obtained by the use of a very small coupling condenser.

The case for the set is not shown, as it was thought best to leave the design of this to the individual requirements of the constructor.

Crystal or V.F.O.?

Multiple Crystal Oscillators and Various Forms of Alternative Oscillator are Discussed Here

by W. J. DELANEY (G2FMY)

THE beginner usually builds his transmitter with a Tritet or simple crystal oscillator feeding either a P.A. direct or a P.A. following a doubler. He soon finds, however, that there are a number of drawbacks to the crystal type of oscillator, and these have to be weighed against the main advantage of this particular arrangement, namely, stability. It will be noted that the transmitting licence calls for a satisfactory method of frequency stabilization, and that where the apparatus is not crystal controlled there has to be a reliable frequency meter of the crystal type capable of measuring the frequency to an accuracy of not less than ±0.1 per cent. The crystal fixes the transmitter to one definite point, and when searching the band one often hears a good DX contact calling in vain on some frequency different from that to which the transmitter is set up, and quite a large majority of the amateurs on the other side of the world seem to have a habit of searching only just round their own particular frequency. Under these circumstances one feels the need for changing the transmitter frequency fairly quickly, so as to be able to come up on or near the received frequency, and thus perhaps obtain a contact which would otherwise be lost. There are several ways of doing this.

Multiple Crystals

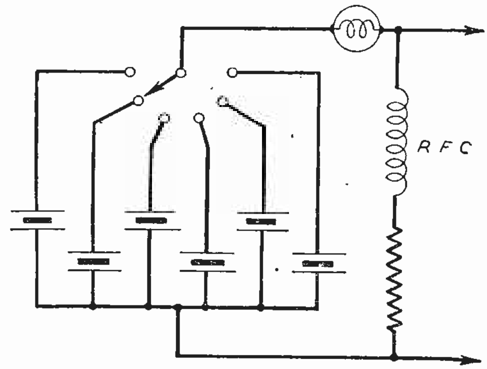
The simplest scheme is, of course, to have a number of crystals any one of which may be quickly selected. There is not much difficulty about this, but it is expensive, with crystals at 30s. or so each. Changing the crystal alone is not, of course, sufficient, as all tuned stages have also to be adjusted. Where a doubler follows a Tritet and feeds a P.A., obviously the job is not a very speedy one, and it will be found that it is desirable to have a meter in each tuned stage rather than to use the common arrangement of having a single meter with a plug which has to be transferred from stage to stage. If the change in frequency is not too great, it might be possible to leave the P.A. near its original setting and try to see if contact can be made, and to adjust it after making your contact. Half a dozen crystals spaced throughout the band will give a fairly good choice, and should prove quite satisfactory. But against this scheme must be considered the variable-frequency oscillator. The E.C.O. *can* be quite a satisfactory arrangement and, in fact, quite a number of amateurs use it, but it has its failings, as anyone who has tried it knows. A scheme which does not seem to be so widely known in this country as it deserves to be is the conversion exciter, or heterodyne exciter. In this a single crystal is used, and the principle of the superhet is adopted and an oscillator is made to beat with the crystal to produce another frequency. Furthermore, by using a low-frequency oscillator (which can be made very stable) and beating this with a high-frequency crystal one obtains both the variable feature of the oscillator and the stability of the crystal, and, after all, what more does one want?

The Heterodyne Exciter

The actual method of carrying out this idea is not critical, but calls for a few extra valves as well as the other necessary circuit components. One scheme is to connect the crystal in a Pierce type oscillator circuit, and to use two 6L7's in push-pull with their injector grids joined through a variable capacity to the grid of the crystal oscillator stage. Obviously alternative schemes will suggest themselves to the experimenter when the main idea is grasped. The great advantage of this arrangement is that quite a number of standard broadcast components can be called into play (with consequent saving in both expense and critical values or methods of construction). The actual constructional features may be left to individual choice, but it should be pointed out here that the great idea underlying this form of oscillator or exciter is its flexibility, but this must not be offset by any form of instability. Some amateurs favour the arrangement whereby each stage is enclosed in its own screening box, but this leads to temperature rise under certain conditions, and obviously this may offset all the gains previously obtained. Similarly, valves which have had a very long period of use may also be found to vary in emission, and so upset the working of the arrangement.

A Practical Scheme

Tests which have been carried out at our own station show that best results were obtained with the complete stage operated from its own separate power supply, using standard voltage stabilisers; a minimum of metal in the way of screening shields or boxes, and with all resistors chosen to have very conservative ratings. There are quite a number of good ex-service components now on the market which prove ideal in a unit of this type, and in the R.A.F. equipment will be found not only complete medium-wave tuning units of very high efficiency, but tuning condensers with dials which may be locked at definite points, and with these incorporated it will be found a very simple matter to have pre-selected spots completely covering a given wave-band which may be found immediately and leave little to be desired in the way of band-spotting. It is not intended at this stage to give a practical circuit for several reasons. Most amateurs will have their own ideas concerning the best way to put the scheme into operation, and here again one finds the great advantage of building the complete transmitter on the unit or separate chassis system. An exciter may be built up, tested and, when found to be working satisfactorily, it may be connected up in the transmitter by the simple method of removing the chassis containing the existing exciter



Multiple crystal switching. The switch should be of the Yaxley or Wafer type.

and placing in the new unit. This again draws attention to one point in connection with the real experimenter's equipment, namely, power supplies. If a single power unit is used, the output will obviously be adjusted according to the valves or circuits in use. Supposing you are using at the moment a Tritet, Doubler and P.A. This will run to three or four valves (depending on whether the P.A. is single-ended or push-pull). If now a unit such as has been outlined is added this will mean that heater current for at least three more valves will be called for, in addition to the extra H.T. current. There is thus very much to be said for designing each unit with its own power supply. With the exception of the P.A. and Modulator, simple, low-priced mains transformers may be used (delivering at the most, 350 volts). The main rear runner of the rack or whatever type of unit is in use may then carry a normal two-pin standard 3 or 5 amp. power socket at each section of the assembly, and it is thus a simple matter to remove and replace units for experimental purposes, without upsetting any of the supplies of the remaining units.

ON YOUR WAVELENGTH

By THERMION

The Inquiry

THE inquiry conducted by Sir Valentine Holmes into charges of bribery and corruption made against certain officials of the B.B.C. by a Member of Parliament has been made public and well ventilated in the Press. The charges were unfounded, according to Sir Valentine, who merely thought that certain officials had been "unwise" in accepting presents. Sir Valentine has also enunciated his own plan for avoiding the reprehensible practice of song plugging which the B.B.C. say they have unsuccessfully tried to stamp out during the past twelve years. I do not think they could have tried very hard. Surely it must be the easiest job in the world to stop it, and Sir Valentine would not need to be a Sherlock in order to trace the cause and suggest a cure.

Apparently the system is for band leaders to be booked for certain dates, and the choice of songs and dance tunes is left largely to the band leaders, although an official of the B.B.C. has finally to approve the répertoire. We all know that this does not work in practice. Music publishers are prepared to pay band leaders handsomely to plug a certain tune, and from that point we are told over the air that it is a popular tune. Once it has been decided to plug a certain tune it is "popular" before the public has even heard it.

Naturally this gives rise to keen competition between music publishers for the services of band leaders to peddle their wares. Moreover, it is a temptation to band leaders to bargain with music publishers. If they are offered X-pounds by the Cacophony Publishing Company to plug the merest piece of tripe, and Mr. Tom Trombone, the band leader, does not think the fee offered enough, he can go to another publisher, say that he has been offered X-pounds, but is prepared to plug the second publisher's tunes for 2X pounds.

Now, the giving of presents can be an innocent affair, round about Christmastime, or Easter. If presents, however, are made in order to induce a person to do what they otherwise would not do, that amounts to bribery. Apparently there was no evidence that any member of the B.B.C. had been seduced from the paths of loyalty and business rectitude. This really means that the band leaders and the publishers have been throwing their money away.

There is another side to the question. The band leaders say that they cannot make a profit out of their broadcasting fees. They have their bandsmen to pay, expenses are heavy, and they have to rely upon publishers' fees and gramophone recordings in order to make a living.

And, of course, competition is getting keener. Each member of a band nurtures the secret ambition to break away and form his own band, and this has been done on a number of occasions. The bands split up and multiply like germs, which only goes to show what little qualification is required to run a dance band.

But the B.B.C., if it really tried, would not need the services of Sir Valentine Holmes in order to find a solution. It could ask the music publishers to submit details of their new tunes, have them played over in one of the B.B.C. studios, make their own selection, and then submit them to the dance band leaders. They must at the same time take temptation out of the way of the dance band leaders by paying them adequate fees.

Alternatively, the B.B.C. could invite the vast army of song writers to submit their tunes direct to the B.B.C., which would arrange for the publication of selected tunes after they had been broadcast. Those are two fairly simple solutions which should go a long way towards stopping the practice of song plugging.

I do not suppose that any completely foolproof scheme can be evolved. Too much importance is attached to dance band music. Almost anyone could compose a dance tune. The orchestration may be a little more difficult, but the B.B.C. employs its own staff of orchestrators.

The B.B.C. could employ its own resident dance bands. In these and many other ways which will occur to readers we could be certain that the public were not having foisted upon them tunes which dance band leaders and music publishers have decided shall be popular. A tune should achieve popularity by its own merits, and not by plugging. Very few have achieved success in this way.

Shape of Things to Come

[A paper devoted to spiritualists and spiritualism, says: "It is very difficult to find out at what wavelength the spirit world vibrates."]

Oh! surely not! Some error here.
All "Indian guides" should know
The wavelength which we ought to use,
And kindly tell us so.

Ask Heap-Big-Chief White Eagle,
Or Indian squaw Red-wing,
Who, if we listen to their claims,
Know almost everything.

We cannot speak with them direct,
The mediums tell us so;
But mediums will help us.
Who red man's language know;

And he, or she, when in their trance,
White Eagle then translates,
And he may tell them if he will
How spirit world vibrates.

His answer, "Wah-ne-toki-tum,"
We have to take on chance;
But medium understands each word
They hear when in their trance;

They stiffen out, their limbs they jerk,
Their eyeballs roll around,
They say, "White Eagle plenty work
Till answer has been found."

And then with modern radar set
Through ether we may range,
And contact those with whom we'd speak
Through the Spirit World exchange.

"TORCH."

Radio Amateurs' Examinations

The November Test Paper and Details of the Results

THE second paper set by the City and Guilds of London Institute is reproduced below. The examination was held on Friday, November 15th, and of 216 candidates, 150 succeeded in obtaining a pass. This was the paper which was set:

Candidates should attempt as many questions as possible. Use should be made of diagrams where applicable. The maximum possible marks for each question are shown in brackets.

1. Why are frequency multipliers sometimes employed in radio transmitters? Describe, with diagram, a frequency-multiplying stage for a low-power transmitter. (10 *marks.*)

2. What is "fading," and how is it caused? (10 *marks.*)

3. Describe briefly the principles of operation of a superheterodyne receiver, illustrating your answer with a block schematic diagram of a typical receiver. (10 *marks.*)

4. The D.C. feed to the last stage of a transmitter is 250 volts, 60 mA. It is found that the H.F. current flowing in a load resistance of 500 ohms is 0.1 ampere. Calculate:

(*a*) the power input;
(*b*) the power output;
(*c*) the efficiency of the stage. (10 *marks.*)

5. What are the advantages and disadvantages of directional aerials for transmission and reception? Describe, with diagrams, a simple directional aerial and explain its method of operation. (10 *marks.*)

6. Describe the principle of the heterodyne frequency-meter and explain how you would use it to determine the frequency of a received signal. (10 *marks.*)

7. (*a*) What is the purpose of key-click filters, and of what do they consist?

(*b*) An amateur transmitter on the 14 Mc/s band was found to interfere with television reception on 41-45 Mc/s. How was the interference probably caused and what steps could have been taken to minimise it? (20 *marks.*)

8. (*a*) What is the procedure laid down by the Postmaster-General for the use of call-signs when making and answering calls?

(*b*) One condition imposed by the Postmaster-General as regards "Non-interference" is as follows:

"When telephony is used, the system of modulation must be such as to prevent the carrier-wave being modulated more than 100 per cent."

What are the objections to over-modulation, and how would you minimise the risk of over-modulating? (20 *marks.*)

Results

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

	No. of Candidates	No. of Passes	No. of Failures	Percentage of Failures
May, 1946	182	145	37	22.2
November, 1946	216	150	66	30.5

The falling off in the proportion of passes, as compared with the May, 1946 examination, appears to be due to the fact that a number of persons sat for the examination without adequate preparation. There was a tendency, noticeable also in the first examination, for answers to be worded so briefly or vaguely that it was difficult, or impossible, for the examiner to assess correctly the entrant's knowledge of the subject. A typical example of this occurred in the question on over-modulation, in which a number of candidates wrote that this could be prevented "by the use of a cathode-ray oscilloscope" without giving any evidence that they knew what such an apparatus is, or stating how it should be used, or what results would be strived for. The advantages gained from the use of diagrams in answering questions still seems not to be appreciated by many students. For example, even the question on fading was answered by many without the aid of a diagram! A few candidates used no diagrams at all in their answer papers. Comments on the individual questions are:

Question 1.—*Frequency multipliers.* Fairly well answered, though a number of candidates were under the misapprehension that the harmonics are produced by a piezo-electric crystal. Many failed to grasp that the harmonics are produced as a result of the conditions under which the valve in a frequency multiplier operates, and failed to describe these conditions, i.e., the portion of the characteristic on which the valve is biased to work.

Question 2.—*Fading.* Many candidates, while describing fading along a single path, omitted to describe fading caused by two or more signals arriving by differing paths with varying phase relationships. The majority gave good diagrams, but a number submitted very poor diagrams and in a few cases no diagram at all was given. These latter were perhaps candidates having insufficient knowledge of the subject to do so.

Question 3.—*Superheterodyne Receiver.* Fairly well done. Most candidates drew the block schematic diagram correctly, but many gave an inadequate description of the functioning of the receiver!

Question 4.—*The calculation.* Generally well done.

Question 5.—*Directional aerials.* Only fairly well done.

Question 6.—*Heterodyne frequency-meter.* Not very well done. Answers generally were somewhat confused, or lacking in essential detail. This question appeared to catch a number of candidates by surprise.

(*Concluded on page* 262)

Triode Vectors—2

Further Details on the Subject Discussed Last Month. By "DYNATRON"

The "Series-Parallel" Conundrum

THE answer to this riddle is fairly simple.

In Fig. 2(a) are shown two alternators working in parallel. They are in parallel in relation to the external circuit. The total voltage V will be that of *one* machine, whilst the total current supplied will divide between the two parallel paths.

But if we inserted a voltmeter in the closed mesh interconnecting the two machines it would register zero. The E.M.F.s are in *series opposition*. If the connections to one machine were reversed, the total E.M.F. in this closed (short-circuited) series mesh would be *twice the voltage of each machine*—an enormous circulating current would flow, but, of course, with a high-resistance voltmeter in circuit, we should simply get maximum voltage reading.

The case suggests how a parallel network has also a "series aspect."

In our valve network, a signal E.M.F. Eg applied to the grid gives rise to an E.M.F. in the anode circuit of μEg volts, acting on (Z+ra) in the series sense. There is no question of any parallel combination here. *Relative to μEg, Z and ra are in series.*

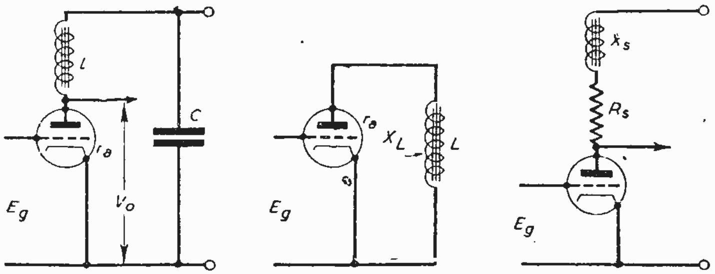
But, the *output voltage* Vo is that existing across Z and given by Eq.(2). Or, rather, Vo is the phase-reversed version of the supply voltage existing across Z. We needn't worry about "phase" at the moment. Though there are difficulties about the view, we may say that Vo is *common* to Z and ra, *regarded as a parallel combination.*

Perhaps the easiest way to see that the valve is in parallel with the load is to look at a typical shunt-fed circuit (Fig. 2(b)). Here, the thing is perfectly obvious, but, again, μEg acts in the closed mesh comprising Z, C and ra *in series*. The voltage existing across the parallel network is not μEg, but Vo.

It is hoped this brief discussion will help to elucidate the matter, even though some difficulties may be apparent in devising vector conventions to meet both (series and parallel) cases.

"Purely Reactive" Load

This will explain why, with a triode valve, the phase-shift for the case of a purely inductive load (Fig. 3(a)), is practically the same as if the load were a pure resistance—no matter how large the inductive reactance.



(a) (b) (c)

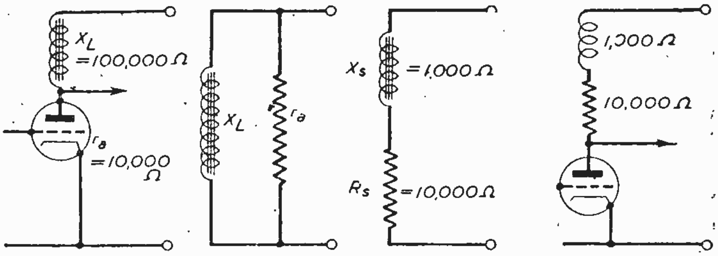
Fig. 3.—The resistance ra in parallel with inductive reactance X_L, may be expressed as a series-equivalent (for purposes of estimating "phase") consisting of a reactance X_s and resistance R_s, as in (c).

The valve ra is in parallel with L (Fig. 3(b)), so, no matter how large the reactance, the net result will be some value of impedance *less than ra*. It will approximate to a pure resistance, because ra is small (let us suppose) compared with the inductive reactance $2\pi f$L.

Eq.2 remains correct for the voltage amplification. For this purpose we still consider $2\pi f$L and ra as *separate parts* of a series network. Of course, our "Z" in Eq.(2) will be $2\pi f$L, whilst *vector* instead of arithmetical summation will have to be used in the denominator of the equation.

But as regards the *phase* of the output voltage Vo, we must bear in mind that this voltage exists across the parallel network. Thus, even though L may have a reactance as much as 10 times ra, or more, the comparatively *low* shunting resistance ra will have the effect of giving a "load" (relative to Vo) which is largely resistive.

Fig. 4.—Numerical illustration of the device of expressing a parallel circuit by a series-equivalent. Observe, however, that the simple series circuit of ra and X_L must be used to arrive at the expression for voltage-amplification, using μEg, i.e., circuit (a).



(a) (b) (c) (d)

As far as the phase of Vo is concerned, we have nothing like a " purely reactive " load in the anode circuit. The parallel effect of ra may be expressed by means of a *series-equivalent* resistance, Rs (Fig. 3(c)). If the reactance is large, and ra comparatively small, Rs will be a *large* resistance, comparable with or greater than the reactance.

For example, suppose ra = 10,000 ohms, $2\pi fL$ = 100,000 ohms = 10ra. It can be shown that the equivalent series resistance is 10,000 ohms, and the equivalent series reactance only 1,000 ohms. So, if we suppose ra to be infinite (because it is included in the anode load (Fig. 3(c)), we have a series circuit where the *resistance* is 10 times the reactance !

We started with a reactance of 10 times the resistance. But, because this resistance is virtually in parallel with 100,000 ohms, the *equivalent* series circuit boils down to a resistance 10 times as great as the reactance.

To explain this part more clearly, the conditions are illustrated in Fig. 4.

Starting with a reactance XL = 100,000 ohms, ra = 10,000 ohms (Fig. 4(a)), we have, in (b), 10,000 ohms in parallel with 100,000 ohms—the valve shunts the reactance. The series equivalent of 100,000 and 10,000 ohms in parallel is a reactance of 1,000 ohms and a resistance of 10,000 ohms in series (c). Having thus allowed for the effect of ra, we may suppose now that ra itself is infinitely large, when our anode load reduces to Fig. 4(d).

The voltage amplification will be that due to an impedance of 100,000 ohms in the anode circuit. But the phase-shift will be that due to a reactance of only 1,000 ohms, and a resistance of 10,000 ohms (Fig. 4(d)). Since the resistance is 10 times the reactance, conditions will not be very different to those existing if the load were entirely made up of resistance.

Actually :

$\tan \phi = Xs/Rs = 1/10 = 0.1$,

and from a table of tangents :

$\phi = 5$ deg., very approximately.

Thus, the only effect of L will be to shift Vo by 5 deg. in an anti-clockwise direction from being exactly at 180 deg. to the anode current Ia.

In the case of a pentode, ra is very large. The equivalent series circuit will thus be a *small* resistance and a large reactance, and consequently ϕ will approach 90 deg. as outlined in previous articles.

All this comes down to the simple statement which I made when replying to Mr. R. S. Hatch. With a triode it is impossible to obtain a purely reactive load in the anode circuit, because the resistance of the valve is so low that its shunting effect is equivalent to introducing a high resistance in series with the pure reactance.

We must next proceed to examine the reasons why Ia can become de-phased upon Eg.

Constant Anode Voltage

First, let us take a simple case where Ia and Eg are in phase. Provided the anode voltage is constant, for example, if tied directly to +H.T. as in Fig. 5(a), the electron current will vary exactly in step with alternating potential variations Eg between grid-cathode. The same will be true at some higher or lower value of the H.T.

The anode + potential provides an electric field inside the valve, drawing electrons from the vicinity of the cathode. The only effect of Eg is to vary the strength of this field near the cathode. Since the potential of the anode does not vary, the number of electrons attracted will depend only upon the magnitude of Eg.

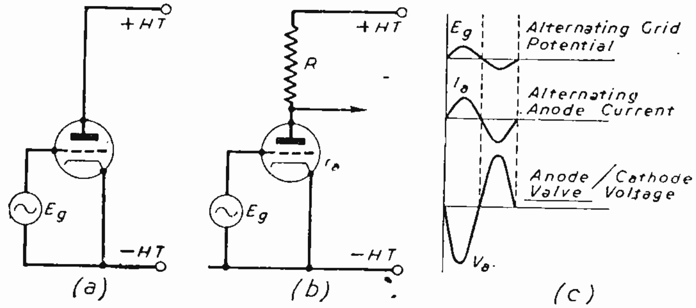


Fig. 5.—Without an anode load (a), the volts on the anode will be constant, and Ia and Eg will be in phase. Also, with load as in (b), there will be no phase-shift between anode current and grid potential—the load resistance R simply determines the maximum value of Ia, i.e., the magnitude *of Ia.*

Variable Anode Voltage

But suppose we varied the anode potential *simultaneously* with Eg. Suppose that when Eg is varying the grid-cathode potential in a *positive* sense, the anode-cathode + potential va is caused to *decrease*.

We may further suppose than when Eg is at a maximum in the positive sense, va will have fallen to some minimum value. This means that va is 180 deg. out of phase with Eg and Ia, as in the case of a valve with a simple resistance load.

The only effect of the change of va in such a case will be to reduce the *magnitude* of the current change caused by Eg. The *phase* of Eg and Ia will *not* be altered, because the anode potential reaches minimum at exactly the same instant as the grid-cathode potential is a maximum.

A little consideration will show that our assumed case of a variable anode voltage corresponds to what actually happens when there is an impedance (e.g., a resistance) load in the anode circuit. A rise in volts across the load is accompanied by an equal voltage-*fall* across the valve, and so the magnitude of Ia will be determined by the values of *Eg and va.*

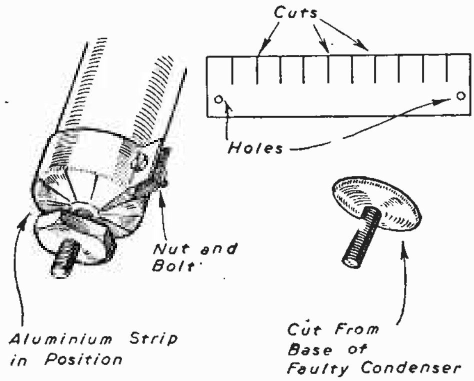
We will look at this point in a little more detail next month.

(To be continued)

Practical Hints

Electrolytic Condenser Mounting

THE following idea may prove useful to readers of this page. While servicing an amplifier, I had to replace two 16 mfd. condensers. These were of the "self" clamping type, and the spares I had were the standard type. Below is shown the modification. Cutting around the bottom I soon had removed the screwed plug. Next I obtained a metal strip—aluminium—and this was about 1$\frac{1}{2}$in. wide, and of length $\frac{1}{2}$in. longer than the circumference of the other condenser. This $\frac{1}{2}$in. is used for the clamping bolt; then I cut $\frac{5}{8}$in. deep along the edge of one side and drilled two holes.



A novel idea for electrolytic condenser mounting.

Placing the plug on top of the standard condenser and wrapping the metal strip around it, the tags are pressed by tinsnips on to the base. Finally clamping gives the completed job as shown.—F. C. PALMER (Truro).

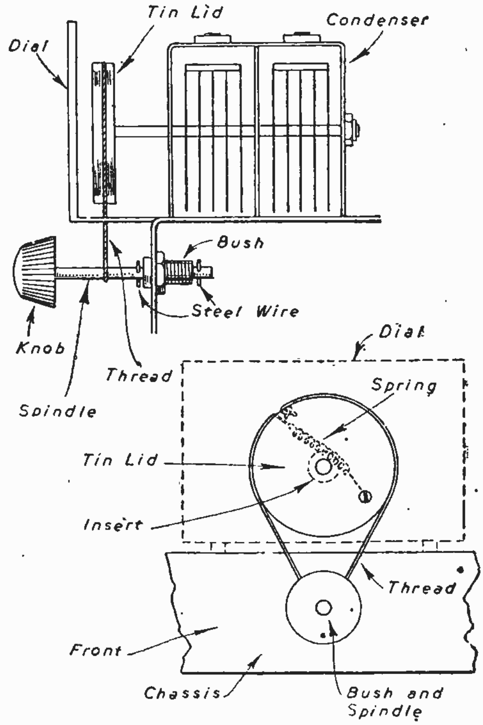
Slow-motion Drive

WANTING a slow-motion drive for a T.R.F. midget, I hit on the following idea.

An ordinary cocoa tin lid is drilled in the centre with a $\frac{1}{4}$in. drill, a $\frac{1}{4}$in. brass insert is now soldered on the inside of the lid, but over the hole.

A $\frac{1}{8}$in. hole is now drilled $\frac{1}{4}$in. off centre, through which is passed a 6 B.A. nut and bolt.

A burnt-out long spindle volume control is now stripped of everything except the spindle and bush, a 1/16in. hole being drilled in the spindle on either side of the bush, and a piece of steel wire passed through each hole to stop the assembly from slipping. The bush is now passed through the chassis after a $\frac{3}{8}$in. hole has been made and a groove cut in the spindle with a file. The tin lid is now punched through the side opposite the $\frac{1}{8}$in. hole with a small punch. The lid assembly is then fixed to the condenser and a piece of thread passed over the spindle, and the two ends pushed through the punched hole. The thread is next tied on to a spring from an old relay, the other end of the spring being attached to the 6 B.A. bolt. The result is an efficient 6-1 reduction drive.—A. TAYLOR (Ashford).



A home-made slow-motion drive.

Screened Leads

EXPERIENCING instability recently, I fitted some screening to certain leads in the set, and although this stopped the instability results were very poor. It was eventually found that the inferior performance was due to the screened leads. In some cases the high-capacity to earth resulted in H.F. loss, and in two cases the trouble was due to the fact that the screening leads were improvised with wire wound round a thick rubber-covered flex. This, I finally realised, gave an inductance effect over the internal wire. The trouble here was cured by running solder along the whole length so as effectively to short-circuit the coil so formed.—E. NORMAN (N.W.9).

The Three-

A Self-contained Attache-case

AS the year advances, many amateurs will be looking with interest toward designs of home-constructed portable receivers. There have been many ultra-portables published, working with one, or perhaps two valves, having very low H.T. Others have been built specially for the kit-bag. All these will be found most useful, and very easy to construct, but they have their limits, and are not usually expected to give loudspeaker results.

The portable about to be described, was constructed by the author with the object of giving moderate speaker results on the home stations, whilst at the same time paying attention to stability. Thus it was decided to confine the set to one wave-band only, the medium, and so avoid the complication of wave-change switching for both coil and frame aerial, together with the matching difficulties that would arise with more than one wave-band.

The Case

The receiver was actually made to fit into an old Decca portable gramophone case. Not everyone has such an instrument, of course, but the author feels that the design he has arrived at has quite a few novel features, and is of sufficient interest to be worthy of a trial by other amateurs. The case might be constructed of suitable hardwood of $\frac{1}{4}$in. to $\frac{3}{8}$in. thickness, and could, of course, be suitably covered or polished to taste. The inside dimensions of the case shown, and which are very slightly fuller than the sizes given, are as follows. The lid is $11\frac{1}{8}$in. wide $\times$ $11\frac{1}{4}$in. $\times$ $3\frac{1}{2}$in. deep. The bottom container is of the same size, but $3\frac{7}{8}$in. deep inside.

In order to utilise this case for the portable, the four corner blocks of the bottom container, originally occupied by the gramophone motor and turn-table, were removed, and replaced by simple brass corner brackets for strengthening purposes. The similar blocks in the lid compartment, were left, and the frame aerial designed to fit, with the necessary clearance all round.

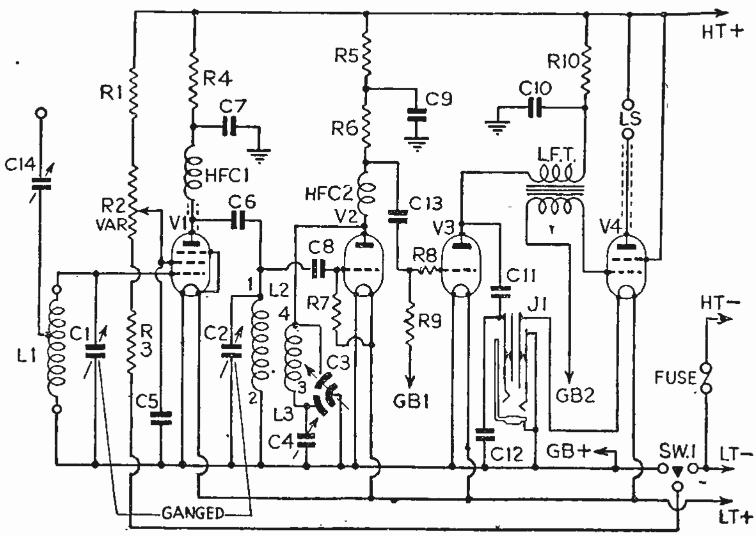
Much care has been taken to make the frame aerial as efficient as possible. The 17 turns are securely anchored in slotted strips made from Perspex, and when the frame aerial is finally fitted into the case, these turns are almost entirely air spaced.

A simple aerial socket and small series condenser have been included, the latter going to a tapping point on the frame for connecting an external aerial if so desired. However, as is usual with portable sets, best all-round results will be obtained using it as a portable, and the extra gain one might expect by attaching an external aerial, is not always forthcoming or really found necessary.

The midget M.C. speaker has been arranged on the back of a circular cut-out portion of the frame-aerial front panel, so that the speaker can be quickly and easily removed. Most amateurs are continually occupied with different pieces of experimental apparatus, and an extra speaker that can be "hooked up" quickly at a moment's notice is very useful.

The set was designed to work from a standard H.T. battery of 90 volts, together with the very excellent little Varley Dry Accumulator, model V.20, for low-tension supply. This latter is most compact and, of course, quite unspillable. Its very modest size of $2\frac{7}{8}$in. square $\times$ $4\frac{1}{4}$in. high, overall, is very convenient.

A rather unusual feature, perhaps, is the small



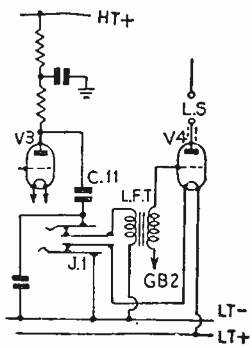


Fig. 2.—Theoretical circuit of the receiver and Fig. 2 (a) (above) details for alternative wiring of the phone jack.

our Portable

eceiver Described by R. L. G.

screened L. F. transformer unit, which the author has called an Add-on-transformer Unit. This unit, together with the batteries, just comfortably fill one half of the compartment, and the flex connections to them from the set are very short.

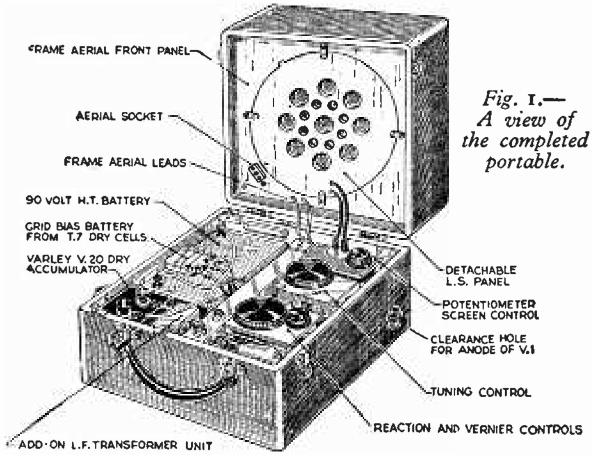


Fig. 1.—A view of the completed portable.

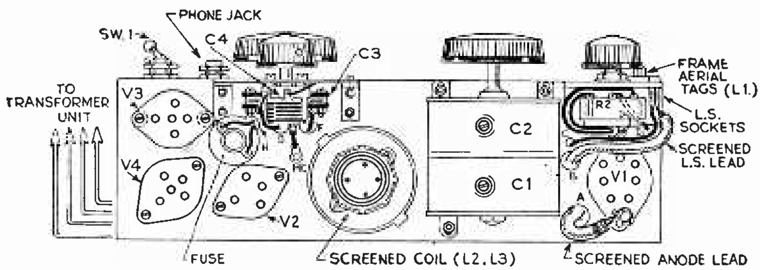
Complete Layout

Fig. 1 shows the complete portable assembled and connected up. To show clearly the layout of the various parts, the plywood cover panels have been omitted in the drawing of this view. They can be seen in detail in Fig. 8.

Owing to space restrictions, it was not found possible to fit slow-motion drives for tuning and reaction. Instead, very large tuning knobs have been used, and with these quite fine tuning will be found possible. These knobs, by the way, are quite a standard article, measuring 2⅛in. dia. by ½in. thick, and will be found in many short-wave enthusiasts' boxes, or are readily obtained from most component suppliers.

The author has made use of normal-sized components, and with the exception of the midget M.C. speaker, the only other component that can be classed as midget is the twin-ganged tuning condenser. This is a screened and very efficient component measuring 2½in. × 3in. × 3½in. deep, and has both side and bottom tags for connection to fixed vanes of each section.

As a result of using normal sized parts, it was necessary to design the set carefully, so that every part was correctly positioned, and little space has therefore been wasted.



Circuit

The circuit diagram is given in Fig. 2, from which it will be seen that the receiver is quite a straightforward four-valve arrangement. It consists of an R.F. amplifier (tuned), with tuned-grid coupling to the detector, this latter being a normal leaky-grid arrangement. This is followed by a resistance stage, and the anode of this valve is coupled to the output valve by means of an A.F. transformer.

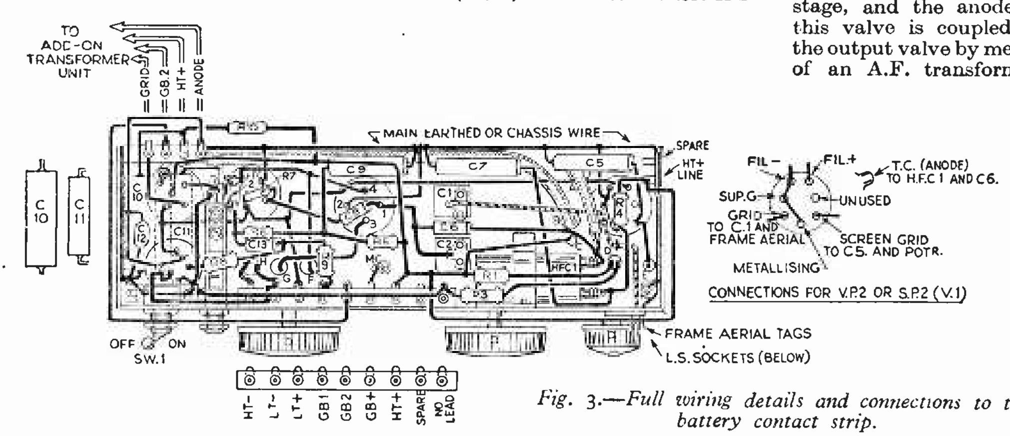


Fig. 3.—Full wiring details and connections to the battery contact strip.

Differential reaction has been employed, and this will be found to give very stable results, the operation being very smooth and controllable.

A phone jack has been included between the anode of the third valve, via an .02 mfd. fixed condenser to chassis, the filament of V4 being automatically switched out of circuit on the insertion of the phone plug.

Some criticism may arise at the inclusion of the primary winding of the L.F. transformer into the H.T.+ line, but the author considered it worth sacrificing a little in quality, for the extra "punch" obtained over the parallel-feed system. Should the reader wish to try comparable results of one system against the other, then the connections from the phone jack, might be as shown in Fig. 2A. The resistances shown would be restricted to a somewhat low value owing to the H.T. of 90 volts.

A potentiometer control has been employed to vary the screen voltage on V1. This system has been adopted in place of the more usual grid-bias control, as any overloading of R.F. on the home stations can be readily eliminated by rotating the portable bodily, thus using the directional properties of the frame aerial winding to control input to V1. As the "bleeder" system has been used for this potentiometer control, it is of the utmost importance that R3 of this particular network is taken to one of the connections of the three-point switch. Otherwise, if it is connected directly to the chassis, a slight consumption of H.T. would take place even when the set were switched off. This will be referred to later.

Chassis

The set has been built up on a robust aluminium chassis, full details of which are given in Fig. 5, and the aluminium sheet should be as stout a gauge as is convenient for working. As will be seen it is of a plain three-sided construction for ease of wiring. It has a small aluminium sub-panel mounted on top, by simple stout brass brackets, this panel being for the two reaction condensers. The potentiometer, and loudspeaker sockets, are mounted on a bakelite panel, also bolted on the extreme left of the chassis. Immediately below this panel, will be seen the small frame aerial connecting panel, and the large clearance holes for these two tags should be adhered to, so that these are well clear of any metal. The two tags of course project inside and outside the chassis for connection.

As the reader will no doubt be making use of components already to hand, as far as possible, a careful check-up is advised, with a preliminary layout of all components to be used, to see that sufficient clearance between them is possible, without need of any drastic re-arrangement of layout. The diameter of some of the holes may vary, and should be checked with components being used.

Also, if a similar carrying case to that illustrated is to hand, and it is decided to use it, check up the inside sizes of the compartments, to see that these agree. A smaller carrying case would not of course be so convenient as a slightly larger one. A point worth watching also is the clearance for dial knobs and other controls. This will be the distance between frame aerial panel to these controls when the case is closed. It was for this reason that the author found that a slight recessing of the ⅜in. frame aerial panel was necessary.

(To be continued.)

LIST OF COMPONENTS.

C1 & C2—Midget twin ganged tuning condenser, .0005 mfd. (Polar).
C3—Differential reaction condenser, .0003 mfd. (Igranic).
C4—Trimmer type variable condenser, .00005 mfd.
C5 & C7—Decoupling tubular fixed condenser, .1 mfd.
C9—Decoupling tubular fixed condenser, .25 mfd.
C10—Decoupling tubular fixed condenser, 1 mfd.
C6 & C8—.0001 mfd. fixed condenser (mica type).
C13—Coupling tubular fixed, .002 mfd.
C11—Coupling tubular fixed, .02 mfd.
C12—H.F. by-pass fixed, 200 mmfd.
C14—Series aerial, trimmer type, 100 mmfd.
R1 & R5—20,000 ohms fixed resistance, ½ watt type
R4 & R10—1,000 ohms fixed resistance, ½ watt type.
R7—1 megohm grid leak resistance, ½ watt type.
R6—50,000 ohms fixed resistance, ½ watt type.
R8—Grid stopper, 10,000 ohms fixed, ½ watt type.
R9—½ megohm fixed resistance, ½ watt type.
R3—30,000 ohms fixed resistance, ½ watt type.
R2—Potentiometer 20,000 ohms variable.
L.F.T.—L.F. midget transformer 1-3 (Graham Farish "Pip").
R.F.C1—H.F. choke, screened, type H.F.15 (Bulgin).
R.F.C2—H.F. choke, unscreened, disc type.
J1—Phone jack and plug with make-and-break contacts.
Sw.1—Mains type switch, suitable for three-point working.
L2 & L3—Four-pin coil former, eight-ribbed type, 1½in. diameter with suitable screening can and base 2½in. diameter.
Seven-pin chassis mounting valve holder V1.
Five-pin chassis mounting valve holder V4.
Three four-pin chassis mounting valve holders, for coils, and V2 and V3.
Tag board with eight or nine soldering tags.
Tag board with four soldering tags.
Coil of best frame aerial wire (Lewcos).
Stout gauge aluminium for chassis and reaction panel.
Small sheet of bakelite, 6in. by 3in. sheet of ⅛in. Perspex.
Baseboard pattern fuse-holder, and fuse bulb.
Two large type dial knobs. 12in. of ⅜in. by 3/32in. strip brass.
Set screws, small nuts and bolts (brass).
Permanent magnet, midget loudspeaker 5in. or less with matching transformer.

VALVES
V1—Mullard V.P.2.
V2—Mullard H.L.2.
V3—Mullard P.M.1 L.F.
V4.—P.M. 202 or P.M. 22A.

Six small cells for grid-bias battery size T.7. Ever Ready.
H.T. battery, 90 volts (Vidor).
Accumulator dry type (Varley) list V.20.
Stout tinned copper wire for connections with slip on sleeving.
Flex, soldering tags, etc.

News from the Clubs

THE HOUNSLOW AND DISTRICT RADIO SOCIETY

Hon. Sec. : A. H. Pattle, 11, Abinger Gardens, Isleworth, Middlesex.

THE society, which meets alternate Wednesday evenings at the Grove Road Schools, Hounslow, at 7.30 p.m., is increasing in membership in a very healthy way. The winter's programme, which includes the building of a unit communications receiver, a T.R.F. receiver and P.A., is now well under way, the members showing great enthusiasm in the construction of various components for these units.

Several members hope shortly to obtain their tickets, and it is hoped to put the club's TX on the air.

CANNOCK CHASE RADIO SOCIETY

Hon. Sec. : K. R. Boot (G2FZG), 75, Beech Tree Lane, Cannock, Staffs.

WEATHER conditions again reduced attendance in March, only eight members being present. However, new members were welcomed, who in spite of the weather had travelled some distance to attend. Members decided to commence construction of a society transmitter and receiver and sub-committees were formed to build same. Lectures are to be arranged if possible for the next meeting, from those members who have already offered to give them. Slow morse instruction was welcomed by some and Mr. C. J. Morris (G3ABG) offered to run the classes. The society meetings will now take place on the first and third Tuesdays in the month at the Black Horse Inn, Mill St., Cannock, at 7.30 p.m. A party is being arranged to visit certain functions of the Wolverhampton Radio Society in May. Messrs. Austin (G2FQR) and Alexander had a tough time travelling back to Stafford after the meeting owing to the blizzard which raged at the time. Everyone is pleased to hear that Mr. R. Emery has now recovered from his illness and there is no doubt that his final will now take shape.

BRADFORD SHORT WAVE CLUB

Hon. Sec. : V. W. Sowen, Rushwood, Grange Park Drive, Cottingley, Bingley, Yorks.

THE above club is coming to the end of a very full and interesting season of lectures and demonstrations, and the annual general meeting is to take place on Monday, April 21st, 1947.

As the headquarters have been requisitioned for conversion into a dwelling place, temporary headquarters are being taken at the Temperance Rooms, Harewood Street, Bradford, from April 1st.

R. S. G. B. BRIGHTON AND HOVE GROUP

Hon. Sec. : Lt.-Com. J. R. D. Sainsbury, 80, Lansdowne Place, Hove.

Meetings. Alternate Mondays, Golden Cross Public House, Western Road, Brighton.

IT is believed that there are some members of the Radio Society of Great Britain in the area covered whose names and addresses are not known to the local committee. Every endeavour is being made to put Brighton and Hove on the amateur radio map, and the co-operation of all "hams" is invited.

3YY exhibited his re-built 60 Mc transmitter and gave a most interesting talk. Mr. Crabtree's first talk on aerials dealt with basic principles of propagation.

8HV returned to Hove recently and is installing his rig at the shack of 8379 due to lack of room at his own QTH. 8379 plans to take his City and Guilds exam. on May 8th. 5ZQ is building for 60 and is trying hard to get authority to erect an aerial run over his prefab. house. 3APO is active.

3WR and 8AC continue to work DX on 14 Mc/s.

Recent meetings have been noticeable for the attendance of several new junior associates.

Future Programme — April 21st: Aerials, by Mr. Crabtree; May 5th: Mobile and VHF Receivers; May 19th: Low-power Transmitter, by Mr. Aldridge; June 2nd: VHF Receivers, by Mr. Fairchild.

YEOVIL AMATEUR RADIO CLUB

Hon. Sec. : Mr. D. Hover, 57, Everton Road, Yeovil.

ALTHOUGH only recently formed, the Yeovil Amateur Radio Club is making excellent progress and members now number 17, including G8FP and G3BEC who are of great assistance to the prospective full call holders. On the listening side there is Mr. D. Mclean, the well-known SWL, to encourage the newcomer to the art of DX.

Recent activities have included a lecture by G8FP on elementary transmitter theory and practice, and G3BEC has given regular morse practice and instruction. It has been decided to affiliate with the B.S.W.L. and any local members of the League who are not yet in the Yeovil Club are cordially invited to join up. Plans are in hand to hold a field day on 56 Mc/s, in which local S.W.L.s are invited to participate. They are glad to welcome their first lady member, who is quite at home on 1 kW and over, as she is at the Somerton Station. Meetings are held every Thursday at 7.30 p.m. at the Pen Mill Café, Sherborne Road, Yeovil. Full details may be obtained from the secretary, or press secretary Mr. K. Gilbert, Summerlands, Yeovil.

SOUTH SHIELDS AMATEUR RADIO CLUB

Hon. Sec. : W. Dennell, G3ATA/P, 12, South Frederick Street, South Shields.

THE activities of the above club are now in full swing, and interesting and instructive lectures and demonstrations are being given weekly.

The following future programme will benefit all who are interested in short waves:

(i) Valves.
(ii) Portable transmitting and receiving demonstrations.
(iii) Building of transmitters and receivers.

Anyone interested in any of the above subjects is invited to attend, and anyone requiring further information should apply to the secretary.

EXETER AND DISTRICT AMATEUR SHORT WAVE RADIO SOCIETY

Hon. Sec. : E. G. Wheatcroft, 7, Mount Pleasant Road, Exeter, Devon.

EFFORTS to bring together "Hams" in the Exeter area have been rewarded with success. The inaugural meeting took place on February 6th, 1947, with an attendance of 11 (including two with G call signs). Membership now stands at 20 and there are at least six "hams" who have been prevented from coming along yet, due to sickness or the adverse weather conditions. Inquiries continue to come in and the first lady member came along last week. Transmitting members include G2DOL (C. Garroway); G6JN (R. Jackson); G3SN (R. Ellis); G3JW (E. Bright).

Morse classes for the beginner and for the advanced members are now taking place and it is hoped in the near future to have a course on radio from the very beginning. Other suggestions are brought up weekly for discussion and some of these will be adopted in the future. Visits to various B.B.C. transmitters are planned.

The society meets on Thursday of each week from 7 p.m. to 9.15 or 9.30 p.m, at Mount Pleasant Chapel Schoolroom (entrance in Thurlow Road), and a welcome is extended to all in their district.

International Call Signs

THE following comprehensive list of call signs (published by courtesy of the R.S.G.B.) in alphabetical order of call signs and of country has been agreed to by representatives of the Incorporated Radio Society of Great Britain, the American Radio Relay League and "C.Q."—monthly journal of "Radio Ltd.," California.

Prefix	Name of Country
(AC3)	Sikkim
AC4	Tibet
(AR)	Syria
CE	Chile
CM-CO	Cuba
CN	Morocco, French
CP	Bolivia
CR4	Cape Verde Is.
CR5	Guinea, Portuguese
CR6	Angola
CR7	Mozambique
CR8	Goa (Portuguese India)
CR9	Macau
CR10	Timor, Portuguese
CT	Portugal
CT2	Azores Is.
CT3	Madeira Is.
CX	Uruguay
D	Germany
EA	Spain
EA6	Balearic Is.
EA8	Canary Is.
EA9	Morocco, Spanish
EI	Eire (Irish Free State)
EK	Tangier Zone
EL	Liberia
EP-EQ	Iran
ET	Ethiopia
F	France
FA	Algeria
FB8	Madagascar
FD8	Togoland, French
FE8	Cameroons, French
FF8	French West Africa
FG8	Guadeloupe
FI8	French Indo-China
FK8	New Caledonia
FL8	Somaliland, French
FM8	Martinique
FN	French India
FO8	French Oceania (Tahiti)
FP8	Miquelon and St. Pierre Is.
FQ8	French Equitorial Africa
FR8	Reunion I.
FT4	Tunisia
FU8, YJ	New Hebrides
FY8	Guiana, French and Inin
G	England
GC	Channel Is.
GI	Ireland, Northern
GM	Scotland
GW	Wales
HA	Hungary
HB	Switzerland
HC	Ecuador
HE1	Liechtenstein
HH	Haiti
HI	Dominican Republic
HK	Colombia
HP	Panama
HR	Honduras
HS	Siam
HZ	Saudi Arabia
I	Italy
I6	Eritrea
J	Japan
KA	Philippine Is.
KB6	Baker Is., Howland Is. and Am. Phoenix Is.
KC4	Little America
KG6	Marianas Is., Guam
KH6	Hawaiian Is.
KJ6	Johnston Is.
KL7	Alaska

Prefix	Name of Country
KM6	Midway I.
KP4	Puerto Rico
KP6	Jarvis I., Palmyra Group (Xmas Island)
KS4	Swan I.
KS6	Samoa, America
KV4	Virgin Is.
KW6	Wake I.
KZ5	Canal Zone
LA	Norway
(LI)	Libya
LU	Argentina
LX	Luxembourg
LZ	Bulgaria
NY4	Guantanamo Bay
OA	Peru
OE	Austria
OH	Finland
OK	Czechoslovakia
ON	Belgium
OQ	Belgian Congo
OX	Greenland
OY	Faroes, The
OZ	Denmark
PA	Netherlands
PJ	Netherlands West Indies
PK	Java
PK4	Sumatra
PK5	Borneo Netherlands
PK6	Celebes and Molucca Is.
PK6	New Guinea, Netherlands
PX	Andorra
PY	Brazil
PZ	Guiana, Netherlands (Surinam)
SM	Sweden
SP	Poland
ST	Anglo-Egyptian Sudan
SU	Egypt
SV	Crete
SV	Greece
SV5	Dodecanese Is. (Rhodes)
TA	Turkey
TF	Iceland
TG	Guatemala
TI	Cocos I.
TI	Costa Rica
UA1-3-4-6	Soviet Union: European Socialist Federated Soviet Republic
UA9-0	Asiatic Russian S.F.S.R.
UB5	Ukraine
UC5	White Russian S.S.R.
UD6	Azerbaijan
UF6	Georgia
UG6	Armenia
UH8	Turkoman
UI8	Uzbek
UJ8	Tadzik
UL7	Kazakh
UM8	Kirghiz
UN1	Karelo-Finnish Republic
UO5	Moldavia
UP	Lithuania
UQ	Latvia
UR	Estonia
VE	Canada
VK	Australia and Tasmania
VK4	Papua Territory
VK9	New Guinea, Territory of
VO	Newfoundland and Lab.
VP1	British Honduras
VP2	Windward Is.
VP2	Leeward Is.
VP3	Guiana British

Prefix	Name of Country
VP4	Trinidad and Tobago
VP5	Cayman Is.
VP5	Jamaica
VP5	Turks and Caicos Is
VP6	Barbados
VP7	Bahama Is.
VP8	Falkland Is.
VP8	S. Georgia, S. Orkney Is., S. Sandwich Is., S. Shetland Is.
VP9	Bermuda Is.
VQ1	Zanzibar
VQ2	Rhodesia, Northern
VQ3	Tanganyika Territory
VQ4	Kenya
VQ5	Uganda
VQ6	Somaliland, British
VQ8	Chagos Is.
VQ8	Mauritius
VQ9	Seychelles
VR1	Gilbert and Ellice Is., Ocean Is.
VR2	Fiji Is.
VR3	Fanning I. (Christmas I.)
VR4	Solomon Is.
VR5	Tonga (Friendly) Is.
VR6	Pitcairn I.
VS1, VS2	Malaya
VS4	Borneo, British North (including Labuan)
VS5	Brunei
VS5	Sarawak
VS6	Hong Kong
VS7	Ceylon
VS9	Aden and Socotra I.
VU	India
VU4	Laccadive Is.
VU7	Bahrein I.
W, K	U.S.A.
XE	Mexico
XU, C	China
XZ	Burma
YA	Afghanistan
YI	Iraq
YN	Nicaragua
YR	Roumania
YS	Salvador
YT-YU	Yugoslavia
YV	Venezuela
ZA	Albania
ZB1	Malta
ZB2	Gibraltar
ZC1	Transjordan
ZC2	Cocos Is.
ZC3	Christmas I.
ZC4	Cyprus
ZC6	Palestine
ZD1	Sierra Leone
ZD2	Nigeria
ZD3	Gambia
ZD4	Gold Coast and British Togoland
ZD6	Nyasaland
ZD7	St. Helena
ZD8	Ascension I.
ZD9	Tristan da Cunha and Gough I.
ZE	Rhodesia, Southern
ZK1	Cook Is.
ZK2	Niue
ZL	New Zealand
ZM	Western Samoa
ZP	Paraguay
ZS	Union of South Africa
ZS3	South West Africa
ZS4	Basutoland

Name of Country	Prefix
Aden and Socotra I.	VS9
Afghanistan	YA
Alaska	KL7
Albania	ZA
Aldabra Is.	
Algeria	FA
Andaman and Nicobar Is.	
Andorra	PX
Anglo-Egyptian Sudan	ST
Angola	CR6
Argentina	LU
Ascension I.	ZD8
Australia (including Tasmania)	VK
Austria	OE
Azores Is.	CT2
Bahama Is.	VP7
Bahrein I.	VU7
Baker Island, Howland Is. and Am. Phoenix Is.	KB6
Balearic Is.	EA6
Barbados	VP6
Basutoland	ZS4
Bechuanaland	
Belgian Congo	OQ
Belgium	ON
Bermuda Is.	VP9
Bhutan	
Bolivia	CP
Bonin and Volcano Is. (*e.g* Iwo Jima)	
Borneo, British North (including Labuan)	VS4
Borneo Netherlands	PK5
Brazil	PY
British Honduras	VP1
Brunei	VS5
Bulgaria	LZ
Burma	XZ
Cameroons, French	FE8
Canada	VE
Canal Zone	KZ5
Canary Is.	EA8
Cape Verde Is.	CR4
Caroline Is.	
Cayman Is.	VP5
Celebes and Molucca Is.	PK6
Ceylon	VS7
Chagos Is.	VQ8
Channel Is.	GC
Chile	CE
China	XU, C
Christmas I.	ZC3
Clipperton I.	
Cocos I.	TI
Cocos Is.	ZC2
Colombia	HK
Comoro Is.	
Cook Is.	ZK1
Corsica	
Costa Rica	TI
Crete	SV
Cuba	CM-CO
Cyprus	ZC4
Czechoslovakia	OK
Denmark	OZ
Dodecanese Is. (*e.g.* Rhodes)	SV5
Dominican Republic	HI
Easter I.	
Ecuador	HC
Egypt	SU
Eire (Irish Free State)	EI
England	G
Eritrea	I6
Ethiopia	ET
Falkland Is.	VP8
Fanning I. (Christmas I.)	VR3
Faroes, The	OY
Fiji Is.	VR2
Finland	OH
Formosa (Taiwan)	
France	F
French Equatorial Africa	FQ8
French India	FN
French Indo-China	FI8
French Oceania (*e.g.* Tahiti)	FO8
French West Africa	FF8
Fridjof Nansen Land (Franz Josef Land)	
Galapagos Is.	
Gambia	ZD3
Germany	D
Gibraltar	ZB2
Gilbert and Ellice Is. and Ocean I.	VR1
Goa (Portuguese India)	CR8
Gold Coast (and British Togoland)	ZD4
Greece	SV
Greenland	OX
Guadeloupe	FG8
Guantanamo Bay	NY4
Guatemala	TG
Guiana, British	VP3
Guiana, French, and Inini	FY8
Guiana, Netherlands (Surinam)	PZ
Guinea, Portuguese	CR5
Guinea, Spanish	
Haiti	HH
Hawaiian Is.	KH6
Honduras	HR
Hong Kong	VS6
Hungary	HA
Iceland	TF
Ifni	
India	VU
Iran	EP-EQ
Iraq	YI
Ireland, Northern	GI
Italy	I
Jamaica	VP5
Jan Mayen I.	
Japan	J
Jarvis I., Palmyra Group (Christmas I.)	KP6
Java	PK
Johnston I.	KJ6
Kenya	VQ4
Kerguelen Is.	
Korea	
Kuwait	
Laccadive Is.	VU4
Leeward Is.	VP2
Liberia	EL
Libya	(LI)
Liechtenstein	HE1
Little America	KC4
Luxembourg	LX
Macau	CR9
Madagascar	FB8
Madeira Is.	CT3
Malaya	VS1, VS2
Maldive Is.	
Malta	ZB1
Manchukuo	
Marinas Is., Guam	KG6
Marshall Is.	
Martinique	FM8
Mauritius	VQ8
Mexico	XE
Midway I.	KM6
Miquelon and St. Pierre Is.	FP8
Monaco	
Mongolia	
Morocco, French	CN
Morocco, Spanish	EA9
Mozambique	CR7
Nepal	
Netherlands	PA
Netherlands West Indies	PJ
New Caledonia	FK8
Newfoundland and Labrador	VO
New Guinea, Netherlands	PK6
New Guinea, Territory of	VK9
New Hebrides	FU8, YJ
New Zealand	ZL
Nicaragua	YN
Nigeria	ZD2
Niue	ZK2
Norway	LA
Nyasaland	ZD6
Oman	
Palau (Pelew) Is.	
Palestine	ZC6
Panama	HP
Papua Territory	VK4
Paraguay	ZP
Peru	OA
Philippine Is.	KA
Phoenix Is. (British)	
Pitcairn I.	VR6
Poland	SP
Portugal	CT
Puerto Rico	KP4
Reunion I.	FR8
Rhodesia, Northern	VQ2
Rhodesia, Southern	ZE
Rio de Oro	
Roumania	YR
Ryukyu Is. (*e.g.* Okinawa)	
St. Helena	ZD7
Salvador	YS
Samoa, America	KS6
Samoa, Western	ZM
Sarawak	VS5
Sardinia	
Saudi Arabia (Hedjaz and Najd)	HZ
Scotland	GM
Seychelles	VQ9
Siam	HS
Sierra Leone	ZD1
Sikkim	(AC3)
Solomon Is.	VR4
Somaliland, British	VQ6
Somaliland, French	FL8
South Georgia	VP8
South Orkney Is.	VP8
South Sandwich Is.	VP8
South Shetland Is.	VP8
South West Africa	ZS3
Soviet Union:	
Armenia	UG6
Asiatic Russian S.F.S.R.	UA9-0
Azerbaijan	UD6
Estonia	UR
European Russian Socialist Federated Soviet Republic	UA1-3-4-6
Georgia	UF6
Karelo-Finnish Republic	UN1
Kazakh	UL7
Kirghiz	UM8
Latvia	UQ
Lithuania	UP
Moldavia	UO5
Tadzhik	UJ8
Turkoman	UH8
Ukraine	UB5
Uzbek	UI8
White Russian Soviet Socialist Republic	UC5
Spain	EA
Sumatra	PK4
Swan I.	KS4
Swaziland	
Sweden	SM
Switzerland	HB
Syria	(AR)
Tanganyika Territory	VQ3
Tangier Zone	EK
Tibet	AC4
Timor, Portuguese	CR10
Togoland, French	FD8
Tokelau (Union) Is.	
Tonga (Friendly) Is.	VR5
Transjordan	ZC1
Trieste	
Trinidad and Tobago	VP4
Tristan da Cunha and Gough I.	ZD9
Tunisia	FT4
Turkey	TA
Turks and Caicos Is.	VP5
Uganda	VQ5
Union of South Africa	ZS
United States of America	W, K
Uruguay	CX
Venezuela	YV
Virgin Is.	KV4
Wake I.	KW6
Wales	GW
Windward Is.	VP2
Wrangel Is.	
Yugoslavia	YT-YU
Zanzibar	VQ1

Programme Pointers

This Month MAURICE REEVE Looks to the Summer Proms and Discusses a Plebiscite

I HOPE readers are taking advantage of the excellent series of operatic broadcasts, usually given in the Home service on Wednesdays, and repeated in the "Third" on Friday evenings. They are really excellent presentations and are the result of most careful rehearsing and planning.

I recently touched upon the pros and cons of telling the story of the opera and describing the scenes and the action between the acts. And, whilst making every allowance for the new boy—or girl—who is to be found in every class, I still feel that a more suitable time and place could be found for this bit of teaching. The B.B.C.'s own weekly publications offer the most obvious and suitable place. Or a quarter of an hour's talk before the opera begins and get it over with. But during the breaks in the transmission, I do feel that the majority of listeners want to feel as they would were they forming the audience at the real thing—free for their own physical and mental relaxation, if not their well-being!

After all said and done, no-one coming on to the stage either to lecture on the story to be unfolded or to give a critical résumé of the work's merits or demerits would be tolerated for one moment. He would, of course, be a wonderful advertisement for the bar.

Summer Proms

This summer's season of Promenade Concerts is to run to nine weeks, divided into three parts, each given by a separate section of the B.B.C. Orchestra and a different conductor. I don't think programme building has yet commenced, but I do commend to those whose task it is to tackle this vexed question to emulate Mr. Shinwell and embark on some musical load shedding. It will be tragic if the extra week—six programmes—offers the excuse for retaining the old flogged, frayed and festering war horses. It would certainly be very simple to say "let's keep them all going—'Tschaik,' Grieg, Pathetic, all the lot, and just form six programmes of new or less hackneyed works." But it would be lamentable, for the situation is serious both musically and commercially.

The public has already started its own load shedding by shedding the concert altogether. All are agreed that the war and post-war boom is all but over. The market is grossly overcrowded without any appreciable expansion of programme variety, with the inevitable result that many excellent concerts this winter have been sparsely attended, including the B.B.C.'s own symphony series. The severe winter has only been partially to blame. The two main causes are the state of the market—over which I can say little—and that our economically weary and hard-pressed public do not apparently find the same source of escapism in the Tschaikowsky and Rachmaninow type of symphony and concerto as they did when they were war weary and rocket scared.

All have their part to play in saving the prosperity of the concert world. The agents must realise that public moods and tastes change, and that they cannot go on for ever having artistes at their beck and call to cash in on a temporarily good thing. Artistes must also appreciate the same thing—put the other way round—and that the time has come when they must at last do a bit of practice, learning new works or reviving others which have been on the shelf all too long. Teachers must wake up to the fact that their artiste pupils start their concert careers largely with the repertoires they have helped them to build up. And the public must be fully alive to the fact that, sooner or later, it will get what it wants, as it usually does, but only if it insists loudly and long enough.

An Exhaustive Plebiscite

I would earnestly suggest, both to the B.B.C. and to all concert givers—also to the Gallup Poll organisers—an exhaustive plebiscite, beginning with the B.B.C., whose resources are so much greater and whose audiences are so much vaster than anyone else's. Other orchestras and artistes would have to publish their repertoires. But the B.B.C., having command of the source of anything asked for, are capable of providing it. The Promenade Concerts will be attended by over 300,000 ardent music lovers. A carefully and concisely drawn up questionnaire on the programme would not only provide a first-class reflection on the tastes and wishes of this enormous section of the concert-going public, but they themselves would fill it in with avidity and enthusiasm.

Better still to do it through the medium of *The Radio Times* where everyone can be both appealed to and finally sorted out.

The greatest care would have to be taken to sort out the opinions of the different types of concert-goer. Whilst the Promenader and, say, the patron of the Royal Philharmonic Society's concerts are just as "fond" of music, they are, I am certain, often fond of it in quite a different way. And were the latter to give at their concerts what the former had asked for at theirs, we might have a half-empty house and a pretty kettle of fish.

Next month I will endeavour to draw up a suitable form for a plebiscite such as I have outlined above. It would be much better left undone than to be tackled on the wrong lines. Music is very much like food, beauty competition and many other things. What we would vote *for* in one place we might feel very strongly against. All are agreed that strawberries and cream, bacon and eggs, and roast beef and Yorkshire are fine foods. But we don't want No. 1 for breakfast, No. 2 for dinner or No. 3 for tea if it can possibly be avoided. So the mere voting bacon and eggs as, perhaps, actually our favourite dish doesn't necessarily mean we would relish it at all times and in all places. I will sort the problem out next month.

25 Years of Experimental Radio

An Amateur Looks Back on His Radio Career.

By A. W. MANN

RECENTLY, when looking through some old reference books, the writer discovered that his first wireless receiver was built 25 years ago. It was of very crude design, the slider method of tuning being employed. Others, with condenser and variometer tuning respectively, were built later.

In addition, experiments were carried out with various types of aerials with a view to improving reception results. Crystal reception had its limitations, and the construction of a simple one-valve regenerative receiver was taken in hand. In this design the method of applying reaction was by means of a swinging coil; also, series, parallel, and constant aerial tuning could be used at will. The grid leak was of the variable type. A plain direct drive tuning dial was used.

As might be expected, tuning was rather a tricky business. In spite of its many defects, this little receiver brought in many home and continental programmes. In the way of DX the American medium-wave station KDKA was received. This was later verified.

Medium Wave DX

One winter evening, using the smallest basket weave coil and series aerial tuning, a transmission radiated by one of the first transatlantic telephone transmitters was received. The variable grid leak and almost everything else were very much alive.

Once the hands were clear of the panel, the lady operator ceased to call London so far as I was concerned. As to the actual wavelength, I have no record. It was however well below the lower medium-wave limit.

Loudspeaker Receivers

Activities were next centred on the construction of loudspeaker type receivers. Several three valvers were built, various methods of reaction control, L.F. coupling and H.F. amplification were tried out.

One particular three-valver, with swinging coil reaction, was really outstanding as a medium wave DX'er. With favourable reception conditions, and after the B.B.C. stations were off the air, several American medium-wave stations, including WTIC of Cincinnati, Ohio, were received and later verified.

Short Waves

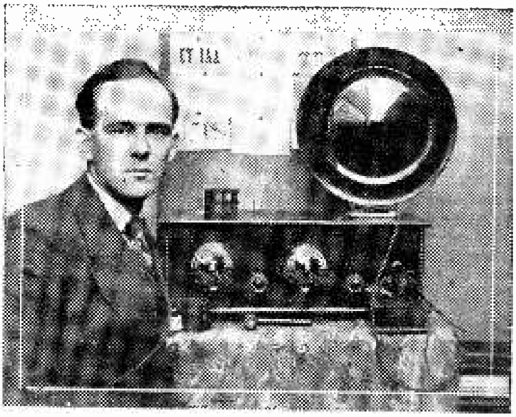
The short waves were by this time in the news. Coupled with them were the names of several prominent radio amateurs, including Gerald Marcuse (2NM) and E. J. Simmonds (2OD). Long-distance two-way records were being made and broken overnight.

It was all very thrilling. The technical press adding fuel to the fire of enthusiasm by the publication of constructional articles written by the experts.

First Short-wave Receiver

My first short-wave receiver was a single valve regenerator. The coils were home-made, and mounted on a platform screwed along the top edge of the panel. As in the case of previous receivers described a bright emitter valve was used.

This receiver was devoid of screening, the tuning and reaction condenser were .0003 mfd. capacity. Because of the latter, tuning was very sharp. Hand-capacity effects were, of course, very troublesome. With this receiver all I managed to receive was a lot of morse I could not read and a French amateur 'phone station.



The author of this article, with one of his early receivers. The photograph was taken in 1929.

A Sponsored Design

As, judging by the results obtained, I did not in my own opinion appear to be shaping like a second Marcuse, I took the wisest course and built a receiver of sponsored design.

It was built exactly to specification and sometime later was considerably improved by replacing the home-made H.F. choke with a commercial one of suitable design.

As in the case of the previous receiver .0003 mfd. was the specified tuning capacity. It was difficult under the circumstances to tune in amateurs on 'phone. Nevertheless I settled down for a time to concentrated short-wave listening, and eventually managed to accomplish the, at that time, difficult feat of hearing all continents.

Experimenting Again

Within a few months the urge to experiment was again in evidence. The circuit chosen was a triode detector, followed by two transformer-coupled L.F. stages. The under side of the baseboard was lined with copper foil, and the panel backed with sheet aluminium.

In addition the individual stages were screened one from the other. This was due to the fact that an overseas friend of mine was getting good results with a unit-constructed receiver, in which each stage was built into a separate screening box. Much trouble resulted from the use of two transformer-coupled stages, not due to the transformers themselves but to my own lack of experience with this type of circuit. The wiring was a hay-wire sort of job. Nowadays we insist on the short and direct method. This receiver gave fair results and taught me what to avoid in the future.

Having by this time changed over to dull-emitter valves, it was decided to rebuild this receiver in a modified form. The screened plywood panel and baseboard were retained, but the second L.F. stage was replaced by R.C.C. Inter-stage screening, however, was not included. On test it proved a revelation as a station getter, and was used for two years for DX listening. Another rebuilding was then carried out on modern lines. The whole being enclosed in a metal cabinet and thus completely screened.

The original model is shown in the illustration, together with the author. Note the dual-purpose output unit as described in the April 8th issue, 1933, of this journal.

A Commercial Kit Receiver

Within a few weeks of completing the totally-screened receiver, a really big job was in the offing. A now many years defunct short-wave organisation notified me that I was the prizewinner in a club competition.

The prize was a complete short-wave and television receiver, in kit form. This was A.C. operated, and the line up as follows: two S.G. H.F. stages, S.G. detector, and three R.C.C. L.F. stages. According to the designers the amplifier had a straight response from 14 cycles to 40,000 cycles.

In due course the kit arrived. After unpacking and checking over the contents, the layout and the theoretical diagrams were carefully studied. A start was made with the mechanical construction. When this was finished, the completed chassis was examined in order to work out the best wiring method to follow.

The heater wiring was completed first, and followed by the grid wiring, leaving the plate side to the last. There was tricky work ahead, when it came to wiring up the coil-holders and gang condenser. As all joints were soldered there was much turning around and about of the chassis before the job was complete.

The time for a complete check up arrived. Everything found to be correct, valves were fitted in their sockets, aerial coupled up, earth, speaker and mains. Switching on, the valves were allowed to warm up. The results were as good as we had hoped they would be.

With this receiver in use for an extensive period an impressive log materialised.

In Passing

Discussing commercial receivers, brings to mind the following incident: I saw and admired when in London a six-valve, battery-operated short-wave superheterodyne receiver, the product of a well-known firm. The price, however, did not suit my purse.

Two years later a trade friend notified me that he had a consignment of receivers in to be dismantled. As there might be some useful components I called in, and a packing case of familiar dimensions drew my attention. Inside was an improved version of the original model.

This was new and unused, although three of the valves were missing. The price was right, the crackle-finished brass sheet screening cabinet, cadmium plated inside, being alone worth the money. This overseas short-wave super has given good and reliable service for a number of years and is still in use.

Radio Journalism

Reverting to earlier days, the time arrived when the radio periodicals we read were one by one ceasing publication. Under the circumstances the appearance of this journal was welcome. It happened to coincide with further developments in my experimental activities. Somewhat earlier I had entered the sphere of radio journalism, and had had a few short articles published.

The short-wave section was to me of considerable interest. I saw in it a medium whereby readers without previous experience could be encouraged to make a start. My first contribution appeared in one of the earlier issues. This was followed by frequent further contributions up to the early part of the war. A period of about nine years.

As a contributor my policy was to build and try out the individual apparatus which was to form the subject of an article. Also keeping in mind that experimental receivers and associated apparatus would be built with components to hand.

In the writer's opinion this is a policy to be recommended. Difficulties, if experienced, can be removed and overcome. The reader is later given the how and why of the matter, from which he will derive much benefit.

Short-wave Aerial Experiments

Some of the most interesting experiments the writer has carried out were relative to short- and ultra-short-wave aerials. I remember carrying out a series of comparative tests with a vertical aerial and different type of horizontals. Results favoured the vertical.

At this time certain American 'phone amateurs were discussing over the air the salient features of their rotary beam systems. It so happened that one of them demonstrated his for the benefit of a fellow amateur.

I was greatly interested, but on further investigation I found that I had insufficient space to erect a similar one. It appeared that some form of vertical beam was the only satisfactory arrangement.

I studied the matter for some time, and eventually worked out a method whereby a single wire could be so arranged and mounted between brackets that when tuned to resonance it should show marked directional properties.

A fixed model was made and erected directional to the West. Tests proved my theories to be correct.

The next job was to design a suitable drive mechanism which would enable the aerial system to be rotated through 360 degrees. By this means full benefit was derived from the directional properties of the system. The idea was patented and later commercialised.

Underneath the Dipole

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

A MONTH or so ago I mentioned a few developments in stereoscopic kinematography which I thought might be worth while trying out on television. Several readers expressed interest in this particular field, and one correspondent drew attention to the use of polaroid screens as a means of isolating the left-eye view from the right, an essential principle in true stereoscopy. The crystalline structure of these screens has a strongly directional effect on the transmission of light rays, reducing reflections emanating from strong light sources at 90 deg. to the optical system, when adjusted to a "maximum" position. In photography, still or movie, they can be used to cut down interfering reflections, such as the sky, etc., on a shop window, thus enabling the goods within to be clearly photographed with no sense of a plate-glass sheet being between camera and subject. In landscape views, for instance, a very blue sky (which is, in effect, an area of the sky which is "side lit" by the sun) can be darkened to give almost a night effect without reducing the colour of the foreground. Reflections of the sky on water can also be eliminated, and this particular application has led to the invention of "angler's glasses"!

The Scientific Angler

Equipped with his "polaroid" spectacles, the angler is able to see his fish in clear water, without the interfering reflection of the sky. One can imagine the scientific practical angler of the future setting out on his favourite chalk stream beat loaded up with the latest Hardy or Farlow "polaroids," radar, walkie-talkie, torque-motor controlled thread-line reel and ultra-duralumin rod! Master Trout, that highly educated *species pisces*, reputed to be familiar with every page in Hardy's fishing-tackle catalogue, will have to take a course in electronics. There are no flies on the trout family!

Stereoscopics

The polaroid method of separating the right-eye and left-eye viewpoints was strongly supported by the late Will Day, who, it will be remembered, was one of the original financial backers of Baird in the very early days of television. Other methods of achieving stereoscopic kinematography, some of which have been "invented" several times during the last 25 years, include devices which oscillate the film camera between two lenses, rotate the lenses, or make use of oscillating mirrors or mirror drums—all with the object of recording on the film alternate frames representing respectively the right and left aspects. The stumbling block of all these inventions is, of course, the projection of the resultant pictures upon the big screen of a theatre still retaining the stereoscopic effect. And the same difficulty will apply at the receiving end of "stereoscopic" television. Usually, some kind of pseudo-stereoscopic effect is detectable on a few shots, probably those in which the camera is moving or "tracking," but this is not true stereoscopy.

The Soviet's Fourth Dimension

There have been reports of extraordinary stereoscopic effects being obtained in a new Russian film, "Robinson Crusoe"; but as was the case with the great Indian rope trick such reports have been based upon something somebody else has seen, and must be treated with "reserve." So far, there has been no scientific explanation of the way in which stereoscopy has been achieved in Russia, but claims have been made of results which are nothing short of staggering. One report enthusiastically described the realistic effects obtained when the pictures were projected upon a screen composed of thousands of strands of wire. Another, equally ecstatic, stated that a laminated semi-translucent plastic screen was used—no further technical information being forthcoming. I am interested—but I prefer to reserve my opinion until I have actually "viewed the body." In the meantime stereoscopy is regarded by the film trade as an embellishment which the public does not really require! This is somewhat discouraging for the dozens of fourth-dimension inventors, so perhaps they will divert their attention to adapting their ideas direct to television.

Television's Temporary Eclipse

The power cuts and the fuel crisis naturally proved a big set-back to the progress of British television, with programmes restricted and cancelled, production and testing of sets held up and factories shut down. The food crisis, the housing crisis, the coal crisis and the economic crisis succeed one another and leave the man in the street in a frame of mind which regards television as a useless, new-fangled anachronism in an age which is (in Britain) rapidly reverting to candlelight, cave-dwelling and verbal cannibalism. In due course we shall probably be welcoming missionaries from darkest Africa, who will enlighten us on the inner mysteries of the jungle telegraph! Here, at last, will be an opportunity of a lifetime for the frustrated British radio trade: valve-less jungle telegraph receivers, produced in electrically cut-off factories, in accordance with a secret recipe of Chief Bigga-Banga! "Dr. Livingstone, I presume," in reverse.

Second-hand Values

But to return to more serious matters, the full expansion of television in this country will—let's face it—now be retarded, especially so far as the establishment of provincial transmitters is concerned. The high cost of sets, their slow delivery, the uneven servicing and the uncertainty as to whether the B.B.C. are going to fulfil their part of the contract with individual viewers, known as the "Television Receiving Licence," is discouraging to all. Nevertheless, viewers who were early purchasers of sets have every reason to congratulate themselves. I have heard of television receivers which are nearly 10 years old being sold for more money than they cost new. Like second-hand cars, their value continues to rise. During the war television sets with all-wave radio receivers were being sold at half their pre-war price, for use purely as broadcast receivers; they have now reached a value much above that figure. Or is it that the pound is depreciating in value? I have seen quite a number of these old sets in action during the last few months, and the results on many of them are quite excellent. The principal difference in the post-war models is in the brilliance of the picture and the simplification of the controls. In making this comparison I am talking of the half-dozen or so best pre-war models, not the "also rans," which were notable for various kinds of picture distortion due to amplifier and scanning deficiencies. Both new and second-hand sets seem to be good investments, anyway, as they both retain their value—or, in some cases, increase in value.

New Character Wanted

I feel that television needs something more than technical excellence to catch the imagination of the general public. If only the clever young producers at the Alexandra Palace could create some item or character with the appeal of, say, "Itma," word of mouth advertising by viewers would intensify the demand for sets to such an extent that the manufacturers might be able to plan television set manufacture on a much bigger scale. Such artistic creations, however, are not the result of intense effort or of burning the midnight oil while waiting for inspiration. They just "arrive" and catch the fancy of the public, whether it is in the field of films, radio, hair-do's or of television characters. I felt that something seemed to be brewing in the excellent weekly edition of "Kaleidoscope"; but while it is good, it is not consistently good. Nevertheless, the mixture is usually enjoyable, a pleasing patchwork-pattern of music, speech and picture, with characters and musical treatment which grow on one, week by week. This is a development which is on the right lines.

Slide Rule in Radio Calculations

Some Useful Tips on Maths. by F. G. TUCKER

It is some time since hints have been given regarding the use of the slide rule in wireless work, i.e., in the use of the reciprocal scale with reference to parallel resistor and series condenser problems, and the following may be of some interest to readers who are in the habit of using the "slipstick" in their work, especially as the methods given are not nearly as well known as they deserve to be.

All the references given are the conventional ones, i.e., "A," "B," "C" and "D" scales, and "R" for the reciprocal scale; the latter being almost a necessity for radio work.

Firstly, for use as a table in problems of the nature

$$\text{Wavelength} = 1{,}885\sqrt{LC}$$

which may be converted to

$$L(\text{in } \mu H) \times C(\text{in pF}) = \text{Wavelength}^2 \times 0.281.$$

Set L or C (whichever is more convenient) on "A" to 0.281 on "B," under C or L on "B" read wavelength on "D," e.g.:

To what wavelength will 50 pf. tune with 200 μH?

Set 0.281 on "B" to 200(L) on "A"; under 50(Cap) on "B" read 189 metres on "D."

It will be noticed that under any value of capacity on "B" the relative wavelength may be read on "D," also that L and C are interchangeable.

Most people nowadays, however, prefer to work in frequencies and the equation :—

$$\text{frequency} = \frac{1}{2\pi\sqrt{LC}} \text{ which}$$

may be converted to

$$\text{frequency}^2 = \frac{25{,}330}{CL}$$

may conveniently be used.

To fix the position of 25,330 accurately on "A," place "π" on "C" to 5 on "D," and the "constant" 25,330 is found on "A" over "1" on "B," then proceed as follows (still using the above example):

Set 200 on "B" to 25,330 on "A," and under 50 on "A" read 1.59 m/cycles on "R." As in the first example, L and C are interchangeable, and the frequency may be read on "R" under any value of capacity on "A." It is most important that the proper half of the "A" and "B" scales should be used with these methods, i.e., for numbers with an even index the first half—from 1-10 should be used, and for numbers with an odd index the half from 10-100 should be used; this is because squares and square roots are involved.

Another Method

Another useful method is where equations of the nature

$$Z^2 = R^2 + X^2$$

are involved, this also may be changed around and made to produce

$$Z = R\sqrt{1 + (X/R)^2}$$

and the method used with the slide rule is as follows:

Take

$$Z^2 = 3^2 + 4^2$$

i.e.

$$Z = 3\sqrt{1 + (4/3)^2}$$

Place 3 on "C" to 4 on "D"; to the result (1.7) on "A" add one (giving 2.7), set "1" on "B" to this number on "A," and under 3 on "C" read 5 on "D."

Output Transformer Ratio

Most readers will probably know that the output transformer ratio may be determined by one setting of the rule, but there are, no doubt, some who do not, and for their benefit the method is given below:

$$T(\text{ratio}) = \sqrt{\frac{R - (\text{optimum valve load resistance})}{Z - (\text{speaker speech coil impedance in ohms})}}$$

Set R on "B" to Z on "A," and under "1" on "C" read T on "D." Here again it is necessary to use the correct half of the "A" and "B" scales.

A good knowledge of indices is a great help in determining the order of the answer in such problems.

CLIX

Radio and Television Components

are used by all the leading set manufacturers

★

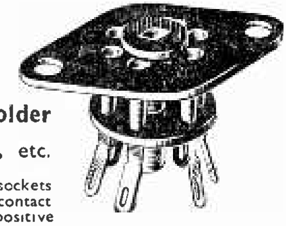
Points of Low Contact Resistance in Circuit Design of Miniature Receivers

B7G

Miniature

Laminated Valveholder

for use with IT4, IR5, etc.



Designed with 7 special sockets giving extremely low contact resistance and ensuring positive location of pins. Tags and centre screen pre-tinned. Fixing centres ·875, Hole Dia. ·100.

PLATE DIMENSIONS: Major axis 1·093, Minor axis ·680. For mounting either above or below chassis.

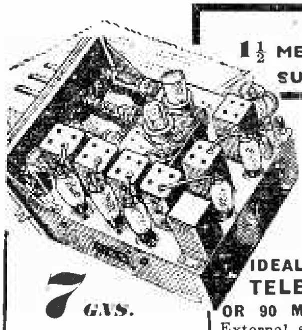
BRITISH MECHANICAL PRODUCTIONS LTD.

21 BRUTON STREET, LONDON, W.1 *Telephone: MAYfair 5543*

Foremost in Valveholder design

EX-GOVT.

1½ METRE 10 VALV. SUPERHET UNITS



CIRCUIT COMPRISES

1 Pre. amp. Osc., Mixer, 5 I.F., Det., Video Amp. I.F. Frequency 12 megs. Band-width 4 megs. Co-axial input and output sockets.

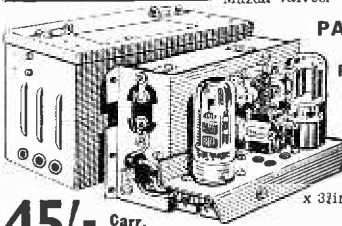
IDEAL FOR CONVERSION INTO TELEVISION RECEIVERS OR 90 MEGS. F.M. RECEIVERS

7 GNS.

Carriage paid. Cash with Order. Special discounts to Trade, Radio Societies, etc., in lots of 25 or more receivers.

External source of L.T. and H.T supply is required. Manufactured to stringent Government specification by such famous makers as R.G.D., Pye and Murphy. Brand new and unused and in manufacturers' sealed cartons. Complete with 10 Mazda valves.

PACKARD-BELL MICROPHONE PRE-AMPLIFIERS



One twin triode 6SL7GT and one twin pentode 28D7. Input and Output transformer. Housed in aluminium case 5in. x 3½in. x 3½in. A beautiful job.

45/- Carr. paid

WIRELESS INSTRUMENTS (LEEDS) LTD.

54-56, THE HEADROW, LEEDS, 1. Tel. 22262.

HENRY'S

5, Harrow Rd., Edgware Rd., W.2.

THE BEST IN RADIO

MIDGET TWO-GANG .00036, 2in. x 2in. x 1½in. Enclosed in Perspex, with Trimmers, 14/6. Outstanding value.
MIDGET I.F. UNIT. In aluminium can, 4½in. x 2½in. x 1in. Comp. 465 k/cs, Midget I.F. Trans., 1T4 valve, 8 midget Resistors and Condensers. 15/-. New and unused.
MAINS ENER. SPEAKERS, with Trans., 5in., Plessey, 350 ohm, Rola, 1,000 ohm, 30/- each.
P.M. SPEAKERS, Rola, Goodmans & Plessey, 6½in., with Trans., 27/6; 8in., with Trans., 27/6.

Large Stocks of Guaranteed Components

CASH WITH ORDER, OR C.O.D. (OVER £1)

Send Stamp for 1947 Price List

Phone: *PADdington* 1008/9 **RADIO**

COVENTRY RADIO

COMPONENT SPECIALISTS SINCE 1925.

HAVE YOU SENT FOR OUR

1947 LIST

OF A THOUSAND RADIO COMPONENTS?

Price 3d. Post Paid,

FULL DETAILS OF "NAPP" RADIO PRODUCTS.

COVENTRY RADIO,
DUNSTABLE ROAD, LUTON.

SPARKS' DATA SHEETS

ANNOUNCE A NEW AND AMAZING DESIGN BY L. ORMOND SPARKS

THE EMPIRE ALL-WAVE TWO

No. LO/15. All-dry 2-Valver covering 3 S.W. Bands, Medium and Long waves. Powerful 'Phone Sigs. on 9v. H.T. or Speaker results on higher voltage. Simple Plug-in Coils. No Complicated Switching. Midget in size but Great in Performance. No Hand Capacity. This design supersedes the famous little LO/M which can easily be modified to secure the advantages of the LO/15. Complete Data Sheet, giving Full-size Drilling Assembly, Wiring and Coil Plans, plus detailed descriptive matter, 2/6 plus Stamp.

SEND STAMP FOR FULL LIST OF 33 DESIGNS
Components for my designs available

L. ORMOND SPARKS (P)
9, Phoebeth Road, Brockley, S.E.4
'Phone: Lee Green 0220.

SOUTHERN RADIO'S LATEST

ex Government Purchases

BRAND NEW MOTOR GENERATORS

Input, 11-12 volts, output, 480 volts, 40 mA. 17/6 each. TYPE F. Input, 28 volts, output, 1,200 volts, 72 mA. 25/- each.

Carriage and Packing, 2/6 extra on either type.

Ex Government Morse Tappers, 1/6 each, 15/- dozen. Buzzers, 1/6 each, 15/- dozen, all brand new.

Portable TRANSMITTERS TYPE T1333. Brand New. Complete with Hand Driven Generator, etc., in original cases, 55/-, carriage and packing 5/6.

SOUTHERN RADIO SUPPLY Co.,
46, LISLE ST., LONDON, W.C. Gerrard 6653

WEBB'S Radio

WELWYN WIRE WOUND RESISTORS

each

Type AW3111—6 watt rating ... 2/9
50, 100, 250, 350, 400, 500, 750, 1,250, 1,500, 1,750, 1,800, 2,500, 12,500, 15,000 ohms.

Type AW3112—12 watt rating ... 2/9
250, 500, 750, 2,500, 7,500, 12,000 ohms.

Type AW3124—45 watts rating ... 3/9
500, 1,000, 1,500, 2,000, 3,000, 5,000, 7,500, 10,000, 15K., 20K., 30K., 50K. ohms.

Type B3141—115 watt rating ... 5/9
15K., 10K., 20K., 25K.

Type C3146—280 watt rating ... 10/9
25K., 30K., 50K., 75K., 100K.

Types AW3111/3112 and AW3124 are wire ended Resistors.

Types B3141 and C3146 require mounting clips, available at 1/- per pair.

WELWYN HIGH STABILITY CARBON 1 WATT RESISTORS, Type A3634

Tolerance ±1 per cent.
100, 250, 500, 750, 900, 2,000, 2.5K., 5K., 10K., 30K., 50K., .25M., .5M., 1M. ohms.

Tolerance ±2 per cent.
510, 1,000, .25K. ohms.

Tolerance ±5 per cent.
10, 100K., 3M., 5M. ohms.
From stock 2/6

"SATOR" SILVER MICA CONDENSERS

Recommended as precise and stable capacitors. To your specified assorted values.
Price per dozen 4/6 (or 6d. each)

3 p.f. ... ± 15%	580 p.f. ... ± 2%
40 p.f. ... ± 5%	590 p.f. ... ± 2%
307 p.f. ... ± 1%	680 p.f. ... ± 1%
410 p.f. ... ± 2%	700 p.f. ... ± 10%
425 p.f. ... ± 1%	800 pf. ... ± 1%
435 p.f. ... ± 10%	1,620 p.f. ... ± 1%

TEST INSTRUMENTS FROM STOCK

Taylor "Junior" Model 120A (A.C./D.C.—1,000 ohms per volt.) £8 10 0
Avominor Universal ... £8 10 0
AvoMeter Model 40 ... £17 10 0

BROWN'S MOVING COIL TELEPHONES

Type K.—For high Fidelity reproduction.
Resistance 90 ohms. Per pair £5 5 0
Matching transformer, 7,000/90 ohms. ... 7/0

WEBB'S RADIO,
14, SOHO ST., OXFORD ST., LONDON, W.I.
Note our SHOP HOURS: 9 a.m. to 5.30 p.m. Sats., 9 a.m. to 1 p.m.
Telephone: GERrard 2089

—THESE ARE IN STOCK—

TELEVISION RECEIVING EQUIPMENT, by W. T. Cocking, 12s. 6d., postage 4d.
WIRELESS SERVICING MANUAL, by W. T. Cocking, 10s. 6d., postage 5d.
RADIO COMMUNICATIONS, by W. T. Perkins and R. W. Barton, 12s. 6d., postage 6d.
RADIO ENGINEERING, by F. E. Terman, 30s., postage 9d.
THE TECHNIQUE FOR RADIO DESIGN, by E. E. Zepler 21s., postage 6d.
RADIO RECEIVER SERVICING AND MAINTENANCE, by E. J. G. Lewis 8s. 6d., postage 6d.
RADIO CIRCUITS, by W. E. Miller, 3s. 6d., postage 3d.
THERMIONIC VALVES IN MODERN RADIO RECEIVERS, by A. T. Witts, 10s. 6d., postage 4d.
ELECTRONIC EQUIPMENT AND ACCESSORIES, by R. C. Walker, 25s., postage 10d.
RADIO TUBE VADE MECUM, by P. H. Brans, 12s. 6d., postage 6d.
RADIO PHYSICS COURSE, by A. A. Ghirardi, 37s. 6d., postage 10d.
THE WIRELESS WORLD VALVE DATA, 2s. postage 2d.
SHORT WAVE RADIO, by J. H. Reyner, 10s. 6d., postage 4d.
ELECTRIC DISCHARGE LIGHTING, by F. G. Spreadbury, 15s., postage 4d.

We have the finest stock of British and American Radio Books. Write or call for complete list.

THE MODERN BOOK COMPANY. (Dept. P.13), 19-21, Praed Street, London, W.2.

PRATTS RADIO

1070 Harrow Road, LONDON, N.W.10 (Nr. SCRUBS LANE)
Phone: LAD 1734.

SPEAKERS.—P.M., L./Tr., 2½in., 25/-; 3½in., 29/-; 5in., 18/-; 6½in., 21/-; 8in., 21/6; 10in., 38/6.

TRANSFORMERS.—350-0-350v. or 275-0-275v., 4v., 4v. or 5v., 6.3v. C.T., 26/6; speaker transfrs., midget universal, 5/-; multi-ratio, 5 watt, 7/6; 30 watt, 22/6; I.F. transformers, Weymouth midget, 18/6; standard, 15/- pair (465 k/cs.).

VARIABLE CONDENSERS.—2 gang .0005 with trimmers, 12/6; less trimmers, 11/6; Dielectric, .0005 and .0003 mfd., 4/6 each; preset, .0005, 2/3 each; .0001, 1/3 each; 50 pf., 9d. each.

CHOKES.—Midget 300 ohm, 4/9; standard 60 m/a, 20 hy, 360 ohm, 6/9; 20 hy, 450 ohm, 250 m/a., 24/6; 150 m/a., 21/-; 90 m/a., 9/6.

MAINS DROPPERS.—.3 amp. 800 ohm, 5/-; .2 amp. 1,000 ohm, 4/9 (inc. feet and sliders); linecord, .3 amp. 60 ohm, per ft., 3-way, 8d. ft.; 2-way, 7d. ft.

CONDENSERS.—Most types in stock.

COILS.—Weymouth coil packs, 36/6; L.M. and S. wave coils aerial and osc., 465 k/cs., 11/6 set; L. and M. wave coils with reaction, 9/- pair; dual range coil with reaction, 4/6 each; Wearite P coils, 3/- each.

MISCELLANEOUS.—Midget L.F. transfrs. 3-1, 5/6; 5-1, 5/9; volume controls, less sw., 3/6; with sw., 6/6; valve holders, paxolin, 7½d.; amphenol, 9d.; knobs ¾in. to 2in., 6d. to 10d. each. Plugs, solder, dials, slow motion drives, T.C. wire, vibrators, everything for the radio amateur. Overseas orders invited.

VALVES.—6K7, 6J7, 1C5G, 1H5G, 1N5G, 84, 6C6, 6D6, 12SK7, 6R7, 77, 0Z4, 6J7GT, 5Z4G, 5Y3G, 5U4G, 6B8G, 12SR7, 35Z4, 6H6, 6L6G, 6V6G, 6F6G, 6K6GT/M, 12J5GT, 6X5G, 6F5GT, EF39, EL33, EL32, TP22, PM2B, VP13C, MS4B, AZ31, U403, Pen45DD, TDD4, etc. S.A.E. for list or advice. Orders over 30/- post free C.O.D. or C.W.O.

Buses 662, 664, 18B pass door.

NEW UNUSED GOODS ONLY.

GALPINS

GOVERNMENT SURPLUS ELECTRICAL STORES
408, HIGH STREET, LEWISHAM, LONDON, S.E.13
Telephone: Lee Green 0309. Near Lewisham Hospital.
TERMS: CASH WITH ORDER. NO C.O.D.

MAINS TRANSFORMERS BY WELL-KNOWN MAKERS, double wound, 230 volts to 110 volts at 4,000 watts, **£22/10/-** each, carriage fwd., ditto 200/250 volts input, 450/0/450 volts at 150 m/a 5 v. 2 a., 6.3 v. 4 amp., **37/6** each carr. **2/6**; ditto 350/0/350 v. at 200 m/a, 5 v. 3 a., 6.3 v. at 20 amps. **55/-** each, post **2/6**; ditto 700/0/700 v. 80 m/a, 4 v. 2 a., 12½ v. 1 a. **25/-** each, **2/-** post. Another with an 80/100 volt primary, 450/0/450 at 250 m/a, 6.3 v., at 6 a., 5 v. 2½ a., **17/6** each, **2/-** carriage.

Ex G.P.O. (U.S.A.) CONVERTERS, vibrator type 4/6 volts D.C. input, 100 volts A.C. output, fitted in metal box size 9in. x 6in. x 6in., new and unused **27/6** each, **2/-** post.

LARGE TYPE METAL RECTIFIERS, outputs, 12 volts 4 amps, **42/6**; 12 volts 6/8 amps., **55/-**; 50 volts, 1 amp., **35/-**; 50 volts 2 amps., **42/6**; carriage on all types, **2/-**. Mains transformers to suit the above tapped input, tapped output, 6, 12, 24 v. at 6/8 amps., **40/-**, **2/-** post. Transformers to suit the 50 v. rectifiers, **42/6** each, **2/-** carriage.

"WESTON" Moving Coil Meters, edge type, 2½ in. scale, 0 to 0.3 amps., **30/-**; 0 to 2 amps., **27/6**; 0 to 60 volts, **27/6**; 0 to 150 volts, **27/6**; all have F.S.D. of 2 m/amps.; 0 to 1 volt, 1 m/a. F.S.D., **35/-**; another 3½in. scale reading decibels 50 microamps., F.S.D., **70/-**; another 301 model 0 to 3 m/a., **40/-**; 0 to 50 m/a, **35/-**; 0 to 200 m/a, **35/-**.

ELECTRIC LIGHT CHECK METERS, for 200/250 A.C. mains, 50 cycles 1 phase, for garages, sub-letting, etc., 5 amp. type, **12/6**; 10 amp., **15/-**; 15 amp., **20/-**; 20 amp., **25/-**; 25/30 amp., **30/-**; 50 amp., **45/-**; 100 amp., **55/-**. All **1/6** each carriage.

VOLTAGE CHANGER TRANSFORMERS. Auto-wound, fully guaranteed, immediate delivery. 250 watts, **45/-** each; 500 watts, **70/-**; 1,000 watts, **£5/15/-**; 2,000 watts, **£8/15/-**. All tapped 0, 110, 200, 220 and 240 volts.

EX-R.A.F. MASTER OSCILLATORS. New and unused. Range from 2 m/cs to 7½ m/cs, complete with valves; 4x Neon Stabiliser, 2 Parretters and 8-06 output price, **55/-** each, **5/-** carriage.

PERMANENT MAGNET MOVING COIL SPEAKERS. Makers: Truvox, Tannoy, for extension, or small P.A. work. Fitted in wooden box, size 9in. x 9in. x 7in., price **37/6** each.

EX-R.A.F. CATHODE RAY RECTIFIER UNIT. Sold for components which consist of mains transformers, high voltage condensers, tube holders, 120 resistances and condensers, 15 Octal base v/holders, all mounted on metal baseboard and fitted in metal cabinet, size 23in. x 11½in. x 11½in. Condition of all components as new. Price **65/-**, carriage **5/-**.

EX-G.P.O. PRE-UNISELECTORS, 3 ohm automatic relay operating a 4-way Yaxley switch, fitted with 2 condensers, .01, 1½ M.F., new, boxed, **5/-** each. G.P.O. Polarised Telegraph Sounders in new condition, **10/-** each. G.P.O. Polarised Relays, operating on 10/20 m/amps. coil resistance, 230 ohms, **12/6** each, as new.

SHORT WAVE H.F. CHOKES, 1/6; H.F. chokes, **1/-**; .01 condensers, **4/-** per doz. R.I.3 to 1 L.F. transformers, **6/-**; condensers, 1 M.F., **1/3**; 2 M.F., **2/-**; 4 M.F., **3/6**; 10 M.F., **5/6** each; smoothing chokes, 20/30 henrys, 80/100 m/amps., **8/6**; electrolytic condensers, 80 M.F. 350 v. wkg., **7/6**; 500 M.F. 50 v. wkg., **8/6**.

On the Amateur Bands

A Monthly Report of Results and Conditions Experienced on the Short Waves. • By "KAYAK"

World Conference and Amateur Allocations

THE coming World Telecommunications Conference, which takes place in Miami in May, during which the amateur bands will be fixed for the next seven years, is no doubt responsible for the flood of pessimistic rumours concerning frequency losses. In this country current rumours suggest loss of the complete 1.7 Mc/s band. In America, strong suggestions that part of the 14 Mc/s band was being handed over to broadcasting authorities had to be vigorously denied by the American Radio Relay League in a special broadcast to all radio amateurs. In consultation with Washington the A.R.R.L. were advised that the rumours were groundless, and all amateurs were requested to help squash the rumour.

The American authorities have always been most considerate to their own radio amateurs and it is doubtful whether any claims will be made on the amateur bands. But what of amateur radio in Europe? In our own country current "pointers" are not promising. Official proposals indicate continuance of broadcasting stations in the 7,200-7,300 kc/s portion of the 7 Mc/s band (shared with amateurs), and the sharing of three-quarters of the 3.5 Mc/s band with "other services." In connection with B.B.C. activity in the "shared" portion of the 7 Mc/s band the following extract from a recent issue of their overseas journal "London Calling" will be of interest: "The B.B.C. does not wish to interfere with amateur activities and will always seek to avoid such interference by choosing frequencies in other broadcasting bands when these are suitable and available. As solar activity is now increasing the B.B.C. expects to maintain its services to the Americas during the next few years without recourse to the 41-metre band, thus reducing to a minimum interference with amateur activity." Recent observations on this frequency by the A.R.R.L. indicate that the B.B.C. have already moved some stations off.

British official proposals affecting the higher frequency bands savour none too well for British amateurs. It is suggested that the 14,350-14,400 kc/s portion of the 14 Mc/s band be shared between amateurs and broadcasting, and that the full width of the 28 Mc/s band be used pro tem "pending further consideration."

Ronne Antarctic Expedition

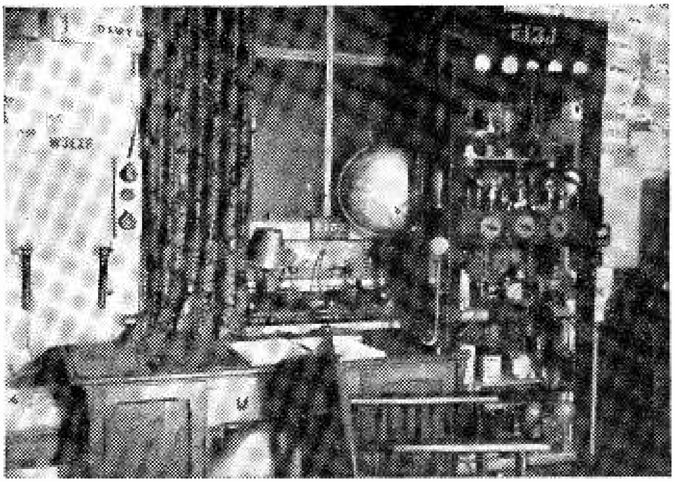
This American expedition to the Antarctic is looking for amateur contacts. At 0400 G.M.T. the expedition station AYZH calls CQ on 12,480 kc/s and listens for replies in the 14 Mc/s band. At 0420 G.M.T. the station then changes to 8,330 kc/s and listens for replies on the 7 Mc/s band. We set watch for this station as soon as this information was received and soon came across a strong signal signing "AYZH." The station appeared promptly at 0400 G.M.T. and made the following: "CQ hams Ronne Expedition authorised communication with ham stations—answer 20-metre band." A contact with a Pacific coast American station then followed and AYZH gave position as off coast of Chile. When this QSO terminated AYZH then moved to 8,330 kc/s but was not located by us. This is a nice DX contact for early risers!

DX Review

Conditions on the high-frequency bands have been much below average. The 28 Mc/s band has produced little of interest, and for days at a time the 14 Mc/s band has accounted for nothing but European stations coming in on a short skip. During the first period of the A.R.R.L. DX contest (CW) conditions could hardly have been worse, very few North American signals being audible during daylight hours. Power cuts in this country have curtailed hours of operation for many "hams" and short-wave listeners. A European station on 'phone, commenting on absence of British stations owing to power cuts, remarked how easy he found it to work DX when British stations were off the air!

28 Mc/s Band

D. L. McLean reports the following 'phones: EL2A, Harbel, Liberia; KP4AJ, Puerto Rico;



EI3J, Cork, Eire, has worked 68 countries on 'phone during his first three months' post-war activity.

PZ1A, PZ1G, both in Surinam; VS9AB, Aden; VP6YB, Barbados; W8SAU/MM, mobile marine; and many Pacific coast signals. He also lists several Americans heard on the 27 Mc/s band. The 27 Mc/s band is used by North American stations only, and as there is no QRM from European signals it is a good frequency for coming across stations from the more difficult North American states. Other reports received covering the 28 Mc/s band include nothing other than the commonplace.

14 Mc/s Band

Last month we mentioned LI2BO and suggested that he was a "pirate." We stand corrected! Dennis Tyler writes to say that this station is in Libya. We can confirm this as we recently came across LI2JC, on key, who gave QTH as R.A.F., El Adem, Near Tobruk. LI2JC said that there were three stations on from Libya, and that they were all run by Air Force personnel. We believe the third one to be LI2CL whom we have heard being called.

Many interesting 'phone stations have been heard by John Roscoe, of Bedford, who lists XACP, Sardinia; PR1AB (QTH ?); VS1BX, Singapore; LI2BO, Libya; VQ4ERR, Nairobi, Kenya; and two from Morocco, CN8EE and CN8ED. The latter are both at a U.S. Naval Air Station, and cards should be sent to W4IJW, Tony Sivo, 2200 Virginia Avenue, Norfolk, Va. Other 'phones listed by John include HZ2BY who gave QTH as 20 miles north of Mecca; OX3GC, Greenland; and FF8FT, Lagos, F. W. Africa.

Our own meanderings around the band resulted in the following stations logged because of exceptional signal strength. They are all 'phone: XZ2HD, Rangoon, Burma; VU2KB, Calcutta; CX2CA, Montevideo; VQ4ERR, Kenya; HZ4DO, Mecca (P.O. Box 112B); and SV1AH, Athens. QTH for the latter station is Athens Airport, Greece. Other good signals from Greece have been SV1AZ and SV1RX.

BSWL 804 reports ('phone): CT2AB, Azores; EK1AD, Tangiers; FF8FP, French West Africa; HH5PA, Haiti; HZ1AB, Saudi Arabia; KH6CT, Hawaii; VQ2HC, Northern Rhodesia; W2MMO/MM, mercantile marine; and many from Southern Rhodesia and South Africa. BSWL 804 also sent along many DX QTHs which are included in our monthly list.

Dennis Tyler's report included a recent list of Japanese call areas listing principal cities, which are as follows:

J2 Tokyo, Yokohama, Nagoya.
J3 Kobe, Osaka.
J4 Hiroshima, Kochi.
J5 Nagasaki, Kumanoto.
J6 Aomori.
J7 Otapu, Kushiro, Hakodate.
J8 Keijo, Fusan.
J9 Okinawa.

Japanese call assignments to Allied personnel are made by the U.S. Military authorities. Amateurs holding an American callsign continue to use that call and add the applicable "J" suffix; others are given a normal "J" callsign.

G2FLK, Romford, while spending most of his time on "top band" occasionally gets down to higher frequencies and has sent along the following CW selection: YO5WZ, North Roumania (QSL via HB9AG); EA6AV, Balearic Islands; EA9AI, Melilla, Spanish Morocco (QSL to that address); OE9AA, R. Richards, A.P.O. S/565, Klagenfurt, Austria; Peruvian OA4AB; PK3PL, Surabaya; VS1BX, Singapore; and CR9AN, Macao. An unusual one listed is LJ2H, of which we have no trace.

The 7 Mc/s band is the only other band of which we have received DX listings. Dennis Tyler heard PY7QG and CM2LT. G2FLK reports XE1GA, W7ZK and ZS6KG.

DX QTH List

CT2AB, A.P.O. 406, c/o Postmaster, New York.

KH6CT, P.O. Box 237, Lanikai, Hawaiian Islands.

PZ1A, P.O. Box 679, Paramaribo, Surinam.

TI2LR, P.O. Box 196, San Jose, Costa Rica.

TR1P, A.A.C.S., A.P.O. 498, c/o Postmaster, New York.

VO2AF, U.S. Navy Base. Argentina, Newfoundland; Navy 103 Fleet P.O., New York.

VP4TJ, U.S. Navy Base, Trinidad.

VQ4ERR, P.O. Box 1313, Nairobi, Kenya.

ZE1JM, P.O. Box 587, Bulawayo, Southern Rhodesia.

ZS2CN, P.O. Box 688, E. London, South Africa.

VO2M, Cape Bonavista, Newfoundland.

CN8EE and CN8ED, via W4IJW.

LI2JC, R.A.F., El Adem, Libya.

VU2AN, G.H.Q. Signals, New Delhi, India Command.

AYZH, Ronne Antarctic Expedition, c/o A.R.R.L.

SV1AH, Athens Airport, Greece.

HZ1AB, R. Thanisch, c/o T.W.A., Dhahran, Saudi Arabia, 1264 A.A.F.B.U., A.P.O. 788, New York.

OY3IGO, Ingvar Olsen, c/o Ingenieur F. Wellejus, Thorshavn, Faroe Islands.

CN8AB, P.O. Box 50, Casablanca, French Morocco.

LZ1XX, Qsl via HB9CE.

ZB1AC, Army Signals, Malta.

PK4KS, Pangkalpinang Banka, Dutch East Indies.

VO6H, A.P.O. 677, c/o Postmaster, New York. (Station at Goose Bay, Labrador.)

KL7GG, Box 307, Anchorage, Alaska.

VQ5JTW, Government Radio Station, Entebbe, Uganda.

W3KIF/MM, U.S. Tanker *White Falcon*, c/o 100, Montgomery Avenue, Bala, Penn., U.S.A.

VP2MY, Frank Derisle, Montserrat Island, B.W.I.

VR2AA, c/o R.N.Z.A.F., Lauthala Bay, Suva, Fiji Islands.

EK1AA, c/o R.C.A. Communications, British P.O. Box 57, Tangiers, Morocco.

J3AAD, A.P.O. 301, c/o Postmaster, San Francisco.

W6VKV/I6 (call being changed to I6USA), U.S. Army Radio Station, Asmara, Eritrea.

ZS1CN, Box 277, Paarl, South Africa.

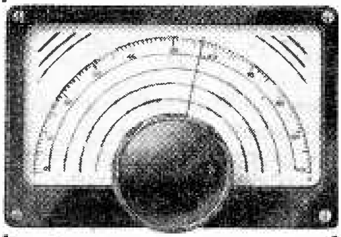
CR9AG, J. J. Alvares, G.P.O., Macao.

YR5W, Box 326, Bucharest.

FM8AC, Bob Martinon, Box 260, Fort-de-France.

OQ5AR, Box 370, Jadotville, Belgian Congo.

Two Popular Items from the EDDYSTONE COMPONENT RANGE



EDDYSTONE FULL VISION DIAL

WITH SPARE SCALES

A most useful dial, recently improved by the inclusion of an Ivorine printed scale. In addition, two paper scales are supplied for experimental purposes. Escutcheon measures 6ins. x 4½ins. across. Outer scale marked 0-100. Large fluted instrument knob. Drive mechanism is free from backlash and has beautifully smooth movement. Reduction ratio 10-1. *Catalogue No. 598* **19/9**

EDDYSTONE SLOW MOTION DIAL

Slow-motion Dial, with Vernier reading device, 3½in. scale and large fluted instrument knob. Reduction ratio 10-1. Matt Black with White fillings. *Cat. No. 594* **17/6**

Cat. No. 637. Matt silver finish scale **20/-**

PLEASE ORDER FROM YOUR LOCAL EDDYSTONE RETAILER (Address on request) AS WE DO NOT SUPPLY DIRECT

STRATTON & Co LTD
EDDYSTONE WORKS
ALVECHURCH ROAD
WEST HEATH BIRMINGHAM.

VALUE! MATT has it

SPECIAL OFFER Headphones with lead and Jack Plug. 5/6 per pair (boxed 2 pairs).

SPEAKERS. P.M. 4in.. 17/6 ; 5in., 15/6 ; 8in., 22/6. All less Transformers. Transformers (output) to match, 5/6 each.

CONDENSERS. .1. .01. 9/- dozen. 8 mfd. (canned). 3/6. 8+8 (canned), 6/6.
All 500 v. working. 16 mfd. Electrolytics (Chassis Mounting), 7/6.

LINE CORD. .3 amp (60 ohms per ft.). 2-way. 1/6 per yd. 3-way. 2/6 per yard.

VOLUME CONTROLS (Centralab), various values. L/S, 3/6. W/S. 4/9.
Rothermel Crystal Pick-ups De Luxe, £2/16/3 (Inc. P. Tax). Metal, £2/12/6 (Inc. P. Tax).
Cosmocord-Magnetic P.-ups. 33/-, (Inc. P. Tax).
Television Cable. (Aerial Lead-in). 1/- per yard.

A large assortment of B.V.A. and V.S. valves always in stock. Let us have your enquiries.

MATT RADIO SERVICE (Kingston 4881)

152, Richmond Road, Kingston-on-Thames, Surrey.

A FREE BOOK

for all interested in

MORSE CODE TRAINING.

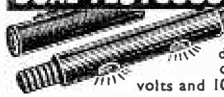
There are Candler Morse Code Courses for Beginners and Operators.

Send for this Free "BOOK OF FACTS"

It gives full details concerning all Courses.

THE CANDLER SYSTEM CO. (5.L.O.)
121, Kingsway, London, W.C.2.
Candler System Co., Denver, Colorado, U.S.A.

DUAL TESTOSCOPE



This new dual model indicates 2 to 30 volts and 100 to 750 volts.

Send for leaflet (A 24) on "Testing."

RUNBAKEN · MANCHESTER · 1

SOLDERING DIFFICULTIES SOLVED.

Have you been put off making a set because of soldering difficulties, either through lack of electricity or low voltage. Here is the answer—Use the "DORSET" HOT SPOT Soldering Outfit in conjunction with any car battery (hired if necessary from garage). As used during recent cuts for construction of our Coil Packs etc. Makes cleaner and neater joints and avoids damage to components. Complete with instructions for use 5/6d.

Weldona Radio Accessories, Ltd., Swanage.

LASKY'S RADIO

This Month's Special Offers.

Moving Coil Ammeters, 2in. flush panel mounting, first grade, 0-10 amps. (shunt can be removed). Boxed New and Unused. Price 12/6 each.

EX-AM. PRESS BUTTON CONTROL BOXES, new and unused. Consisting of 5-way press button unit. 4-pole 3-way tran./rec. switch indicator and 2-pin plug and socket. Price 8/6 each.

SOLID DIELECTRIC VARIABLE CONDENSERS, .0005 and .0003 mfd., 2/11 each.

YAXLEY TYPE SWITCHES. 4-pole, 2-way, 2-bank, price 2/6 each ; 2-pole, 5-way midget, price 2/6 each.

P.M. MOVING COIL SPEAKERS, 3 ohm voice coil, less transformer ; 5in., 19/- ; 8in., 21/- (8in. with o/trans., 27/6) ; 6½in., 21/6 (6½in. with o/trans., 27/6).

ENERGISED MOVING COIL SPEAKERS, 5in., with trans. 1,000 ohms field, 3 ohm v.c., 29/6 ; 8in., less trans., 1,500 ohms field, 3 ohms v.c., 29/6 ; 10in., with trans., 5,000 ohms field, 3 ohms v.c., 39/6.

MEDIUM AND LONG WAVE T.R.F. COILS. AE and OSC, high gain with reaction, 8/6 per matched pair, circuit included.

SPECIAL PURCHASE P.T. 15's, as used in ex-R.A.F. T1154 transmitter. Ceramic 5-pin English base. New and Unused. 22/6 each. 42/6 per pair (postage extra).

ELECTROLYTIC CONDENSERS, 8+8 mfd., 5/6 ; 8 mfd., 4/- ; 4 mfd., 2/11. 500 v.w. T.C.C. Pico-Pack, 20 mfd., 12 v.w., 2/6 . 10 mfd., 25 v.w., 2/6 ; Tubular bias, 50 mfd.; 12 v.w., 2/- ; 25 mfd., 25 v.w., 1/9 ; 250 mfd., 12 v.w., 2/6 ; Tubular cardboard, 8 mfd., 150 v.w., 1/11 ; 15 mfd., 250 v.w., 3/6 ; 16 mfd., 450 v.w., 4/9 ; 8 mfd., 450 v.w., 4/-.

We have space for only a few items from our extensive stocks. Send 1d. for our current list and bulletin. Terms, Pro Forma, C.O.D., or cash with order (no C.O.D. under £1). Orders over £5 post free. All goods covered by our unconditional guarantee. It will pay you to pay us a visit.

LASKY'S RADIO
370, Harrow Road, Paddington, W.9. (opp. Paddington Hospital). Telephone : Cunningham 1979.

TRANSMITTER - RECEIVERS

(Type 58 Mk. I*)

The most modern version of that very fine Canadian set, the 58 Mk. I, this "Star" Model is now offered at only 2/3rds the price. They are in Original Makers' Cartons as supplied to the Government, and are BRAND NEW and UNUSED. Each Set is supplied with 8 valves, 2 sets of headphones and microphone, 3 aerials, Battle Battery, Haversack, etc., and Instruction Book. Complete and Ready to Switch on. **Only £10 10s. 0d.** (carriage 5/-). Descriptive leaflet available.

Ex R.A.F. "Identification Friend or Foe" TRANSMITTING-RECEIVING Units Type R3003

As used on aircraft in conjunction with Radar. Operates between 155-185 megacycles and is easily convertible for Amateur use. All are complete with 10 valves, as follows, 2 type RK34, 1 type EF50, 4 type SP41 and 3 type D1. There is a built-in 20 watts motor generator, and a host of components worth well over £40. At the price offered they are well worth "putting in to stock" against future requirements, either for converting or for component value. **Only 79/6** (carriage 4/-).

SHORT WAVE SECTIONAL AERIAL

Comprises 16 sections copper tubing each 12in. in length, and colour coded to facilitate easy assembly. Complete in web case. **Only 12/6 each** (postage 1/-).

U.E.I. CORP.
32, St. Gabriels Road, London, N.W.2

Impressions on the Wax

Review of the Latest Gramophone Records

IT has been written about the Strauss family that "no family in history has contributed more than they to the gaiety of nations." All down the nineteenth century these remarkable men poured forth a steady stream of entrancing light music—not only waltzes, but some marches and many excellent polkas, which dance almost rivalled the waltz in popularity with our grandfathers. There was Johann Strauss I, covering the first half of the century, and his sons Johann II (died 1899), Joseph (died 1870) and Eduard, who died as late as 1916. Johann II is perhaps the greatest of them, and most of the finest waltzes and many operettas (including "Fledermaus") belong to him. His output was colossal, his later opus numbers reaching three hundred and fifty. Most of the Strauss family are represented this month on two records—*H.M.V. B*9528 and *H.M.V. B*9473—recorded by the Boston Promenade Orchestra, under its permanent conductor, Arthur Fiedler. This orchestra, which has contributed so many outstanding records of well-known classics and the best light music, has become one of the most popular organisations in the States.

"La Traviata"

AN outstanding recording this month is made by Columbia with a complete recording in Italian of Verdi's "La Traviata." This splendid set of 15 double-sided records was made under very difficult conditions on the stage of the then Royal Opera House at Rome, in August, 1946, and the actual recording occupied about two weeks. When it was found that no recording gear was available in Italy, the last portable apparatus having been bombed in a train between Rome and Milan in 1943, it was necessary to bring complete recording apparatus, together with some hundreds of wax discs, from England. There were protracted negotiations with the authorities before the valuable machinery and other materials were admitted into the country. Once that had been settled satisfactorily to all parties, the question of transport offered another problem. Finally, the gear was shipped to Naples, and with the help of the British authorities, taken thence by lorry to Rome in 52 large packing-cases. When it was assembled, the electric supply was found to be intermittent, as the main power supply had been destroyed by the Germans. In the end, it was arranged that an uninterrupted supply should be given during the recording sessions. Many well-known Italian singers are featured, together with chorus and orchestra of the Opera House, Rome, conducted by Vincenzo Bellezza. The records are *Columbia DX*1324-*DX*1338.

Light Music

THE first two records of George Melachrino with his famous Strings called for demands that recordings of his full orchestra should be produced, and *H.M.V. B*9527 introduces this popular artist with his full complement of players. For this, Melachrino has chosen the "Liebestraum" of Liszt and a piece of his own composition entitled "Winter Sunshine." The "Liebestraum," originally written as a piano solo, has been arranged for every conceivable instrument and combination of instruments, but it is doubtful if it has sounded more delightful than as now presented by Melachrino's full orchestra.

Another popular band is Charles Shadwell and his Orchestra, and this month he contributes "Melody on the Move" and "The Dancer at the Fair," on *H.M.V. B*9526. "Melody on the Move," written by Clive Richardson, composer of "London Fantasia," is the signature tune of the new radio series of "Rainbow Room" programmes and is featured by Charles Shadwell in his stage show.

First Recording

NOEL COWARD reveals a unique genius in everything he creates for the theatre, and his latest operetta, "Pacific 1860," written for the reopening of Drury Lane Theatre last December, after its seven years' occupation by E.N.S.A., has the finished charm and enchanting melody we have learned to expect from his work.

Tuneful melodies abound throughout and this month Noel Coward has recorded four of the most attractive numbers on *H.M.V. B*9532-3 which will be welcomed as a pleasing memento by those who have seen the show.

Dance Music

THE broadcast by Harry Davidson and his Orchestra of dances from Victorian and Edwardian times is one of the highlights of our Saturday evening programmes from the B.B.C., and the Old Time Dance Series by Columbia makes it possible to have these attractive melodies at one's finger-tips, ready for any occasion when two or three are gathered together with an urge to dance. The best of these pieces are astonishingly virile in tune and rhythm, and Harry Davidson's Orchestra plays them with infectious enthusiasm. The two dances added this month include a Schottische, a round dance in two-in-a-measure time, to be distinguished from the Ecossaise, which was a country dance. The record is *Columbia DX*1347.

Frank Sinatra's fascination for America's millions of film fans, radio listeners and record enthusiasts shows no signs of diminishing. In this country, too, there is a tremendous welcome for each record by him. The demand for his rendering of "White Christmas" and "Silent Night, Holy Night" can only be described as phenomenal, and his latest record—*Columbia DB*2283—features two topical numbers, "The Things we did Last Summer" and "Somewhere in the Night."

Geraldo and his Orchestra are challenging for the position of top band in the country, and this month he has recorded four popular tunes of the moment on *Parlophone F*2204-5.

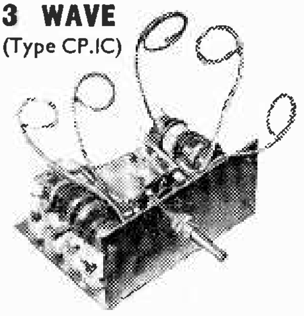
They are "Southern Scandal" and "Artistry in Rhythm," and "Sooner or Later" and "The Things we did Last Summer." Most of the other popular bands have recorded this month, giving the dance band enthusiast a wide range from which to make his choice.

LOWER COST PLUS IMPROVED PERFORMANCE

Now incorporating a split aerial coupling winding. For use with 465 KC. I.F. transformers. 36/6 each.

SUPERHET COIL PACK 3 WAVE

(Type CP.IC)



WEYMOUTH RADIO MFG. CO. LTD.
Crescent Street, Weymouth, Dorset

YOU can become a first-class RADIO ENGINEER

We are specialists in Home-Study Tuition in Radio, Television and Mathematics. Post coupon now for free booklet and learn how you can qualify for well-paid employment or profitable spare-time work.

T. & C. RADIO COLLEGE
NORTH ROAD, PARKSTONE, DORSET.

(Post in unsealed envelope 1d. postage.)
Please send me free details of your Home-Study Mathematics and Radio Courses.

NAME ....
ADDRESS ....
P. 80 ....

A.I.S

Once again we are giving a more detailed list of our standard products. All are manufactured and tested to conform to our usual high standard of technical excellence.

40 Coil Pack: A superhet Coil Pack with an H.F. stage. Uses 9 iron cored coils in a 16-50, 200-550 and 800-2,000 metres circuit for 465 kcs., I.F. Complete with circuit diagram, aligned and gain tested, this Coil Pack enables the amateur with no signal generator to construct a first class all-wave receiver. Price **£3 10s.** Circuit diagram only, **2/6** post free.

30 Coil Pack Series: A famous series of precision made Coil Packs now too well known to need description. Superhet types: Model 30, 16-50, 200-550, 800-2,000 at **42/-**; 30A, 12-30, 30-75, 75-200 at **42/-**; 30B, 16-50, 200-550, at **30/-**; 30C, 200-550, 800-2,000 at **30/-**; 30S, 12-30, 30-75, 200-550 at **42/-**. TRF types: Model 30D, 16-50, 200-550, 800-2,000 at **35/-**; 30E, 12-30, 30-75, 75-200 at **35/-**; 30F, 16-50, 200-550 at **27/6**; 30G, 200-550, 800-2,000 at **27/6**. Each is complete with circuit diagram. Circuits only **2/6** each.

High 'Q' I.F. Transformers: 465 kcs. Iron cored, permeability tuned. Recommended for use with Coil Packs 40, 30, 30A, 30B, 30C and 30S. Aligned and gain tested. Price **17/6** per pair.

A.I.S. Tuning Scale: Manufactured exclusively for A.I.S. and bearing our name. Attractively designed and colour printed on metal. Size 8½in. by 6in. For use with 30, 30D and 40 Coil Packs. Price **5/-**.

Model 30 TUNING HEART: Completely assembled and tested, this unit is built around the 30 Coil Pack covering 16-50, 200-550, 800-2,000 metres. Fitted with 6K8G, 6K7G and 6Q7G valves. Ideal for use with any amplifier. Requires 250 volts at 30 m/a and 6.3 volts at .9 amp. Price **£9 9s.** Delivery approximately 6 weeks from date of order.

Receiver Kit: This famous 5-valve A.C./D.C. Superhet Kit uses the 30 Coil Pack and thus provides excellent reception on all bands. All components included plus 3 blue-prints giving full constructional information. Price **£12 1s. 11d.** An attractive oak veneered cabinet is available to house this receiver. Price **55/-**.

X A.I.S. CIRCUITS: 6-valve A.C mains superhet using 40 Coil Pack. 3 constructional drawings and priced Parts List, **3/6** per set. The same, but for A.C./D.C. operation, **3/6** per set. 5 valve A.C. mains superhet using 30 Coil Pack. 3 constructional drawings and priced Parts List, **3/6** per set. The same, but for A.C./D.C. operation, **3/6** per set. These drawings show how to make the best use of our Coil Packs.

MANY OTHER INTERESTING A.I.S. PRODUCTS ARE AVAILABLE. SEND STAMP FOR NEW PRICE LIST. NO C.O.D. UNDER £2.

ALIGNED INSTRUMENTS SERVICES,
1, COLWORTH RD., LEYTONSTONE, E.11

CONSTRUCTORS

COMPLETE KIT OF PARTS for 200-250v. A.C./D.C. T.R.F. Receiver. Medium and long wave. Including valves, 5in. P.M. speaker, Weymouth coils, illuminated coloured ivorine dial (station-named), drilled aluminium chassis 10-5-1½ins., and everything required down to last nut. Circuit supplied. Price, including purchase tax, **£6/14/6.** Attractive polished wood (walnut) cabinet to suit. Size 12½-6½-7½ins., **30/6** extra.

TUNING COILS. High gain T.R.F. M. and L. wave, with reaction and circuit, **8/6** per pair. Medium with circuit, **5/6** per pair. Wearite "P" coils, all types, **3/-** each. Midget superhet coil pack, M. and L. wave, Litz wound coils, complete with padders, etc., circuit and instructions, **22/6.**

YAXLEY TYPE WAVE - CHANGE SWITCHES. 4-pole, 3-way, **4/3**; 4-pole, 2-way, **3/6**; 3-pole, 2-way, **2/11.**

FIXED CONDENSERS. Dubilier and Hunts mica. 40, 50, 60 mmfd., .00015, .0002, .0003 mfd., **3/6** per doz., **4d.** each. Micamold .01 mfd. 600v. .1 mfd. 350v. Phillips .05 mfd. 500v., **4/6** per doz., **5d.** each. Ferranti and Mullard .1 mfd. 350v., **4/-** per doz. Micamold .25. .5 mfd., 350v., **5/-** doz.

DIAL AND DRIVE ASSEMBLIES. Complete with station named M. and L. wave dial, pointer, glass, and escutcheon. Square plane, 4½-3½in. Airplane, 3½ins. diameter, **10/9** each.

CABINETS. Polished wood (walnut) attractively designed, size 12½-6½-7½ins., **27/6** each. Midget walnut, 9½-5½-5½ins., **22/6.**

VOL. CONTROLS. 10k., 50k., .25 meg., .5 meg., 1 meg., less switch, **2/6** each; 2k., 5k., 10k., 25k., 50k., wire wound, **3/6** each.

CHASSIS, undrilled 16 gauge aluminium, 10-5-1½ins., **4/-** each; drilled, 4 valves, etc., **5/-** each.

SPEAKER TRANSFORMERS. Multi-ratio, 5 watt, **6/-**. Power and pentode, 5 watt, **5/6.** Midget P. and P., **5/6.**

SMOOTHING CHOKES. 60 m.a., 420/450 ohms, **5/6.**

C.W.O., otherwise C.O.D. Postage extra. Trade supplied. Stamped addressed envelope all enquiries. Lists **2d.**

E. POWELL, 19, LIDGET HILL, PUDSEY, LEEDS.

BULGIN

A Name famous in Radio

★

A. F. BULGIN & CO., LTD.
Bye Pass Road, Barking, Essex
Tel: RIPpleway 3474 (5 lines).

MIDLAND INSTRUMENT CO.

SPECIAL OFFER OF EX-GOV. ALL-DRY BATTERIES.—Highest grade manufacture, tropical standard, brand new and fully guaranteed by us, 90-volt H.T. plus 1½-volt L.T., **5/-**, post 8d. Sealed cartons of 8, **35/-** post paid. Trade supplied. Above can easily be split to form three 30-volt H.T. units (size of U.2 cell) ideal for midget sets, deaf aids, etc.

EX-AIR MINISTRY RECEIVING UNITS, TYPE 69.—Includes 10 valves, 6 VR.91, 4 VR.55, 3 relays, rectifiers, chokes, condensers, resistors, etc. Complete with rotary transformer, smoothing, etc. Sets complete as new, **£5**, carriage 5/-. Sets complete, less rotary transformer power pack, **£3**, carriage **3/6.**

Hundreds of other lines, send s.a.e. plus 2d. for our new May lists.

18, Harborne Park Rd., Birmingham, 17
Tel. HARborne 1308.

Open to Discussion

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

"The Vector Problem"

SIR,—I would like to say that I agree with Mr. Hatch's Fig. 2, except for one thing. He shows Ia 45 deg. behind the generator voltage μEg. which is what would be the case with the anode load in question, but adds a vector Ia_2, which is described as the "true" direction of current flow. If we assume Eg to be positive in the diagram, and therefore μEg negative, the electrons of the alternating component of the anode current will actually be flowing away from the anode (with a delay of 45 deg.), increasing the total anode current. That is, they will be actually flowing in the direction which a generator whose terminal is negative would produce, so that Mr. Hatch's vector Ia represents the actual demonstrable direction of flow, and Ia_2 does not. I emphasise that this is not a question of any convention, but of easily provable fact.

On another matter, I would like to ask "Dynatron" how he gets V and V_0 in Fig. 2, in your January issue, as being in opposite phase. As the terminals of the H.T. supply can be, and often are, joined together by a large condenser of negligible reactance, they must be at the same alternating potential, and they are in fact often shown joined by a line in diagrams illustrating alternating conditions. How then can the anode move in opposite phases to what is, in the alternative sense, one and the same point ?

Let me give an instance. Suppose we have an H.T. battery of 120 volts, and that 20 volts are dropped in a resistance anode load, so that the static voltage at the anode is 100 volts. An impulse on the grid causes the anode voltage momentarily to drop to, say, 90 volts.

It has thus gone 10 volts more negative in comparison with its former position with regard to H.T. positive, and it has also gone 10 volts negative relative to its former position compared with H.T. negative. That is, the phase relation is exactly the same to the two fixed points. However much D.C. voltage there may be between these two points, they are the same point in the A.C. sense.

"Dynatron" refers to Figs. 2, 3 and 4 in Section K of the Admiralty Handbook. I had some correspondence with the Admiralty in 1945, particularly on Fig. 4. The top curve in this figure is one of total anode current, showing it increasing and decreasing as Vg (bottom curve) goes positive and negative. Naturally, the curve goes up with an increase of total current (Vg positive) and down with a decrease (Vg negative). But it does not represent the actual phase relations between Vg and the alternating component of Ia ; for when the increase takes place on the positive half cycle of the grid, the electrons are flowing in the direction in which they would be driven by an imaginary generator μVg on its *negative* half cycle—away from the generator's terminal, the anode. And vice-versa. Hence my contention that the alternating Ia is in phase with μVg (when the load is resistance or tuned anode) and in anti-phase to Vg. —A. O. GRIFFITHS (Wrexham).

"Regulation of Power Supplies"

SIR,—I read with much interest the article on "Regulation of Power Supplies" by C. A. Hooley, in the February issue of PRACTICAL WIRELESS. There are, however, one or two points on which I would like to comment.

Firstly, Mr. Hooley assumes in his calculations for a VR.90 valve that the minimum load current is zero. In most cases this is not so. Take, for example, a simple amplifier : the H.T. load for no signal input may be 100 mA. and the load for maximum output 120 mA. The *change* in load is 20 mA., and a VR.90 could still be used to stabilise a power supply for such an amplifier. Let us call the current through the valve I_T and the load current I_o, then the value of R is given by :

$$R=\frac{E_1-E_o}{I_T Max+I_o min.}$$

I realise that in the above example that an H.T. voltage in excess of 90 volts would be required. This can be done by putting several valves in cascade, say three, to give 3×90 volts $\doteq 270$ volts stabilised output.

The main points I want to bring out are that the *change* in load current must not exceed 20 mA., and that the total load current need not be limited to 20 mA.

Secondly, Mr. Hooleys' calculations assume a "constant" supply voltage, E_1, and a varying load current, whereas it is important to realise that it is possible to provide a constant output with varying supply voltage and fixed load. It is also possible to stabilise when both E_1 and I_o vary.

It is also of interest to note that the stabilised voltage of individual valves may vary as much as 30 volts from that stated in the manufacturers' tables ; no close control of the characteristics being possible during manufacture. — "ENGINEER." (N.W.4)

"Faults in Fault Finding"

SIR,—As a regular reader of your journal, I have before me the issue for March.

In the article entitled "Faults in Fault Finding," on page 146, I note what you write in the paragraph headed "Voltage from Current." I agree with your statement that the best way of ascertaining the actual applied anode volts is by measuring anode current by means of a milliammeter but feel that a much quicker and better method than that outlined (". . . inserted at the point marked C") would be to (a) measure the resistance of the two resistors in the H.T.+ line ; (b) measure the P.D. across these two at points c and a, then deduct this reading from that obtained between point a and H.T.—ve. Surely by Ohm's Law Ia can be determined without inserting a milliammeter ? —G. H. SMITH (W. Ealing).

Peculiar Faults

SIR,—As a reader of your magazine for many, many years, may I say just how much I appreciate the articles it contains in each issue. They really are most helpful. I also take a great interest in "Open to Discussion," in which I have often seen radio freaks described. I wonder if any of the readers can explain the following radio peculiarity. It happened on a receiver I was servicing some few weeks ago.

Receiver was a 1939 5-valve superhet and developed a loudspeaker fault. Set was switched on, with loudspeaker disconnected, and a station was clearly heard. Signal could not be tuned and vanished on switching to long waves. Signal appeared to be coming from large screen covering coils and switching, but even after this was removed the signal could clearly be heard, and I simply could not trace the exact cause. Can any reader offer any suggestions as to its cause? No loudspeaker or phones were in any way connected with Rx.—RICHARD G. GUY (Truro).

[*A similar fault was often experienced before the war and was due to the vibration of L.F. transformer laminations. The speech currents flowing in the primary and secondary windings made the transformer in effect a moving-iron loudspeaker on a small scale. However, have any readers got any other solutions to this peculiarity?*—ED.]

Amateur Reports

SIR,—I should like to offer, if I may, some aid to readers. My veries for 1946 had a 65 percentage return. In all sincerity I offer the following: Have printed some cards, postcard size, with listening number—League number, etc., in large letters on the front. One space with QRA. On the reverse the layout for the report. A ham does like a card. They can be filed—or put on the wall. But paper sheets get put to one side and eventually lost—as "straight into the waste-bin." This remark from a ham himself!

Enter on the card the first report and enclose a report sheet of further QSO's. A good thing to report on its general conditions of other transmissions coming from the area you are reporting to. Do *not* send to stations in QSO with Great Britain. You can report to G stations for transmissions on VHF bands, and all reports over any distance are normally very welcome. Do *not* report to high-powered hams—the 600-1,000 watts transmitters. They get smothered with reports and are very indifferent to them. Above all, be honest with the report. If the signal or speech, etc., is bad—say so. Otherwise your report is of no use whatsoever.

For my own experiences I have followed this method and am *very* pleased and satisfied with the result. I am not an old hand—a mere youngster of 15 months' listening age. I maintain still, the thrill of Dx is, in the main, to be had best on 10, 20 and 40 metres.—W. E. HARRIS (E. Suffolk).

Valve Details Required

SIR,—Could any reader please let me know the connections and operating data of the following midget valves that I have acquired?

They are 1¼in. high by ⅜in. wide. They have a top cap and the base has six contact pins, four at one side and two at the opposite side. There is a narrow metalised band near the top on which is marked R.V.12, P.2000.—GEORGE SOMERVILLE (Braemar).

Contacts Wanted

SIR,—I would be much obliged if you would, through the medium of your paper, allow me to say "Hello again" to the many SWL and ham pals I had the pleasure of knowing prior to the recent war. So, would any of my old friends please note that my address is now 152, Narborough Road, Leicester, and no longer 18, Debden Road, Saffron Walden, Essex? Also, I have two requests to make, viz: I urgently wish to contact any Christian readers who are interested in religious broadcasting of an evangelical nature similar to the activities of Radio HCJB, Quito; and I am an isolated SWL who would like to buy, beg or borrow a call book if at all possible.

This is my first contact with the radio world since 1941, so you can imagine how much I've missed!—FRED HART (Leicester).

LI and SU Calls

SIR,—I am at present in this country on leave from Egypt and feel I can answer two points in your April article.

The prefix LI is being used by a number of stations operating from Libya, mostly by British military personnel. With regard to the SU stations the position at the beginning of February was that the Egyptian authorities had not issued any transmitting licences, but the matter was being taken up on a high diplomatic level.

About the only station operating from Cairo at that time was SU1HF. Whether he is still on the air I cannot say but he used to operate regularly on 28 Mc/s phone (the L.F. end of the band) between 12.00 and 13.00 G.M.T. QSL via P.O. Box 360, Cairo.

I cannot give you any information on SU9SV—it's a new one to me—but of the pre-war SU stations, SU1KE, 1EC are now in England, while Bill Speechley, SU1SP, was off the air when I last saw him, early in February. QSL's for any SU station can be sent via the above address in Cairo. The above information is a little old, but as I left Cairo early in February I have been rather out of touch with the position.—J. E. HODGKINS (Bury, Lancs).

RADIO AMATEURS' EXAMINATIONS

(*Continued from page 236.*)

Question 7.—(*a*) *Key-clicks.* Only fairly well done. The use of filters for primary keying was rarely mentioned. Very few candidates sketched the wave-forms with and without the filters.

(*b*) *Interference to television reception.* Not well done. Few could mention all the standard methods of suppressing the third harmonic.

Question 8.—(*a*) *Use of call-signs.* Fairly well done. Practically all candidates had a general, if not precisely correct, idea of the procedure.

(*b*) *Over-modulation.* The objections to over-modulation were well brought out. Descriptions of the methods of preventing it were often only partially correct, or in terms which were too general or too vague to score highly.

CLASSIFIED ADVERTISEMENTS

RATES: 3/- per line or part thereof, average five words to line. Box No. 6d. extra. Advertisements must be prepaid and addressed to Advertisement Manager, "Practical Wireless," Tower House, Southampton St., Strand, London, W.C.2.

MORSE & S.W. EQUIPMENT

"H.A.C." Short-wave Receivers, famous fcr over 15 years. Complete kits now available. All components, accessories, with full instructions. One-valve model **20/-**, two-valve model **43/-**. Easily assembled in one hour. Send S.A.E. for free catalogue.—"H.A.C." Products (SW), 66, New Bond Street, London, W.1.

A COMPLETE LIST of S.W. Stations, wavelength and frequency, accurately compiled, price **2/3**.—Handyshop, 109A Church St., Croydon.

THE SHORT WAVE LISTENERS ANNUAL, 1947 Edition, is now on sale. Over 80 pages essential data for DXers. **2/6** from local booksellers, or **2/9** direct from "Short Wave News," 57, Maida Vale, London, W.9.

RECEIVERS & COMPONENTS

KITS of Radio Receivers from **£7/8/0**. 4 and 5 valve. All new materials. Table Models, Semi-Midget. Our latest Kit—Wylwyn Star 1947—has connections for Gramophone Pick-up and extensions to Loudspeaker. A.V.C. 6 hours average time for constructing. Full details and diagrams with each kit. C.W.O. or C.O.D.—Isherwoods, Reme House, 81, Plungington Road, Preston, Lancs. Tel.: 3348. Estd. 1936.

EVERYTHING for the Radio Constructor. Chassis, Valveholders, Coils, Condensers, Resistors, Volume Controls, Mains Droppers, Transformers, Electrolytics, Loudspeakers, 2½in. to 12in. 500 Valves in stock.—H. Tabner, 118, Nightingale Rd., Hitchin.

NEW LINES for this month. Varley Quiescent push-pull intervalve transformer, Type DP36. **18/-**. Heavy duty push-pull intervalve transformer, ratio 1.25 each half, type DP6, **26/-**. 150hy 70ma. 2,000 ohm chokes, **15/9**. Small output transformers suitable for battery pentode, and tapped for mains pentode and battery triode, max. primary current 30ma., **5/3**. 30 hum-dingers, **1/9**. Signal lights, red or white, **3/-**. J.B. condensers, .0005 two-gang with trimmers, **13/6**. Page 5in. speakers, **22/6**. Goodmans 12in. speakers, **£6/15/-**. Price increases. 250-0-250 mains transformers now **23/6**. Heavy duty 24 ratio output transformers now **20/3**. Postage extra on all items. T. W. Comins, 399, Chiswick High Road, London, W.4. Phone: Chiswick 4530.

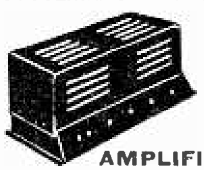
FRITH RADIOCRAFT, LTD., the Leicester specialists, offer from their comprehensive stocks:—
Design for 3-wave Superhet Tuning Unit, **2/6**; ditto, for 5v. Superhet Midget, **2/6**, both designs using U.S.A. octals and Wearite coils. Wearite "P" coils, most types, **3/-** each. Guaranteed resistors and condensers, 750, 1,500, 2.2 m., ½ watt; 75, 4,700, 10K, ½ watt; 68K, 680K, 1 meg., 1 watt; 20K, 33K, 100K, 150K, 300K, 2 watt; 4,700, 6,800 3 watt; .001, .002, .005, 01, .02, .05, .1, .25, .5 mfd.; any assortment or one size, **£1** per ½ gross parcel. Stanelco soldering irons, 200 or 250v., list 21/-, our price **12/6**. Woden de Luxe Diecast Output Transformers, 6,000, 6,600 and 10,000 A to A, CT, 3 to 15 ohms sec., 30 watts. **39/6**. Rothermel Senior Xtal Pickups, **56/3**; Sapphire Needles, **12/6**. S. G. Brown lightweight headphones, **23/-**. Agents for Quartz and G.E.C. Xtals, Eddystone, Raymart, Woden and Labgear.—Frith Radiocraft, Ltd., Churchgate, Leicester.

ENAMELLED COPPER, COTTON, SILK and RAYON COVERED WIRES offered in various gauges. Wanted 38, 40 and 44 s.w.g's EN. COPPER. BOX No. 134. "Practical Wireless," Tower House, Southampton Street, W.C.2.

SPECIAL ANNOUNCEMENT.—Now that our designer has returned from the Forces we are in a position again to accept orders for special equipment, e.g., quality amplifiers, Radio equipment and amateur R.T. equipment. Our aim is as usual 100% perfection and the closest attention to the wishes of the customers. Our engineers are at your service any time to advise you.—Watford Radio Co., 25-27, Queens Road, Watford, Herts.

SCOTLAND'S LARGEST STOCKISTS

Agents for
EDDYSTONE
TANNOY
& RAYMART
Write for Lists



AMPLIFIER CASES

High grade. Black crackle finish with base shield. Excellent value. Chassis 15" × 6" × 2¼". Complete **35/-**

Midget Radio Cabinets. Pastel Shades. Inside sizes: 10⅜" × 9¼" × 4⅜" deep. **22/6**

BUCCLEUCH RADIO MANUFACTURERS
Melville Terrace, Edinburgh.
Phone Edinburgh 42803. Grams. Therm. Edin.

★

'Radiospares' Quality Parts
The Service Engineer's First Choice

★

"OSMOR" A.C./D.C. 3-wave 5v. superhet Receivers. Excellent reproduction and sensitivity. Attractive Cabinet. Early delivery. Shipping wave band if required. Write for literature.—**MORGAN OSBORNE & CO., LTD., Southview Road, Warlingham, Surrey.**

O. GREENLICK, LTD.
ROTARY TRANSFORMERS. Brand new, Ex. Govt. stock. Suitable for Car Radios, Mobile Amplifiers, Country House receivers, etc. Solid frame with fixing feet. These transformers can be utilised for 6 or 12 volt input, and will give with 6v. input, output of 200v. at 50 mA. for continuous operation, 150v. at 80 mA. for periods up to 3 hours, or with 12v. input, output of 480v. at 40 mA. continuous operation, 400v. at 80 mA. for periods up to 3 hours. Size 7¼in. x 3¼in. Weight, 6½ lbs. Cost **£7/7/0d.** Each **25/-**.
COILS. Weymouth iron-cored midget I.F.s, 465 kc/s, per matched pair **18/9**; Weymouth All-wave coil pack at **36/6**; standard I.F.s 465 kc/s. **15/-**; M. wave midget T.R.F. coils, per pair, **5/-**; M L wave coils with reaction, boxed with circuit, **7/6**; the latest iron-cored T.R.F. coils, M/L wave, with adjustable iron cores, per pair, **10/6**; Superhet, coils, SML wave, per pair, **10/6**; all coils supplied with circuit.
SPEAKERS. P.M. minus trans.: 5in. at **20/6**; 6in. at **27/6**.
ELECTROLYTICS. Tubular 8 mfd. 150v. at **2/6**; 50 mfd. 12v. at **2/-**; 200 mfd. 12v. at **1/6**; Can type 8 plus 8 mfd. 500v. at **7/6**; Block type 24 plus 24 mfd. 300v. at **9/-**.
DRIVES AND DIALS. Epicycle drive, **3/3**; Slow-motion drum drive, **3/-**; Coloured All-Wave Dials, ivorine. 4in. x 3¼in., **2/-**; 5in. x 5½in., **2/6**; Celluloid transparent dials, M/L wave, 6in. x 5in., **1/6**.
CHOKES. "Ultra" midget smoothing chokes, 360 ohms, 40/50 mA., **5/-**; Midget ditto, 50/60 mA., **5/6**; Standard ditto, 100 mA., **8/6**; heavy duty ditto, 150/200 mA., **12/6**.
POTENTIOMETERS. Wire Wound Potentiometers, 2,000 and 50,000 ohms, **4/-**.
P.V.C. WIRE. P.V.C. Aerial Wire, 50ft. coils at **1/3**; Luxury speaker fabric, 8in. squares at **1/-**.
O. GREENLICK, LTD., 34, Bancroft Road, Cambridge Heath Road, London, E.1. 'Phone: STEpney Green 1334.

CHARLES BRITAIN RADIO, LTD., offers attractive bargains this month. Coil Packs: "Radiomaster" Three Wave band with trimmers, padders, and full circuit diagram, **27/6** ea.; "Douglas" Long and Medium Wave with trims, pads and diagram, **22/6** ea. Individual Coils Midget Iron-cored, wound with Litz wire; H.F., aerial and oscillator, Short, Medium and Long bands, **2/6** ea. Varley Mains Transformers, 80 m.a., 4 and 6v. types, **30/-**.
SPECIAL OFFERS. Moving Coil Meters, 2¼in. scale marked 0-3v., 0-1.5v., 0-60 m.a., 0-5,000 ohms, will form basis for first class test meter, **25/-** ea. 5in. Speakers less trans., **14/6** ea. Ex-RAF Indicator Units; these are complete with a 6in. Electrostatic Cathode Ray Tube and a time-base using several EF50 and EB34 Valves, **£6/10/0** ea. Can only be sold to callers. Moving Coil Mikes with metal grille undamaged, 5/- ea.
BARGAIN PARCELS. No. 1, 36 Assorted Tubular Condensers, .001, -.1 mf., **10/6**; **No. 2,** 72 Assorted ¼, ½, and 1 watt Resistors, 100 ohm to 1 Meg., **12/6**. **No. 3,** Special constructors parcel containing resistors, condensers, valve-holders, switches, tag bars, fixing strips, 4 and 6 b.a. nuts and bolts, grid clips, fuse holders and socket strips. A Real Bargain—**£1** only. **No. 4,** Power Pack Parcel; 2, 8 mfd. Condensers, Mains Dropper, Choke and Metal Rectifier, **18/6**.
Send for our List giving details of our many goods too numerous to advertise.
NEW PURCHASE. Brand new ex-Govt. M.C.R.1 miniature resistance movement radio, 20-3,000 metres. Complete with power pack, 4 plug-in coils, phones, etc., 97-250 volts AC DC or from dry batteries, **£7/19/6** (Post 1/6). Batteries for same, **16/6** each extra (Post free). Terms cash with order or C.O.D. over £1. Send for latest List "P.W."
Charles Britain (Radio), Ltd., Radio House, 2, Wilson Street, London, E.C.2.
Phone: BIS 2966.

THE LAST WORD IN RADIO KITS! Really detailed Instructional Manuscript how to build best type of A.C./D.C. 4-valve receiver, **2/6**. Absolutely complete Kit, including valves and super cabinet, **£8**, carr. paid. Also 5-valve 3-wave Superhet Assembly consisting of all main components, factory mounted on chassis, including very attractive dial, iron-cored coils and iron-cored I.F s. Builds a first-class receiver for the discriminating listener. Price **£8**, carriage paid, with blueprints. Send postage for specifications and Bargain List.—Northern Radio Services, 66, Parkhill Road, London, N.W.3. Gulliver 1453.

SOUTHERN RADIO'S WIRELESS BARGAINS.
LATEST RADIO PUBLICATIONS: *Radio Valve Manual*—Equivalent and alternative American and British types, with all data, **3/6**. *Radio Circuits*—Fully illustrated, receivers, power packs, etc., **2/-**. *Amplifiers*—Fully descriptive circuits, **2/-**. *Radio Coil and Transformer Manual*, **2/-**. *Short Wave Handbook*, **2/-**. *Manual of Direct Disc Recording*, **2/-**. *Test Gear Construction Manual*, **1/6**. *Radio Pocket Book*—Formulas, tables, colour code, etc., **1/-**. *Ten Hows for Radio Constructors*, **1/-**. *Bulgin Radio Service Manual*, **2/6**. *Radio Constructor's Manual*, **3/-**. *Radio Resistor Chart*—Colour codes at a flick, **1/-**. *Radio Reference Handbook*—Cloth bound, comprehensive and up to date, covering all branches of radio, **12/6**. *American Service Manuals*. Sparton-Emerson, Crosley-Belmont (Parts I and II), Stewart-Warner-Fada, **12/6** per volume. Postage extra on all publications.
YAXLEY type Rotary Switches, 2-way, **5/-**. Resistances, assorted values, 2 watt to ½ watt, **20/-** per 100. Permanent Crystal Detectors, **2/6** each. Aluminium Panels, 16-gauge, 18ins. x 7in., **3/6**. Cutler Harmer Rheostats, 30 ohms and 10 ohms, **4/6**. Ex-Government Morse Keys, brand new, **1/6** each (**15/-** per dozen). Ex-Government Buzzers, brand new, **1/6** each (**15/-** per dozen). Westectors, type WX6 and W112, **1/-** each (**10/-** per dozen).
LUFBRA Adjustable Hole Cutters, for use on metal, wood, plastics, etc., **5/-** each.
LATEST ex-Government purchase. Miniature Communication Receiver (M.C.R.I.). A.C./D.C., complete with power pack 'phones, aerial, etc. For use on all voltages 20 to 3,000 metres, 5 valves, brand new in original cartons, **£10 10s.**, carriage and packing, **5/6** extra. All goods advertised are postage extra.
SOUTHERN RADIO SUPPLY CO., 46, Lisle Street, London, W.C.
Gerrard 6653.

Practical Wireless
BLUEPRINT SERVICE

PRACTICAL WIRELESS — *No. of Blueprint.*

CRYSTAL SETS

Blueprints, 6d. each.
1927 Crystal Receiver .. .. — PW71*
The "Junior" Crystal Set .. — PW94*

STRAIGHT SETS. Battery Operated.

One-Valve : Blueprints, 1s. each.
All-Wave Unipen (Pentode) .. — PW31A*
Beginners' One-valver .. .. — PW85*
The "Pyramid" One-valver (HF Pen) .. .. — PW93*

Two-valve : Blueprint, 1s.
The Signet Two (D & LF) .. — PW76*

Three-valve : Blueprints, 1s. each.
Selectone Battery Three (D, 2LF (Trans)) .. .. .. — PW10
Summit Three (HF Pen, D, Pen) — PW37*
Hall-Mark Cadet (D, LF, Pen (RC)) — PW48*
F. J. Camm's Silver Souvenir (HF Pen, D (Pen), Pen) (All-Wave Three) .. .. .. — PW49*
Cameo Midget Three (D, 2 LF (Trans)) .. .. .. — PW51*
1936 Sonotone Three-Four (HF Pen, HF Pen, Westector, Pen) — PW53*
Battery All-Wave Three (D, 2 LF (RC)) .. .. .. — PW55*
The Monitor (HF Pen, D, Pen) .. — PW61*
The Tutor Three (HF Pen, D, Pen) — PW62
The Centaur Three (SG, D, P) .. — PW64*
The "Colt" All-Wave Three (D, 2 LF (RC & Trans)) .. .. — PW72*
The "Rapide" Straight 3 (D, 2 LF (RC & Trans)) .. .. — PW82*
F. J. Camm's Oracle All-Wave Three (HF, Det, Pen) .. — PW78*
1938 "Triband" All-Wave Three (HF, Pen, D, Pen) .. .. — PW84*
F. J. Camm's "Sprite" Three (HF Pen, D, Tet) .. .. — PW87*
The "Hurricane" All-Wave Three (SGD, (Pen), Pen) .. .. — PW89*
F. J. Camm's "Push-Button" Three (HF Pen, D (Pen), Tet) .. — PW92*

Four-valve : Blueprints, 1s. each.
Beta Universal Four (SG, D, LF, Cl. B) .. .. — PW17*
Nucleon Class B Four (SG, D (SG), LF, Cl. B) .. .. — PW34B*
Fury Four Super (SG, SG, D, Pen) — PW34C*
Battery Hall-Mark 4 (HF, Pen, D, Push-Pull) .. .. — PW46*
"Acme" All-Wave 4 (HF Pen, D (Pen), LF, Cl. B) .. .. — PW83*
The "Admiral" Four (HF Pen, HF Pen, D, Pen (RC)).. .. — PW90*

Mains Operated

Two-valve : Blueprints, 1s. each.
A.C. Twin (D (Pen), Pen) .. — PW18*
Selectone A.C. Radiogram Two (D, Pow).. .. .. .. — PW19*

Three-valve : Blueprints, 1s. each.
Double-Diode-Triode Three (HF Pen, DDT, Pen) .. .. — PW23*
D.C. Ace (SG, D, Pen) .. .. — PW25*
A.C. Three (SG, D, Pen) .. .. — PW29*
A.C. Leader (HF Pen, D, Pow) .. — PW35C*
D.C. Premier (HF Pen, D, Pen).. — PW35B*
Ubique (HF Pen, D (Pen), Pen) .. — PW36A*
F. J. Camm's A.C. All-Wave Silver Souvenir Three (HF Pen, D, Pen) — PW50*
"All-Wave" A.C. Three (D, 2 LF (RC)) .. .. .. — PW54*
A.C. 1936 Sonotone (HF Pen, HF Pen, Westector, Pen) .. — PW56*
Mains Record All-Wave 3 (HF Pen, D, Pen) .. .. — PW70*

Four-valve : Blueprints, 1s. each.
A.C. Fury Four (SG, SG, D, Pen) — PW20*
A.C. Fury Four Super (SG, SG, D, Pen) .. .. .. — PW34D
A.C. Hall-Mark (HF Pen, D, Push-Pull) .. .. .. — PW45*
Universal Hall-Mark (HF Pen, D, Push-Pull) .. .. .. — PW47*

SUPERHETS

Battery Sets : Blueprints, 1s. each.
£5 Superhet (three-valve) .. — PW40*
F. J. Camm's 2-valve Superhet.. — PW52*

Mains Sets : Blueprints, 1s. each.
A.C. £5 Superhet (Three-valve) .. — PW43*
D.C. £5 Superhet (Three-valve) .. — PW42*
F. J. Camm's A.C. Superhet 4 .. — PW59*
F. J. Camm's Universal £4 Superhet 4 .. .. — PW60
"Qualitone" Universal Four .. — PW73*

SHORT-WAVE SETS. Battery Operated

One-valve : Blueprint, 1s.
Simple S.W. One-valver .. — PW88*

Two-valve : Blueprints, 1s. each.
Midget Short-wave Two (D, Pen) — PW38A*
The "Fleet" Short-wave Two (D (HF Pen), Pen) .. .. — PW91*

Three-valve : Blueprints, 1s. each.
Experimenter's Short-wave Three (SG, D, Pow) .. .. .. — PW30A*
The Prefect 3 (D, 2 LF (RC and Trans)) .. .. — PW63*
The Band-spread S.W. Three (HF Pen, D (Pen), Pen) .. — PW68*

PORTABLES

Three-valve : Blueprints, 1s. each.
F. J. Camm's ELF Three-valve Portable (HF Pen, D, Pen) .. — PW65*
Parvo Flyweight Midget Portable (SG, D, Pen) .. .. .. — PW77*

Four-valve : Blueprint, 1s.
"Imp" Portable 4 (D, LF, LF (Pen)) .. .. — PW86*

MISCELLANEOUS

Blueprint, 1s.
S.W. Converter-Adapter (1 valve) — PW48A*

AMATEUR WIRELESS AND WIRELESS MAGAZINE

CRYSTAL SETS

Blueprints, 6d. each.
Four-station Crystal Set .. .. — AW427*
Lucerne Tuning Coil for A.W.427*, 6d.
1934 Crystal Set .. .. .. — AW444
150-mile Crystal Set .. .. — AW450*

STRAIGHT SETS. Battery Operated.

One-valve : Blueprint, 1s.
B.B.C. Special One-valver .. — AW387*

Two-valve : Blueprints, 1s. each.
Melody Ranger Two (D, Trans) . — AW388*
Full-volume Two (SG det, Pen).. — AW392*
A modern Two-valver .. .. — WM409*

Three-valve : Blueprints, 1s. each.
£5 5s. S.G. 3 (SG, D, Trans) .. — AW412*
Lucerne Ranger (SG, D, Trans) . — AW422*
£5 5s. Three De Luxe Version (SG, D, Trans) .. .. .. — AW435*
Transportable Three (SG, D, Pen) — WM271
Simple-Tune Three (SG, D, Pen).. — WM327*
Economy Pentode Three (SG, D, Pen) .. .. — WM337
"W.M." 1934 Standard Three (SG, D, Pen) .. .. .. — WM351*
£3 3s. Three (SG, D, Trans) .. — WM354
1935 £6 6s. Battery Three (SG, D, Pen) .. .. — WM371
PTP Three (Pen, D, Pen) .. — WM389*
Certainty Three (SG, D, Pen) .. — WM393
Minitube Three (SG, D, Trans) .. — WM396*
All-wave Winning Three (SG, D, Pen) .. .. — WM400

Four-valve : Blueprints, 1s. 6d. each.
65s. Four (SG, D, RC, Trans) .. — AW370
Self-contained Four (SG, D, LF, Cl. B) .. .. — WM331
Lucerne Straight Four (SG, D, LF, Trans) .. .. .. — WM350
£5 5s. Battery Four (HF, D, 2LF). — WM381*
The H.K. Four (SG, SG, D, Pen).. — WM384
The Auto Straight Four (HF, Pen, HF, Pen, DDT, Pen) .. .. — WM404*

Five-valve : Blueprints, 1s. 6d. each.
Super-quality Five (2 HF, D, RC, Trans) .. .. — WM320
Class B Quadradyne (2 SG, D, LF, Class B) .. .. .. — WM344
New Class B Five (2 SG, D, LF Class B) .. .. .. — WM340

Mains Operated

Two-valve : Blueprints, 1s. each.
Consoelectric Two (D, Pen) A.C. . — AW403*
Economy A.C. Two (D, Trans) A.C. — WM286

Three-valve : Blueprints, 1s. each.
Home Lover's New All-Electric Three (SG, D, Trans, A.C.) .. — AW383*
Mantovani A.C. Three (HF, Pen, D, Pen) .. .. .. — WM374*
£15 15s. 1936 A.C. Radiogram (HF, D, Pen) .. .. .. — WM401*

Four-valve : Blueprints, 1s. 6d. each.
All-Metal Four (2 SG, D, Pen) .. — WM329
Harris' Jubilee Radiogram (HF, Pen, D, LF, P) .. .. .. — WM386*

SUPERHETS

Battery Sets : Blueprints, 1s. 6d. each.
'Varsity Four .. .. .. — WM395*
The Request All-Waver .. .. — WM407

Main Sets : Blueprints, 1s. each.
Heptode Super Three A.C. .. — WM359*

PORTABLES

Four-valve : Blueprints, 1s. 6d. each.
Holiday Portable (SG, D, LF, Class B) .. .. — AW393*
Family Portable (HF, D, RC, Trans) .. .. — AW447*
Tyers Portable (SG, D, 2 Trans.) — WM367*

SHORT-WAVE SETS. Battery Operated

One-valve : Blueprints, 1s. each.
S.W. One-valver for America .. — AW429*
Roma Short-Waver .. .. — AW452*

Two-valve : Blueprints, 1s. each.
Ultra-short Battery Two (SG, det Pen) .. .. — WM402*
Home-made Coil Two (D, Pen) .. — AW440

Three-valve : Blueprints, 1s. each.
Experimenter's 5-metre Set (D, Trans, Super-regen) .. .. — AW438
The Carrier Short-waver (SG, D, P) .. .. — WM390*

Four-valve : Blueprints, 1s. 6d. each.
A.W. Short-wave World-beater (HF, Pen, D, RC, Trans) .. — AW436*
Standard Four-valver Short-waver (SG, D, LF, P) .. .. .. — WM383*

Superhet : Blueprint, 1s. 6d.
Simplified Short-wave Super .. — WM397*

Mains Operated

Two-valve : Blueprints, 1s. each.
Two-valve Mains Short-waver (D, Pen), A.C. .. .. .. — AW453*

Three-valve : Blueprints, 1s.
Emigrator (SG, D, Pen) A.C. .. — WM352*

Four-valve : Blueprints, 1s. 6d.
Standard Four-valve A.C. Short-waver (SG, D, RC, Trans) .. — WM391*

MISCELLANEOUS

S.W. 1-valve Converter (Price 6d.) — AW329
Enthusiast's Power Amplifier (10 Watts) (1/6) .. .. .. — WM387*
Listener's 5-watt A.C. Amplifier (1/6) .. .. — WM392*
Radio Unit (2v.) for WM392 (1/-) — WM398*
Harris Electrogram battery amplifier (1/-) .. .. .. — WM399*
De Luxe Concert A.C. Electrogram (1/-) .. .. .. — WM403*
New Style Short-wave Adapter (1/-) .. .. — WM388
Short-wave Adaptor (1/-) .. — AW456*
B.L.D.L.C. Short-wave Converter (1/-) .. .. — WM405*
Wilson Tone Master (1/-).. .. — WM406
The W.M. A.C. Short-wave Converter (1/-) .. .. .. — WM408*

SPECIAL NOTICE

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

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

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

HINTS COUPON

This coupon is available until June 2nd, 1947, and must accompany all Practical Hints.

PRACTICAL WIRELESS, May-June, 1947

Published on the 7th of each month by GEORGE NEWNES, LIMITED, Tower House, Southampton Street, Strand, London, W.C.2, and printed in England by W. SPEAIGHT & SONS, LTD., Exmoor Street, London, W.10. Sole Agents for Australia and New Zealand: GORDON & GOTCH (A/sia), LTD. South Africa: CENTRAL NEWS AGENCY, LTD. Subscription rates including postage: Inland 10s. 6d. per annum; Abroad 10s. per annum. Registered at the General Post Office for the Canadian Magazine Post.