The SHORT WAVE Magazine

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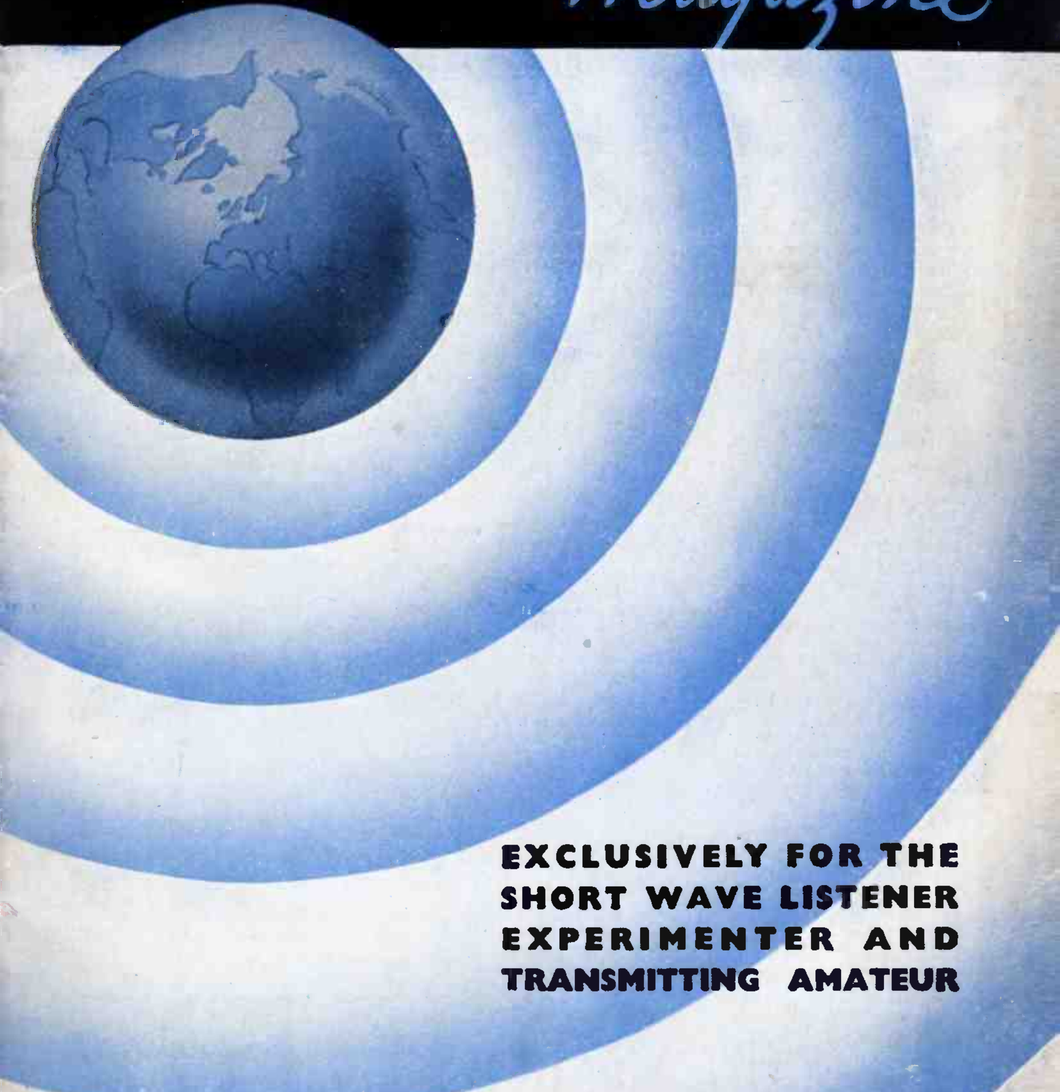

EXCLUSIVELY FOR THE SHORT WAVE LISTENER EXPERIMENTER AND TRANSMITTING AMATEUR

VOL. IV No. 2 APRIL 1946


AVO
MODEL 7
UNIVERSAL
AvoMeter
MODEL 40
UNIVERSAL
AvoMeter
THE "AVO"
TEST
BRIDGE
THE "AVO"
VALVE TESTER
THE
ALL WAVE
"AVO" OSCILLATOR

SHORT WAVE MAGAZINE

FOR THE RADIO AMATEUR AND AMATEUR RADIO

Vol. IV. APRIL 1946 No. 2

CONTENTS

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EDITORIAL

Behaviour

With the resumption of transmitting activities there are already signs of the growth of certain evils in our midst which, if not corrected, will do great harm to Amateur Radio in this country. Piracy, not confined to 7 mc, is one of the worst features of the bands to-day, followed closely by bad operating and the use of excessive power.

The latter two faults lie with the individuals concerned to correct. We shall be no party to any policing system for our bands, though this is not to say that persistent offenders should not have the error of their ways brought home to them. Bad or selfish operating is quite often due to honest ignorance and is neither as deliberate nor as malicious as it frequently appears. In a word, it is a matter of education and experience.

Piracy is in a very different category and, under the present licensing regulations, there can be no possible excuse for it on the part of G operators. Though a sign of total irresponsibility and the lack of all sense of the ordinary decencies of behaviour, it is nevertheless too often encouraged by the glamour which nowadays attaches to the gangster. By the same token, we may be sure that the pirate operator, whose existence is well known to the authorities, can never be really easy in his mind. The D/F vans may be round his way any day ; prosecution will be swift, the penalty rigorous and the publicity unpleasant.

Our bands will become more crowded than ever before, and it behoves every licensed operator to consider how—while using them to his own maximum benefit and enjoyment—he can reduce the interference caused to others. Immediate simple steps are short calls and short contacts and the avoidance, as far as may be possible, of the busy week-end periods. Another possible expedient, though it requires much good will from all concerned, is agreement with one's neighbours on operating hours. Technically, single-channel working with ECO and break-in would be a tremendous help towards preventing unnecessary interference.

It is no fable that at one time British amateur operating was held up and accepted as being the best in the world. And good operating means not only good signals and good procedure, but also good manners. We doubt whether foreigners can feel the same about it now.

Austin Forsyth G6FO.

Five Metres

G6CW/G6VA Work over 122-Mile Path —Equipment Notes—Aerials—April/May Test Periods—First Activity List

By **A. J. DEVON**

IT is a great pleasure to be able to start this month by announcing a good inter-G DX contact on 58 mc, in the north-south line. On March 16, at 1930, G6VA (Warlingham, Surrey) had two-way contact with G6CW (Wollaston, Notts), the distance being 122 miles. This is good work and good news, and bears out what last month was in the nature of a prophecy that such contacts would be made. Both stations used 25 watts, with G6CW on 'phone (RST57F) and G6VA on the key (RST339). The 'phone contact was held for 30 minutes.

G2MR (Surbiton, 114 miles) also heard G6CW, who is using an 815 as PA; his aerial array, which consists of six half-waves, stacked, is rotatable, and fed through a 600-ohm line. This aerial puts a good signal into the London area with the array looking south.

So much for the first post-war DX contact on 58 mc. There will be many more, as activity is increasing and, in the main, people are using CC transmitters with either straight or superheterodyne receivers. Those few misguided individuals who even in this year of grace are still working with super-regenerative receivers or the wretched transceiver type of equipment are coming in for a good deal of caustic criticism. As G6VA remarks, a super-regenerative receiver with a direct-coupled aerial can cause bad interference over a wide area and a considerable band of frequencies, while at the same time suffering from all the inherent defects and disadvantages of the type, as mentioned in last month's article. If people must use super-regenerative receivers, in the interests of others the very least they can do is to put an aperiodic RF stage in front of the detector to prevent radiation off the aerial.

Late Flash: On March 24, 1500-1600, G5BY (Thurlestone, South Devon) was heard by G6OH (Ascot, 156 miles) and G2MR (Surbiton, 169 miles). Details next month.

Other Contacts

G6VA works G2CY (St. Albans, 33 miles) quite consistently on 'phone at S7-8, and G6CW has had contacts with G6GO (Rugby, 40 miles). G3CQ (Havering-atte-Bower, Essex) has worked G6OH (Ascot, 40 miles), G5MA (Ashstead, 30 miles) and G4CI (New Malden, 24 miles).

G2NH (New Malden), with G2MR, have between them worked no fewer than 22 stations, mainly in the area in and around London. Six others have been heard but not yet worked. It is quite evident that there is a very useful level of activity in this area, which should in time lead to QSOs with the more distant centres of 58 mc operation.

At the foot of this article is given what we are calling our First Activity List, which has been compiled mainly from information given by G2NH, G3CQ, G6CW and G6VA. As more data become available, this list will be added to from time to time, thus maintaining a record of activity and providing all concerned with an up-to-date check on callsigns and locations. Readers are therefore asked to let us have news not only of their own stations and equipment, but also similar data on others in their neighbourhood. The only overseas station of which we have yet heard as being definitely on 58 mc is SU1RD, Alexandria; he is said to be using this band exclusively. We may have more about this next month.

Listener Reports

We have yet to see our first listener report on 58 mc, a band upon which very useful and interesting work can be done. As in the case of transmitters we shall keep a register of active receiving stations, which will be published in this column.

Test Period Result

Due to the unexpected delay in the appearance of the first post-war issue of the *Magazine*, readers would hardly have had time to know that a Test Period had been scheduled. However, G3CQ got his copy in time and duly kept the schedule, working the stations already mentioned. Incidentally, G2NH makes a useful comment, which has been duly noted for future guidance, regarding our Test Period timing. He says that since activity is mainly between 2200 and 2300 on weekdays, we should cover this in setting the Test Period. Agreed, but we are, of course, also keen to encourage activity earlier in the evening, and also during daylight hours, especially at week-ends.

April/May Test Periods

In future it is proposed that there should be two Test Periods each month, the first early on and the second about the middle of the month. So here they are: April 14-16 inclusive, nightly 2100-2300, and additional times for Sunday April 14, 1130-1300 and 1700-1830. Then for the period May 2-4 inclusive, nightly 2100-2300, Saturday, May 4, 1400-1600.

Reports on this month's Test Period should reach the office by April 19 latest, so as to be in time for writing up for the May issue of the *Magazine*.

Equipment in Use

On the transmitting side, G2NH has a four-stage rig, working from a 3·5 mc crystal to a neutralised HK24 in the final; this is modulated by a pair of 2A3's in Class A. His aerial is a 33 ft. wire, voltage fed, and since it is four half-waves on 58 mc is not too directional. He has a three-element close-spaced beam under construction. G2NH's trouble is that he is badly screened to the north. His receiver is an HRO adapted for 58 mc in rather an ingenious fashion, which dates from before the war. The mixer grid lead is removed and a new tuned circuit for 58 mc connected between grid and chassis; the beat is brought in by using the second harmonic of the 28 mc oscillator. The modified 58 mc mixer stage is preceded by an RF amplifier using an Osram Z62, which is built as a separate unit. The same general arrangement is used by G4CG, G5MA and with G2MR's FBXA.

At G2MR, the PA is also an HK24, running at 12 watts, and driven by 6V6 doublers from a 7 mc crystal. He has a vertical dipole and a horizontal rotary dipole. G2MR is one of the most active stations on the band, coming up every evening round about 2200. G4CI has 25 watts, also in an HK24, with a home-built superheterodyne receiver having its IF on 2 mc. The aerial is a close-spaced three-element array in the roof space, and is known locally as the "plumber's delight."

G5MA runs 25 watts in a 6L6-807-35T line-up, with 500 volts on the PA. G3CQ has 6L6-6L6-807 doubler, with an Ultra Skyrider for reception, and the aerial is a Zepp eight half-waves in length.

Aerials and Polarisation

Considerable discussion is taking place on the question of polarisation—that is, whether to use a vertical or a horizontal aerial. Before the war there was tacit agreement on the point in that nearly everyone went horizontal, but many operators new to the band have gone for vertical aerials.

The main advantage of a single vertical half-wave aerial is that radiation is to all intents and purposes omnidirectional; but the very serious disadvantage, as most operators agree, is that ignition noise is far worse with a vertical wire. It is, on the other hand, easy to get radiation more or less all round with a horizontal aerial by making it several half-waves long. All in all, it would seem that this is the best solution.

Polarisation is not of great importance in outside-ground-wave contacts, since, if reflection is taking place at all, the polarisation is certain to be changed along the path. But for pure ground wave work it is always desirable to have both aerials in the same plane. G2NH, who initiates the foregoing discussion, concludes by remarking that he has noticed that ground wave signals seem to be more affected by fading when the aerials are not in the same plane.

All this is very interesting, and with the notes on aerials in the March issue under this heading, should be helpful to newcomers to 58 mc. We should like some authoritative opinions on the most practical type of rotatable beam, such that good directivity can be obtained without much mechanical complication.

Since the aim of this feature is to cover every aspect of 58 mc operation, it is hoped that all workers on the band will keep in touch with us, and, above all, report their results and local activity. What, for instance, is happening on 58 mc in the North and West? Address all correspondence to A. J. Devon, c/o *Short Wave Magazine*, 49 Victoria Street, London, S.W.1.

FIRST 58 mc ACTIVITY LIST

Call	Location
G2BI	Calne, Wilts.
G2CY	St. Albans, Herts.
G2MC	Pinner, Middlesex.
G2MR	Surbiton, Surrey.
G2MV	Coulsdon, Surrey.
G2NH	New Malden, Surrey.
G2UA	Harrow, Middlesex.
G2WS	Shortlands, Kent.
G3CQ	Havering-atte-Bower, Essex.
G3FU	South Wimbledon, London.
G3NR	Chiswick, London.
G4CI	New Malden, Surrey
G4CG	Wimbledon, London.
G5BY	Thurlestone, South Devon.
G5KH	Putney, London.
G5MA	Ashtead, Surrey.
G5OJ	Ewhurst, Surrey.
G5RA	St. Johns Wood, London.
G5RD	Sunbury-on-Thames, Surrey.
G6AU	Cheam, Surrey.
G6CW	Wollaton, Notts.
G6FO	Penn, Bucks.
G6GO	Rugby.
G6NA	Guildford.
G6TI	Nottingham.
G6OH	Ascot, Surrey.
G6VA	Warlingham, Surrey.
G8JR	Highgate, London.
G8JV	West Bridgford, Notts.
G8LY	North Waltham, Hants.
G8SK	Enfield, Middlesex.
SU1RD	Alexandria, Egypt.

HF Feeder Lines

Some Observations and Experiments

ALL those interested in transmission on 58 and 28 mc will know that obtaining drive into the final stage on these frequencies is often no easy matter, even if there is plenty of RF available at the doubler or buffer tank.

Some recent tests when setting up a 50-watt PA on 58 mc gave particular point to this; to our alarm, we could only get a couple of mA grid drive into the final from an exceptionally efficient buffer running at 25 watts input on load and showing some 10-12 watts of RF output. It was then discovered that the 15 in. of twin-flex used for the link-coupling was quite warm to the touch and it was obvious that this link, with its two ends closed by the single-turn loops, was loading up on its own account.

After trying different lengths and types of link-line, it was found that best results were obtained by putting two equal lengths of single rubber-covered flex side by side and binding them loosely together such that they lay parallel; either cotton or string can be used for the binding, though in our case it was the artificial silk sleeving stripped from the original piece of flex.

The improvement obtained with this link-line as finally evolved—and it could probably be made still better by using thinly insulated wire of heavier gauge—is shown by the fact that the grid drive to the final went up to 32 mA and the buffer input down to 16 watts. : . . And it matters quite a lot *which way round* the link is connected.

58 mc Aerial Feeders

As many people are using centre-fed aerials on 5 metres with long twisted-flex feeder-lines, arising from the above notes we carried out some tests to see how it all worked out on the aerial side. An adjustable 5-metre doublet was strung up indoors, such that 18 ft. of feeder was required to couple it to the transmitter, and the aerial arranged to resonate as nearly as possible at the working frequency; "as nearly as possible" because it was found that the resonance peak was very much flatter than one had been led to expect, and at the given frequency, quite considerable alterations in the length of the two arms (up to 2 in.) had to be made before there was any noticeable change in the reading of a thermo-ammeter hung across the centre insulator, or in the glow from a couple of small neons attached to the ends of the aerial.

The expectation of finding serious deficiencies and losses when using ordinary flex as the feeder was not disappointed. Actually, with everything under control and the whole set-up visible and within easy reach, it was extremely difficult to get anything like satisfactory RF indication on the aerial, in view of the amount available at the tank of the transmitter PA stage—at least 25 watts on full load.

The flex feeder again showed signs of warming, and two of the cheaper types of commercial HF cable gave scarcely better results. Finally, the twin-flex line was unravelled, all the insulation except the actual rubber covering stripped off, and the two resulting lengths laid parallel and held loosely together, as before.

The increase in efficiency all round was remarkable; whereas previously only a glow could be obtained at the ends of the aerial, the neons now lit brilliantly, while the ammeter reading at the centre was practically double. The PA loading was decreased, and with full power, the amount of RF indicated on the aerial was much greater than anything obtained previously.

These results are by no means final —they only suggest the directions in which improvement is possible. They certainly show that hanging out a doublet and assuming a high transfer efficiency because the system "loads up well" is in most cases likely to be fallacious and misleading, and it is probable that few long feeder lines of the simpler types are delivering much RF to the aerial itself on 58 mc.

Conversely, what applies to this particular transmission problem also goes for the reception side.

PHOTOGRAPHS

We shall be glad to see, for publication, photographs of Amateur Radio equipment or stations. These can be any size, either prints or negatives, but *must* be clear and well defined ; they should also be accompanied by notes on the subject. All such photographs used will be paid for, and the original returned to the sender if so desired.

The difficulties surrounding amateur photography these days are well appreciated. In suitable cases we are therefore prepared to consider paying the fees of a locally-commissioned commercial photographer to take the picture. In such instances, readers should of course communicate with us before ordering the work and, if possible, also obtain an estimate of the cost.

The Principles of Short-Wave Reception

PART II *Constructional Information for Two Receivers—Making Coils—Simple Receiver for 58mc—Aerial Design and Coupling*

By A. A. MAWSE

LAST month, two good short-wave circuits of the "straight" type were described, so it is appropriate now to give some practical information regarding the construction of receivers designed around those circuits. Provided that a separate power pack is to be used for the mains version—and this is advised—the actual layout can be practically the same for both battery- and mains-operated receivers.

An aluminium panel measuring about 9 in. by 7 in. is suitable, and may be used with a box-type chassis measuring 9 in. long by 5 in. wide by 1½ or 2 in. deep. The chassis may be an aluminium one if suitable tools are available for working metal. Alternatively, it could well be made of plywood, provided that the upper surface is covered with metal foil. A suggested layout for both panel and chassis-top is given in Fig. 1, but there is no need to follow this slavishly. In any case, slight modification may be necessary to suit the components which are available.

Plug-in Coil Formers

It should be noticed that the octal-base six-pin coil holder is placed close to the tuning condensers (band-set and band-spread) and also to the detector valve-holder. The reasons for adopting this arrangement will be understood from the theoretical explanation given last month.

Apart from the valve-holders, coil-holder and AF transformer, all the chassis components are placed underneath the chassis. The majority will be supported by the wiring and by the valve-holder contacts. Perhaps it should be explained here that although an octal-base holder is employed for the plug-in coils, other types of holder may be used if the coil formers are of types having different arrangements of base pins. The octal type of holder is to be preferred, however, because it is now becoming standardised for coils on the 1½ in. diameter formers which will be specified.

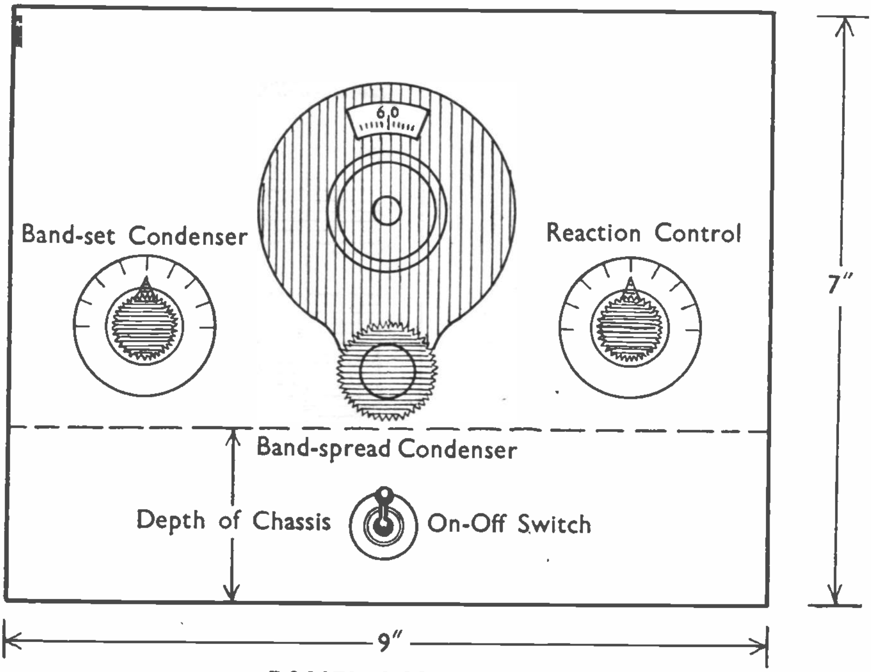
Suitable Components

In general, the choice of components is not critical. Nevertheless, it is very desirable to use midget tuning condensers of low-loss type and of reputable make. In addition to the low-loss characteristics, these condensers will have a low minimum capacity. This is important, for the tuning range of any one coil is governed by the ratio of maximum to minimum capacity of the condensers, rather than by the maximum rated capacity alone.

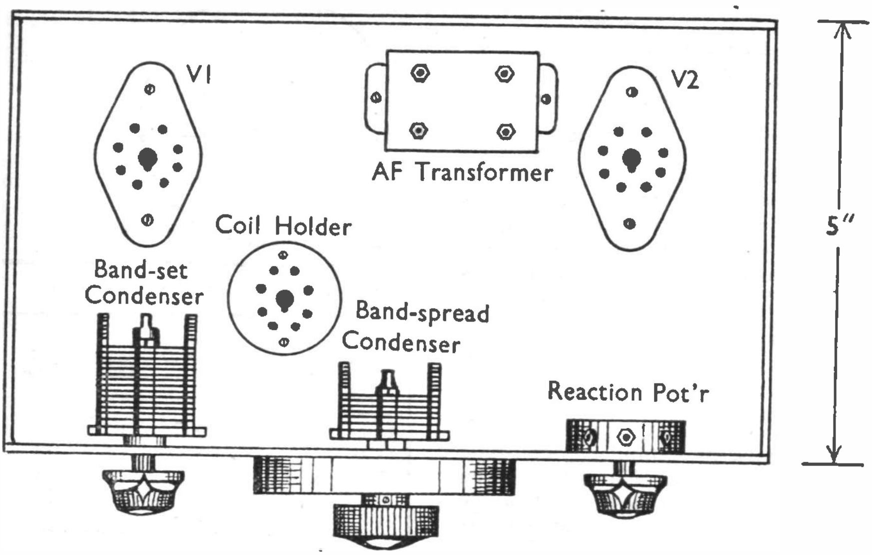
The coil- and valve-holders should also be of a low-loss type; there are plenty of good ones available—but there is also a good deal of rubbish on the market. As mentioned before, the potentiometer serving as reaction control should be a really first-class one, for an inferior component will prove "noisy" in action. One of the carbon-track type with swash-plate action is generally to be recommended.

Coil Construction

It is suggested that the plug-in coils be home-made, provided that low-loss ceramic or similar formers can be obtained. A good deal of information

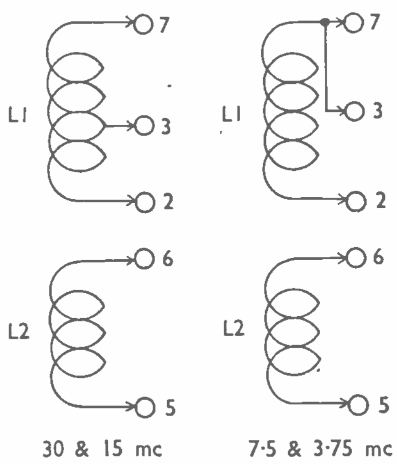


PANEL LAYOUT



BASEBOARD LAYOUT

Fig. 1. Suitable layout for aluminium panel and chasis of short wave receiver of either type described last month. *Octal-base holders are shown for both coil and valves but other types of valve-holder may be required according to the particular valves employed.*



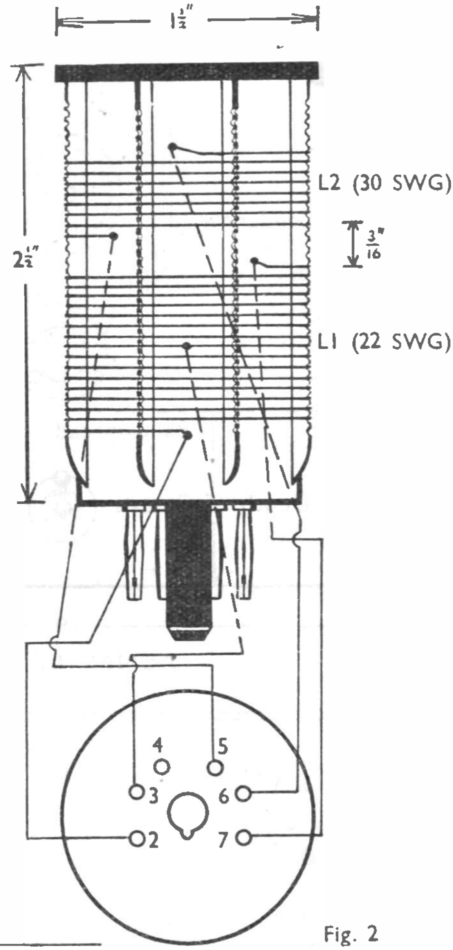


Fig. 2

CONNECTIONS	
Grid and Band-set Condenser (Fixed Vanes)	7
Band-spread Condenser (Fixed Vanes) or Cathode	3
Earth Line and Moving Vanes of Condensers	2
Detector Anode (or Aerial)	5
Reaction Condenser (or Earth or Dipole)	6

Fig. 2. Constructional details of octal-base six-pin coils suitable for short wave bands between 3 and 30 mc. *Base connections shown are as seen when looking at the coil base or under side of the holder. Note that turns of L1 on all except 3·75 mc coil are spaced to fill a length of 1½ in. on the former. For the 3·75 mc coil, L1 is close-wound, as they are for L2 on all ranges.*

in respect of the coils is given in Fig. 2, where the use of a standard octal-base former is assumed. The details given are applicable to coils for any of the circuits and reaction arrangements described last month, and the following table gives the numbers of turns and positions of tapping points for the two windings for the various frequency ranges.

DETAIL OF COILS FOR 3.75 TO 30 MC

Band (mc)	L1 (turns)	Band-spread Tap	Cathode Tap	L2 (turns)
30·0	4	2	1	5
15·0	4	3	1½	4
7·5	16	—	2	8
3·75	30	—	2	10

NOTE: Tapping points are given as number of turns from lower (earth) end of winding.

The wire required for L1 (the grid winding) is 22 SWG enamelled, while that for L2 (used for either reaction or aerial winding, according to the circuit) is 30 SWG enamelled or single-silk covered. It will be seen from the table that a band-spread tapping is not used for the two lowest-frequency coils, and it will be understood from the circuits previously given that cathode tappings are used only on coils not having the band-spread tapping. Two other points to observe are that both windings are in the same direction and that the turns of winding L1 for all except the 3·75 mc coil are spaced so that they extend over a former length of 1¼ in. This spacing is very important, because the frequency to which the coils will tune is dependent almost as much upon the spacing as upon the number of turns employed.

It is necessary to drill small holes through the coil-former between the ribs to allow the connections from the windings to go through to the pins. The ends of the connecting wires should be bared and tinned with solder; they are passed through the hollow connecting pins, pulled taut, and then soldered by applying the hot iron and a spot of solder to the tips of the pins.

Coil Connections

With regard to the pin connections, it should be mentioned that there does not yet appear to be any agreed standard, but those shown are most usual. In some cases of ready-made coils the pins are numbered differently from the numbering given in Fig. 2. The numbering shown, however, is standard for octal-base valve holders, and is considered to be the least confusing.

Should it be decided to employ ready-made coils it is important that the proper connections should be obtained from the suppliers of the coils so that the wiring of the coil-holder may be correct. It may also be found that ready-made coils have a different number of turns from those given in the above table; that will probably be because the turns are spaced differently.

The radio-frequency chokes may be bought ready-made or may be made at home. In buying chokes, however, make sure that they are suitable for use on frequencies between 3 and 30 mc; chokes described merely as "short-wave chokes" may be quite unsuitable for the wide frequency range now required.

If the chokes are to be home-constructed it is an advantage to make them as two separate units which can be connected in series. The smaller of the two will be suitable for 30 mc, while the larger one will have the necessary inductance for use on the lower frequencies. This calls for a little explanation. A choke intended for use on the lower frequencies may well have too high a self-capacity at 30 mc, with the result that it will act as a small condenser and by-pass the RF. On the other hand, a choke designed for 30 mc will generally have far too low an inductance to be effective at the lower frequencies.

RF Choke Construction

The smaller choke should consist of 60 turns of 32 SWG enamelled wire on a low-loss former about ⅜ in. in diameter. A suitable former for this purpose is the body of a three-watt ceramic type fixed resistor with a value of not less than one megohm. Solder one end of the wire to one of the connecting wires on the resistor and wind on the 60 turns, spaced with a length of sewing cotton; the cotton will separate the turns evenly. Bare the other end of the winding, solder it to the second connecting wire and remove the cotton. Although the resistor will be in parallel with the choke it will not have any appreciable effect.

For the second RF choke, a former about ½ in. in diameter will be required, and this may be a paxolin or other low-loss tube about 2 in. long. It should be fitted with small terminals and soldering tags, and a length of about 1½ in. should be filled with 32 SWG wire, arranging the turns close together and side by side.

When connecting the chokes (in series) the smaller one should be joined to the anode of the detector by a short

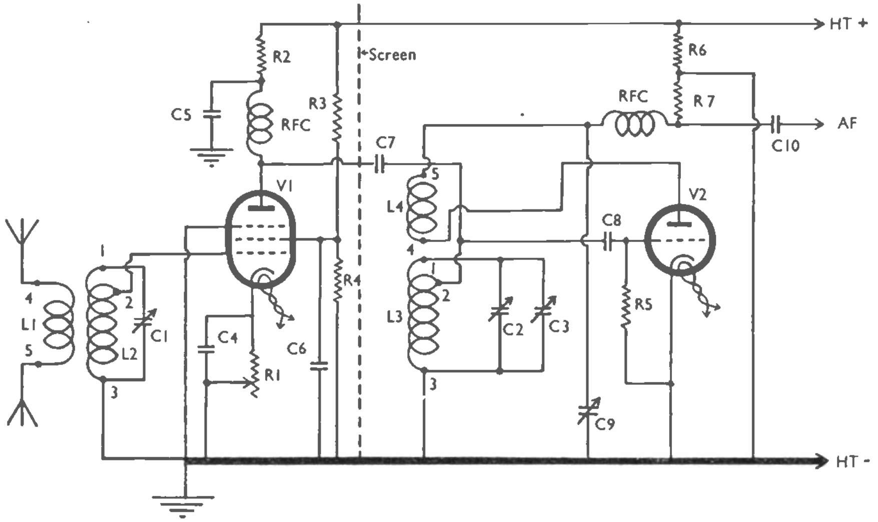


Fig. 3. A good circuit for the RF and detector stages of a simple 58 mc receiver.

Stages shown may be followed by a normal audio amplifier, if required. To prevent mains hum it may be necessary to connect a 500 μμF fixed condenser between each valve-holder heater terminal and earth. Following are appropriate component values: C1 and C2, 35 μμF; C3, 15 μμF; C4, C5 and C6, 500 μμF; C7, 15 μμF; C8, 50 μμF; C9, 100 μμF; C10, ·05 μF; R1, 10,000 ohms; R2, 1,000 ohms; R3 and R4, 25,000 ohms; R5, 5 meg.; R6 and R7, 50,000 ohms; L1, L2, L3 and L4, see text and Fig. 4; RFC, see text; V1, Osram W.42 (mains), VS24/K (battery) or similar; V2, Tungsram HL4g (mains), Osram HL 2/K (battery) or similar.

connecting wire. The length of connection to the "free" end of the second choke is unimportant, because this is at low potential in respect of RF; in common parlance, it is "cold," while the anode end of the choke is "hot."

Tuning the Receiver

The operation of either receiver so far described is quite straightforward. With the band-set condenser in any one position, turn the band-spread condenser slowly through its full range until a signal is heard. The band-set condenser can then be readjusted and searching repeated on the band-spread unit. It may be necessary to bring up reaction until the detector is just oscillating; that condition can be recognised by a faint "breathing" or "hissing" sound. When the detector is oscillating a signal will appear as a "chirp." For telephony, reaction should then be eased back until the receiver is just out of oscillation; to keep the set in tune while turning back reaction it may be necessary to make a slight readjustment to the band-spread condenser.

If you are new to short waves and fail to receive anything at the first attempt, do not lose hope; a fair amount of practice is necessary to operate any short-wave receiver. Once the knack of tuning and adjusting has been acquired, it will be found that the set can be operated very easily.

A Circuit for 58 mc

Turning now to a "straight" type of receiver for use on the 58 mc band, a suitable arrangement is shown in Fig. 3. As will be seen, the circuit is somewhat different from those suggested for use on the lower-frequency bands. The chief difference concerns the inclusion of a radio-frequency stage prior to the detector. This stage is not intended to provide very much amplification—nor can it be expected to do so—but to act as a buffer between the aerial system and the detector. By isolating the detector in this manner, it is possible to ensure smoother reaction control and, in consequence, to simplify the operation of the receiver.

Only two stages are shown, but an audio-frequency amplifier of the type previously shown for the 3 to 30 mc receiver can of course be added. The RF stage includes a variable-mu pentode, the variable bias control of which provides a good control of volume, and also a safeguard against overloading of the detector when receiving very strong signals.

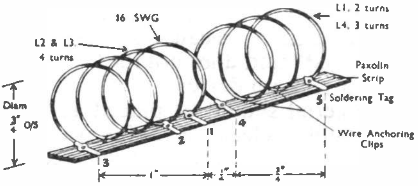


Fig. 4. Coil details for 58 mc receiver of type shown in Fig. 3.

The wire used should be not less than 16 *SWG to ensure rigidity if the coils are to be self-supporting as shown. If thinner wire is employed it should be wound on a low-loss former. The numbered connections shown agree with those given in Fig.* 3. *Two of these assemblies will be required.*

Details of the two coils employed are given in Fig. 4. The two are similar in respect of the tuned windings, but the aerial coupling winding (L1) is somewhat smaller than the reaction winding (L4). It will be seen that the grid connections are made to tappings on the tuned windings, rather to the ends of the windings. This is to reduce the damping effect of the valve on the oscillatory circuit.

It will probably have been noticed that the reaction circuit which is shown for V2 is different from any of those described last month. The method employed is known as throttle control. Coupling between L3 and L4 is sufficiently tight to produce oscillation, but the reaction condenser C9 can be used to by-pass a certain amount of the RF appearing in the detector anode circuit. Thus, as the capacity is increased the tendency of the valve toward oscillation is reduced.

Receiver Layout

In making a receiver using this circuit, the same general form of construction may be followed as for the other sets described, and the mains power unit referred to last week may be used. The panel should be about 12 in. long, while the chassis should be about 8 in. wide and 2 in. deep. It is necessary to place a screen between the RF and detector portions of the set, as indicated by a broken line. It is also best to mount the aerial coil (L1, L2) below the chassis, and to place the detector coil (L3, L4) adjacent to the band-set and band-spread condensers (C2 and C3). To ensure short leads to this coil the detector valve-holder should be mounted on pillars or fixed in a vertical position on a bracket attached to the chassis.

The tuning of C1 will be found to be relatively flat. In consequence, tuning will first be carried out by means of the band-spread condenser C3; C1 will then be adjusted until the best volume level is obtained.

It should be mentioned that the two RF chokes can be made in the same manner as the smaller choke described above, by using a ceramic or composition type of fixed resistor as the former.

The circuit given is for a mains-operated receiver, fed from a power pack of the type shown in Fig. 5 of last month's article. But a similar circuit could be used for battery operation by employing battery-type valves and a normal variable-mu circuit with 9-volt grid bias battery.

Short-wave Aerials

It is well worth while in all short-wave work to take advantage of the fact that special types of aerial system can be employed, and to take some care with regard to the method of coupling the aerial to the receiver input circuit. Perhaps the simplest and generally most effective is a dipole or doublet arrangement, but three suitable types of aerial are shown in Fig. 5; two of these are centre-fed dipoles or doublets.

In the case of a dipole the total

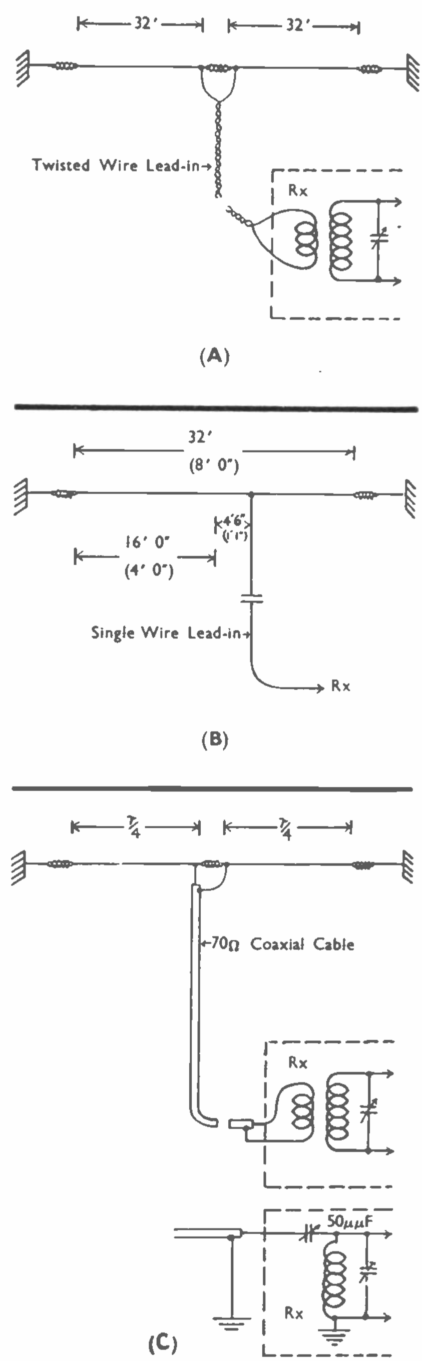


Fig. 5. Three aerial arrangements suitable for short wave reception.

At (A) is shown a simple dipole or doublet with twisted-wire lead-in; alternatively, two single wires fitted to transposer blocks can be used. The aerial at (B) needs only a single-wire lead-in, but is not quite as satisfactory as the other two aerials. Dimensions given apply to 15 and 58 mc respectively. The aerial shown at (C) employs a co-axial lead-in which may be connected to the aerial coil by either of the methods illustrated.

length of the horizontal portion is one half-wavelength, but in practice a compromise has to be made when a range of frequencies is to be covered. While a twin feeder or lead-in is shown in Fig. 5 for the aerials marked (A) and (C), a single wire is used with the aerial system marked (B). It is generally better to use a twin-wire or co-axial lead-in, because this is "self-neutralised" and does not itself tend to act as a pick-up device.

The aerial should be placed as high as possible, clear of buildings and trees and away from the field created by electric house wiring and motor-car ignition systems; the latter produce particularly heavy interference on frequencies above 30 mc.

The aerial shown at (A) is about one half-wave length at 7·5 mc and is suitable for frequencies between 15 and 3·75 mc. It will also serve moderately well at 30 mc, but for that purpose it is better to have a separate doublet with an overall length of 16 ft. Special twin lead-in cable is recommended; failing that, twisted vulcanised rubber wire may be employed. Another method is to use bare wire in conjunction with transposer blocks, which should be spaced at about 18 in. intervals.

The aerial shown at (B) is suitable in country districts where interference is generally less troublesome. Dimensions are given for aerials suitable for both 15 and 58 mc. It should be especially noticed that the lead-in is taken from a point some distance away from the centre of the horizontal wire.

Using a Co-axial Lead-in

When co-axial cable can be obtained, an aerial of the type shown at (C) is very satisfactory, especially for the 58 mc band. On that band, each half of the aerial would be approximately 4ft.

long. The most suitable arrangement in this case is to employ two copper rods, mounting these end-to-end on a board or batten by means of stand-off insulators. The aerial assembly might then be mounted vertically against a chimney stack, or on the side of a wooden mast.

It is worthy of mention that any of the aerials may be mounted vertically should that prove more convenient; the horizontal arrangement is usually rather better for 3 to 30 mc, however, because it permits of a higher average height of aerial.

Dipole aerials should generally feed into a separate winding on the aerial coil, as indicated at (A) and (C), but the alternative method of connection shown inset at (C) is quite satisfactory with the co-axial or twin-wire feeder. The series variable or pre-set condenser is adjusted for optimum reception about the centre of the frequency band to be covered, and does not normally require any further adjustment.

Next month's article in this series will deal with superheterodynes for short wave working.

G9BF Calling

or, If the Cap Fits, Wear It

FIRED up rig on 14 megs, with about 150 watts to T20. Freq seemed to be around 14,420 kc—OK to dodge QRM. Decided to use call KZ7LX ; this should bring the boys back. Made long, fast CQ (all good ops send fast) and listened at LF end of band. ND—try again ; longer, faster call this time. This raised local G using phoney callsign—take no notice of him. Third try hooked a F8 with very rusty T3 AC note. Gave him "ur sigs RST579 vy fb hr QRA nr Balkans." Back he comes with "ur sigs RST589x pse pse QSLL QSLL QRAR." Don't know this QRAR, so give him "Sure QSL ob tnx QRU" and wonder how he got me T9x as only smoothing condenser in power pack blew weeks ago.

Decide to try 'phone, as rig obviously getting out well. Slow ticking noise from modulator not alarming, but fierce hum from power pack. But mike alive and all meters kick hard downwards when mike shaken. Understand this shows plenty modulation. Make few preliminary passes at mike, whistles, "calling and testing," etc., in style of all well-known G 'phones, and then settle down to calling "Hullo-CQ-ten-metre-twenty-metre-phone-hi-hi-come-in-somebody-please-kay-somebody-please." Repeat this many times.

No replies on Rx, but neighbour comes round complaining of BCL QRM. Tell him am fully licensed amateur radio transmitter, and am carrying out very important experiments. He says he wants to QRX " Itma " and not noise like elephant crushing eggshells. Before have time to make suitable retort, loud bang from Tx room and find power pack blazing.

Neighbour says he will now go back to "Itma" and don't let it happen again. More of my DX experiences next month.*

* (*Not if it can be avoided.—Ed.*)

★ ★ ★

PUBLICATION DATE

The publication date for the *Short Wave Magazine* is, as it always used to be, the first Wednesday in the month. We failed to meet this date in March mainly because it was the first post-war issue and there was an enormous amount of work involved in getting under way again. We may also be a little late on this issue, but by May we hope that the gap will be closed and that we shall appear on the duly announced day. Distribution of the *Magazine* to direct subscribers takes place on the day of publication.

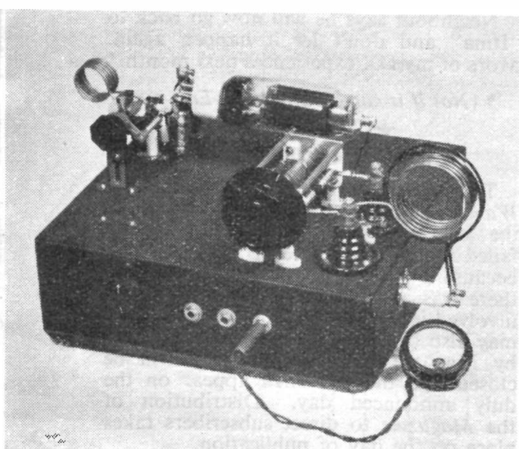
A 28 mc Power Amplifier

The PT15 Pentode as an RF Amplifier —No Neutralisation—60 watts RF Output for 1 watt Drive

By **AUSTIN FORSYTH (G6FO)** *Editor*

IN considering a PA to follow the CO-FD arrangement described last month, it was decided to try the PT15, a valve in the RF pentode family, of which the RK20 is the American equivalent. The 28 mc PA described and illustrated here is the outcome of some experimental work to establish what application the PT15 has in the Amateur Radio field.

The conclusion reached as a result of these tests, so far as 28 mc is concerned, is that the PT15 is easy to handle, easy to drive, free of vices, does not require neutralisation at 28 mc, and is capable of giving high RF output for low driving power. It is robust mechanically, has a British 5-pin ceramic base, 6·3-volt 1·3-amp. directly heated filament, and top anode.



In a word, the PT15 is an attractive proposition from all points of view, though it must be emphasised that as yet the valve has not been fully tested on 58 mc, nor has it been tried for telephony. But its characteristics and behaviour as a Class-C RF amplifier under CW conditions on 28 mc suggest that it will be entirely satisfactory in all amateur services for which an RF pentode of this type is applicable.

The intention of this article is to describe one way of using the PT15 as a PA, driven from any source which will give 5-6 mA into its grid. As to the circuit and form of construction given here, it is to be emphasised that the design is merely a suggestion for one way of making the valve work very well. Any experienced transmitter will be able to adapt it to meet his own ideas regarding construction and layout.

The Circuit

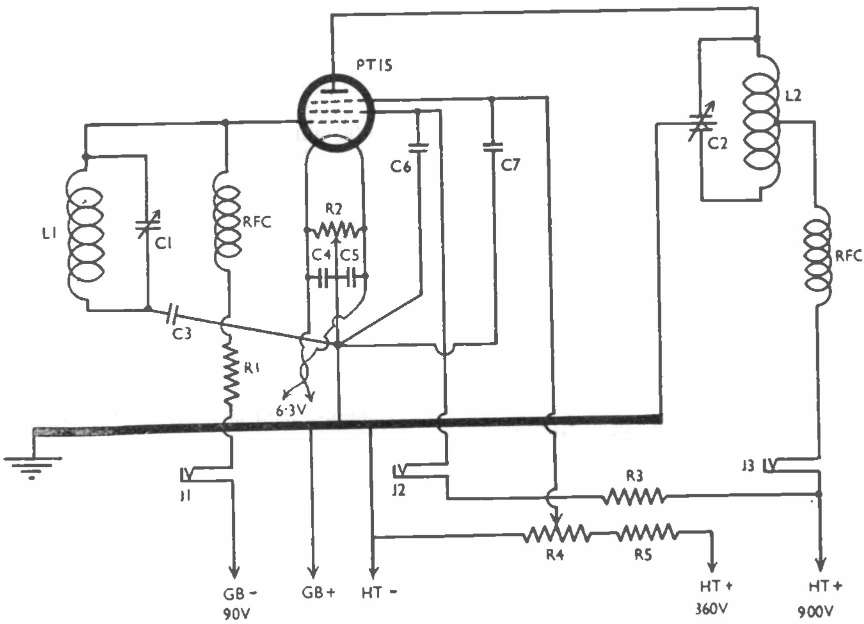
This is conventional PA design for RF pentodes and calls for comment on a few points only. C2 is a split-stator tuning condenser, with the rotor earthed; power can be taken from either end of L2 or, as in the photograph, from the middle, which is "cold." The screen grid is fed *via* the series resistor R3, while the centre-tapped filament and by-pass condensers C4 and C5 are essential at this frequency.

In regard to the suppressor HT supply, the PT15 gives a noticeably increased RF output with + 40 volts on the suppressor grid. Since this is a very small voltage to take off the main

HT, and it is in any case most undesirable to allow the possibility of any stray external coupling between suppressor grid and plate, the suppressor HT should be separately supplied. In the model it was convenient to do this from a source which happens to give 360 volts. As the suppressor voltage should be set at + 40 volts, the potentiometer-resistor combination R4, R5, was provided for the purpose. It return leads. The values have been arrived at as the result of much careful experiment to find the best operating conditions at 28 mc, and should, therefore, not be changed.

Layout and Construction

The layout is most important, since the valve is extremely sensitive to stray coupling effects and, in fact, the makers suggest not only that neutral-



Circuit arrangement for the PT15 as a PA.

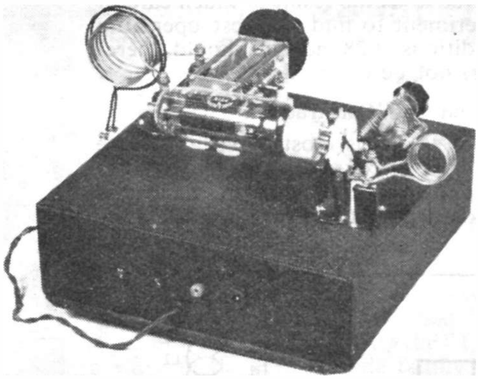
Note that as far as possible all earth returns should be taken to one point ; this helps to eliminate the need to neutralise and prevents "squegging." Values are given in the table.

is then only a matter of setting R4 to give 40 volts on the suppressor, using a high-grade voltmeter to make the adjustment.

There is, of course, no necessity to go to the trouble at all if a slight decrease in efficiency can be accepted. Under these conditions, the suppressor grid should be strapped direct to the earth point.

The circuit diagram has been drawn to emphasise the importance of a common earthing point for all the isation may be necessary at 28 mc, but also specify a screen between the grid and plate elements of the circuit. However, with the layout shown here, these measures were not required, though it should be stated that three different layouts were tried at the grid end of the valve before complete stability was achieved and all grid-anode coupling eliminated.

The photographs show all the necessary details quite clearly, but particular attention must be drawn to two points,



A view of the amplifier showing the construction at the grid end of the PT15. *Note the grid coil mounting: fixed condenser C3 is to the right and one side of C6 goes directly to the screen terminal of the valveholder.*

The by-pass condensers C3 and C6 should be mounted on the grid coil support and valveholder respectively, and if the valve is to be operated in the horizontal position as shown the filament should be in the vertical plane.

The grid coil has valve pins sweated directly to the ends of L1, and is plugged into valve-sockets bolted to the pillar stand-off insulators which carry the mounting brackets for the valve-holder. Condenser C1 is placed so that the connection from its fixed vanes to the grid is as short as possible; the grid RF choke is supported by its own wiring, above the chassis, and is soldered directly to the grid terminal of the valveholder.

The construction and mounting of the tank tuned circuit C2/L2 is self-explanatory from the photographs, and in regard to the sub-chassis wiring the only RF element is the plate RF choke, all the other wiring being at low RF potential with respect to earth. It is not actually necessary to mount C2 on stand-offs, but it was done to shorten the connections to L2 and to bring the whole tank assembly level with the anode of the valve. The jacks J1, J2, J3, are of the close-circuit type and, reading from left to right in the photograph, are grid, screen and plate respectively; the knob to the left is for the control of R4.

The chassis used for the construction happens to be 12 in. square by 3½ in. deep, but a smaller one, 9 in. by 12 in. by 2 in. deep would do just as well unless some different form of input and output coupling is used, necessitating adjustable link connections.

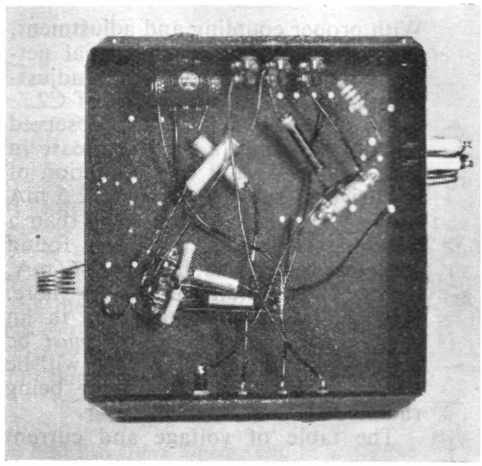
Operation

This PA requires a source of RF which will give but 6 mA into its grid (J1) against −90 volts bias and the 20,000-ohm grid resistor R1. The model is being driven from the CO-FD unit, using KT8's, which was described last month. The coupling between L1 and the output side of the FD is obtained inductively merely by placing the PA in such a position that L1 is 2 in. from the driver tank. This will give no less than 15 mA of drive into the PT15 with about 25 watts input to the second KT8 in the FD. But the makers specify 10 mA as the maximum allowable grid current, and in practice ample output is obtained with from 4-6 mA. There is no point whatever in over driving, since the valve will give its 60 watts of RF output quite comfortably with 5 mA in the grid. L1 can, of course, be link coupled to the drive source, in the usual way, if this method of coupling is more convenient.

To set up the PA at the drive frequency, switch LT to the valve and tune C1 to obtain, say, 6 mA at J1. Listen to the signal in the monitor and swing C2 until a faint "flick" is heard as C2/L2 goes through resonance. The point at which the "flick" occurs is the approximate setting for C2 for resonance tune. It is worth finding it before switching HT to the PT15 as it prevents the needle hitting the stop when the meter is plugged to J3 and HT applied with C2/L2 off tune. There should be *no change*, however slight, in grid current during this operation. If there is a dip on the grid meter needle, it is a sure sign that the valve is going to require neutralisation.

If HT is applied without drive, there will be a standing plate current of about 50-60 mA, depending upon how much the actual HT voltage varies above or below 950 volts. On drive being applied and C2 brought to resonance, this figure will drop to about 20 mA or less, provided C2/L2 is not too "lossy."

The PA is now running in the unloaded condition under full drive. On presenting the load, the PA plate current will rise as the loading is increased. It will be necessary to re-adjust slightly on C2 as full plate input is reached—about 80 to 90 mA at 900 to 1,000 volts—but if this retouching becomes more than a matter of about two degrees on the knob then the coupling to L2 is too tight and the load is reacting on the tune of C2/L2.



Underneath the PA chassis. *Note how the return leads that matter are bunched to one point for soldering. R1, R2 and R5 are supported in the wiring ; R3 is represented by the mounted resistor which has an additional 10,000 ohms in series to make up the full value required.*

VOLTAGE AND CURRENT READINGS

Actual HT Voltage	Plate mA	Screen mA	Sup. mA	Grid mA Drive	Grid Bias Actual	Load	DC Input watts	RF Output watts
960	22	22	10	6	– 210	off	21*	—
930	90	24	10	5	– 190	on	84	60

* Dissipated at anode under no-load conditions.
Grid bias actual includes — 90 v. fixed bias.
Suppressor grid voltage set at + 40 by potentiometer R4.
Standing plate current 55 mA.

Table of Values

L1 = 5 turns No. 12 SWG bare copper, 1½ in. diam., spaced to 1 in. centres.

L2 = 6 turns self-supporting, No. 12 SWG bare copper, 2½ in. diam., turns spaced to 1½ in. length, centre-tapped.

RFC = RF chokes of good make, as specified for 28 mc.

C1 = 25 $\mu\mu$F variable.

C2 = Split-stator, 25 $\mu\mu$F per section.

C3, C4, C5, C7 = ·005 μF mica.

C6 = ·005 μF mica, 1,000 volt DC working.

R1 = 20,000 ohm, 2 watt.

R2 = 200 ohm, filament centre-tapping type ("humdinger").

R3 = 30,000 ohm, 20 watt.

R4 = 10,000 ohm, 5 watt, potentiometer type.

R5 = 20,000 ohm, 5 watt.

With proper coupling and adjustment, and careful tuning of the aerial network, there should be very little adjustment necessary on the setting of C2.

On full load it should be observed that there is only a slight decrease in grid drive mA, and that reduction of the drive still further—say, to 2·5 mA—will not reduce output more than a fraction. However, it will be found that the valve runs best at 5-6 mA, under the conditions given here. Keying should, of course, be in an early stage, and RF cut-off *must* be complete, otherwise the PT15 will be triggered, leading to a spacer being radiated.

The table of voltage and current readings accompanying this article were obtained from the model under the conditions and with the form of construction exactly as described and illustrated here. As to results, some very good DX has been worked on 28 mc, but since DX depends upon conditions, aerial design, operating ability and the opportunity of being on the air at the right time for DX, it is not proposed to detail DX contacts as an indication of the effectiveness of this PA. Obviously, with 60 watts of RF available, it should be possible, other things being equal, to work anything that is going on 28 mc.

The application of this valve to 58 mc will be discussed next month.

MORE ABOUT LICENCES

Qualifications for Exemptions

It is now possible to amplify somewhat the summary on licensing conditions which appeared on page 8 of our March issue. The Service trades carrying exemption from the technical examination and/or the Morse test have been published. Broadly speaking, personnel of all three Services who were in the communications maintenance-operating and instructor trades are regarded as fully qualified to hold a licence.

This needs qualifying in that those concerned with maintenance *only* are excused the technical examination but must take the Morse test, while those who were in communications *operating* trades are not required to pass the Morse test but must sit the technical examination.

Radar Exemptions

Personnel employed on radar duties and holding a radar trade classification are in all cases exempted from the technical examination but are required to pass the Morse test.

In other words, the whole list of exemptions is on an entirely rational basis, and anyone can decide for himself or herself which examination must be taken, or whether exemption can be claimed from both. If you were in a communications maintenance or radar operating trade for which no Service Morse qualification was necessary, you are excused the technical examination but have to pass the G.P.O. Morse test to get your licence. If you were in one of those categories—such as Ldng. Radio Mech. W/T, or a Foreman of Signals, or a Wireless Operator (Air)—which required both technical *and* Morse qualifications in order to earn the badge, you do not have to take either examination.

A leaflet will shortly be available from the Engineer-in-Chief (W5/5), G.P.O. London, E.C.1., setting out the particulars of *all* exemptions, including civilian professional qualifications.

Applying for a Licence

When applying to the GPO for a licence, state your trade classification and claim exemption as indicated above. If you were an officer, support your application with a letter from your last C.O. stating what Service qualification you held ; or, alternatively, quote your place in the appropriate Service list. Other ranks should submit any official document, such as their Discharge Certificate, which proves their trade classification.

The Morse Test

The test is given at a speed of 12 words per minute, sending and receiving, for a period of three minutes in plain language, and 1½ minutes of 5-figure groups. Four mistakes, transmission and reception, are allowed in the plain language test, and two in the figure-group test. A failure can be followed by another try a month later.

The Top Band Again

1,800-2,000 kc Reopened—Some Notes on 1·8 mc Working

By **THE EDITOR**

IT was in December, 1937, that the *Short Wave Magazine* drew editorial attention to the neglected 1·7 mc band—as it then was—and suggested not only its greater use but, in reviewing the DX results to that date, also hinted at the possibility of organising a new series of Trans-Atlantic Tests.

It is worth taking a little space to discuss pre-war doings on 1·7 mc because, like all our bands, it also has a history which is worth preserving. Some of the very early work on 180 metres has already been touched upon in "Looking Back," in the March issue. When the downward rush to the shorter and more DX-worthy wavelengths started, "180" was virtually abandoned by all but a faithful little company of adherents who found it ideal for inter-G working. One knew on what particular day of the week old so-and-so would be on, and exactly where he would come up on the dial. Schedules, in some cases kept regularly several times a week for years, were maintained by several well-known stations, and altogether 1·7 mc was an extremely pleasant and friendly band on which to operate.

It was also very effective, in that with the 10 watts allowed, one could work comfortably to a radius of 50 miles in daylight and over the whole country on CW after dark. Probably, in all these activities, not more than 30 stations at most were involved.

Return of DX

In the winter season of 1931-32 it was noticed by many, in common with the writer, that those European amateurs who did appear on 1·7 mc could be worked just as easily on that band as on, say, 7 mc—and with a great deal less QRM. The outstanding example was the famous OK3SK who, using only 3 watts, worked on one particular evening all the G stations that happened to be on—and repeated the performance night after night. Moreover, there was no question that he had but three watts, and in any case all the G's were on genuine QRP.

This success encouraged a small group of keen 1·7 mc operators to set about organising some Trans-Atlantic Tests. At that time, the very idea of this was so ludicrous that it was kept a close secret from all but the chosen few. The Test was duly staged in December, 1932, in co-operation with several American stations, the G's of course being tied down to 10 watts input. So far as any of our signals getting over to the States was concerned, the Test was a failure, but we did hear quite consistently two or three W's, of whom W1DBM will always be remembered. He came over every morning at anything from S5 to S7, being readable right up to 0800 GMT, or daylight on this side. We found afterwards that this was scarcely to be wondered at, as he was using 460 watts input, into a directional aerial 560 ft. long, and his QRA was on the tip of Cape Cod, about as near this country as he could reasonably get !

Discovery—And Success

However, another and more important fact which emerged—and it should be explained here that the December schedule had run from midnight till breakfast-time daily—was that the peak period for the arrival of 1·7 mc Trans-Atlantic signals in this country was 0530-0730 GMT, while it also became evident for other reasons that the season was not sufficiently far advanced for two-way working with low power.

Accordingly, a further Test on the same lines was organised two months later, in February 1933, the same group of stations taking part. The writer had the good fortune to be first across, working W1DBM one very chilly morning for over an hour between 0600 and 0715 GMT, with solid copies both ways. This was with 9 watts input from 230-volt DC mains to a pair of P650's in push-pull, the radiating system being a simple type of aerial-counterpoise arrangement with 66-ft. arms, such as could be erected almost anywhere. GW5WU was also heard by another W on this occasion, his equipment being almost identical with that described for G6FO.

The following year, several other low-power G stations repeated the feat, and by 1935 about six British stations—among them GW5WU, G2II, G6YQ and G2PL—had been across the Atlantic on 1·7 mc.

However, for the next four or five years 1·7 mc occupancy remained at a very low level, with a temporary burst of activity for just a few days each summer and winter when the Radio Society of Great Britain announced National Field Day and the 1·7 mc Contest. But in the main these events were supported not so much by newcomers to the band as by the regular workers, who naturally came to regard the contests as something in the nature of full meetings of the lodge, and enjoyed themselves accordingly.

First Magazine 1·7 mc Test

The possibility, and even the reasonable probability, of further DX on 1·7 mc had always remained as a matter of great interest to the writer. In February 1938, the *Magazine* arranged a short series of Tests, with certain American collaborators, for the period February 19-27. About fifteen G and W stations kept a ten-minute calling-listening schedule from 0500-0700 GMT daily. But conditions were hopeless, and had it not been for one fact, we might almost have given up trying again.

This, as before, was the consistent appearance, morning after morning during the Test, of one W signal—this time W1BB of Winthrop, Mass., who was heard by everyone taking part on this side. How we called him, and how he called us ! But all to no purpose. True, W1BB was using 500 watts and a large radiating system, but the point was that his signal came through steadily and regularly.

The fact that it was possible to hear a W at all was sufficient incentive to keep on trying, though many well-intentioned friends gave it as their opinion that we were not only wasting our own time but also investing 1·7 mc with merits which it could not possibly possess, thereby continuing to delude those few readers who might still be prepared to believe our words.

DX in 1939

But the tide turned at last, as it always does. In the *Magazine* for February, 1939, we were able to report some really remarkable DX on 1·7 mc, with G's working W's and VE's as freely as they usually could on 3·5 mc, which was recognised at the time as the medium-DX band. All this took place in the early mornings, 0500-0830 GMT, of January 8, 15 and 22, 1939. It justified a long-cherished belief in the DX potentialities of 1·7 mc, and augured well for the success of the *Magazine* 1939 1·7 mc Tests, which had been scheduled for February 4-16, between 0430-0730 every other day. Interest and enthusiasm were at a high pitch on both sides of the Atlantic, and it only remained for Old Man Conditions to play his part for the Tests to be a real success.

In truth, we were more than a little worried as to whether conditions would hold for so long as a month on that band. In the event, the February Tests went off even better than we had dared hope, and gave us a great story for the April issue of the *Magazine*. It would be wearisome to new readers here to recapitulate all that happened and to recount the many first contacts that were made across the water on 1·7 mc.

Suffice it to say that some 50 stations kept the very exacting schedule involved, and G, GI, GW, HB, F, FA, SM, OZ, W1-4 and W8 were represented among the participants. The outstanding signal on this side was, as expected, our old friend W1BB, who bumped in morning after morning and had ten G contacts. Several stations with very simple equipment—notably G3JU, G5RI and G6GM—did extremely well, and for many other G's it was a case of completing the five-band QSO with the States. Some of our listener-reports included W 'phones, E. P. Willis of Dolton, N. Devon, identifying no less than six.

The Americans were enthusiastic at the results obtained, and a particular development was the practical interest in 1·7 mc shown by a number of Europeans. this band never having been much used on the Continent before.

Of course, we had it planned to try and repeat the whole performance in 1940, but by January of that year 1·7 mc DX had been forgotten again and we on this side were concerned with sterner problems.

Present and Future

So here we are back on the old band, though with no prospects of real DX working yet as the W's and VE's have not had 1·7 mc reopened to them and, by all accounts, may never get it back again. If sufficient publicity is given to the merits of what we shall in future call the 1·8 mc band, we should at any rate see plenty of G activity and later there will probably be a few regular Europeans anxious to work us.

The 1,800-2,000 kc area is noisy at night and at the HF end there are the ground stations of the Loran high-power pulse navigation system, which are capable of causing almost world-wide interference—or perhaps we ought to say giving world-wide reception, though the coverage for actual navigation is much more restricted and determined by the location of the stations.

Nevertheless, there is plenty of room in that 200 kc for regular operation and, as already mentioned, the band is quite ideal for daylight working, schedule keeping in connection with 58 mc tests, and as a general club wave. We *must*, however, keep to the power limitation and we must also avoid interfering with Loran reception by ships and aircraft, and with the trawler coast stations. All this is quite easily done by keeping away from the regularly used frequencies, which can be determined by a little listening round between 1,800-2,000 kc before operation commences. Another factor is BCL interference, which has often deterred operators in residential areas from using 1·7 mc. But the fact is that ten watts, even if modulated, is unlikely to cause as much trouble to neighbouring BC receivers as 100 watts on 28 mc. Provided the normal precautions, such as RF chokes in the supply leads and a loose-coupled aerial system, are taken there should be no bother. If there is a complaint from a very near neighbour, deal with it sympathetically and give the receiver a wave-trap tuned to your frequency.

Equipment

As we are limited to 10 watts, there are no particular difficulties about equipment—a "one-lunger" consisting of a twin-triode in CO-PA, or a KT8 in ECO, will do admirably for CW, and for 'phone a two-stage modulator will usually give sufficient power for modulation.

It is probable, in fact, that most operators will be using ECO-type transmitters, since before the war crystals were usually chosen for frequencies near the LF end of 1·7 mc in order to be able to double up into the higher frequency bands. Just at the moment, we have no positive information as to the immediate supply position in regard to 1·8 mc crystals, but they will no doubt become available.

Aerials

While it is true that a 264-ft. aerial is desirable for 1·8 mc, much can be done with a Marconi, an aerial-counterpoise system, or by loading up the 28 mc wire if it is a reasonable length—say, five half-wave. In general, one needs to have about 80 ft. of wire out in order to approach reasonable radiating efficiency on 1·8 mc.

Plans for 1·8 mc

In early issues, we shall be publishing constructional information covering equipment for 1·8 mc operation and, as previously, we shall take particular interest in encouraging 1·8 mc activity. We have it in mind to organise a Test a little later on, and in the meantime would like to see some 1·8 mc Calls Heard lists.

Puzzle Picture. *What is it? Answer on p.* 109.

LEARNING MORSE—AN OFFER

Readers in the London Area who would like Morse instruction will be interested to know of a generous offer which is being made by W. H. C. Jennings, A.M.I.R.E. He is prepared to give instruction and practice on Thursdays and Fridays, 7.30-9.30 p.m., at the Grafton L.C.C. School (top floor), Eburne Road, Holloway, London, N.7. Equipment is provided and there is nothing to pay!

Anyone wishing to take advantage of such an unusual opportunity is asked to communicate in the first instance with Mr. Jennings at his private address—82 Craven Park Road, London, N.15. (Tel.: Stamford Hill 3891.)

The Cathode-Ray Tube

PART II

Deflection Voltages—Impedance and Stage Gain Measurements

IN considering the various images produced on the screen of a cathode-ray tube by the application of given voltages to the deflector plates, it should be continuously borne in mind that the displacement of the beam is in fact the displacement of a single spot, and that no matter how complex the resultant image may be, it is being traced by the rapid movement of a single spot of fluorescence. The fact that the image produced may consist of a continuous line or a series of lines is due to the persistency of vision created by the eye failing to respond to individual changes occurring beyond a certain rate.

In order to observe in more detail the manner in which a complex image may be built up, it will be worth while to examine still further the movement of the fluorescent spot caused by the application of DC voltages to the deflector plates.

Spot Control with DC

Assuming that a DC voltage source is connected across each pair of deflector plates in such a manner that the top plate of the vertical pair is positive with respect to the bottom plate, and the right hand plate of the horizontal pair is positive with respect to the left-hand plate, and commencing with zero voltage on both pairs of plates, the spot would be in the exact centre of the screen. Now, by increasing the voltage across the vertical plates in steps of say 10 volts, the spot will take a new position at each change, moving towards the top plate. Similarly, by reducing this voltage to zero, and applying a series of voltage changes to the horizontal plates the spot will move correspondingly towards the right-hand plate.

If now the experiment is repeated with both the vertical and horizontal voltages applied at the same time in equal increments, the spot will move as shown in Fig. 7. Examining this diagram, it will be noted that the displacement of the spot from zero along either axis is exactly the same whether the voltages are applied singly or together, and the resultant spot position is in accordance with the deflecting force exerted by both voltages. It will thus be readily appreciated that by correct manipulation of the respective voltages the spot may be moved to any position within the top right-hand quadrant of the circle representing the screen of the cathode-ray tube, *but only within this quadrant.*

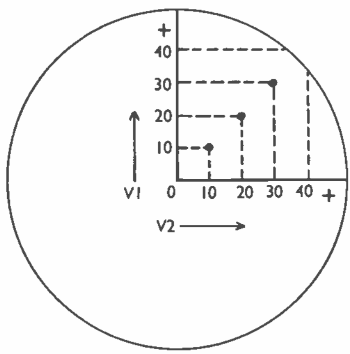


Fig. 7. Showing spot displacement due to equal values of DC voltages between horizontal and vertical plates.

In order to position the spot elsewhere on the screen it will be necessary to change over the polarity of the

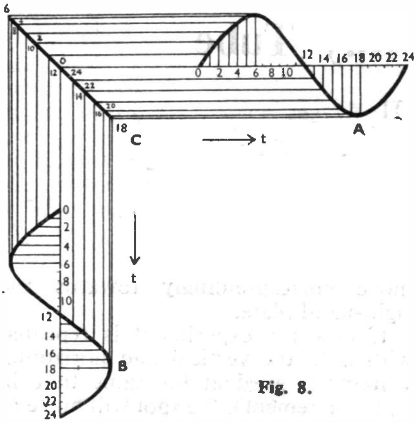


Fig. 8.

voltage connected to one pair of plates; for instance, reversing the connections to the horizontal plates would position the spot within the top left-hand quadrant of the screen, and reversing both voltages would bring the operating area to the bottom left, and so on.

AC voltages

In Fig. 6 of the previous article, a diagram was shown illustrating the manner in which a sine wave was produced on the screen as a line, and it was seen that the beam could be considered as having first made an excursion above the zero line to a distance corresponding to the peak value of the voltage, and then an equivalent excursion below the zero line, the total displacement of the spot being double that for a similar value of DC voltage.

Fig. 8 shows the combined effect of two alternating voltages applied simultaneously, both voltages A and B being of the same amplitude and in phase. The spot movement C is proportional to the resultant of two forces at any instant and will therefore, in the case under consideration, be diagonally across the screen at an angle of inclination to the horizontal axis of 45°, as was the case for the two equal DC voltages.

It should be obvious that any alteration in the voltage applied to one pair of plates will cause the angle of inclination of the line to change; for instance, if the horizontal voltage is gradually decreased, the line of deflection would tend to become vertical, and if the vertical voltage is reduced the line will gradually approach the horizontal axis.

The angle of inclination, therefore, is a direct indication of the relative amplitudes of the two voltages, and the further fact, that the image is inclined to the left of the vertical axis and is a single line pattern, is an indication that there is zero phase difference between these two voltages.

Introducing a phase difference between the two voltages causes the straight line to change into an ellipse, and by increasing the phase angle still further the ellipse becomes broader; finally, at a phase angle of 90° between the two potentials a perfect circle is formed, assuming both voltages to be equal. For phase angles greater than 90° the circle again becomes an ellipse, but now the direction of inclination of the ellipse is to the right of the vertical axis.

Fig. 9 shows how an ellipse is formed by two sine waves, between

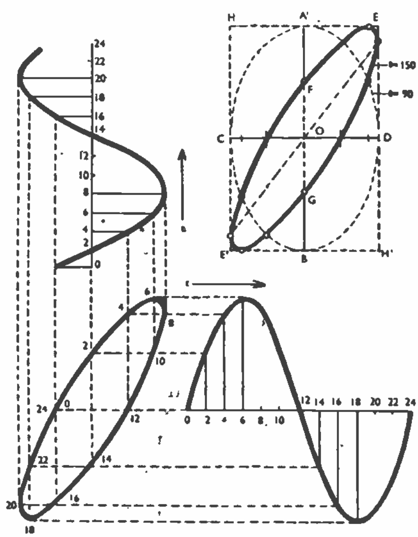


Fig. 9. Diagram showing the formation of an ellipse from two sine waves out of phase and of different amplitude.

which there is a phase difference of 150 deg. In addition to the phase displacement, the two sine waves are of different amplitude, and it is important to note that the dimensions of the rectangle HE H′H′ shown at the top right-hand are given by the ratio of the voltages on the two pairs of plates. All curves corresponding to this voltage ratio, no matter at what phase angle they are plotted, fall within the rectangle and touch it on all sides. It is an easy matter to mark out this rectangle straight from the screen of a cathode-ray tube on to a sheet of transparent squared paper, and to trace out the ellipse, from which the voltage ratio and the phase angle may immediately be determined. At this point it should be remarked that it has been assumed in discussing the resultant figure to be obtained by the application of given voltages to the deflector system that the deflection sensitivity of each pair of plates is the same, but such is not usually the case, and where the deflection sensitivity is different between the horizontal and vertical plates correction must be made for this.

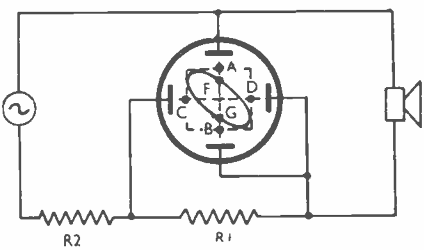


Fig. 10. Diagram of circuit used for measuring the impedance of loudspeakers or output transformers.

Impedance Measurement

Fig. 10 shows a method of measuring an impedance such as that of a loudspeaker. The loudspeaker is connected to an AC voltage via a series resistance R2 (equal to the internal resistance of the valve normally used with it), and a resistance R1 of known value is interposed in the circuit. The voltage drop at the terminals of R1 is applied to one pair of plates, and to the other pair is applied the voltage E at the loudspeaker terminals.

The loudspeaker impedance is $Z = \frac{E}{I}$ where E is the voltage across the loudspeaker and I is the current through it, which is given by the equation $I = \frac{E'}{R1}$ (E′ being the measured voltage-drop at the terminals of R1). There results a value of $Z = \frac{E}{E'} \cdot R1$, or referring to Fig. 10, $Z = \frac{AB}{CD} \cdot R1 \cdot K$; where K is the ratio of the deflection sensitivity in the directions AB and CD.

Fig. 11 gives a practical example of an impedance measurement carried out in this manner, using the circuit shown in Fig. 10. The loudspeaker under test and the resistance R1, which has a known value of 2,800 ohms are in the anode circuit of a valve PEN/B4, so that R2 represents the impedance of this valve. The measurement was taken at 500 cycles, and in accordance with the above formulæ the impedance is found to be

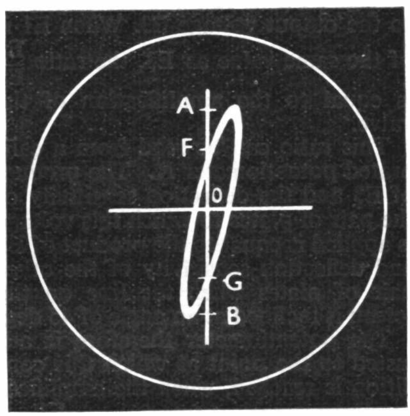


Fig. 11. Diagram of image on cathode-ray tube from which impedance and phase angle measurements may be taken.

$$Z = 2{,}800 \times \frac{41 \text{ mm.}}{11{\cdot}5 \text{ mm.}} = 10{,}000 \text{ ohms.}$$

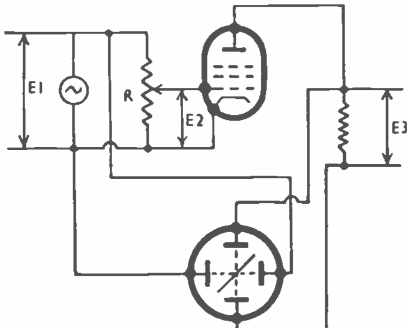


Fig. 12. **Circuit arrangement for measuring the amplification of a valve.**

From such a diagram as Fig. 11 it is also possible to calculate the power output of a receiver under given operating conditions.

Amplification of a Valve Stage

From the observation of such simple diagrams it is also possible to measure the amplification of a valve stage, and for this purpose one pair of plates is connected to a constant AC input voltage E1 (Fig. 12), and the other pair to the output voltage E3. When E1 is of the same value as E3, the ratio $\frac{E1}{E2}$ is equal to the amplification of the valve.

This ratio can be read from a calibrated potentiometer R. The product of E3 and the deflection sensitivity of the pair of plates to which this voltage is applied is equal to the product of E1 and deflection sensitivity of the other pair of plates when the line on the screen is inclined at an angle of 45 deg.

The potentiometer therefore is adjusted to the point at which this condition is reached, when the amplification can be calculated from $\frac{E1}{E2}$ K, where K is again the ratio of the relative sensitivity of the two pairs of plates. In practice, of course, the actual figure obtained on the screen of the cathode-ray tube would probably be in the form of an ellipsoid, the major axis of which would form the angle of reference.

Explaining the Time Base

For a number of purposes it is necessary to apply to the horizontal or " X " deflection plates of a cathode-ray tube a "time-base" voltage, and reference is often made to the fact that such a voltage should be "linear." The purpose of this voltage is to enable the observation of a voltage applied to the "Y" plates, as a function of time, and it is perfectly obvious, therefore, that any time-base voltage should, when applied to the deflector plates, cause the spot to traverse the cathode-ray tube screen uniformly with time.

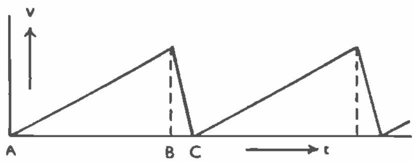


Fig. 13.

Fig. 13 shows a typical voltage-time curve, and from the shape of it the significance of the term "saw-tooth," which is sometimes applied to a time-base voltage, is apparent.

It will be noticed that during the interval of time A-B the voltage increases proportionally with time; during the interval B-C it drops rapidly to zero.

The time interval A-B might be called the "traverse time," that is, the time taken for the spot to move completely across the screen, and the interval B-C is known as the return time or fly-back and should, of course, be as short as possible.

In discussing the characteristics of a time base, as, for instance, in connection with television, the fly-back time is usually expressed as a percentage of the total period A-C.

In principle the simplest circuit for the production of a time-base voltage is a condenser which is charged via a resistance and periodically short-circuited, perhaps by means of a contact on the shaft of a motor (see Fig. 14).

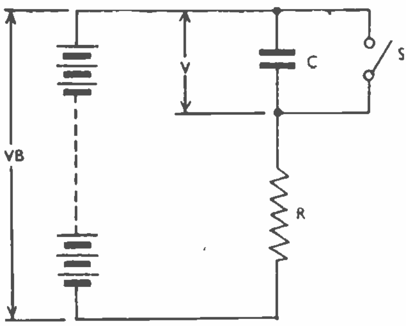


Fig. 14.

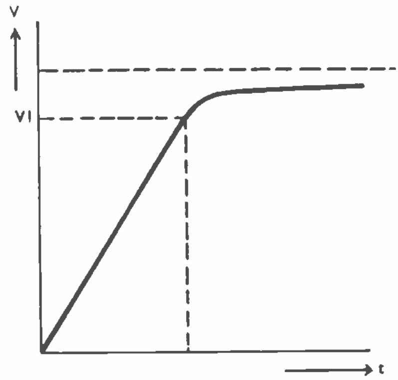


Fig. 15.

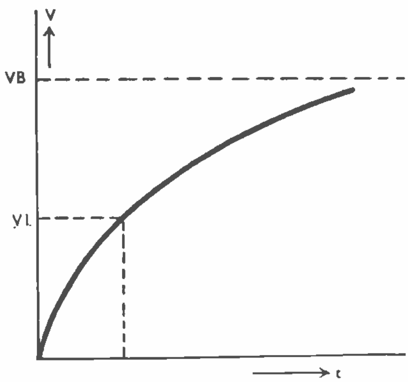


Fig. 14a.

Examining this circuit arrangement in detail, it is known that the voltage across a condenser which is being charged through a resistance will vary with time as shown in Fig. 14a. The voltage does not increase linearly with time, excepting during the early part of the charging period, when it may, with some degree of approximation, be assumed to do so.

In order, therefore, to obtain from this circuit a voltage wave-form which is reasonably satisfactory for use as a time base, it would be necessary to discharge the condenser each time the voltage across it has risen to V1. An obvious drawback to this arrangement, therefore, is that it is only possible to use a comparatively small part V1, of the total changing voltage VB, so that in order to obtain the necessary deflection voltage for even a moderate size of tube it would be necessary to use some hundreds of volts as a charging source. A further drawback to the use of any mechanical system of discharging the condenser is of course the fact that it would be impossible to obtain a sufficiently high frequency by this means.

If, instead of charging the condenser via a resistance, a constant current charging source is employed, a voltage-time curve is obtained as shown in Fig. 15, from which it will be seen that the linearity of the voltage is extended almost to the end of the complete charging period. Such a constant current charging source might be either a saturated diode or a pentode. A pentode is usually employed because the normal type of diode available has not a sharp saturation point, a diode having a plain tungsten filament being desirable for this purpose.

An ordinary neon lamp could be used as a means of discharging the condenser, but it would have the disadvantage of limiting the available sweep voltage to about 30-50 volts, which represents the difference between the starting and extinguishing voltages of this type of tube, and moreover this range of operation is not constant and the lamp therefore is uncertain in action.

Gas Triodes

A considerable improvement results from the use of a gas-filled triode, the action of which is as follows: When a negative bias is applied to the grid, no anode current will flow until the anode voltage has reached a value which is, say, "n" times greater than the grid bias. The factor "n" is constant for a given valve, so that by doubling the negative grid bias, the starting or ignition voltage will also be doubled. By adjusting the negative grid bias, therefore, the starting voltage can be selected to any desired value within the permissible limits set by the construction of the valve.

The operation of the circuit shown in Fig. 16 then, is that at the moment of switching on, the voltage across C commences to rise proportionally with time, until it reaches the critical value holding for the particular gas triode in use. Immediately ionisation commences within the valve, the condenser begins to discharge until, having reached the lower critical value at which ionisation ceases, the grid of the gas triode again takes control and the whole sequence of events is repeated.

As a charging valve Fig. 16 shows a pentode. As is known, the Ia/Va characteristic of a pentode is such that the anode current varies very little over a wide range of anode voltage so that the charging current will be more or less constant.

The value of the charging current can be controlled by a voltage applied to grid 2, but since this control will give only a limited range of charging current it will be necessary to arrange for the switching in of various capacities in order to cover a wide range of frequency.

In operating the circuit shown in Fig. 16, therefore, the grid bias of V2 forms the amplitude control of the time base, and within the limit of each capacity unit, the grid bias of V1 forms the frequency control.

It should be noted here that in altering the amplitude of the time-base the frequency will also change, since, in altering the value of voltage at which the gas triode will "trigger off," the condenser takes either more or less time to charge up to this value.

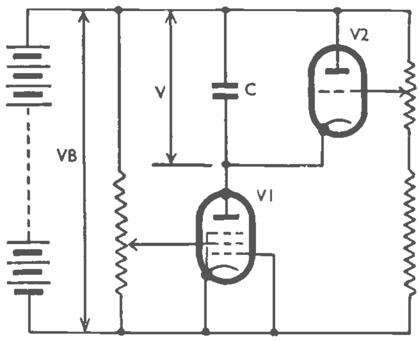


Fig. 16.

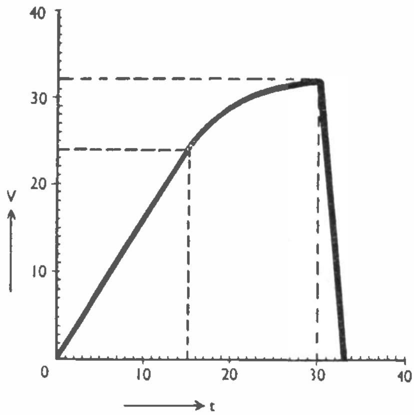


Fig. 17.

An approximation to the time-base frequency using the circuit shown is given by the formula

$$F = \frac{I}{CV}$$

where I is the charging current in microamperes, C is the capacity in microfarads and V is the voltage swing.

Linearity of Time Base

Some further attention might with advantage be paid to the actual effect of a non-linear time base on the appearance of an image due to, say, a sine wave voltage, across the vertical plates.

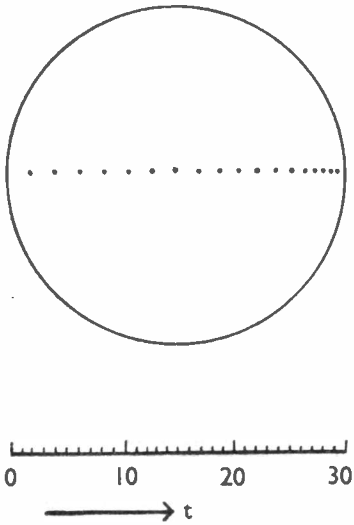


Fig. 18.

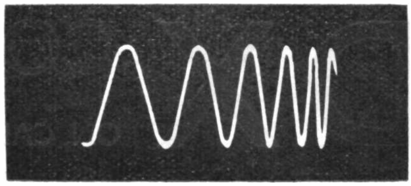


Fig. 19.

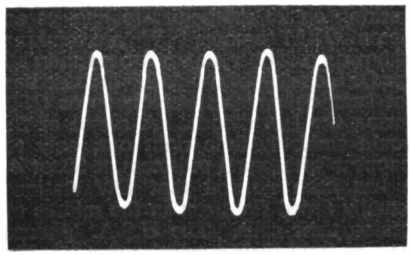


Fig. 20.

Fig. 17 shows an enlarged image of a non-linear time-base voltage with the time and voltage scales marked off in degrees. It will be seen that during the first 15 units of time the potential across the horizontal plates of the cathode-ray tube will have risen to 24 units, but during the second half of the charging period the potential only rises by a further 8 units.

Now for the purpose of translating this voltage-time curve into scanning speed it will be assumed that the time scale is calibrated in seconds and the potential scale in volts, and for a deflection sensitivity a value of 5 mm. per volt will be assumed. Now, during the first 15 seconds the spot will have travelled a distance of 120 mm., so that the speed of the spot during this period is 8 mm. per second. During the second half of the charging period the spot travels a distance of 40 mm., but at a gradually decreasing speed, the *average* of which is just under 3 mm. per second.

Therefore, if a series of spot positions could be taken over equal intervals of time for a complete scan of the tube, they would appear somewhat as shown in Fig. 18.

It follows from this that using such a time base, any voltage which varies as a function of time, would, when applied to the vertical deflection plates, produce an image which was cramped towards one side. Fig. 19 is of a sine wave voltage showing 6 complete cycles, and in this the effect of the non-linear time base is very clearly seen.

As a comparison Fig. 20 shows a similar sine wave against a linear time-base.

(To be continued)

DX COMMENTARY

ON CALLS HEARD, WORKED & QSL'd

By H. A. M. WHYTE (G6WY)

AMATEUR Radio has really got under way now. The number of stations, both local and DX, heard working on 28 mc begins to give us an idea of QRM to come! We are thinking of having a rubber stamp for marking all our QSL cards "with QRM," but this has not been nearly so troublesome as QSB during the last month. A signal of S8 would suddenly fade right out, only to reappear with equal swiftness at S3 or 4. It has been noticed that CW stations actually faded right out in the middle of signing their calls. The U.S.A. 'phones seem to hold their strength more steadily than the CW signals, probably due to their greater efficiency, plus some form of directional aerial.

Conditions

Some newcomers to 28 mc may be thinking that DX conditions have been very good owing to the strength of the W's at times. In actual fact, by comparison with the years immediately before the war, conditions have been poor. When 28 mc is really "hot," it is alive with steady S9 signals from 28 to 29 mc. Signals have not held their strength for long and have quickly faded out to be followed by others from another district, which in turn have disappeared. It would appear that the F-layer, which produces our 28 mc DX, is in a state of turbulence due to variations in the ionising radiation from the sun. Most amateurs are aware that when this radiation reaches a high intensity, the "hiss effect" is produced on frequencies above 20 mc—even lower in cases of bad electronic storms—and it has been reported that this hiss was heard on March 5 between 1000 and 1140, loud enough to drown all signals. In really bad cases, the radiation destroys the ionised layers and amateur and commercial signals disappear into space and are not reflected back to earth. This is known as the "Dellinger Effect." It would appear that these radiations from the sun have been sufficiently strong this winter to disturb the F layer badly enough for poor 28 mc conditions to have resulted. It seems that we must expect such conditions to continue until in April the F layer finally refuses to bring back E-W signals to us. N-S signals should, however, still come in, with the African continent providing workable DX.

Efficiency

These pour conditions have had a beneficial effect in that they are making us bring our apparatus up to a high state of efficiency; 28 mc is not a band on which a novice would normally commence his operations, but by being compelled to start on this frequency, the lower frequencies will be found easy. There is also the point that an efficient 28 mc transmitter using modern valves should work well on 58 mc. Of course, it is essential to take great care with aerial design. Most newcomers to 28 mc probably use some form of long-wire aerial, with numerous half-waves along its length. This has the virtue of being omni-directional, and therefore gives a good initial all round coverage, but it will soon be found that some form of aerial which gives greater directivity is necessary to overcome QRM when the band is crowded at week-ends. The next step would be a simple half-wave doublet, fed in the centre with a low impedance line. We know that some operators have been obtaining very encouraging results from vertical dipoles which, although omni-directional, do not waste energy earthwards or skywards. A vertical dipole can be suspended by a cord from any normal long-wire aerial, and the other end secured to a stake in the ground with another piece of cord. Thus a quick comparison can be obtained between the horizontal long wire and the vertical dipole. Half-waves in- and out-of-phase are the next step, and it will be observed that the beam effect is sharpened up quite considerably when two half-waves are used. Another arrangement which we have tried is to sling the 28 mc aerial underneath the long wire in a horizontal plane, care being taken that it is not nearer than a ¼-wave; this system appears to decrease the angle of radiation to the horizontal, which is a good thing, because upward radiation is partly reduced by the long wire above. Before the war we used a 14 mc and a 28 mc half-wave system slung directly under a long wire, and results were satisfactory.

" Handles "

We are venturing to enquire what the average British amateur thinks about the prevalent habit of asking for the "handle" (American for name !). There is no doubt that this is the typical reserve-breaking approach of the Americans and is used by them quite normally. In fact, it may be said that it is "the done thing" over there. We do not, however, hear inter-G or inter-European contacts using this method of address, and we have been surprised to observe that Canadians seem to prefer the more English expressions "name" and "over" for "handle" and "take it away." It appears that British amateurs do not readily ask for names when working each other, but prefer the time honoured "old man." One G we know when pressed hard before the war for his "handle" eventually produced "Algernon," as he felt that courtesy demanded that some name should be given, but he preferred not to give his real name and have it bandied about the ether ! Opinions on this point will be of interest.

QRP

It has always been *Magazine* policy to encourage genuine QRP work, and later on we intend to organise a QRP Contest for readers. We staged a contest of this kind before the war which met with a very good response and led to the suggestion that the *Magazine* should sponsor a QRP Operators' Club. Of course, if you operate with a rare call it can readily be proved how well a QRP signal gets through to distant parts. Typical examples overheard during March were W7HRY, at sea near the Azores with 5 watts input, who was putting a really strong signal into G on CW, and XACD in Athens, Greece, using 30 watts 'phone and CW. This latter station is operated by G6WD and cards should be sent to his Call Book address in Harrogate, Yorks.

ON THE AMATEUR BANDS

From the Russian Zone

Any signal coming from territory controlled by the Russians is of interest. It would appear that more than ordinary courage is needed for some of these unlicensed amateurs to come on the air. YR5A, YR5B, YR5C, YR5F and YR5X have all been very active when skip has been short enough on 28 mc. QSL's for these Rumanians can be sent via HB9AG, who seems to be acting as a very useful intermediary. Another dark one is SX4BB, who claims to be in "the Black Sea Area." Yet another QRP mystery station is PR1AA, who uses 15 watts and is "in the Balkans." Do not confuse him with PR1VY in the Andaman Is. We have no reports of any other signals from behind "the iron curtain."

Licensed Countries

There is not yet full official information as to which countries are properly licensed. The following countries are known to be cleared for operation on 28 mc. G, GM, GW, GI, EI, W, K (all U.S.A. controlled territory), VE, VO, LU, PY, HK, HB, LA, VK. It is also possible that other parts of the British Empire have been officially authorised, but no signals have been heard. From observation on 14 mc, CT, EI, VO and South Americans appear to be released.

170 Metres Again !

We have just heard that 1.8 to 2 mc has been released to British amateurs with effect from March 15, with power limited to 10 watts. This should be very useful, especially to those now having licences issued to them. It is also believed that it may not be long before the whole, or at least part, of our 14 mc band is reopened to us. The addition of 29,000 to 30,000 kc was another relaxation during last month, and although the occupancy of this section of the ten-metre band is at present very low, we prophesy that it will not be long before it becomes fairly well used. Next winter season should see its full benefit realised, and we strongly recommend that it be treated as a separate band ; that is, those who work on, say, 29,050 kc should start searching about 29 mc, and tuning towards the HF end. The old system of listening near your own frequency is to be strongly recommended when the band is full.

Some DX Results

G8IG (Bromley) has been spending most of his spare time on 28 mc, and is to be congratulated on the fine list of DX worked— all on 'phone unless otherwise stated. He claims fastest WAC and WBE for 28 mc. All continents were worked on March 9 in 4¼ hours on 'phone. Here are the calls and times : 0845 W5KDA in Okinawa, 0956 G6CU in Cocos I., 1100 VK4LP, 1138 XABY in Athens, 1203 SU1USA in Cairo, 1230 W3BDL, 1300 HK4AX. He added VE4EK at 1405 to make WBE in 5 hours 20 mins.—also claimed to be an all-time record. Other DX worked by G8IG includes TA1AF (CW), XAAF (Athens), XU1YO, XU1YV (Tangku, N. China), XU1YQ, XU1YK (Pekin), W8CJR (Shanghai), W4YA (on the Burma Road), W9WUG (Guam), W6NFL (Okinawa—QSL to 3420 Blair Drive, Los Angeles 28), W4HVT/PY7 at Natal, Brazil, OQ5VQ, ZS2X, ZS1P, ZS6FN, and LU4EC. Other DX heard which he says he is hoping to work, includes TG9JW in QSO with G2PU for his first G contact, W6NVA in the Marianas, W9QTC in Guam, W6QKB in Okinawa and K4ENT. G8IG belives he was the first British amateur station to work outside the British Isles since the war's end ; he QSO'd LA8C at Sandjford, Norway at 1616 on January 9, 1946. Any other challengers ? G8IG uses 75 watts to a T55.

Another excellent DX record comes from G2IG (Orpington) : 'Phones W8VOK/KA1 in the Philippines, W6MDA/KB6 on Tinian I., Mariana Group, W9QCJ (Guam), W4HVT/PY7, SV1EC (our old friend SUIEC/ZC6EC, now in Athens), VK4LP, VS6DY (Hong Kong), ZS6W, W6NFL/J5 (Okinawa—also operated by W5DST), and ZS6FD. CW contacts included VQ3TOM, XU1YO and W2KQT/KB6 in Guam.

Before the Americans had all the Mariana Islands, they owned Guam (KB6) and this used to count as a separate country, but we now feel that the whole Island group should count as one. Okinawa is part of Japan and should not be claimed as a separate country.

Yet a third report of terrific DX worked is just in from G6QB (Bexhill), who remarks how fortunate it is that many of the American amateurs are still dispersed over the world ! This has given many of us an opportunity of working places which may never again boast another amateur station. His log, for the period March 10-14, includes W2KQT, Guam ; W6PUZ, Tinian ; W9HJW, Saipan ; W1NSW and W6NFL, Okinawa ; W6PBI, Tsingpao ; W6NDW, Manila ; W4HVT and W5GPA, Brazil ; W4YA, Burma Road ; W9KXN and W3FWI, Azores ; G6CU, Cocos Is.

Other interesting DX in the same period was XU1YV, China ; PJ3X, Curacao ; TA1AF, Turkey ; SV1EC and XABY, Greece ; VU2BG and VU2WP, India ; HS2F, Siam ; VS6DY, Hong-Kong. All to say nothing of quite a large crowd of South Africans, South Americans and Australians. Then on March 16, G6QB knocked off five Americans on Guam, one on Saipan, one Tinian and one Korean —mostly on 'phone, and in a couple of hours.

G6QB is using less than 100 watts to a pair of 807's, feeding a Windom, and nearly all his contacts are telephony. As he says, the mornings are best for this rare DX, between about 0900 and 1300. And now is the time—there has never before in history been such a time—since the Americans will soon be on their way home.

G5CM (Bognor Regis) worked W9EWY/VS6, giving 'EWY his first G and WAC from Hong-Kong, and W6FHE. G5CM uses only 18 watts on 28 mc, the transmitter being three-stage, with a Collins-coupled three half-wave aerial, 15-ft. high. This is good going, and shows what can be done with low power.

G2LT (Sheffield) worked G6CU/ZC2 on March 15, 'CU saying that he would be leaving the Cocos Islands in a few days but that the transmitter would be kept on the air by a new operator, who would use ZC2CU. So this puts us in the clear again for ZC2 contacts.

Swiss Note

An interesting letter from HB9T sets out the latest position in Switzerland. They have all bands back except 1.7 mc, and the address for the official HB QSL Bureau is U.S.K.A., Box 196, Berne-Transit. The licensed calls are in the sequences HB9A-HB9Z, HB9AA-HB9AZ, HB9BA - HB9BZ, HB9CA - HB9CZ, HB9DA-HB9DZ, HB9EA-HB9EZ, and HB9FA. All other HB calls are "phoneys" from outside Switzerland. The HBs are working plenty of DX on 14 and 28 mc, and HB9CD claims the first FM contact with the States.

LA6A, now in London, gives us the latest information about licensing in Norway. They have got the 10-, 5-, 2½- and 1¼-metre bands back again, without power limitations. All pre-war amateurs are allowed on the air provided they can obtain a certificate to show that they behaved themselves during the occupation. LA6A says that they hope to have 3.5 mc shortly, and reports that the active LA's are working their full share of DX.

An interesting letter from Norman Joly, SV1RX, who is in England for a few months, sheds more light on XACD and other matters of Amateur Radio interest in Greece. XACD is Lt. G. Woods, G6WD, and his transmitter is ECO-driven, with 30 watts from batteries and a generator. All Greeks were under cover before the war, but the situation in regard to licensing is more hopeful now. In any case, SV1RX expects to be on sometime this summer with 250 watts into rotating beams on 28 and 58 mc. He has recently been in Egypt, visiting the SU's.

A little more DX heard before we close includes W6PUZ/Tinian on CW with a rough T5 note—QSL to 1557 Poppy Peak, Pasadena, California, U.S.A. W9GHW/-K4 and W3FWI/CT2 were both on 'phone. Do not be taken in by KF6SJJ/W1—he is in Mass., U.S.A. There must have been a large number of migratory movements among American amateurs to judge by these reports ! W6's and VE5's made a welcome appearance during March and stayed in sufficiently to make a few contacts. Finally KA2NJ, SU1MV, ZS4AE have been heard on 'phone, while CW stations include VQ3ED, LU7AZ (in for some contest), VK4HR, VU2WP (Calcutta), OQ5AQ, PY2AJ, KA1JM, and W8VOK (Philippines). PX1B was heard being called by PY2AJ (can this really be Andorra ?). G6WY worked a new country—ZC4C in Cyprus.

So you see there has been plenty of excitement during March, although all report the suddenness of QSB.

SLP for April

Unfortunately, the first issue of the *Magazine* was a little late, and few readers would have seen it in time to take the March Set Listening Period. The Editor says he is trying to do better for this issue, so we propose another SLP for this month : April 14, 28 mc, 0830-1200 and 1600-1730. Then for 1·8 mc, the old top band, April 13, 2100-2359, and April 14, 1830-2100. We hope to see a large number of receiving logs, which should reach the Office by April 17 *latest*, addressed "H. A. M. Whyte (G6WY), *Short Wave Magazine*, 49 Victoria Street, London, S.W.1."

Reports, Please

G2LT, E. Walker, 11a Welwyn Close, Intake, Sheffield, asks for reports from overseas readers on his 28 mc CW and 'phone. All reports will be acknowledged.

ORIGIN OF 73

From R. C. Horsnell, G2YI, comes an interesting note apropos the paragraph on "Seventy Three" in the March issue.

Shortly after leaving port, merchant vessels always contact the appropriate coast station to clear their passage. The coast station operator usually made BV, for *bon voyage*, at the end of his message. The group BV is also the short figure check for 73 and possibly often got copied as such, particularly if it followed a spell of checking a long message in figure code.

Has anyone else any ideas on the origin of 73 ?

CANADIAN REORGANISATION

With effect from April 1, look out for some new VE prefixes. The Canadian District system is being reorganised and in future will be

VE1—Maritime Provinces
VE2—Province of Quebec
VE3—Province of Ontario
VE4—Province of Manitoba
VE5—Province of Saskatchewan
VE6—Province of Alberta
VE7—Province of British Columbia
VE8A-L—Yukon Territories
VE8M-Z—Northwest Territories

Except in the Yukon and Northwest Territories, existing call *letters* will remain unchanged. This is a rational reorganisation, and it is evident that the Canadian authorities do not expect much amateur activity in the Far Northwest.

We acknowledge March *QST* as the source of our information.

Here and There

Fish 'Phone

Now that we have got back the HF end of our trusty and well tried 1·7 mc band, no doubt we shall once again be entertained by the "fish 'phone" or trawler telephony, which before the war always gave us a certain amount of QRM after dark. Some 1·7 mc operators in coastal districts maintained that particular vessels came on the air every time they caught a fish. The thing was to listen for the skipper's remarks if there were no fish.

Callers

While we value reader-contacts and always welcome callers at our offices at 49 Victoria Street, S.W.1., we would much prefer it if those who think of coming in to see us on any specific point would write instead. Though it may seem a little churlish on our part thus to discourage visitors, the fact is that we are not only always extremely busy, but the members of our staff are seldom if ever available for interview, except by appointment. We had a casual caller the other day who, coming in ostensibly to pick up a copy of the *Magazine*, managed to engage the Circulation Manager for nearly two hours in a discussion on the relative merits of 7, 14 and 28 mc for DX. Our Circulation Manager (who is not yet licensed) now says he is not going to be an amateur transmitter after all.

Export Note

We were extremely interested to hear from Messrs. Multicore Solders, Ltd., that whisky is not the only export from this country to the States. It seems that the Americans have been unable to produce a cored solder with the characteristics of Ersin Multicore, large quantities of which —manufactured in this country—have for long been exported to America. They do nine different gauges of cored solder, in five mixes of tin-lead alloy ; for radio work, the 60/40 or 45/55 alloys, in either 13, 14, 16 or 18 SWG, are recommended as being most suitable. Prices vary from 6s. 9d. to 4s. 10d. the pound reel.

UHF in W/VE

The Americans and Canadians are now licensed for operation in two new amateur bands, 420-430 and 1,215-1,295 mc. The W's already have a whole range of ultra-high frequencies in the bands 2,300-2,450, 5,250-5,650, 10,000-10,500 and 21,000-22,000 mc. The January issue of *QST* records some interesting duplex 'phone on 5,300 mc (5·6 cm.), by W2LFG and W6BMS, over a line-of-sight path of about five miles. Later, on December 2, W2LFG improved on this by working W7FQF/2, over a distance of 31 miles.

Calls Heard on 1.8 mc

As mentioned last month, we shall be glad to see Calls Heard lists for the 28 and 58 mc amateur bands—to which should now be added the 1.8 mc (1,800-2,000 kc) band. The latter band will be "G's only" for some time, but certain Europeans will probably appear before long. Address your list to—Calls Heard, *Short Wave Magazine.*

Do You Know That

It is always better to choose a pentode or a beam tetrode in preference to a triode for transmission on the present HF bands? The reason for this is, of course, the much lower driving power required by modern high-efficiency multi-electrode valves. On 58 mc, some will give as much as 50 watts RF output with less than one watt of drive. Most triodes would require ten times this drive power under the same conditions.

Standard Frequenices

The BBC's 200 kc transmitter is maintained at an accuracy of one part in a million. WWV, the well-known station of the U.S. National Bureau of Standards, radiates continuously on 5·0, 10·0 and 15·0 mc, announcing both in speech and morse. The accuracy of these transmissions is one part in ten million.

Looking Back

The Old DX Bands—Opening 10 Metres in 1929—Goyder Lock—Spitch—80 Metres

PART II

By **L. H. THOMAS, M.B.E. (G6QB)**

JUST as the G.P.O. regulation limiting the length of an amateur transmitting aerial to 100 feet proved an indirect blessing in fostering the design and use of the newly-discovered "Hertz" aerial, so, by about 1926 and 1927, did other cramping features of Amateur Radio help to lead it to better things. "Sunday morning on 40 metres" has long been a byword, but only the old stagers remember that even twenty years ago the 45-metre wavelength was becoming pretty grim. It was excellent for worldwide DX work, but it was only a spot frequency, and all the high-powered stations in the country used it. I well remember the South London ether in those days!

This gave impetus towards the newly appreciated 23-metre wavelength—still not a "band." On 23 metres we went all through the previous history again —first contact with Canada, U.S.A., South Africa, Australia, New Zealand, with many of the old stalwarts still collecting the honours. But 23 was even more of a daylight band than 45, and thus it gave a chance for us to find still more new countries at convenient times of day—chiefly early morning and late afternoon. Except in the heart of the summer there was no point in staying up after 10 p.m.—the band was dead by then. This is now a commonplace to us, but it was almost uncanny to those with whom "DX" and "midnight oil" were synonymous.

The DX Bands—1926

So for two or three years the three wavelengths of 90, 45 and 23 metres carried the brunt of the long-distance traffic, 180 metres being the traditional band for local chatter. And on those three wavelengths the amateurs of the British Isles showed the whole world that low power could do its stuff—for the majority of them were licensed for only 10 watts, and very few indeed for more than 50.

In 1926 or 1927 it was necessary to try to rationalise the various official and unofficial prefix letters being used throughout the world, so the I.A.R.U. (International Amateur Radio Union) decreed that Europeans should use a two-letter prefix starting with "E," Asiatics with "A," South Americans with " S," North Americans with "N," Oceanics with "O" and Africans with "F." This, I believe, was never sanctioned by the GPO, but the fact remains that all stations signed "EG" before their calls for quite a long time, and all United States stations used "NU."

This was to be regularised by an International Convention later, in 1928; and when this occurred the frequency-bands were also internationalised. We lost our spot frequencies of 90, 45 and 23 metres and shared the 80, 40 and 20 metre bands on a worldwide basis. The very select few who had enjoyed permission to work on the wavelength of 32 metres also had to give it up.

By now crystal-control was the rule rather than the exception, and several firms had already started supplying quartz crystals for the amateur bands. This country has always held a fine record for law-abiding amateur work, and the number of off-frequency cases recorded was extremely small. We could not say the same for everyone, since certain lawless spirits abroad found that they avoided most of the interference by sitting just outside the band, and a good deal of bother was caused by interference with commercials.

Results in 1928-29

My own log for the autumn of 1928 shows contacts with all continents on the 20-metre band—I had now moved to a house with AC mains and room for a reasonable aerial!—and it appears that conditions remained extremely good on 20 and 40 all through the following winter. In fact, the work being accomplished by the average amateur then was not very different from what was going on immediately before the war. The world had shrunk to such an extent that it was well within the grasp of anyone with 50 watts, or, in fact, anyone with 10 watts who really knew what he was doing.

One page of the log, taken at random, shows Australia, South Africa, Egypt, Russia, U.S.A. and Sweden in rapid succession—all on 20 metres—and the next shows a whole crowd of European countries on 40. The spring of 1929 gave a spate of contacts with the West Coast of U.S.A. —W6 and W7 stations—as well as with VE5 in British Columbia and Yukon. I well remember that 1929 was quite an exceptional year for them ; they had previously been somewhat rare.

Opening "Ten"

It must be obvious by now that the only logical sequel to all this was the pioneering of yet another band. And so it was! The next victim was the 10-metre band, which we are all finding so exciting in this spring of 1946. In the winter of 1929-30 it did not lack thrills, and it is characteristic of this tantalising band that I find that my very first tentative call raised a South African—the famous ZS1H who became so well known for his 10-metre exploits. But the conquest of the whole world on this band proceeded rather more slowly, because of lack of co-operation overseas. For many months South Africa and a small handful of American amateurs were the only possible customers on 10 metres, and they were in great demand. The sun-spot cycle at that time was not particularly favourable, and the band did not attract the DX fraternity as it might otherwise have done. This seems an opportune moment to mention that by 1930 the amateur world was sharply divided into "experimenters" and "DX-chasers." Some, naturally, fell into both classes, but by that time there was a particular kind of amateur whose sole interest lay in working new countries and collecting QSL cards. He still exists, of course, and he has his place in the scheme of things, but I have always felt that the genuine experimenters deserved a little more credit than they received. It often happened that the typical research worker had not the inclination or the ability to sit on weak signals for hours at a time, and thus the stations appearing in the headlines for outstanding DX work were often merely good operators, with no outstanding technical ability. However, the problem of research versus DX is incapable of solution and should not really exist.

The R.S.G.B. has always fostered both types of amateur. The *R.S.G.B. Bulletin* had long been a monument to the patient research worker, and, at the same time, contests like the annual B.E.R.U. affair have catered for the DX enthusiast. My log shows, incidentally, that in the B.E.R.U. Contest in February, 1933, it was possible to work all continents in about four hours on 20 metres.

By this time 5 metres was well warmed up by the few bold spirits who had taken the plunge, although self-excited transmitters and super-regenerative receivers were the order of the day. This band was used at that time for local and "Field Day" work, and many portables in cars could be found on a fine summer day—inevitably at the top of an inviting hill.

Triodes and Goyder Lock

It is well to remember, by the way, that we still had not reached the days of high-efficiency pentodes and beam tetrodes. One of the most popular valves for medium-powered transmitters then was the DET1—a triode which was a kind of grown-up LS5. The latter valve, a very bright emitter designed as an output triode for audio work, found much favour among the 10-watters, and many LS5's worked all continents for their owners. Since all these triodes required a lot of driving power, the scheme known as "Goyder Lock" (after Cecil Goyder, G2SZ) was very popular. This consisted of locking the grid circuit of a self-excited oscillator to the output from a crystal-controlled frequency-doubler. It worked admirably—if the power ratio was kept reasonably low. But there were those who imagined that 1-watt of crystal control would lock 100 watts of somewhat rough, unstable CW. It then became "Goyder latch," much to the annoyance of neighbouring amateurs, as it would spill over and produce a series of raw AC "squegs" all over the band. Telephony on Goyder Lock, too, was something of a menace, and it was this that gave rise to the immortal word "spitch"—that nauseous combination of over-modulation and instability that added to the charms of Sunday morning on 40 metres.

Telephony

Certain European countries became notorious for the crudity of their amateurs' ideas about telephony, and in the best circles it became the fashion to leave 40 metres alone except as a DX band for high-power CW. For this it was excellent if one could stand the racket of interference from the aforementioned "spitch."

I should mention here that the 80-metre band had by now become somewhat select. Licences for this band were not granted too freely, but only upon special application and for special reasons. For this reason "80" became an excellent local wave-band and some really high-quality telephony transmissions were to be heard. The gathering of old-timers on 80 metres on a Sunday morning was a very pleasant function and if we eventually are allowed to use that band again one hopes that it will not lose its character. This is not to say that we want to see a select and snobbish collection of amateurs monopolising the band, but I feel that some sort of restriction—say, to amateurs with so many years' experience—would not be amiss. It would, at any rate, leave more room for the DX enthusiasts on other bands if those wishing to do local work had an outlet like "80."

(To be concluded)

Puzzle Picture (p. 94). *The lady is busy making "Window," which we used to such good effect as a countermeasure to confuse the German radar. These strips, of aluminium foil backed with paper, were cut to the correct half-wave length to resonate with the frequency of the equipment to be jammed. "Window" successfully engaged the enemy from 80 to 3,000 mc, and played a decisive part in our radio countermeasure operations.*

LETTERS TO THE EDITOR

The Editor will be glad to hear from readers on all matters of short-wave interest, whether Amateur Radio or otherwise. This is not to say that such letters will necessarily appear in print. Our custom is to inform correspondents if we propose publishing their letters.

SMALL ADVERTISEMENTS

Space available is divided into two sections—Trade insertions and Readers' small advertisements. *Trade Advertisements*, 9d. per word, minimum charge 12s. *Readers' Small Advertisements*, 3d. per word, minimum charge 5s. Add 25% for bold face (heavy type) insertions in either section. All charges payable with order. No series discounts. Advertisements of radio interest only accepted. All copy to be in hand by the 15th of the month previous to publication. Apply The Advertisement Manager, *Short Wave Magazine*.

ON THE MARKET

NEWS *from the Trade* *and* NOTES *on Equipment*

We have a number of items of interest this month and it is pleasing to find that this column is not only being well supported, but is regarded as serving a useful purpose. It has been suggested that it would be even more useful if readers put forward, for discussion under this heading, some of their own ideas as to what is required in the way of equipment.

In our experience, practically everything one wants—except a table-mounting chassis-panel assembly on the lines of a small relay rack, which may not be a reasonable requirement—is available somewhere, if one searches diligently enough. The difficulty, of course, is that some of these things are not to be had in sufficient quantities, and it is this which is making us cautious about publicising some of our finds.

Another point to mention here is that firms or their equipment noticed in this feature are in no way linked with our advertising ; the sole object of " On the Market " is to keep readers in touch with what is available, and at the same time to keep the Trade informed of reader requirements.

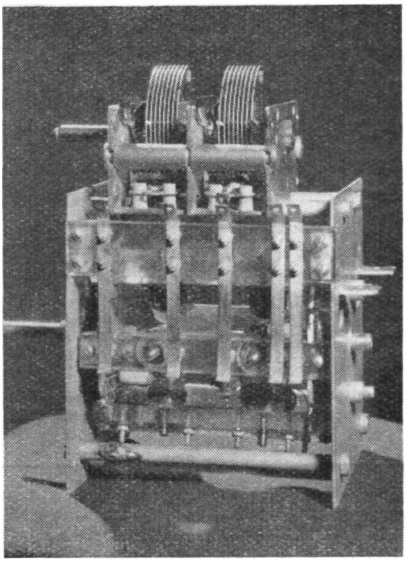
All the apparatus mentioned below is understood to be in good supply, and we give delivery delays where these are applicable.

Ericsson.—Their standard pattern headsets are available in three ranges—120, 2,000 and 4,000 ohms—and are priced at 25s. the pair. They are light, sensitive, fully adjustable, with enclosed connections and are fitted with 6 ft. of flexible cord. We can recommend these instruments for any Amateur Station service.

Acru Electric Tools.—In a range of soldering irons and electric testing devices, the Acru "Pyrobit" iron, type 8/P, is of special interest. It is designed for radio work, can be fitted with six different bit shapes, and weighs only 7 oz. The power consumption is 45 watts and the price of this model, supplied with the type A straight pencil bit, is 22s. Then, at the same price and loading, there is the "Pyrobit" instrument model, designed for close and delicate work, which has a very short tube and a cooling device in the handle. Another interesting Acru product is a universal neon-type tester, which can be used for checking for earth leakage, determining polarity and continuity, and detecting AC or DC ; the price is 12s. 6d. in the 4½ in. size and 13s. 6d. in the 7 in. length.

Automatic Coil Winder and Electrical Equipment.—There are now delays from 14 to 16 weeks in the supply of certain of the Avo instruments. The outstanding selection from their list is undoubtedly the Model 7 50-range Universal Avometer, which is so widely known as hardly to require mentioning. It is a beautiful instrument, and in addition to all the current and voltage ranges ever likely to be needed, it gives capacity, power and decibel measurements at three different input impedances of 500, 5,000 and 50,000 ohms. It would be difficult to imagine a radio test for which this instrument could not be used. Less ambitious, but in its way quite as practical, is the Universal Avominor, which is a 22-range AC/DC instrument capable of meeting most requirements in the Amateur Station. The price of the Model 7 is £19 10s., and of the Universal Avominor £8 10s.

Rothermel.—Their type D.104 crystal microphone, with a frequency response from 50-6,000 cycles, cutting off towards 10,000 cycles, is a high impedance (80,000 ohms at 60 cycles) instrument which can be coupled directly into the grid of the first valve across a 2 to 5 megohm resistor. The crystal is mounted in a chromium-plated metal case, 3 in. diameter by 1 in. deep, fitted with screw eyes to go into a suspension ring, and is supplied with 6 ft. of screened conductor for coupling to the amplifier. The price of the D.104 is £5 5s., and there is a variation of it fitted with a handle and incorporating a "press-to-talk" switch. Rothermels also list two other types suitable for amateur work—the BR2S,which is an omni-directional light-weight instrument, and the type B.H. microphone, in the popular bullet shape and with a switch in the handle.



Denco.—Readers who contemplate a band-switching receiver will be very interested in the new Denco product—a coil turret which eliminates switching; it is illustrated herewith. The range covered is 150 kc to 25 mc in four bands, and the coils are aligned on adjustable iron-dust cores. The model illustrated is for a superhet receiver using a triode-hexode mixer in the first stage, with IF on 1·6 mc. The type C.T.2 turret is the same thing for an IF of 465 kc, and coming along is the C.T.3, which is three-section and designed for communication and similar receivers employing an RF, mixer and separate oscillator stage, with the IF on 1·6 mc. Capacity band-spreading is provided, and the coverage is 150 kc to 35 mc in six bands. All these turrets will shortly be made available with unwound coil formers, for those who are building special apparatus (signal generators, frequency meters, etc.) and want to wind their own coils.

Belling & Lee.—For many years, this firm has been producing small parts for electrical and radio work. Their current catalogue lists plug-socket assemblies, insulated terminals in various sizes, valve- and fuse-holders, and a range of receiving aerial kits for short-wave work, in the "Skyrod" series. These kits are supplied with the well-known "Eliminoise" aerial matching transformers and are complete with the necessary screened downlead. They also offer the "Skytower," a very nice looking tapered lattice mast in steel, supporting a 37-ft. vertical rod aerial. The overall height is 52 ft. and the price of the assembly, complete with matching units and feeder, is £90.

British Mechanical Productions.—The range of products under the trade name "Clix" have for long been well known in the radio and electrical world. Who has not used the famous "Clix" plug, quite the finest thing of its kind yet produced, which secures the flex without having to fiddle with screws? The current list shows a big selection of plugs, pins and sockets, connectors, and panel socket assemblies. There are valve-holders and valve bases in every imaginable variation—including midget, acorn, American and international octal—and in many forms of construction. There are, in fact, no less than 100 different types of valve- and cathode-ray tube holder listed! This does not, of course, mean that there exist 100 different pin numbers in the valve-holder range, but it does illustrate the wide variety of sizes, designs and finishes available.

McElroy-Adams Group.—Many readers will be interested to know that H. R. Adams, G2NO, who used to be with Webbs Radio, was given a special Army appointment in connection with the production of radio equipment for the Polish and Czech underground movements during the war. Some quite remarkable miniature transmitter-receiver apparatus was designed and produced by his organisation, and we hope that it may later be possible to describe some of it.

Of immediate interest is the fact that E. McElroy—the holder of the world's high-speed Morse championship, who is in a large way of business in the States as a radio manufacturer—has joined with G2NO to form, in this country, the McElroy-Adams Group. They are using American design and manufacturing methods to produce in England a full range of communications equipment, and are almost ready to market an Amateur band exciter-transmitter for 28 and 58 mc, a VHF converter, and a range of power packs. The Group also holds the sole concession in the United Kingdom for Hallicrafters equipment.

Bullers.—They offer several items of Amateur Radio interest in the ceramics field. These include coil formers, stand-off and pillar-type insulators in several shapes and sizes, all using Frequelex as the insulating material. The coil formers are threaded to carry the wire and are holed for mounting purposes.

NEW QRA's

G2CPX	W. J. A. Carlton, Sycamore Farm, Sycamore Road, Farnborough, Hants.
G2CSQ	F. R. Stringer, 70 Lowestoft Road, Reydon, Southwold, Suffolk.
G2DHV	Geo. V. Haylock, 170 Engleheart Road, London, S.E.6.
G2FRM	F/O L. D. Hubbard, c/o 122 Sternhold Avenue, Streatham Hill, London, S.W.2. (Tel.: Tulse Hill 5316).
G2JL	R. V. Allbright, 12 North Parade, Penzance, Cornwall.
G2LT	E. Walker, 11a Welwyn Close, Intake, Sheffield.
G2NM	G. Marcuse, Tide Waters, Bosham, Sussex.
G2OF	W. G. D'Arcy, 134 Upper Tulse Hill, London, S.W.2.
G2TG	F/O W. Stockburn, 40 Netherburn Road, Sunderland, Co. Durham.
G5BY	Hilton O'Heffernan, c/o Resthaven Hotel, Thurlestone, Nr. Kingsbridge, S. Devon.
G5CM	T. H. Streeter, Cottesmore, Gordon Avenue, Bognor Regis, Sussex.
G5DU	H. L. Percy, 77 Blackwell Avenue, Walker, Newcastle, 6.
G6BB	H. Brabrook, 35 Criffel Avenue, Streatham Hill, London, S.W.2.
G6FO	A. J. E. Forsyth, O.B.E., Elm Cottage, Beacon Hill, Penn, Nr. High Wycombe, Bucks.
G6IO	E. Rayner, The Firs Bungalow, Westwood Road, Sydenham, London, S.E.26.

APOLOGY

Due to our delayed appearance in March, as explained elsewhere, much of our reader correspondence will have missed this issue (April), and our two Test Periods—on 58 mc for March 14-18, and the SLP on 28 mc for March 17—were rendered more or less abortive. Both A. J. Devon and our learned contributor who writes the DX Commentary are very cross about it.

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CORRESPONDENTS

The *Magazine* is now considering the appointment of regular correspondents, not only in the various centres of Amateur Radio activity in this country, but all over the world. Their function would be to keep us supplied with news from their areas; anything published would be credited to the correspondent concerned and paid for at an agreed rate. The qualifications considered necessary for these appointments are few, but essential—the holding of an active callsign, close contact with local activities, and the ability to distinguish between what is news and what is not.

In the first instance, appointments will be made on an area basis, usually with a city or town centre. Those interested are asked to communicate with the Editor, *Short Wave Magazine*, 49 Victoria Street, London, S.W.1.

INDEX TO ADVERTISERS

The Power Supply

Points for the Transmitter and Ideas for the Beginner

OF the three sources of transmitter power which may be available—batteries, DC mains or an AC supply—the latter is the most usual and, be it said, the most convenient. In fact, in considering the question of power, the amateur who is connected to company's AC can regard himself as being in a fortunate position, as all who have had experience of the various systems will confirm.

While it is the purpose of this article to deal with the type of AC operated HT supply unit the beginner will find most useful, the other methods deserve some attention, as there are one or two points in connection with the use of batteries and operation from DC mains which are worth mentioning.

There is also a fourth but now little used and almost forgotten means of obtaining transmitter HT, and that is (or was) the hand-generator. Of the older school of amateurs, many did very well with these machines, which one actually worked by hand while operating the key at the same time! In those days, when self-excited oscillators were in vogue, it meant steady turning to keep the signal stable, as variations in speed—the generator was a geared arrangement giving perhaps 30 watts maximum output at 600 volts —caused both creep and chirp, while the labour of turning was considerable due to the high gear-ratio. 'Phone working was very difficult—one could hear the operator panting as he turned the handle—though one ingenious soul rigged up a treadle affair with a fly-wheel, which gave surprisingly good results. So much for history!

Battery Operation

Where there are no mains, low-power working from batteries, either triple-capacity dry or HT accumulator, is quite possible, and in country districts there are still those who must use this type of supply. Where dry batteries are employed, they should be kept in a cool, dry place (even if it means running long leads) and the blocks making up the bank insulated from one another and the ground. This is more important than it appears, because a fairly high voltage unit, say 450 volts, simply lying on the ground very often shows a measurable leakage current, which increases in damp weather. This is due among other things to deterioration of the card-board bottoms of the blocks, never very thick even in expensive batteries. They should therefore be stacked up off the ground such that there is ample clearance between them; the simplest way of doing this is to use marine-type or "reel" insulators, which lie flat.

If no meter is available, earth leakages can often be detected by the fact that one gets mysterious and apparently inexplicable shocks from the apparatus when it is supposed to be switched off. It is worth noting here—as an example of how much power can be wasted—that at one battery-operated station the earth leakage in wet weather was found to be nearly 10 mA on a 500-volt supply.

Another point in connection with battery working is that if the unit is tapped for the supply of receiver or oscillator-doubler stages, the blocks should be changed round periodically so that the loading is more or less equal. This prevents one battery going dead before the others, thereby introducing a high resistance link in the chain.

Accumulator Supply

In using HT accumulators, the same safeguards are called for as regards insulation, and it is as well to make sure that the charging—if it is not done at home—is properly carried out at the service station. The writer, visiting a strange garage on one occasion, found HT accumulators (somebody else's) on charge at 3 amps ! At another, the 10-volt blocks of a 240-volt assembly were paralleled and the charge-rate adjusted to ½-amp. which, while it was a step in the right direction, meant that . . . well, work it out !

A third method of getting battery power used to be the well-known Milnes unit, where all the charging could be done in the station if a low-voltage DC supply was available. The disadvantage of this type of battery was the rather high first cost, but Milnes units when used correctly were probably the best answer to the problem of battery working. For those who may not know, they consisted of nickel-iron cells—therefore practically indestructible—made up in standard voltages, and the charging was done from a 6-volt LT accumulator simply by paralleling the cells, switching being arranged for the purpose. That this method of charging was possible was due to the fact that the voltage of a Ni-Fe cell is 1·5.

DC Mains Supply

The standard pressure is 230 volts, and for low-power work with simple gear, DC mains are ideal, for the obvious reason that one need never worry about the milliamps, which are an ever-present anxiety with batteries. Smoothing is, however, very necessary, and there are various precautions which must be taken. The most important one is that the gear should always be earthed through a large condenser, 4 μF or more, in case either the positive side of the mains is at ground potential or the supply leads become crossed accidentally. The best way to ensure that mistakes do not happen is to run the earth lead to one side of the condenser, fixed somewhere well out of reach, the other side going to a large terminal or bus-bar, conveniently placed, to which all earth connections are taken.

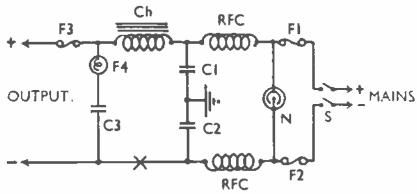


Fig. 1 shows the arrangement of a DC mains filter, delivering a hum- and ripple-free PDC supply and preventing RF feedback from the transmitter into the mains.

DC POWER SUPPLY PARTS

S—DPST main switch.
F1, F2—Mains fuse.
N—230v. Neon pilot.
RFC—Mains RF chokes.
C1, C2—2 μF 250v. DC working.
C3—8 μF electrolytic.
Ch—150 mA 20-henry smoothing choke.
F3—150 mA fuse.
F4—60 mA fuse.
X—Try choke Ch. in this lead, as best results depend upon which side of mains is earthed.

Two further points. The polarity of the supply is easily determined by dipping leads connected to the mains in a glass of water. The side which gasses freely is negative. A precaution to take for this test is to put a house-lamp in series in case the bare wires touch in the water, while the gassing effect can be stimulated by adding a little accumulator acid.

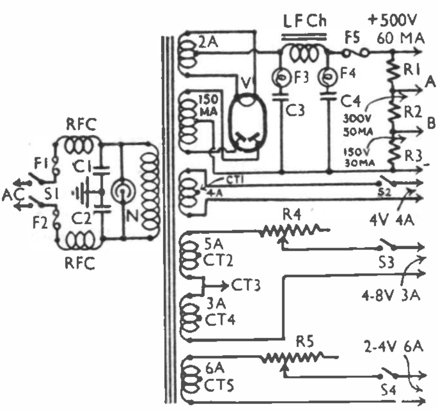
Before leaving DC, it should also be remembered that it is possible to boost up the voltage by putting HT accumulators in series with the main, and the charging of the latter becomes a very simple matter.

AC Units

The requirements of most readers will fall under this head and the design and construction of a suitable unit will be dealt with in detail.

Though, as has been said, good work can be done with a comparatively low-voltage supply, if a power unit is to be installed for transmission, it is as well to put in one giving at least 500 volts at about 150 mA. The reason for this is that transformers and other apparatus up to this rating are in general use and are therefore standardised, which means that they are reasonably priced and easily obtainable. Supplies above 500 volts come into the "special" category, with a consequent sharp rise in cost. Even if the power required initially is only 25 watts or so, a 75-watt unit will take care of immediate future requirements, thereby saving expense on the HT side till really high voltage becomes necessary.

Advertisers in the *Magazine* offer transformers of the rating suggested, and it is wise to select one having as many LT windings as possible, as they are always useful, even if not required at first.



A complete wiring diagram of a suitable unit is shown in Fig. 2. Note that, as in Fig. 1, an RF filter is incorporated, as with certain transmitter arrangements and types of aerial coupling, there is a tendency for RF to get back to the power supply and so into the mains, causing unnecessary and avoidable BCL interference. The condensers C1, C2 and RF chokes are as described under Fig. 1. The latter can be home-made by winding a paxolin tube 3 in. long by 2 in. in diameter full of No. 26 DCC, with 0·5 μF condensers at C1, C2. The main switch S1 should be conveniently placed on the bench so that it can be reached quickly if fireworks suddenly start; the neon pilot N, showing whether the gear is live, should be mounted such that it can be easily seen. The valve V is a full-wave rectifier and various makes are suggested under the diagram. Note that these are all indirectly heated or are of the type having slow-heating filaments. This is an important point, as it prevents high surge voltages due to switching; some of the cheaper rectifiers, particularly those of Continental make, have quick-acting cathode elements. If such a rectifier is used, the fuse F3 will blow when switching on, as the input condenser C3 would charge up suddenly.

The function of the fuses F3, F4 and F5 is partly to save the unit in the case of a condenser breakdown or external short, and partly to give an indication of, and protection from, RF feedback from the transmitter. F3 and F4 should therefore be of the 60 mA bulb type, and F5 can either be a 200 mA bulb or a cartridge fuse. This fusing gives complete protection of the HT supply, and is therefore well worth incorporating.

The point about RF feedback is interesting; under some conditions—particularly when any type of single-wire aerial feed is used—various adjustments of the coupling network will cause the RF return to find an easy earth path through the power supply to the mains, and this can happen even if good RF chokes are used in positive feed leads. The reasons are a variety of coupling and capacity effects which depend on the layout of the transmitter and the disposition of the supply leads, and RF feedback is very prone to occur where a long transmitter earth is necessary.

The result is that a sudden surge of RF energy pushes its way through C4, and even with quite low power can amount momentarily to several amps. This weakens, if it does not destroy, the smoothing condenser, leading at first to insufficient smoothing and finally to complete breakdown. Hence the fuse F4, which covers the power pack in the event of normal failure and also shows visually the presence of feedback, though it should be said here that a 60 mA bulb will only give a single bright flash before expiring.

AC SUPPLY COMPONENTS

V—Full wave rectifier. Cossor 460B.U., Mullard FW4-500, Osram MU.14, or similar.

S1—DPST mains switch.

F1, F2—Mains fuses.

F3, F4, F5—See text.

RFC—See text.

C1, C2—0·5 μF 250v. DC working.

N—230v. Neon pilot.

C3-C4—4 μF 600v. DC working.

Ch—150 mA 20-henry smoothing choke.

R1—2,000 ohms 20-watt resistor.

R2—4,000 ohms 10-watt resistor.

R3—30,000 ohms 5-watt resistor.

R4, R5—See text.

S2, S3, S4—SPST toggle switches.

CT1, CT3, CT5 should be earthed when their respective windings are not in use. If two windings are joined to provide extra LT voltage, as shown, note that CT2 and CT4, the centre-taps of the two individual windings, must at all times be left free as there is a p.d. between them.

Readers operating transmitting apparatus and having continual trouble with smoothing condenser failures should investigate this point, as the insertion of a bulb at F4 may explain the reason. Ordinary smoothing condensers are not designed to carry several amps. of RF !

The resistance network R1, R2, R3 has been calculated to give the outputs shown in the diagram under load conditions. These are convenient values for normal working and assume good regulation, but it should be noted that the voltage at taps A and B will be affected by varying loads at these points. The total resistance R1, R2, R3 forms a bleeder passing a steady 10-15 mA to keep the voltage constant under CW conditions. If the transmitter or other load to be put on the power pack already includes voltage-dropping resistors, or if for any reason the taps A and B are not required, R1, R2, R3 can be replaced by a single 40,000 ohm 10-watt resistor, which will be passing about 12 mA and dissipating 6 watts continuously.

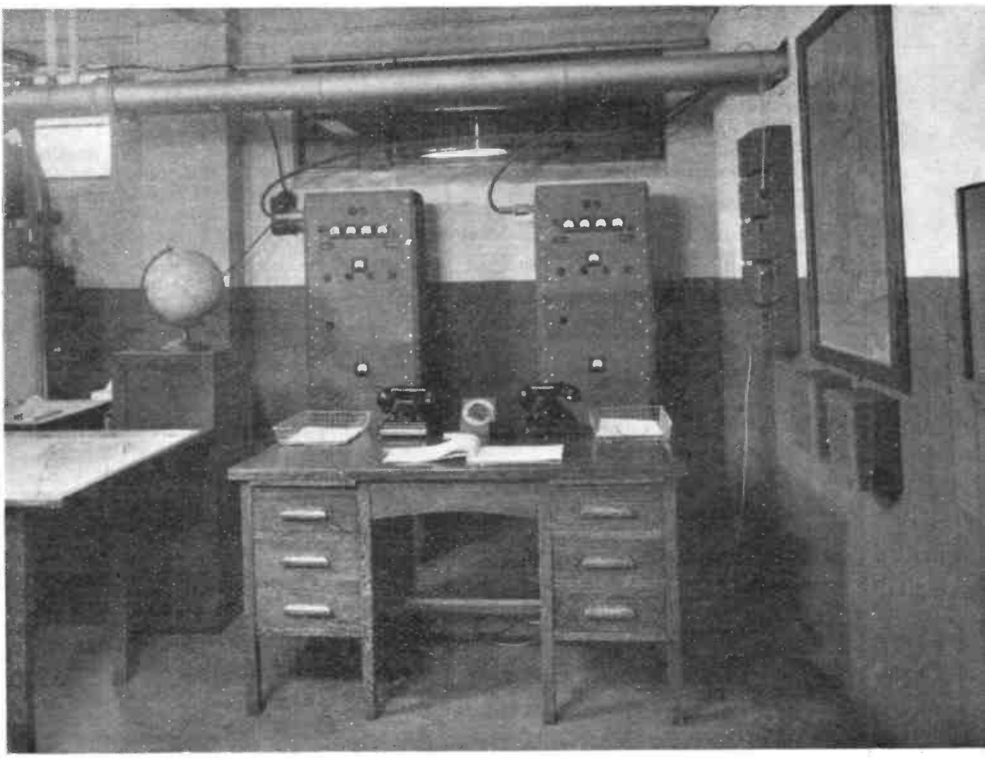
As shown in Fig. 2, the power transformer has five LT windings—leaving four for feeding the transmitter, and assumed to be the usual 2-0-2 volts. If 6 or 8 volt supplies are required, two windings can be put in " series." This is done quite simply by taking the two ends of one winding and testing them in turn against one side of the winding next adjacent. The right way round will be shown by a reading of anything up to 10 volts across the two outers. In phase opposition—the wrong way—the voltage will be practically nil. The current load on two such windings in "series" must not, of course, exceed the rated capacity of the lowest of the two.

The rheostats R4 and R5 will depend upon the output required, but maximum values of 5 ohms, with a current-carrying capacity up to 5 amps. or so, will be ample. Such items can usually be obtained for a few pence from junk shops, while those who ever used bright-emitter valves should have some on hand !

As regards the layout and construction of the power unit, the best thing to do is to mount all the parts on a steel chassis, earthed, about 9 in. by 12 in., such that there is ample ventilation for the rectifier and resistors. A small panel 6-in. by 6-in. carries the output terminals, control rheostats, and heater circuit switches S2, S3, S4, while if an AC ammeter is available, it can also be mounted on this panel and arranged for switching into the LT circuit required. Note, however, that it is better to adjust the rheostats by connecting a good voltmeter across the valve socket, as the ordinary moving-iron type of AC ammeter is usually somewhat unreliable.

After completion and testing, the power pack can be placed under the bench out of the way, and it is advisable to provide it with an earthed sheet-metal cover, with plenty of ventilation holes, which will minimise the effect of dust, prevent the possibility of shocks (or shorts due to tools falling in !) and also restrict the field from the apparatus. Much hum trouble can be obviated by this simple means. A further point to watch in this connection is that of earthing the centre-taps of the LT windings not loaded. These centre-taps should not be otherwise used, as it is always more satisfactory to centre-tap at the valve socket in the usual way.

Finally, if long LT leads are necessary, use heavy cable, as the voltage drop in a few feet of light flex carrying several amps. is quite considerable.



Layout of the Headquarters Station for the Radiophone Mobile Control System developed by Eddystone. *This enables constant two-way contact to be maintained with police patrol cars, fire tenders and floats, and in other services where speedy mobile point-to-point communication is essential. The transmitter, with an aerial power of* 100 *watts, is VFO switched, and the frequency can be set anywhere within the limits* 40-150 *mc.*

Amateur Radio in Germany

Further to the note which appeared on p. 45 of the March issue, we now have authoritative information on the latest position regarding amateur activities in the British and American Zones of Occupation. There is, however, still no leakage of news from behind the iron curtain.

It seems that, due mainly to the efforts of F/Lt. E. J. Fowler (VE5VO-D2VO) and a small band of enthusiasts, the British Signals Communication Board agreed to give qualified individuals of British nationality the same facilities as we enjoy over here, subject only to a power limitation of 50 watts. Licencees need not necessarily be pre-war holders of callsigns, but if not, must be in one of the Service trades qualifying for exemption. The BSCB acts as the licensing authority, the detailed work having been undertaken by D2VO. He also issued the callsigns, from the block D2AA-D2ZZ. F/Lt. Fowler has now been posted back to England on his way home to Canada, and his duties as Organising Secretary have been taken over by Capt. J. E. Terry (G4DI-D2DI).

Below is the list of 25 calls, with QRAs, which have been issued to date in the British Zone. The Americans, working on the same lines as our people but with more liberal notions as to power, have issued no less than 130 licences in their Zone, in the sequence D4AAA-D4AFQ. We have the QRAs, but such a list is too formidable for publication in full. Readers may, however, obtain the QRA of any D4 in this sequence on application to our office. But we can *not* forward cards or other correspondence.

AMATEUR QRA's IN BRITISH ZONE, GERMANY

D2AA	Col. J. D. Parker, Main H.Q., Bad Salzuflen, Posts and Telecommunications Branch, I.A. & C. Division, Control Commission for Germany (BE).
D2AB	Maj. C. M. Clothier, Main H.Q., Bad Salzuflen, Posts and Telecommunications Branch, I.A. & C. Division, Control Commission for Germany (BE).
D2CK	Lt./Col. Charles Kidd, Radio Section, P. & T. Branch, C.C.G. (British Element), c/o 609 Mil. Gov. Det., Hamburg.
D2CM	F/Lt. Chas. A. Mills, Hindenburg School, Herbert Strasse, Oldenburg, Germany. H.Q. 8402 A.D. Wing, B.A.F.O.-B.A.O.R.
D2DA	Maj. D. A. MacDonnell (G6ID XU8DI SU1DA), Elmshorn, Germany, c/o 530 Mil. Gov. Det., B.A.O.R.
D2DI	Capt. J. E. le B. Terry (G4DI), No. 3 Company, 1 H.Q. Signals, H.Q. B.A.O.R., B.A.O.R.
D2DP	S/Ldr. D. E. Postle, H.Q. 84 Group, B.A.F.O.-B.A.O.R.
D2FC	F/Lt. W. Cooney, 4 Straussweg, Buckeburg, Germany, Officers' Mess, Air H.Q. (Admin.), B.A.F.O.-B.A.O.R.
D2HB	7607318 A.Q.M.S. H. Biltcliffe (G5HB), 46 (H) Inf. Bde. W/S, R.E.M.E.-B.A.O.R.
D2HH	F/O. H. B. Hebb, No. 7 Ratshultz Strasse, Oldenburg, Germany. H.Q. 8402 A.D. Wing, B.A.F.O.-B.A.O.R.
D2HU	Capt. T. B. Fox (G3HU), 1 X-Ray Repair Unit, R.E.M.E.-B.A.O.R.
D2JH	915014 Sgt. J. Harris (2FPY), "A" Squadron, 2002 A.D. Wing, B.A.F.O.-B.A.O.R.
D2JM	14308077 C/M J. Monk, 8th Armoured Brigade, R.E.M.E. Workshops, B.A.O.R.
D2KI	W/Cdr. P. C. Mortimore (G8KI), H.Q. No. 2 Group, B.A.F.O.-B.A.O.R.
D2KW	Capt. R. G. Shears (G8KW), Radio Section, P. & T. Branch, C.C.G. (British Element), c/o 609 Mil. Gov. Det., Hamburg.
D2LD	2330805 Sgt. L. M. Davies, 30 Corps District Signal Park, B.A.O.R.
D2OJ	S/Ldr. E. C. Poole (VE3OJ), H.Q. 84 Group (Disarm), B.A.F.O.-B.A.O.R.
D2PF	S/Ldr. B. H. D. Beck (VE3PF), H.Q. 8402 A.D. Wing, B.A.F.O.-B.A.O.R.
D2QU	F/Lt. F. Winters (VE4QU), H.Q. 8402 A.D. Wing, B.A.F.O.-B.A.O.R.
D2SC	Maj. C. Collins (G8SC), 23 Advance Base Workshop, R.E.M.E.-B.A.O.R.
D2TG	Capt. J. T. Blackwood (G3TG), P.T. & T., c/o 609 Mil. Gov., Hamburg.
D2VO	F/Lt. E. J. Fowler (VE5VO), H.Q. 84 Group (Disarm), B.A.F.O.-B.A.O.R.
D2VY	F/Lt. E. K. Williams (G8VY), H.Q. 84 Group, B.A.F.O.-B.A.O.R.
D2WO	S/Ldr. W. K. Walker (GW2WO), H.Q. B.A.F.O. Ops., B.A.F.O.-B.A.O.R.
D2XZ	Maj. McNeil Creig (2FBU), H.Q. 51 (H) Div. Signals, 30 Corps. B.A.O.R.

THE MONTH WITH THE CLUBS

FROM REPORTS

We are glad to welcome no less than five clubs—Whitefield, Northern, Grafton, Watford and Midland—which are new to these pages, and it is hoped that they and all other active radio clubs and societies will appear regularly. The closing date for notes is the 20th of each month, to ensure publication in the following month's issue. If secretaries will make a point of letting us have material by this date *latest*, it will be a great help.

Whitefield and District Radio Society.—The aim of this society, formed in February last, is to cater for all interested in Amateur Radio, irrespective of age, sex or experience. Morse sessions have been arranged and at present the meeting night is every Monday at the Stand Grammar School, Higher Lane, Whitefield, Manchester. The society is planning its own station, and a series of lectures on Amateur Radio has been arranged with the particular object of helping newcomers. Anyone living on the north side of Manchester is invited to the meetings.

Southend and District Radio and Scientific Society.—G6CT reports that a Sale and Exchange section is to be operated at each fortnightly meeting, with the idea of helping members who have new equipment under construction. He emphasises that this will *not* be a junk sale under a new name! Each piece of apparatus will be valued at a reasonable figure. A reference library is being got together, under the direction of G2XW. Now that we have got 1·8 mc back, the Field Days sub-committee is busy with plans for the new season. Southend has always been very keen on the use of this band, and we hope to see some inter-Club activity on 1·8 mc soon.

Watford and District Radio and Television Society.—Secretary J. C. Warren reports a resumption of activity, and all interested in Amateur Radio are invited to attend the meetings—first Tuesday each month—at 7.30 p.m. at the Carlton Tea Rooms, 77 Queens Road, Watford.

Grafton Radio Society.—Readers in the north and north-east areas of London will find Nag's Head Junction very convenient for travelling to the Grafton meetings; they are held every Thursday and Friday, 7.30-9.30 p.m., at the Grafton L.C.C. School, Eburne Road, Holloway, N.7. Regular Morse instruction, as well as facilities for amateur transmission and practical work generally, will be provided. The society is fortunate in having secured excellent premises; arrangements are in hand for a cost-price canteen. Grafton is being organised by W. H. C. Jennings, A.M.I.R.E., who will be very pleased to hear from readers within reach.

Midland Amateur Radio Society.—The orbit of M.A.R.S. is strictly confined to Amateur Radio, and it is one of the strongest and best-known societies of its kind in the country, with a large membership. At the February meeting, the feature of the evening was "Back on the Air," opened by George Brown, G5BJ, with a talk on exciter units. A very lively and interesting discussion followed and it was decided to continue the subject at the March and April meetings, covering station layout, keying circuits, buffers, finals and aerial tuning. It has been agreed that a crystal register should be kept—this is a very good idea in areas where activity is high. The next meeting of M.A.R.S. is on Tuesday, April 16, at 6.30 p.m. in the Chamber of Commerce, New Street, Birmingham. Visitors will be very welcome.

Northern Radio Club.—Membership now stands at 22 and is increasing. The club has arranged visits to the local BBC and grid power stations; Morse classes are held regularly and a series of technical lectures is being given by the more advanced members. A local field day is being planned for May or June. The meeting nights are each Wednesday and Saturday, and new membership is solicited.

Romford and District Amateur Radio Society.—G2FLK has taken over from

G3FT, and reports that the society is sponsoring a special meeting this month to co-ordinate Amateur Radio activities in the South-West Essex and East London areas. Time and place: 2.30 p.m. on April 28, at the Greyhound Hotel, High Road, Chadwell Heath, Essex. All interested will be welcome. Buses 86a, 693 and 721 pass the door. Romford's regular Tuesday meetings are at 8.0 p.m. in the Masonic Hall, Western Road, Romford, and they like to see prospective members.

Edgware.—G4KD writes to say that their future activities will include lectures on radio principles, construction in easy stages, valves and a monthly junk sale. Their last dance was such a success that another is being held on April 20; they welcome visitors. Two of the Edgware AA's have got through the Morse test and are awaiting licences, and two others are being coached for the examinations by members who have already passed these hurdles.

Slade Radio.—At the meeting held on March 22, a talkie film was shown to the Society, explaining the working of a cathode-ray tube and also its application to meteorological research. This was followed by a demonstration and discussion of two commercial and one member constructed oscillograph. The subject proved to be of great interest and a number of points were discussed very fully. Membership is growing very rapidly; 18 new members have been enrolled in the last two months.

On April 26 there will be a lecture on "Transformer and Amplifier Design," and on May 24 a talk and demonstration on "Moving Coil Pickups."

Following are the names and addresses of the secretaries of the clubs mentioned this month. They will be pleased to give every assistance to prospective members.

EDGWARE. P. A. Thorogood, **G4KD**, 35 Gibbs Green, Edgware, Middlesex.

GRAFTON. W. H. C. Jennings, 82 Craven Park Road, London, N.15.

M.A.R.S. W. J. Vincent, **G4OI**, 342 Warwick Road, Solihull, Birmingham. (*Tel.*: Solihull 0413.)

NORTHERN. A. Robson, 522 Denton Road, Newcastle-on-Tyne, 5.

ROMFORD. T. L. Delvin, **G2FLK**, Greyhound Hotel, High Road, Chadwell Heath, Essex.

SLADE. L. A. Griffiths, 47 Welwyndale Road, Sutton Coldfield, Birmingham.

SOUTHEND. J. M. S. Watson, **G6CT**, 23 Eastwood Boulevard, Westcliff-on-Sea, Essex.

WATFORD. J. C. Warren, 29 Market Street, Watford, Herts. (*Tel.*: Watford 5988.)

WHITEFIELD. R. Lawton, 10 Dalton Avenue, Whitefield, near Manchester.

NEW QRA's

A note appeared in our March issue that we would be glad to print the name and address of any licensed amateur whose QRA is either different from the address given in the September 1939 issue of the Call Book, or did not appear in that issue. We should have added that all such QRA's sent in to us will also be forwarded for inclusion in the new Call Book now in preparation. Write QRA Section, *Short Wave Magazine.*

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ADDRESS WANTED

Will C. H. Young, G2AK, or anyone knowing his whereabouts (QRA *not* as in Call Book), please give us his address.

SMALL ADVERTISEMENTS

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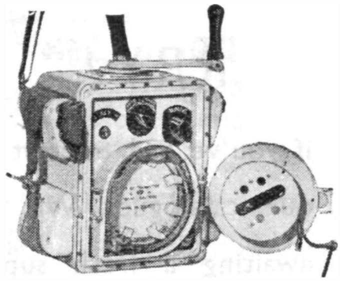
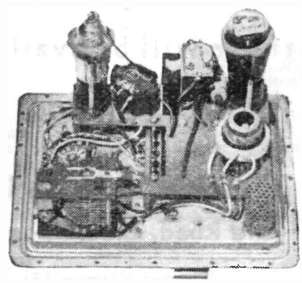


Complete Transmitter



Top Panel of Transmitter

REDIFON 605A WAVEMETER

THE Rediffusion 605A Wavemeter has been constructed to have a discrimination of 0.1 per cent over a range of frequencies from 100 to 43,000 kilocycles (3,000 to 7 meters). This range is covered by using 8 coils, which are carried in a separate case and are used in conjunction with a graph card made out for each individual coil. Tuning is by means of a variable condenser.

The wavemeter unit is light and compact, weighing only 7½ pounds, and is 5″ x 8″ x 8″. The construction throughout has been designed to resist severe variations of climate in most parts of the world. The eight coils are carried in a case of similar size, weighing 4 pounds. In use the coils are attached to two terminals placed on the side of the wavemeter.

This instrument is available now. Further details can be sent on request.

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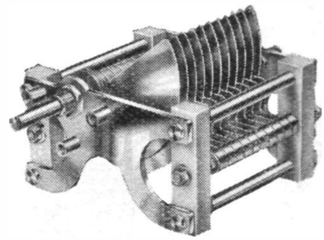

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