

The

SHORT WAVE

Magazine

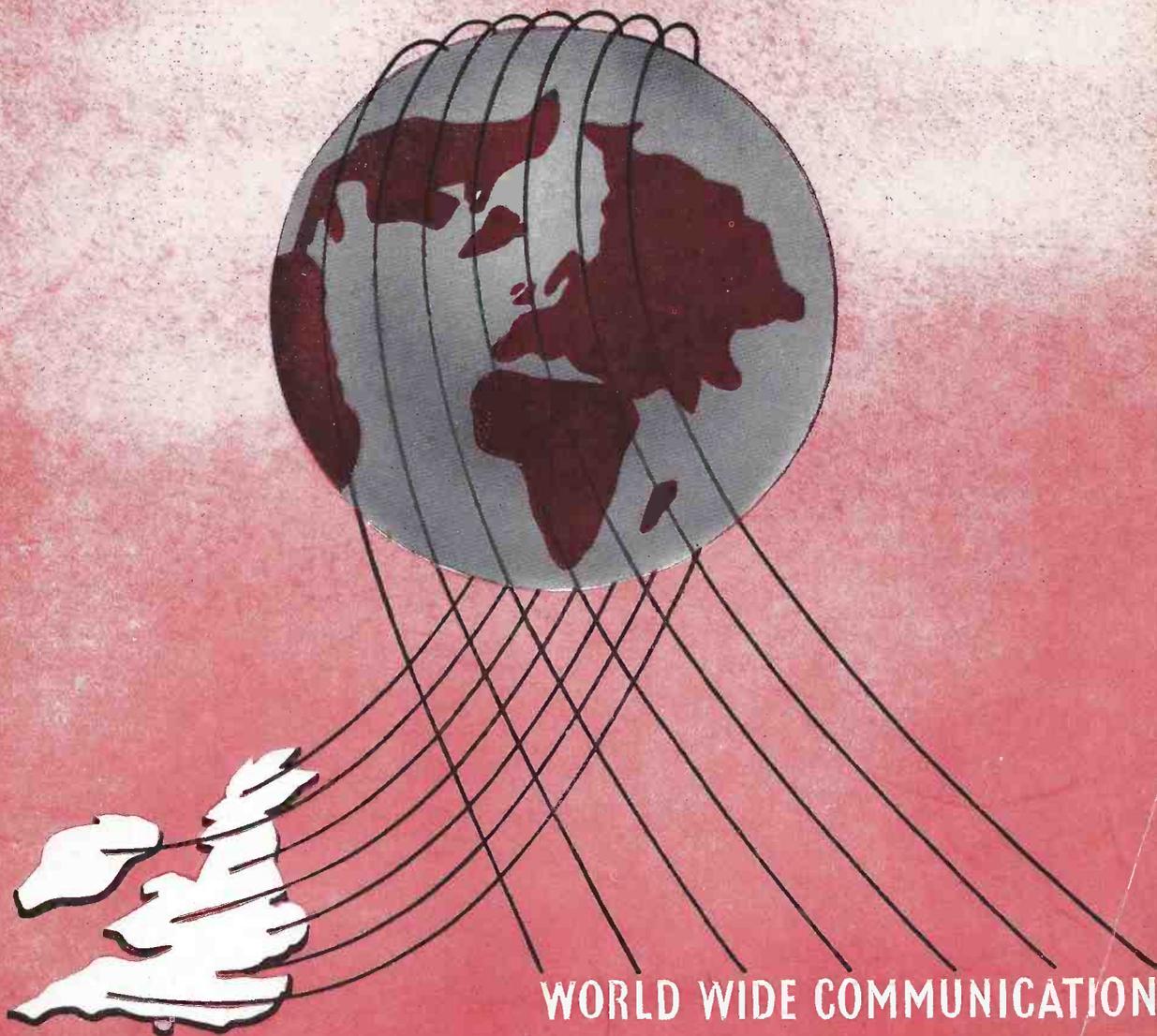
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VOL. XII

SEPTEMBER, 1954

Code

NUMBER 7



WORLD WIDE COMMUNICATION

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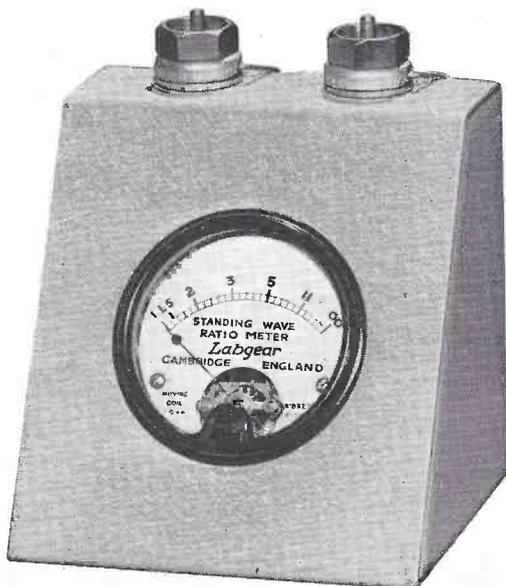
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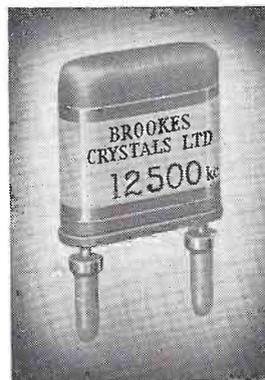


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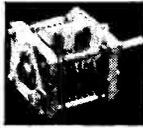
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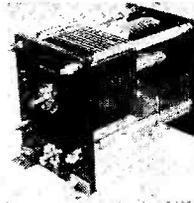
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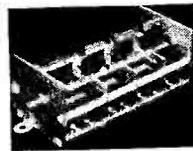
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The
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E D I T O R I A L

Competition

Some years ago in this space, we discussed the competitive element in Amateur Radio, with particular reference to the working of DX as its expression. With the contest season upon us once more, it is worth considering one of the less-obvious aspects of contest activity.

It can be argued that competition would be unnecessary—and even undesirable—in that perfect state to which, but for the frailties of human nature, we might already have succeeded. For two thousand years of recorded history, clever men have been trying to change human nature, with no signs of success. Therefore, it is reasonable to suppose that the competitive element will remain one of the dominant factors in nearly all fields of human activity and endeavour, of which Amateur Radio is one.

However, there are those who maintain that in Amateur Radio the competitive spirit should be discouraged; and they can advance many good arguments to support their contention. But as in any other sphere, in Amateur Radio it is competition that is the spur to progress. It cannot be gainsaid that the great technological advances during the years after 1939 were vastly accelerated by the pressure of war—which is another form of competition. Because of war, on both sides results were produced in three years which otherwise would not have been achieved in thirty.

Reflecting this argument into our own field, it can be shown that the competitive element is a good thing for the progress of Amateur Radio. Thus is the practice of the art improved and developed to the ultimate benefit of all concerned—including those who have no particular interest in competitive activity for its own sake.

*Austin Fobyl
G.F.O.*

Mobile Station G3AMM/M on Eighty

LAYOUT OF
A PRACTICAL
INSTALLATION



G. F. C. LAYZELL (G3AMM)

The notes accompanying the illustrations of G3AMM/M will suggest one possible line of approach for those contemplating mobile working on the communication bands. The receiver problem is met by using dry-battery valves in a simplified superhet circuit, and the transmitter is also stripped to the bare essentials. The aerial is a quarter-wave vertical working against the car chassis, with the radiating element brought to resonance by means of a series loading coil.—Editor.

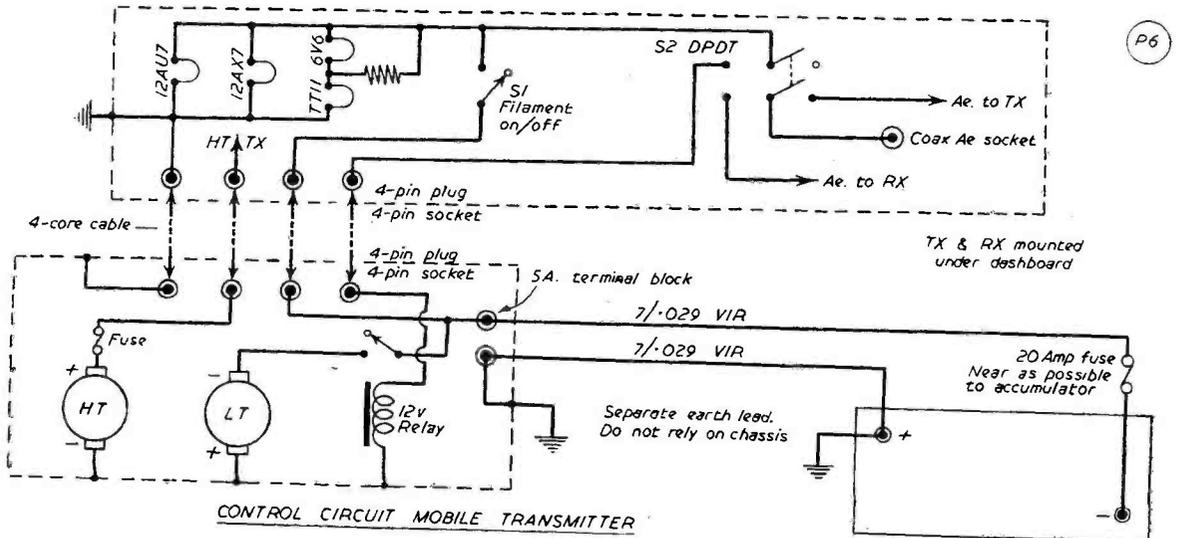
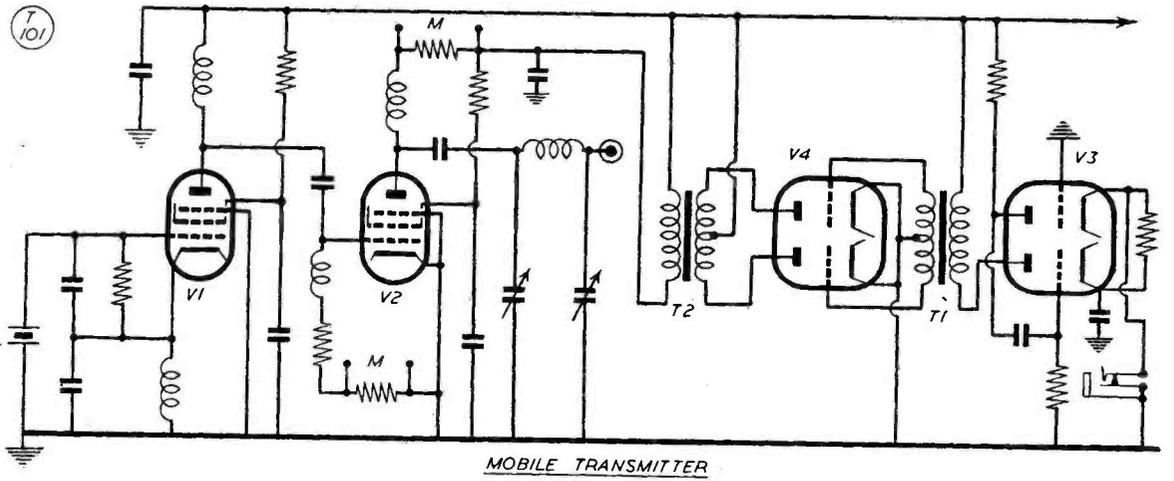
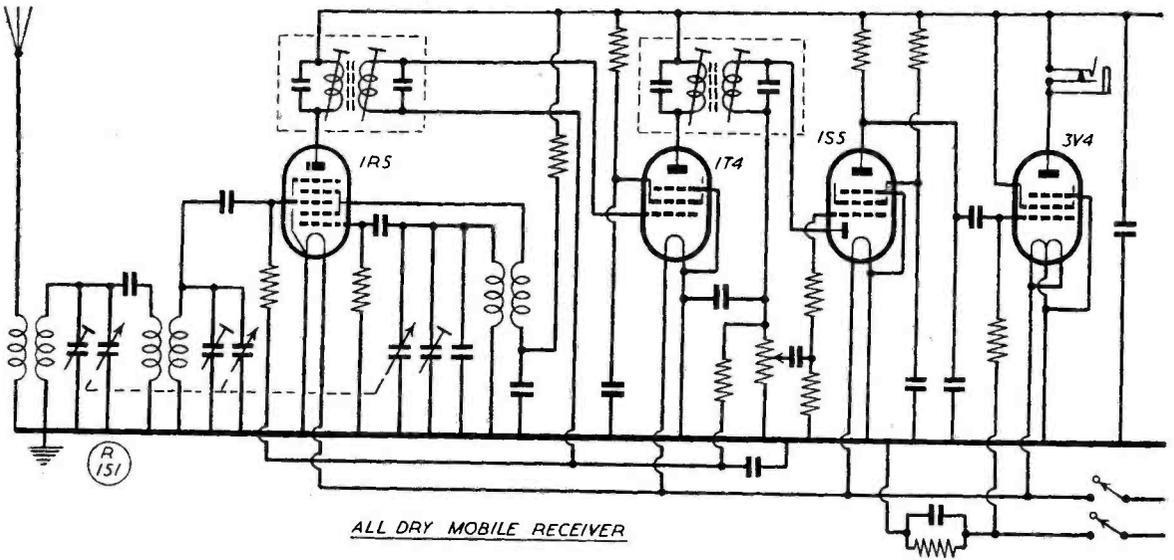
THE transmitter and receiver are separate units mounted in the same case, which is the inside of a TUSB cabinet. The transmitter runs from a dynamotor, while the receiver is "all-dry." The volume control incorporates a DP switch, so that during transmission, the volume may be decreased for monitoring, or the receiver turned off. No drift is experienced when switching on again. Some second-channel interference was noticed at first, but the band-pass arrangement obviates this. The receiver may be peaked up on the crystal frequency, as the band width of the whip aerial is very

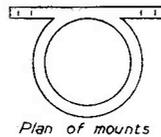
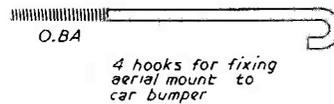
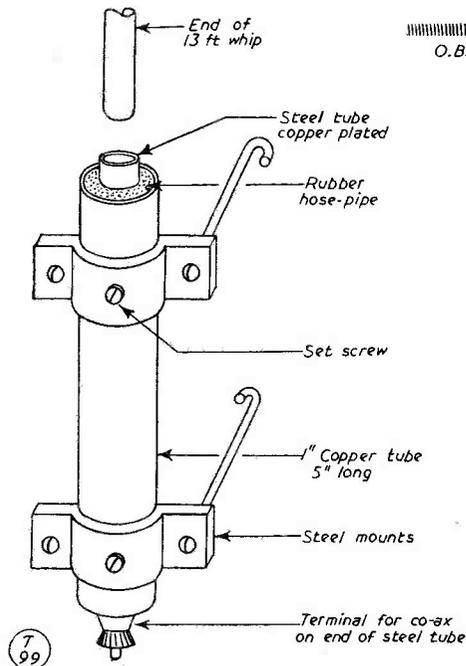
narrow. 90-volt and 1.4-volt batteries are housed in a spare space on the modulator chassis. A closed-circuit jack in the 3V4 anode circuit allows either phones or a 5-inch loud-speaker (with transformer) to be inserted. The speaker is mounted out of sight under the dash.

Transmitter Side

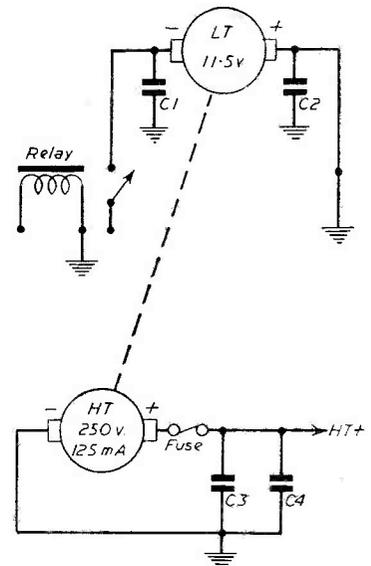
There are two switches on the transmitter. S1 puts on the heaters (HT cannot be applied until this is on.) S2 is a DPDT toggle switch: one side is for aerial change-over, while the other operates the starter relay. The aerial is fed via a Pi-coupler. With the centre-loaded whip correctly resonated at the operating frequency, tank resonance is very broad. The heaters of the 6V6 and TT11 are in series, with a suitable resistance or dial lamp in parallel with the 6V6; or they may of course

Showing the essentials of the Transmitter, Receiver and Power Supply Control Circuit in the G3AMM mobile installation. The dynamotor is mounted under the bonnet, near the 12-volt acc., and draws 5 amps on full load. The receiver is a simplified superhet for 80 metres, using "all-dry" battery valves. Denco coils and Denco IF transformers. In the transmitter, V1 is 6V6; V2, TT11; V3, 12AU7; and V4, 12AX7. T1 is a "Class-B" driver transformer, and the modulation transformer T2 is ex-SCR522; an 0-50 mA plug-in meter is used, with suitable shunts. M in the diagram.





MOBILE AERIAL MOUNTING



DYNAMOTOR FOR MOBILE TRANSMITTER

Details (left) of the whip aerial mounting; the centre tube is a piece off the butt end, forced into the length of rubber hose, which is then rasped down till it in turn is a tight fit in the 1-in. copper tube bolted to the bumper. On the right is the electrical layout of the dynamotor power supply unit; condenser values are C1, C2, 0.1 μ F; C3, .01 μ F, 600v. working; C4, 30 μ F, 500v. working. No other smoothing is necessary. Note the HT fuse.



be run from a 6-volt supply, or a separate lead taken from a tap on the 12-volt car battery.

Whip Aerial

The aerial is a 13 foot "fishing-rod" type of whip, as used on tank equipment, of copper-plated steel and tapered. To make the mount centre, a 5-inch piece is cut from the top of the bottom section. The loading coil, placed between the bottom and middle sections, is wound on a 7-inch length of $1\frac{3}{4}$ -inch diameter paxolin tube $\frac{3}{16}$ -inch thick; it consists of 119 turns of 18 SWG enamelled wire, close wound, and covered with Selotape. The actual number of turns depends on the configuration of the car body and other local factors. It must be adjusted accurately by means of a GDO placed near a two-turn link from the base of the whip to the car chassis. A good plan is to make the aerial resonate slightly above the operating frequency, then lower its resonant point by means of a "pig-tail" consisting of a length of up to 12 inches

The G3AMM/M 80-metre aerial arrangement for operation on the move. The loading coil can be seen just above the level of the car roof; total height is 134 feet. The power loading, from a 12-volt dynamotor, is 250v. at 125 mA total, with a PA input of 8 watts.

of 18 SWG wire clipped immediately above the coil. This will allow adjustments to be made when parked near buildings (or under bridges) by bending a length back on itself.

Feeder Run

The 52-ohm coax is taken under the car, passes up under the bonnet and goes into the interior via a grommet, together with the 4-core cable from the dynamotor. Best radiation is of course obtained from a top-

loaded whip. Even with the loading coil only 4 feet up there is plenty of sway when running at 45-50 m.p.h., but so far we have not had to go back for it!

The chassis of the transmitter/receiver assembly is divided above and below by screens into three compartments. This was not found necessary, but merely done as a precautionary measure. The receiver section can be removed completely by unbolting from the front panel.

Open Wire Transmission Lines

DESIGN, CONSTRUCTION
AND AERIAL MATCHING

P. M. CARMENT, M.B.E., A.M.Brit.I.R.E.
(G5WW)

This article will be of great assistance to those who need a clear explanation of the theory of RF transmission lines of the open-wire type; it will enable the beginner to undertake with confidence the design and installation of such a system for amateur band working. There is no need to reiterate the importance of the aerial if successful results are to be obtained—here we see how the highly-efficient open-wire RF feed line should be engineered for correct matching into the aerial.—Editor.

TRANSMISSION lines, more commonly known as feeders, are used to convey the RF energy from a transmitter to the aerial system or, conversely, to convey the received signal from the aerial system to the receiver. When the general arrangement of the station is such that the aerial system can be connected directly to the apparatus in order to attain the desired results, it is obviously better to do this because no feeder system can be completely loss free. However, in most amateur bands and nearly all commercial applications the requirements placed upon the aerial system are such that it must be more or less remote from the apparatus and connected to it by a feeder line. In this article it is proposed to give a non-mathematical treatment of the subject of feeder installation.

There are two main types of open wire line; tuned lines which deliberately operate with a standing wave on them, and matched, or "flat"

lines on which no standing waves are intended to be present. Before proceeding further it will be necessary to ascertain precisely what is meant by a standing wave and also to deal with other line properties. The most important of these is the surge or characteristic impedance of the line. This may be described as the same value as that of a non-inductive resistor which will accept precisely the same power from the generator as the line will accept when the latter is correctly terminated. The correct terminator will also have the same value as the characteristic impedance and a line so terminated will be flat, *i.e.*, the termination will accept all the power and there will be no standing waves on the line.

The property of characteristic impedance is related to the physical size and spacing of the wires and is given by the relationship

$$Z = 276 \log_{10} \frac{S}{r}$$

Where Z = Characteristic impedance in ohms.

r = Radius of the conductor.

S = Spacing of the wires from centre to centre.

It should be noted that r and S must be in the same units of measurement. The formula only applies when the dielectric between the lines is air. It is only accurate when the ratio of wire spacing to wire radius is fairly large. When close spacing is used the mathematics become extremely complex. It is possible to show a graph which will cover most normal requirements. An example is given at Fig. 1. For convenience, this graph has been constructed to use wire diameter instead of radius; it will be found that SWG wire tables give diameter rather than radius.

If a hypothetical feeder were infinitely long, a current started down it would eventually be completely dissipated and the current and voltage distribution would be as shown in Fig. 2. If we cut this feeder at some point, the current will no longer be able to dissipate along

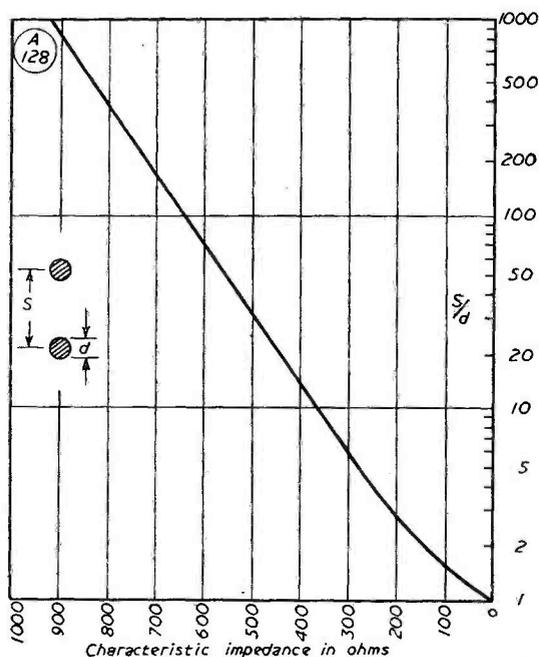


Fig. 1. Characteristic impedance of open-wire transmission lines. From this curve, a line can be designed for any required impedance match, e.g. for a 600-ohm line, the ratio S/d is 70, S being the spacing between the wires and d the diameter of the wire; from the wire tables, we find that 18g. SWG (a good practical size) is .048 in. diameter, making the spacing S , for 600 ohms, $70 \times .048 = 3.4$ inches. Again from the wire tables, we find that a one-pound reel of 18 SWG contains about 120 feet of wire, giving a feeder run of 60 feet, with a maximum current carrying capacity of 1.8 amps. To build the line, spreaders made from polythene rodging can be used, cut and drilled to give a spacing between the wires of 3.4 inches.

its length, but will come to an abrupt stop. As energy is still being introduced at the sending end of the line, something must happen to the current that has reached the open end; it cannot just shoot off into space. So it returns back up the line to the generator and a *standing wave* is set up. The returning current cannot be accepted by the generator so it once more sets out down the line and is again *reflected*. This process continues until the standing wave has built up to the maximum value allowed by the losses in the system and is maintained at that value. In practice a similar condition will be set up if the line is short-circuited instead of being cut. The short circuit cannot accept all the power supplied by the generator. The theoretical treatment of this condition is, however, quite different from that of the cut line.

Definition of SWR

Standing waves are normally expressed as a

ratio of maximum to minimum current along the line, i.e.:

$$\text{Standing Wave Ratio (SWR)} = \frac{I \text{ max.}}{I \text{ min.}}$$

There is, of course, no reason why the standing waves should not be expressed as a ratio of maximum to minimum voltage, but in practice the instruments commonly employed are *current* operated. The neon lamp, frequently used for rough and ready checks, is an exception to this, being voltage operated. The SWR can also be computed if the mismatch between line and termination is known, e.g.:

If a 600-ohm line is terminated with an 80 ohm load, the SWR will be $\frac{600}{80} = 7.5:1$

In practice it is found that the calculated values do not always hold accurately and there are many accidental factors which can prevent the line working strictly in accordance with its theoretical design.

Reverting to our cut line, if we now terminate it with a non-inductive resistor having the same value as the characteristic impedance, all the energy will be absorbed by the termination and there will be no reflection and consequently no standing wave. In other words, the voltage and current will be in phase and the distribution will be as in Fig. 3(a). From this it will be obvious that intermediate cases exist where the load is either higher or lower than the characteristic impedance. In all such cases a standing wave will be set up. The standing wave patterns for low and high resistive terminations are given in Figs. 3(b) and 3(c). It is also possible for lines to be terminated in a reactance which may be either inductive or capacitive. The standing wave patterns under these conditions are given in Fig. 3(e) and 3(g).

Matching

The process of fitting the characteristic impedance to the load and the effective removal

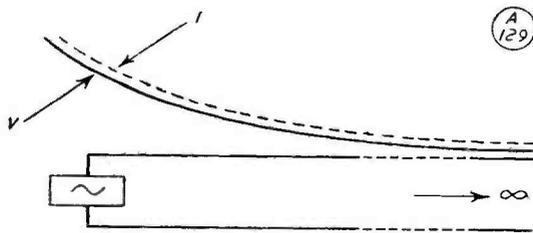


Fig. 2. Current and voltage distribution on an infinite line — see text for discussion.

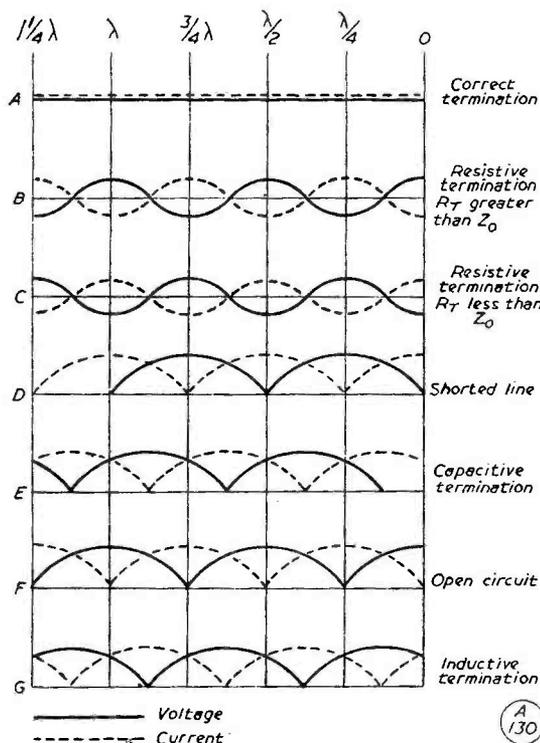


Fig. 3. This interesting diagram shows the relationship between voltage-current standing wave patterns and a variety of the terminations likely to be encountered.

of any reactance is known as matching. When the line is correctly terminated (or has infinite length) it behaves in exactly the same way as a non-inductive resistance having the same value as the characteristic impedance. This means that energy fed into the line will be continuously absorbed and travel outwards along the line with a velocity almost equal to that of light. The ratio of the velocity of the wave along a line to that of a wave in free space is known as the *propagation constant* and varies according to the dielectric medium used in the line insulation. For an open-wire line completely insulated by air, the speed of propagation will, for all practical purposes, be that of light or radio waves in space (186,000 miles per second). The propagation constant can be taken as 1. Such lines are quite practical by using the strained feeder and metallic insulator technique when very high frequencies are concerned. The propagation constant for conventional HF lines will be about 0.99. This delay is mostly introduced by insulators, but for most practical purposes it may be completely ignored.

It should be mentioned in passing that solid dielectric lines such as co-axials are quite a different proposition, the propagation constant generally being about 0.6.

Standing waves can be set up by feeder discontinuities such as sharp bends, changes in spacing and the introduction of high capacity insulators at undesirable points. These causes must be avoided whenever possible otherwise the line will have to be matched at several points throughout its length. The maximum amplitude of standing wave that can be tolerated depends to a certain extent on the type of service under consideration, but it is obviously desirable to keep the ratio as low as possible. In the case of short lines not exceeding a few wavelengths, having only a small number of supporting insulators and used for low power CW service, a SWR of up to 10:1 can be tolerated, always, of course, provided that the transmitter can be loaded to the required input under such conditions. At the other extreme, a high-power pulse transmitter using a peak power of many hundreds of kilowatts will require that the SWR be kept below 1.5:1 if serious corona discharge and flash-over are to be avoided. A high SWR on high power CW service will also cause flashover, and in all probability, excessive heating at current anti-nodes.

RF Into the Line

It is now desirable to discuss the generator that will feed the line, *i.e.*, the final stage of the transmitter. The generator has an internal resistance which is largely a function of the final valve. To understand this properly we must distinguish between the DC and AC properties of the valve anode circuit. With a given DC anode voltage and grid bias voltage, the valve will pass a certain current. The anode

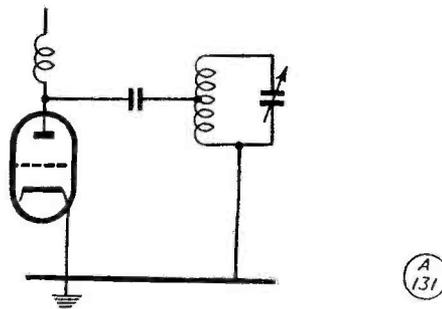


Fig. 4. Matching the PA valve into its own load, the tank circuit. A correct match can be obtained by tapping the anode connection down the tuned circuit.

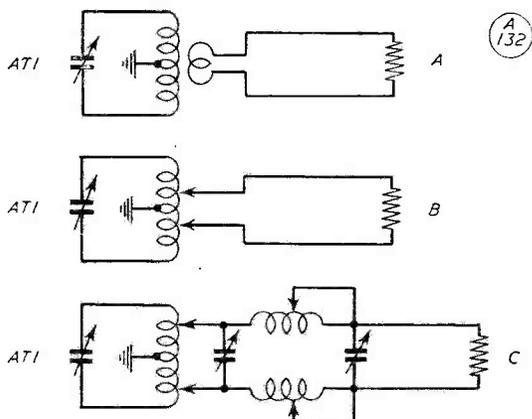


Fig. 5. Matching the tuned tank circuit into the transmission line, which is the immediate load on the tank.

voltage divided by the current in amperes gives the DC resistance, which is the figure required for modulator load calculations, but is of no value in the present consideration. When an AC voltage is introduced into the grid of the valve, we obtain an anode current comprising a steady DC current with a superimposed AC component. The valve offers quite a different resistance to this AC component and this is generally referred to as the anode impedance. The load must be matched to this impedance if the valve is to deliver its rated power output. The immediate load for the valve is its tuned anode circuit which is resonant at its operating frequency and consequently has its own impedance. The valve may be matched to this by tapping the anode down the coil, as in Fig. 4, or by the choice of valve and L/C ratio.

We are now faced with the problem of matching the tuned circuit to the transmission line. This is normally accomplished by some variation of one of the basic transformers or filter networks shown in Fig. 5. In Fig. 5(a) we have a straightforward double wound step-down transformer, and (b) is an auto transformer. Fig. 5(c) is the well-known Collins Coupler or pi-network. In the transformer method, the adjustment of tapping points or size of coupling coil is carried out by trial and error, until maximum feeder current is obtained consistent with correct anode current loading of the valve or valves. (In practice, the impedance of a short wave oscillator or amplifier is not usually known with any degree of accuracy, hence the empirical method). It should be noted that similar couplings can be used in any instance where a feeder is connected to a tuned circuit, *e.g.*, the input circuit

of a receiver.

Correct matching of the generator to the load is only necessary in so far as it is desirable to obtain the maximum transfer of energy. A mismatch at the sending end of the line will only cause a power loss and will not in itself cause standing waves to be set up.

Aerial Matching

The impedance of an aerial is a similar property to the characteristic impedance of a transmission line. It is quite distinct from the DC resistance of the aerial wire which need only be considered for special applications which will be mentioned later. When an aerial is correctly matched to its transmission line it will accept all the power available provided that the construction is such that it is capable of handling this power, *e.g.*, an aerial made of thin wire and with no anti-corona fittings would complain in no uncertain terms if presented with some hundreds of kilowatts! The impedance of an aerial can be explained as follows: Refer to Fig. 6, which represents a centre-fed aerial. The power is conveyed to the centre points along the feeder CA, DB. An alternating EMF, E , will be applied at A and B and an alternating current, I , will flow at these points, hence the aerial will offer an impedance to the feeder. This impedance is measured by the ratio of E to I and will generally have both resistive and reactive components.

A centre-fed aerial will be found to behave as follows: (a) The reactive component will vanish when the length of the aerial is slightly shorter than half a wavelength; (b) For an aerial exactly half a wavelength long, the input impedance is $80 + 43j$ ohms, *i.e.*, 80 ohms resistive plus 43 ohms reactive; (c) When conditions of zero reactance are realised the impedance is found to be 73 ohms; (d) The resistive component is maximum when the aerial is approximately one wavelength long. The resistive component is known as the Radiation Resistance of the aerial. In other words, the radiation resistance is the resistive component of the aerial impedance at the feed point. The value of the radiation resistance is such that if the aerial was replaced by a resistor, the resistor would dissipate the same power as would be radiated by the aerial. If a half-wave aerial is cut to a length which differs slightly from the optimum length, it will have a reactance and this reactance will increase as the diameter of the wire decreases. This is another way of saying that the sharpness of tuning of the aerial depends on the

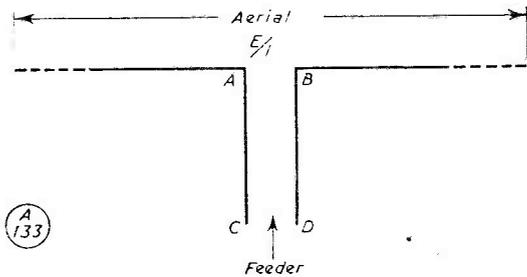


Fig. 6. The impedance at the feed point of a centre-fed aerial — see text.

ratio of its diameter to the wavelength. This property is of no importance in a CW installation operating on a spot frequency, but does begin to matter if broad band operation is required, or when the transmitter is producing wide side bands as in the case of television and pulse systems. In all such systems it is therefore necessary to use a fairly large diameter aerial.

If two aerials are placed close together so that each is in the induction field of the other, their impedances are altered, and if several aerials are placed close together this change in impedance will be considerable. It can be shown mathematically that the radiation resistance of any one aerial in an infinite stack (*Some gain! Ed.*) is 56 ohms. In a stack of finite dimensions the impedance of any one aerial will depend on its position in the stack. The mathematical treatment of this subject is very complex and is outside the scope of this article.

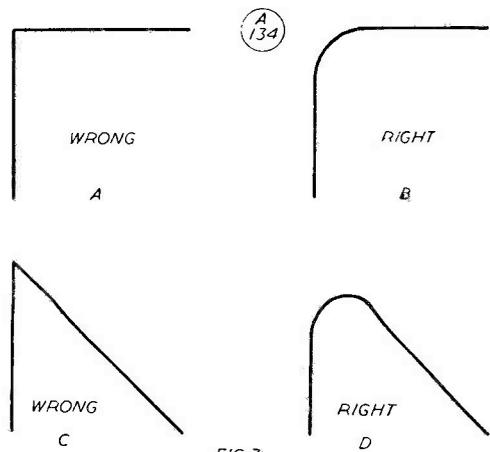
Feeding the Aerial

We now come to a consideration of the various methods of feeding an aerial or array. These may be classified into three broad types: (1) Direct feed without the use of transmission lines; (2) Parallel-wire feeders; and (3) Single wire feeders (the Windom) and co-axial feeders. Parallel-wire feeders can again be sub-divided into open-wire lines, unscreened parallel wire lines embedded in insulating material, and screened parallel wire lines embedded in insulating material. At present we are only concerned with open wire lines. The point on the aerial or in the array to which the feeder is attached will depend on a variety of factors and we will assume that this is specified by the designer of the system to produce the required results, or in the case of a choice of feed points, to provide a satisfactory mech-

anical arrangement in view of the physical layout of the system and the type of structure from which it is suspended.

As already explained, the surge impedance depends on the spacing and thickness of the wire. The most commonly used impedance is 600 ohms. Practical open wire lines can be constructed down to an impedance of 200 ohms. Matching the line to the array is, of course, simplified if the line impedance can be made the same as the array impedance at the feedpoint. Other considerations are the current developed in, and the voltage developed across, the line. It may be found that to obtain a line of specified impedance, the conductors must be extremely heavy in order that they may carry the current without overheating, or that the spacing of the conductors is insufficient to withstand the voltage across the line. In such cases, it is usual to choose a line that is working well within its capabilities and to use a matching device at the array to make the necessary impedance transformation. The line spacing is also controlled to a certain extent by the frequency. The spacing must be very small in comparison with the wavelength in order to keep radiation (or pick-up) down to a minimum. The largest spacing that is normally tolerated is 0.01 of the wavelength.

In the ideal system, the layout of the feeders should be symmetrical with respect to both the ground and the array, but on high frequencies this is found to be only of secondary importance provided that the feeders are at least half a wavelength above ground. It is extremely important that the length of each leg of the line should be the same in order to prevent unbalance. Some difficulty may be



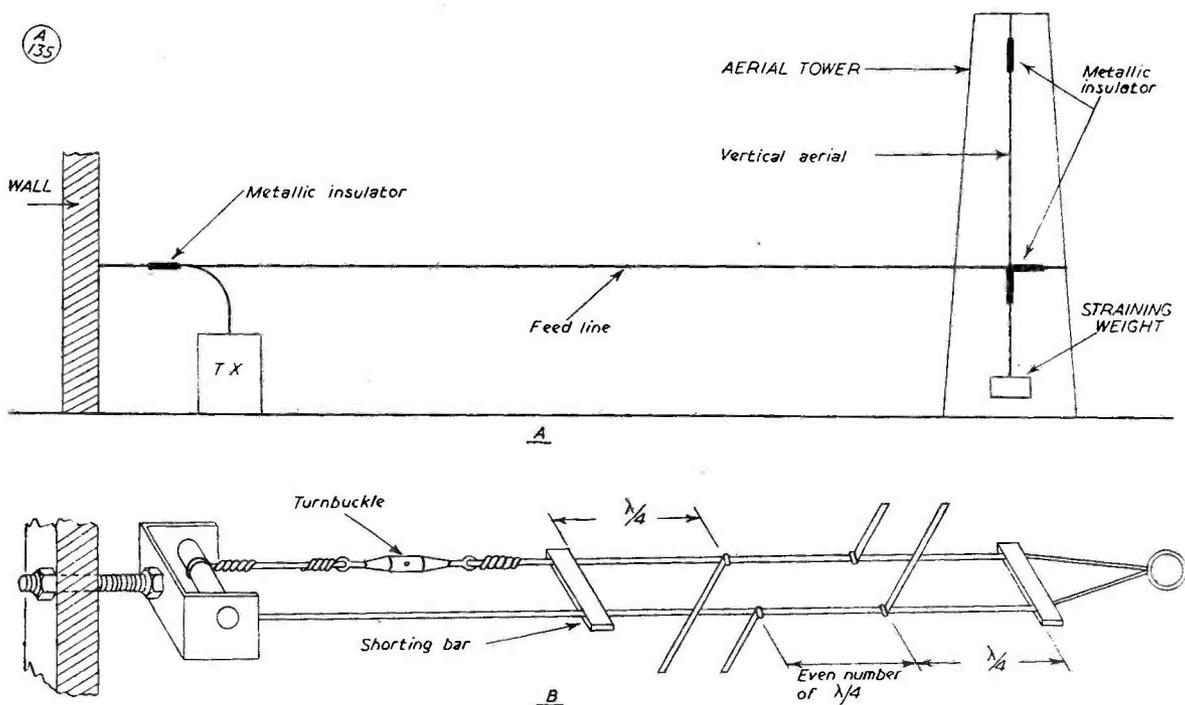


Fig. 8. (A) Single-line diagram to illustrate layout of strained feeder system. The quarter-wave metallic insulators, marked heavily in this sketch, are described in the text (B) is the detail of tensoning arrangements in a feeder system of this kind, using non-stretch wire such as cadmium-loaded copper.

found in achieving this when the line turns a corner, but it may usually be overcome by using lines in the vertical plane. This is only permissible when the line is well clear of the ground, otherwise unbalance may be introduced due to the fact that one leg of the line is closer to the ground than the other over the whole run. When using lines in the horizontal plane, *i.e.*, both at the same height above ground, the only satisfactory method of turning a corner is to change from horizontal to vertical disposition at the bend. This changeover can be made in such a manner that the spacing and line lengths remain constant. The unbalance will be negligible unless the bend is very long.

It is normal practice to avoid sharp bends as they have always been considered to introduce impedance discontinuity. There is no doubt that this is so with orthodox lines supported on fairly high capacity insulators. In all such cases the bend should be made with as great a radius as possible, even if this involves an overall increase in the length of the line. (See Fig. 7.) It was, however, discovered during the last war that feeders used for spot frequency working could be taken through right

angle bends with negligible loss by adopting the strained feeder and metallic insulator technique. Metallic insulators are usually quarter wavelengths of line shorted at the far end. The principles of this technique are shown in Fig. 8. In this type of construction it is advisable to use cadmium copper wire to withstand the strain without stretching. On short runs it is sufficient to use the rigging screw method of tensioning, but on long runs it is better to put on a concrete counter weight. This will ensure that the tension is maintained under varying temperature conditions. The tension required will depend on a number of factors such as wire gauge, length of run and strength of supporting structure.

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Super Modulation Simplified

AUDIO-RF DESIGN FOR AN
807 TRANSMITTER

F. HAGUE (ZB1AH)

Super-modulation is a method of carrier control of considerable experimental interest, because it enables results comparable with high-level modulation to be obtained using very little audio power. However, it is not quite as easy as that, since the RF stage takes a form quite different from the conventional push-pull PA arrangement, and the secret of success lies in setting up and adjustment. This article discusses a simplified Super-modulation system applied to a 10-metre transmitter, a band which is at present both suitable and convenient for experimental work of this kind. The reader is also referred to previous articles on the subject, which appeared in our issues dated October and November, 1950, and May, 1952.—Editor.

WITHOUT doubt super-modulation is a system of control well worth amateur attention. Although many have had difficulty in producing the desired result the labour is well worth while. The author has spent over nine months trying to find an easy way to avoid the many variables which make the lining-up procedure so difficult and it is believed that the circuit shown is as simple as any yet published. Though the circuit as given is intended for Ten Metres it is evident that once operating on this frequency, it is a simple matter to modify it for the other amateur bands. All that is necessary is to change L1 and L2 to suitable values.

Power Supplies

One of the most important factors is the construction of good power packs—since none of these supply large currents only small transformers are required, but careful design of the smoothing arrangements is necessary, choke input being desirable throughout.

For the transmitter discussed here, the following voltages are required :

- (A) 400-750 volts at 150 milliamps.
- (B) 250 volts at 80 milliamps.
- (C) Bias pack giving 270 volts and 45 volts.
- (D) Stabilised screen voltage using either VR150 and VR105 in series, or two VR150's from Power Pack (A).

RF Section

The driver stage is an 807 valve, chosen because it is far more efficient than the usual 6V6 or 6L6; a variable screen supply R1 sets the drive and avoids the necessity for variable drive condensers C7 and C8. The anode supply can be made variable from 400 to 750 volts, since with this form of transmission the power can be varied over wide limits with equally good results. The only adjustment necessary is to reduce or increase the audio gain R9.

Modulator

Though the circuit shown here is more or less conventional, a word about the reason for its choice may be useful. The first two stages are low gain; this has been found to prevent RF feed-back, a desirable feature if the whole is to be housed in one cabinet. The 6L6 was selected because with 250 volts on plate and screen the load resistance is only 2,500 ohms, an important factor since good regulation is necessary. T2 should be 1:1.3 ratio, but as the 6L6 will produce five or six watts a mismatch can be permitted, only two or three watts being required for successful operation of the transmitter.

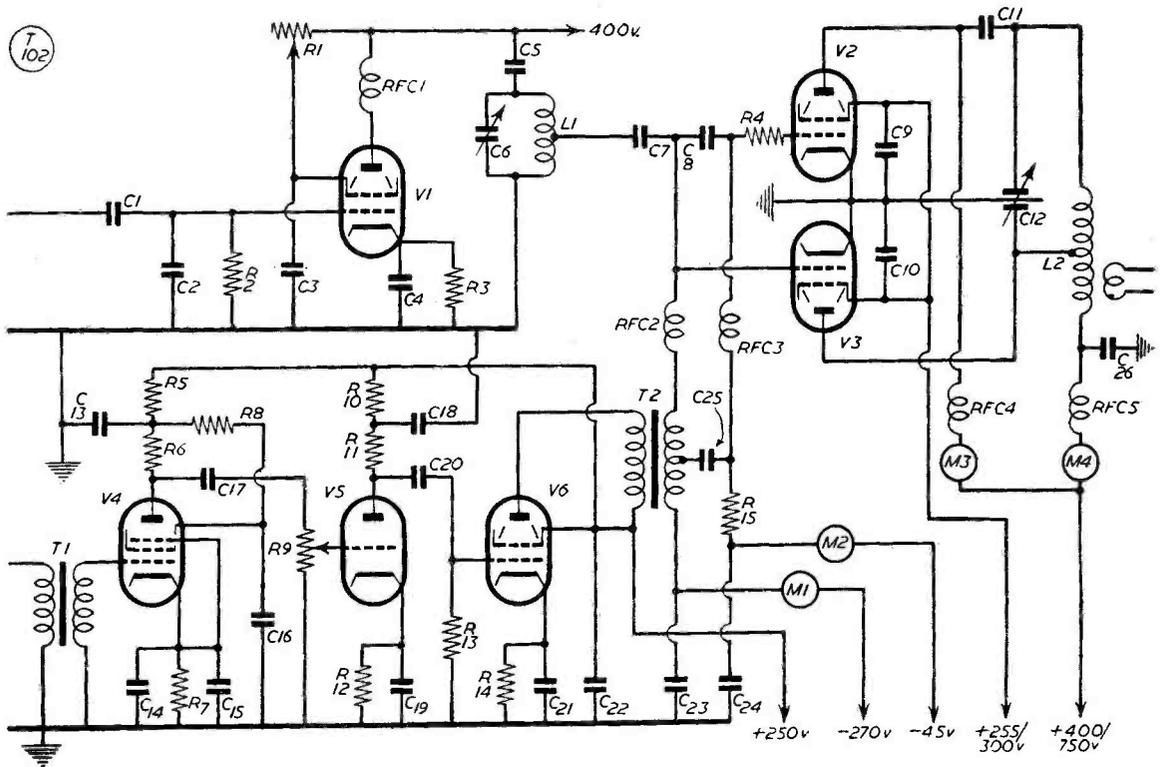
Construction

No hard and fast rules need be laid down—suffice it to say that careful screening of audio, exciter and PA is necessary and all the usual precautions should be taken to avoid parasitics.

Adjustment and Operation

First check that both valves have the correct bias and then with R1 at maximum apply HT to the driver stage. Keep main HT off during this operation. Tune L1 and C6 to resonance and adjust R1 until M2 reads 3 milliamps. M1 should read zero. Now apply HT to V2 and V3 and tune C12 to resonance and load the aerial in the normal manner. Close coupling is essential. M3 should read approximately 90 milliamps with 550 volts on the anodes of V2 and V3, and M2 should drop to 2 milliamps. M1 and M4 should still read zero. All that is necessary now is to speak into the microphone, advancing the audio gain R9 until M1 reads about 3 milliamps and M4 50 milliamps on speech peaks. It is essential to test with a nearby station since this type of transmission can easily be overmodulated, and spreads badly over the band; so use the audio sparingly until tests have been made.

The PA and PM valves V2 and V3 should have screen voltages of 255 volts for all anode



Circuit of a transmitter (for ten metres) using Super-modulation, as suggested by ZBIAH. V1 is the RF driver stage, V2 is the PA and V3 the PM (positive modulator) valve. V4, V5, V6 comprise the speech amplifier-modulator chain, in this case intended for a m/c microphone. The V4, V5, section can of course be modified for any other type of microphone input, but whatever speech amplifier is used, V6 must be fully driven and connected as shown. Details for setting up and adjustment are given in the text and all necessary values in the table.

voltages of 550 v. and below, though the screen can be raised to 300 volts for all anode voltages above this point.

To make it easy, a Table is shown herewith giving meter readings for operating conditions.

Given normal care, reasonable construction and good components, it is a simple matter to construct a neat transmitter giving an extremely clean signal which will really cut through the QRM. In case the reader has been told that Super-modulation has many drawbacks and is fraught with difficulties, a glance through the

Table of Values

Circuit for a Ten-Metre Supermodulated Transmitter.

C16 = 0.1 μF	R10 = 10,000 ohms
C2, C3, C4, C14, C17, C20 = 0.01 μF	R11 = 50,000 ohms
C5 = 0.001 μF	R12 = 1,000 ohms
C11, C26 = 0.002 μF	R13 = 100,000 ohms
C9, C10 = 0.005 μF	R14 = 800 ohms
C7 = 0.00025 μF	R15 = 20,000 ohms
C1, C8 = 0.0001 μF	V1, V2, V3 = 807
C13, C18, C22 = 8 μF	V4 = 6J7
C23, C24, C25 = 2 μF	V5 = 6J5
C15, C19, C21 = 25 μF	V6 = 6L6
C6 = 0.00005 μF Variable	RFC 1, 2, 3, 4 and 5 = 2.5 millihenry R/F chokes
C12 = 0.00005 μF per section split stator	L1 = 5 turns 1" diameter
R1 = 50,000 ohm potentiometer	L2 = 4 turns 2 1/4" diameter, centre tapped
R2 = 15,000 ohms	M1, M2 = 0-5 milliamp Meters
R3 = 250 ohms	M3, M4 = 0-200 milliamp Meters
R4 = 47 ohms	T1 = Moving coil matching Transformer Ratio
R5 = 47,000 ohms	T2 = Modulation Transformer 1:1.3
R6 = 250,000 ohms	
R7 = 1,500 ohms	
R8 = 1 megohm	
R9 = 500,000 ohm Potentiometer	

OPERATING CONDITIONS

METER AND FUNCTION	UNMODULATED CARRIER	ON SPEECH PEAKS
M1, PM Grid	Zero	3 mA
M2, PA Grid	2 mA	3-4 mA
M3, PA Plate	90 mA	60 mA
M4, PM Plate	Zero	50 mA

Readings taken at : Plate HT V1, V2 = 550 volts.
Screen HT V1, V2 = 255 volts.

(Values are for Ten-Metre Band)

following few advantages should set his mind at rest :

- (1) Reduction of mains consumption by over 25%.
- (2) Improvement in audio quality. It is easier to get 3 watts of audio with no distortion than a clean 50 watts, as is required with plate-and-screen modulation.
- (3) Reduction of BCI and TVI to a large extent ; careful screening may eliminate it entirely.
- (4) Less room taken up on the band. Even with full modulation, your signal will be extremely sharp ; 7 kc is the maximum measured spread. At least double the number of stations could operate on our bands than at present without causing interference if everyone used Supermodulation.

- (5) Increased efficiency of your valves ; the PA can be run at CW ratings, since no audio voltages are applied to it ; in fact, it passes *less* current during modulation peaks.
- (6) Far more punch in your speech ; about three times more audio or sideband power is achieved as compared with plate-and-screen modulation.
- (7) Only positive audio is generated. The carrier is suppressed, giving decreased receiver noise and almost complete elimination of heterodynes.
- (8) Power packs can be small, and only one high power pack is necessary for the final stage, since there are no high standing currents to waste power.

The writer would like to offer his appreciation to G4JB and G3BES, who co-operated with initial tests.

Practical Noise Generator

USEFUL TEST INSTRUMENT

G. C. OXLEY, A.M.I.E.E. (DL2MW-G8MW)

A noise generator is an essentially simple device which is yet of great value because it enables comparisons to be made between different receiver arrangements—particularly on VHF—and adjustments to be carried out for improved results. This article describes the construction and application of a standard type of noise generator.—Editor.

MUCH has already been written about the value and use of the Noise Generator in amateur experimental work. The generator described here was built primarily for checks on the 144 mc band but can easily be modified for use at lower frequencies, particularly the intermediate frequencies used in VHF work. Now that CV172's are available the valve question is solved. This valve can be used

Table of Values

Fig. 1. Circuit of the Noise Generator.

C1, C2, C3 = 500 μ F	Rheo 1 = 4 ohms
C4, C5, C6 = 200 μ F	Rheo 2 = 0.5 ohm
R1 = 300 ohms	RFC = RF chokes (see text)
R2 = 100 ohms	L = See text
	S1 = HT switch
	V = CV172

in generators up to 300 mc.

The circuit, Fig. 1, is quite simple and was arranged to fit in with the power units at this station, allowing HT negative to be earthed. The RF chokes are made by forming about 20 turns of 18g. enamelled copper wire on

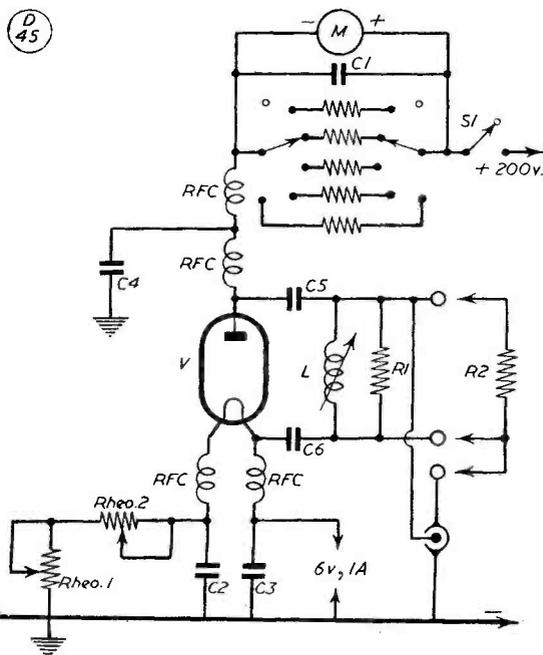


Fig. 1. The circuit suggested by DL2MW, of which Fig. 2. is a rather more elaborate version with a double-bank switch (see text). A noise generator is an extremely valuable piece of equipment for receiver comparison.

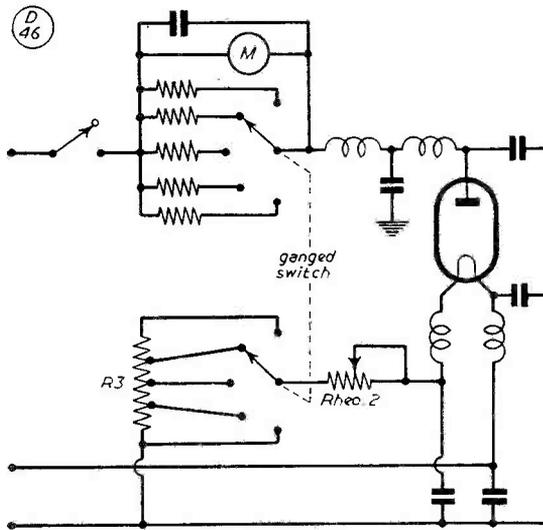


Fig. 2. In this circuit, rheostat No. 1 of Fig. 1. can be eliminated, and R3 is a calibrated 4-ohm resistor tapped at 1, 2, 3 and 4 ohms exactly. The circuit to the right of the valve is as fig. 1.

the shank of a 3/16" drill. The filament rheostats should be capable of carrying one ampere, and the meter shunts are made by paralleling resistors until the correct value is found. (The values are not given, it being an easy matter to work them out for the meter available). As an 0.5 mA 2 inch "surplus" meter was used at DL2MW, marked in volts 0 - 15 and 0 - 600, shunts were made up to give ranges of 0 - 0.5, 0 - 1, 0 - 3, 0 - 6, 0 - 15 and 0 - 30 mA. The 1, 3 and 6 mA scales are the ones most used. For those who wish to produce a better instrument a double-bank switch could be used to switch in a suitable value of filament resistance to coincide with the meter range. Fil. rheo. 1 would not be needed, and the meter would be protected against overload. The HT switch is necessary for quick work. The coil L is slug tuned; 2 turns 18 SWG enamelled on a 3/8" polythene former will suffice for VHF applications.

Apart from one or two points, construction is quite simple. A small box is used, with the meter, meter switch, valve, and the 300-ohm output socket on top; additional and near the 300-ohm socket is an extra metal socket earthed to the chassis. On the right hand wall of the box is a Pye 75-ohm output socket and the HT switch; on the front is rheo. 2, for fine adjustment. Rheo. 1, coarse control, is on the other side, with a hole to enable the coil core to be adjusted. Keep all leads on the output side of the valve as short as possible.

The plug adaptor for 75-ohm output (taken from the Pye plug) consists of a polythene flat plug with a half-watt 100-ohm resistor let into the body; soldered to one end of the plug is a short lead connected to a banana plug.

Operation

To use the generator one needs some kind of output meter. A valve voltmeter or an ordinary rectifier instrument is connected across the output terminals of the receiver. AVC or noise limiters must be out of circuit. Connect the noise generator, by as short leads as possible, to the input terminals of the receiver. Leave the generator HT switched off and the meter switch set on the maximum range. Adjust gain of receiver to give a suitable reading on the output meter, e.g., if your output meter has an 0 - 10 scale, set the gain to give a reading of, say, 4. Now switch on the noise generator HT and alter the filament current until the output meter reading is doubled; say 8 on meter.

Note the reading in milliamps of the noise generator meter. Substitute this value in the following formula: $2IR \div 300$, where R = value of output resistance, 75 or 300 ohms, and I = meter reading in milliamps.

This will give a "noise figure." If this figure is 5 or under you have a good two-metre receiver. Try altering the coupling to the aerial circuit of your receiver, or the amount of oscillator injection in your converter, and similar adjustments. If the noise figure goes down you are going in the right direction. You may find valves of the same species, especially miniature types, will give different noise figures. Reducing heater current slightly, altering anode and screen voltages; all may result in a reduction of the noise figure. Without such a meter (unless one has a very expensive laboratory) it is practically impossible to tell when improvements are effected.

Additional tuned circuits could be made to plug in. Finally, you may take the common logarithm of the noise figure and multiply it by ten. You may then call the figure so many decibels but it is better to stick to plain "noise figures."

BRITISH NORTH GREENLAND EXPEDITION

Among those landing back at Pembroke Dock by Sunderland F/B on August 11 after two years on the Greenland ice-cap was Lieut. R. Brett-Knowles, R.N., G3AAT. He was one of the two officers responsible for the Expedition's communications.

DX COMMENTARY

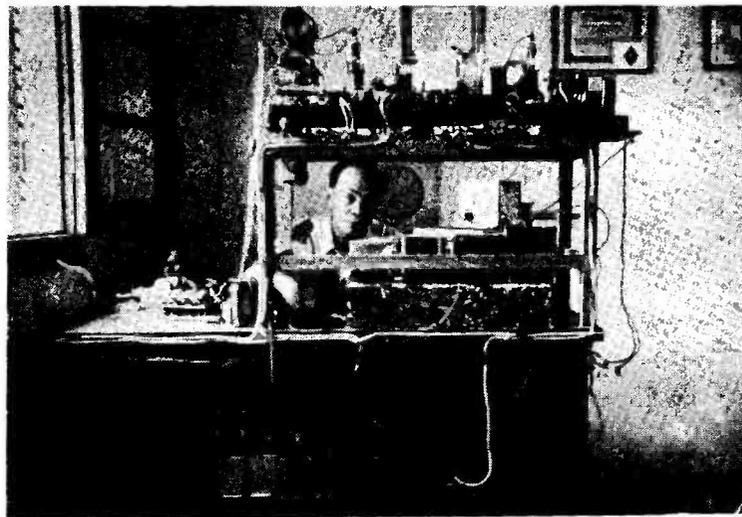
L. H. THOMAS, M.B.E. (G6QB)

ANOTHER month in which nobody outside the tropical latitudes seems to have worked any real DX. What with activity low, conditions poor and weather shocking . . . we need something to cheer us up. Maybe by the time the Contest Season opens we shall find something a little more hopeful to say. A look at the list (displayed elsewhere in these pages) will show that there are quite a few week-ends when activity may be presumed to be high on all bands. Get fired, up, there, and add your signal to the general welter—it may sound like QRM, but at least it makes something for others to listen to.

On the general topic of conditions and DX-availability, it is true to say that there is plenty of interesting stuff to be worked on the DX bands at almost any time. The fairly recently-licensed operator will want to get round the European countries, and whatever we may say about DX, there are always *stations* to work on Twenty. The fact that what one calls DX is not so easy these days certainly does *not* mean that the bands are empty! Numerous G's are happily working away on the DX bands, finding all the *stations* they want; that these are Europeans, short-skippers, Middle Easterners and Africans and not strictly DX does not, to them, really matter a great deal. And so it should be.

But as this is called a DX column, we try and keep it to the subject!

As usual, most of this month's letters deal with the Top Band, which remains a wonderful outlet for energies that would be



PK4KS

CALLS HEARD, WORKED and QSL'd

wasted on the others, according to those who stay up aloft. But more of this later; meanwhile, we will start 'way down at the HF end.

Ten-Metre Activity

Our suggested ten - metre Activity Sunday, July 25, had a very raw deal from conditions. Our mail bag contains a large number of *nil* reports, as well as three or four positive ones. G3IDG (London, S.W.12) heard 38 G stations and 11 short-skippers from Europe—49 stations in six countries. Ten of them were worked. Round about August 4 a new country appeared on the band in the guise of F8FW/FC, who was operating from Corsica on at least five bands. His appearances on Ten, calling "CQ Twenty," caused a little puzzlement, but they had been arranged on Twenty before he QSY'd.

A joint report from SM7AEB and SM7BOA says that they en-

joyed the Activity Sunday from a "vacation QTH" about 120 miles from Malmo. They heard I1ATS, HB9NU, DL4YK, CT1CF and G3DJQ. The transmitter used only 15 watts to a tilted folded dipole, and QSO's were pretty scarce. But the SM's say "These results must seem to you very poor, but to us who have heard nothing for a long time they were quite encouraging." Apparently that particular part of Sweden is very poor for DX in any case, and they have not even been able to work G's on Twenty for some time past.

The 21 mc Band

Now here is a band where there *has* been some DX around. On one of our rare Sundays off we spent some time there, and were quite surprised at the way signals kept popping up and fading out again.

F8FW/FC provided a new country for a lot of G's, including G3HCU (Chiddingfold), who also

raised CR6BX, HC9CV and 9NT, LU, VQ4, ZC4, ZE and ZS.

G5BZ (Croydon), during some spasmodic activity on the band, raised ZC6UNS, OD5AV, CR6AI and F8FW/FC — the latter on both CW and phone.

GW3AHN (Cardiff) also collected the Corsican for a new one, together with CX5AF (phone) and FY7YC (CW), but he thought conditions very poor and was enticed away to 14 mc. G3DO (Sutton Coldfield) added one with the popular F8FW/FC, but mentions nothing more on the band.

The 14 mc Band

Although a perusal of KV4AA's DX Column, and a further glance at the Southern Californian DX Club's *Bulletin* give one a mouth-watering picture of DX on this band, the fact remains that it hasn't been coming in *here*. True, we always hear something such as JA, VS7, VS1, W6 or South

Americans if we listen at the right time of day, but we don't call those DX any more. Turn to just a single page of the Southern California boys' broadsheet and you read of VK1DY, 1EG and 1PG; FB8XX (Kerguelen); KG6IG (Bonin Is.); ZC5FM; SV2R1 and SV9UN (from Rhodes and Crete); FO8AD and VU5AB.

All right, we won't go on torturing you . . . but that's what it's like if you live in or near the Tropics. Our only consolation must be that the folk living further North than we do must have an even thinner time of it!

Among our own correspondents GW3AHN worked ZD6BX, with MP4BBL and PX1AB as new ones. G5BZ collected ZD3BFC on phone, while CW brought him ZD6, ZS3, 4S7, CE, VP9, KZ5, FP8, LU8ZS (South Shetlands) and a lot more, including VQ8CB (Chagos) for an all-time new one.

G5BZ's Five-Band score (like a

FORTHCOMING CONTESTS

LABRE Contest : September 4-5 (CW) and September 11-12 (Phone). For rules, see August issue, p.325.

VK-ZL Contest : October 2-3 (Phone) and October 9-10 (CW). For rules, see August issue, p.323.

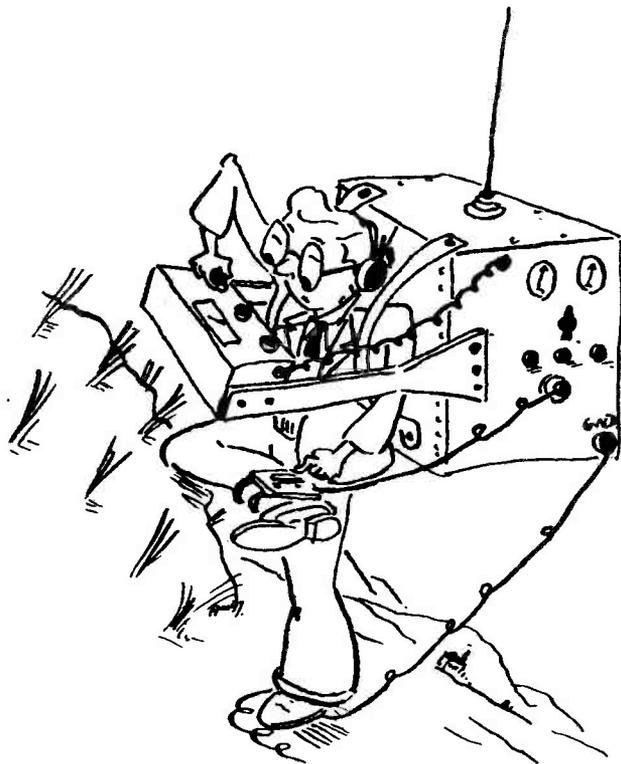
World-Wide DX Contest : October 23, 0200 GMT — October 25, 0200 GMT (Phone), October 30, 0200 GMT — November 1, 0200 GMT (CW). Rules as in former years (multipliers for Zones as well as Countries). Code number comprises RST (or RS) report plus contestant's Zone number — *not* a varying serial number.

lot more) has taken a *downward* turn this month. The reason is, of course, the pricking of the "UU" bubble, covered in our last. We don't intend to say any more about this disgraceful business, except to confirm, finally, that the whole series of "expeditions" was purely imaginary and that all the various "UU" calls with nice new prefixes came from the same spot—Khartoum. (QTH OK in *Call Book*!)

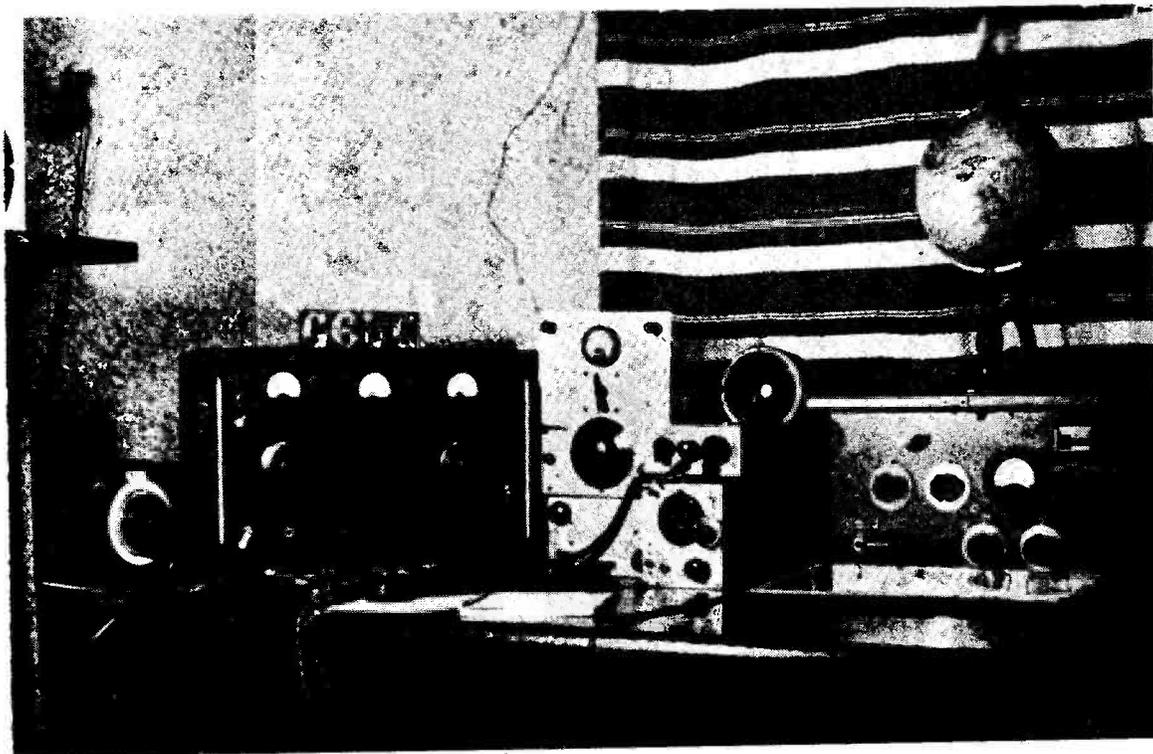
Forty and Eighty

The minutest scrutiny of the month's mail does not reveal one single letter referring to *Forty*; nor have we even heard of anyone working DX on that band. Sufficient comment, therefore, that we heard the members of a phone net on *Eighty* discussing the possibility of getting going on *Forty* with a view to some offensive operations—sitting on the various "pirate" stations between 7000 and 7100 kc. While we admit the desirability of occupying our legitimate territory to the full, we doubt whether 150 watts and the average amateur aerial system would have much effect on the "pirates."

Amateur Radio, it seems, is one of the few remaining groups which remains a minority and a quiet and well-behaved one; in most other spheres to-day it seems to be the minority that makes the most noise and gets the most attention!



“. . . Am equipped for fully portable/mobile operation . . .”



Neat table-top layout at G6UG, Grimsby. The transmitter (on the left) is band-switched for 3.5, 7 and 14 mc. The receiver consists of a combination of BC453/BC454 units, working with converters for Twenty and Ten.

Various devotees of Eighty, particularly at the CW end, have added F8FW/FC to their collection. He certainly did use the bands during his spell of operation. The station was run, by the way, by HB9LA; QSL's should go to him or *via* U.S.K.A. It seems that he was hoping to sign HB9LA/FC. but licensing conditions made the other call necessary.

G3JKO (Nottingham) has been using 2 watts on the band, and with that small power has worked 8 countries and 39 counties.

Top Band Topics

The many 'chasers after WABC have occasion to be grateful once more to G5PP (Coventry), and also to G5RI (Hexham), whose portable DX-peditions in Scotland stirred up a lot of activity and gave many new contacts. Counties made available by these two intrepid explorers included Ross, Sutherland, Inverness, Nairn, Dumfries, Perth, Sutherland,

Peebles and Kirkcudbright! Some of the top-scorers in the ladder have gone up as many as *six* rungs in consequence.

G3HDQ (Woodford) has now topped the 80 mark, but would very much like to find Ayr. East Lothian, Berwick, Selkirk and Roxburgh. He also asks if there is a Top Band station in Monmouth any longer?

G3JBK (Bexleyheath) has been on the band for six months and has yet to find a GW station of any kind! He is even prepared to learn the language in order to get a contact. . . . (See later paragraph headed "A.W.R.S.") G3JBK is now attached towards the bottom of the ladder with a score of 20 and 25.

G3IGW (Halifax) claims his second WABC, the one earned in Scotland having been despatched quite a long time ago. Many of the counties worked from his G location were amassed *before* he became GM3IGW — and with a

mere CO on 1775 or 1860 kc, at that. We don't imagine he will claim a third WABC from his portable expedition in Ireland, but you never know. . . .

G3FUR/A put Rutland on the map for a while, and gave a new one to G3JZQ (Waltham Cross); he heard OK1AK at good strength, and says it seems that winter conditions are almost round again.

G3JHH (Hounslow) succeeded in raising this same OK1AK, but is rather annoyed at the behaviour of two operators who worked him just previously; having finished, they stayed on the frequency to call each other and exchange congratulations. JHH did finally get through, but would like the Yorks. boys concerned to know that he is not at all grateful to them!

G3CO (London, S.E.14) expresses his thanks to G5PP and G5RI, and says "What a difference in the level of Top-Band activity this summer, compared

with previous years!"

G16YW (Belfast) bumped his score up to 87, with the necessary assistance from GM-land; he is QRT on all other frequencies, but hopes to get something going . . . some day!

G3BRL (London, W.5) is now on again, the notorious aerial system having been reinstated by himself and G5SX. Perth, Kirkcudbright and Monmouth have been added.

GM3OM (Larbert) sits 'way up top with no fewer than 92 worked and 90 confirmed! He awaits G3IGW's visit to GI-land with great interest, and asks whether no one will volunteer for an expedition to Alderney and Sark. It even looks as though Working All British Counties will come within the bounds of possibility.

G5LH (Horbury) added Kirkcudbright, but missed the others. G2NJ (Peterborough), operating

21 mc MARATHON

(Starting July 1, 1952)

STATION	COUNTRIES
VQ4RF	108
GW3AHN	104
G5BZ	103
G4ZU	102
G4ZU (Phone)	95
G2BW	92
DL2RO	92
G2WW	89
G3HCU (Phone)	88
G2BJY	81
GW3AHN (Phone)	77
G2YS	74
G3DO	72
ZS2AT	67
ZB1KQ	64
G3CMH	64
ZB1KQ (Phone)	63
G3FXB	62
G3CMH (Phone)	62
5A2CA (Phone)	60
G6QX	57
GM2DBX (Phone)	42

from his boat in Hunts., raised G3JFF/MM, at Torbay. He passes on various notes — G3FUR/A, Rutland; GM3JFG/A, Inverness; and also GM3JNW/A, from Peebles. The new licensing conditions mean that G2NJ drops his "/A" and is plain G2NJ both from Peterborough and from the boat in Hunts.

G3JKO (Nottingham) went up nine rungs, thanks to the GM expeditions; he also collected G4VF/A (Suffolk), G3FUR/A (Rutland) and G3COV in Cumberland. JKO is now keeping down to 2 watts in order to take part in the QRP Society's "200" contest.

Late Flash: Look out for G3IGW/A on the following dates (but "subject to modification"): September 21 and 22, Londonderry; September 23 and 24, Tyrone; September 25 and 26, Fermanagh. G3IGW will be accompanied by G3JML and possibly also by G3HWU. The entire band will be searched to give a chance to CC stations.

General Patter

G3FN (Sheffield) worked OZ1AD and was asked to listen for OZ7BA, who had W2ZXM (Kurt Carlsen of *Flying Enterprise*) in his shack. The intrepid skipper himself was expected to be visiting London towards the end of August.

G3JJZ (London, S.E.6) asks what has happened to the "Young Ops. Club" that was proposed a few months ago. He is now an OT (aged 17) and too old for it, but he would like all YO's to drop us a line so that we can publish a list of operators under 17 years of age. JJZ himself has been active on four bands, mostly 160, where he has scored 40 counties confirmed. He has been playing with the modified OZ7BO El-Bug, as described in the *Magazine* two years ago.

G2HKU (Sheerness) spent a busman's holiday with G6AB, and operated "/A" on Eighty with a 6AG7 CO and 5 watts. He had some nice 579 reports from round Europe, and is beginning to wonder whether we were not happier in the days of crystals and QRP

Short Wave Magazine DX CERTIFICATES

The following have been awarded since the publication of our last list, in the June issue:

WFE

No. 18 VK3CX (Canterbury)

WNACA

No. 71 DL1GU (Flensburg)
72 KP4KD (San Juan)
73 PY1AQT (Rio de Janeiro)
74 PY4KL (Juiz de Fora)

FBA

No. 38 DL1GU (Flensburg)
39 DL2RO (Hamburg)

WABC

No. 65 G3JHH (Hounslow)
66 G3JML (Huddersfield)
67 G3IGW (Halifax)

Details of MAGAZINE DX AWARDS and CERTIFICATES, and the claims required for them, appeared in full on p.323 of the August, 1954 issue.

than we are now with VFO's and 150 watts.

News from Overseas

VP4TP (Point-au-Pierre, Trinidad) sends an up-to-date list of VP4 stations which we will hold for reference. Roughly 31 of them are active. VP4TP himself is ex-G3CBF - MP4KAI - ZC6BF - 4X4BF! He will be working on Forty and Twenty very shortly and will be looking for G's from 2100 GMT onwards. CW only.

ZL3JX and ex-GM3FVX, while bound for New Zealand, had a "fortunate" breakdown of their ship at Panama, and were enabled to sample the hospitality of the KZ5's for a few days. They described it as "overwhelming," and they had the best time of their lives. The KZ5's particularly asked them to try and stir up more activity on 21 mc; the shacks there were most efficiently run and the stations very slickly operated. A memorable occasion and a most fortunate breakdown for the two concerned!

VQ4FB is ex-G3CAT, and is active with a B.2 and an HRO. He is looking for G's and is also running a net with VQ4AQ, 4CH and 4RF on Eighty. QTH: I/P Ward, Signals Officer, Kenya Police Div. HQ, Meru, Kenya.

(Thanks to G3HT for this information.)

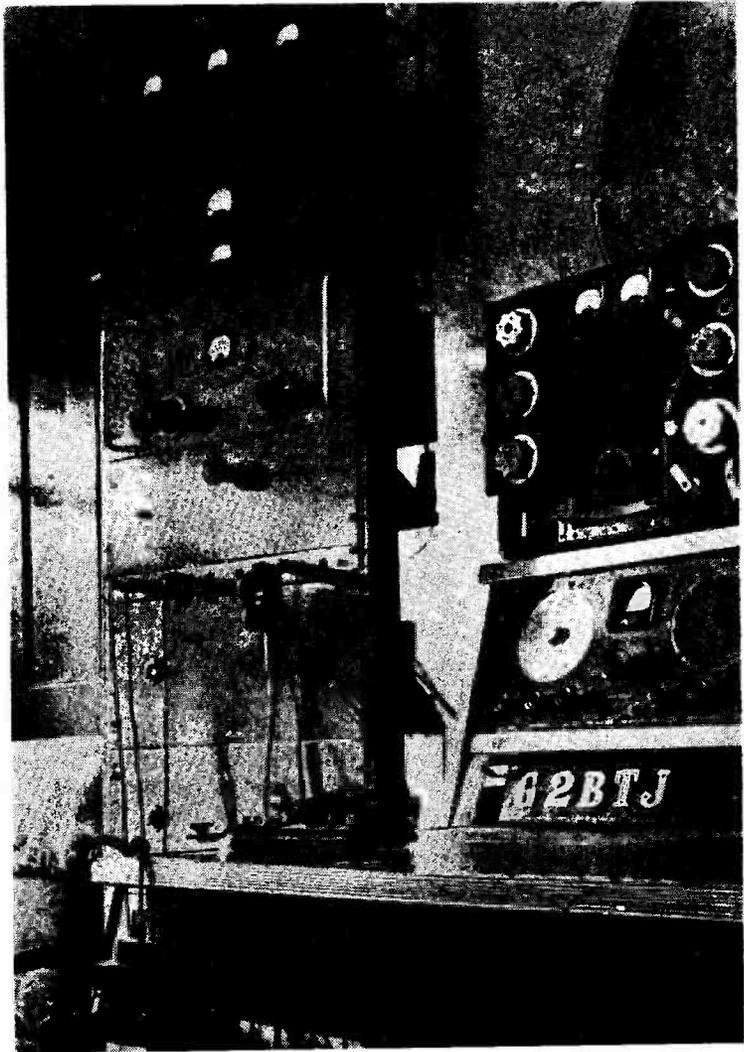
VQ4EI had a brief burst of operation from Zanzibar, signing VQ1DT. So far as we know the only G he worked was G6ZO. His card from Zanzibar says "All FB in VQ1-land except DX!"

Harry Lawton of Huddersfield is Second Engineer in the M/V *King Neptune*, and sends some very interesting news of his travels. They left the U.K. last December and arrived at Madras in time for a big radio exhibition, where VU2FB was contacted. Thence *via* Sarawak to Japan (no QSO's) and then to U.S.A., where

TOP BAND COUNTIES LADDER

(Starting Jan. 1, 1952)

Station	Confirmed	Worked
GM3OM	90	92
G16YW	87	87
G5JM	87	87
G5LH	85	86
GM3EFS	85	86
G6VC	84	84
G2NJ	82	88
G3HDQ	81	82
G3CO	73	80
G3HIW	73	79
G3IVH	70	73
G3BRL	70	72
G2AYG	69	70
G3JEQ	68	79
G3JEL	67	74
G3HTI	66	70
G3IOX	63	74
G3IGW	62	76
G3EUK	62	69
G3FTV	60	68
G3DO	60	64
G3ITY	52	61
G8VG	50	60
G3JKO	49	68
G2HKU	48	50
G3JZ	40	43
G3JBU	32	41
G3HZM	30	42
G3JZQ	26	38
G3JBK	20	25
G3HMF	17	20
G3JKM	15	36



Station of G2BTJ, Liverpool, 18, who started with an AA licence in 1939. Reopening in 1946, the present transmitter is of particular interest in that it runs an 829B in the final, taking 150 watts input on (mainly) Forty and Twenty; valves of this type, normally used in VHF transmitters, can equally well be employed on the communication bands, and make for a very compact PA layout. The receiver at G2BTJ is a Hallicrafters S.20, and the station is also equipped for CW/phone operation on Top Band.

numerous W7's were met.

The next hop led to Panama, Curacao and South Africa, where ZS1KP was encountered. Next to CR7-land and then to Mauritius. VQ8AL disclosed that he and VQ8AR are proposing to go to Rodriguez Island in January 1955 for a holiday of 10-15 days. This place is about 330 miles east of Mauritius and should count as a new one.

Another note of interest — "Mac" of VP8AD, formerly on

South Georgia, is now LU5AAS in Buenos Aires.

G6UT (Bishops Stortford) drops a line to say that he has now retired, and will be spending six months at Wynberg, near Cape Town. He has applied for a ZS1 call and will notify us if and when it comes through.

Visitor from ON

ON4QX, of Antwerp, is touring Europe, and will be in London from September 19 to 23, staying

at the Regent Palace Hotel. He would like to meet as many amateurs as possible during that period, so we hope that some of his many friends will take note of this and get in touch with him.

A.W.R.S.

G3EJF (Tottington) tells us that the Army Wireless Reserve Squadron will be in camp at Chester from September 25 until October 9. During off-duty hours it is hoped to put some of the rarer Welsh counties on the air (Top Band) with portable stations. Any of the following calls may be expected: G3ADZ, 3AMO, 3DNQ, 3EJF, 3FDU, 3FQN, 3RCR, 3IFM, 3JAY, 3JBV, 3PG. The stations will send an abbreviated form of the county from which they are operating, immediately after the call-sign.

DX Strays

KC4AB was expected to be on the air from Návassa Island (14100kc CW and 14296kc Phone) from August 10. At the time of writing he had not, apparently, emerged from the "searched-for" category. However, we gather that KC4AC has

Station	Points	Countries					Station	Points	Countries						
		3.5 m	7 c	14 m	21 c	28 c			3.5 m	7 c	14 m	21 c	28 c		
DL7AA	649	85	154	216	90	104	221	G6QX	407	51	96	146	57	57	170
G6QB	587	52	107	220	73	135	234	G5FA	406	34	118	150	31	73	166
G5BZ	562	60	111	223	103	65	229	G2YS	384	53	68	143	74	46	158
G2VD	493	47	89	178	70	109	187	G2BW	357	24	57	144	89	43	161
G4ZU	487	12	45	208	102	120	210	GM2DBX*	337	27	31	156	42	81	167
G2WW	479	23	70	190	89	107	197	ZBIKQ	284	6	34	118	64	62	139
G2BJY	464	48	78	141	81	116	181	G8VG	280	36	76	124	18	26	141
G3FXB	456	64	117	174	62	39	178	G2DHV	177	20	23	108	11	15	112
G3DO	445	24	46	196	72	107	221								

* (Phone)

been issued to KP4TF, who expects to operate in November.

ZD8V, heard recently, is apparently Not Good. An official reply to KV4BB, by cable from Ascension Island, stated that there was no activity there.

A signal (but probably a small one) may be expected from Tokelau Island, ZM7, where VR2BZ proposes to take a 5-watt transmitter on his next visit, which will also include Tonga, VR5.

FB8BK is a call worth remembering, as he may be on from Tromelin Island.

That is all the news for this month. Please note the next deadline — first post on **Wednesday, September 15**. For the month following (overseas readers please note) it will be *October 15*. Address all news, scores and claims to "DX Commentary," *Short Wave Magazine*, 55 Victoria Street, London, S.W.1. Until then, 73 and BCNU.

H.R.H. SIGNS VE8RZ

During his visit to Yellowknife, on the Great Slave Lake in the Canadian Northwest, on August 11 last, the Duke of Edinburgh went on the air from VE8RZ on the 80-metre phone band. This was by way of being a "private broadcast" on the VE8 phone network. The Duke's speech—reported in the daily press in this country on August 12—was re-broadcast by the BBC in "Radio Newsreel" on the evening of August 11. Except for an edge of QRM in the background and a trace of modulation hum (which might have been brought in at some stage of the recording) it was a very good transmission; this says much for the excellent signal radiated by VE8RZ, located in a timber-built house and owned by Mr. R. Murray of the Department of Transport, N.W.T. In the course of his remarks, His Royal Highness made no direct reference to Amateur Radio—but we may be sure he was prevailed upon to sign the log at VE8RZ before leaving!

SOUTH AFRICAN REQUEST

Readers are referred to the letter from ZS2JW which appeared on p.351 of the August issue of *Short Wave Magazine*, inviting them to participate in an important radio test to be carried out during

the eclipse of the sun in South Africa on Christmas Day. So that those wishing to co-operate can be fully briefed, they are asked to write to ZS2JW before October 1st—see August issue for details, and his address.

CARDS IN THE BOX

If your call sign appears below, it is because we hold card(s) for you in our QSL Bureau, and have no address for forwarding. Please send a large s.a.e., with name and call sign, to: BCM/ QSL, London, W.C.1. and the cards will be sent off with the next G clearance. (This is a full and sufficient address for the QSL Bureau from any part of the world.) If publication of the call sign/address in "New QTH's" and the *Radio Amateur Call Book* is also required, that should be mentioned when sending for the cards.

G3BBC, 3BDI, 3BGJ, 3BS, 3CLN, 3DS, 3EUS/A, 3GQI, 3IBB, 3IEB, 3IVQ, 3JGC, 3JKS, 3JMF, 3JNQ, 3JNU, 3JRV, 3JTE, 3JTG, 3JTL, 3JYA, 3KWT, 3MX, 8YU, GM3IC, 3ICS, 3ISX, GW2HNR, 3EQL, 3FBB.

TRANSISTOR TOPICS

Conducted By **G3HMO**

Audio Oscillator Running on Daylight!

Ideas for Local Calling Circuits

More Transistor DX, G/PA and GC/G

FOLLOWING upon last month's discussion of the junction transistor, this time we have a practical illustration of the extremely low powers with which such transistors will function. The demonstration takes the form of a *light-powered* audio oscillator, shown in Fig. 1. This circuit was first published in the September 1953 issue of the American magazine *Radio and Television News*.

The Light-Powered Oscillator

The Circuit. In the English version, as tried at G3HMO, a Mullard OC70 junction transistor is used in a straightforward grounded-emitter circuit with feedback from collector to base provided by a step down transformer. This is an ordinary 1:4 intervalve coupling transformer with the high impedance in the collector circuit and the low impedance in the base. The output is taken from the collector *via* C2 to a high-resistance headset. The base is isolated from the emitter by the blocking condenser C1 and is biased negatively by the resistance R.

The Photo Power Supply. The only power needed by the oscillator is derived entirely from a selenium photo-cell — no batteries whatever are employed! The cell is of the type used in direct-reading exposure meters and similar devices. (Such cells may be obtained mounted or unmounted from: Megatron Ltd., 115a Fonthill Road, London, N.4, at 8s. 6d. each.) The writer used an unmounted version, size 37 mm x 50 mm, because this is the most economical way of getting the cell. In the mounted version terminals are provided, but in this case connections had to be made to the cell. The back of the cell is the positive contact and the two aluminium strips on the front are together the negative connection. It is worth-while using both these contacts in front as the photo-sensitive layer

to which these connect has a very high resistance. The mount was made as follows: A piece of ebonite has a small strip of copper gauze fixed to it and the cell laid face upwards on top of it. Two brass strips are fixed to the ebonite in such a way that they touch the two aluminium contacts on the front surface and at the same time hold the cell securely on to the copper gauze at the back. A flex connected to the copper gauze and jointly to the brass clips forms the "power lead." To avoid damage to the cell no attempt should be made to solder either to the cell or to the mount unless the cell is first removed. Small pieces of tin foil (silver paper) screwed up into little balls and inserted between the brass contacts and the front contacts of the photo cell help to make good joints.

To test the cell connect to a milliammeter (a suitable range is 0-1 mA or 0-2.5 mA) and place it about a foot from a 100-watt lamp. A current of $\frac{1}{2}$ mA or so should be recorded by a good cell.

Setting Up. When first connecting up a device such as this, it is convenient to simulate the output of the photo-cell with a dry cell of $1\frac{1}{2}$ volts having a 10,000 ohm resistor in series. This resistance may be reduced during the initial setting up if any difficulties are encountered and then increased to make sure that the circuit will function on the very low output of the p-e cell. If no oscillation is obtained try altering the resistance R. Values up to several megohms have been used and with some transistors R may be omitted altogether. In this case the circuit can be simplified to that shown in Fig. 2. Alternative connections for the headphones are also shown in Fig. 2. The condenser C1 may be omitted but the note (in the G3HMO version) is then rather rough. Under these conditions, the circuit goes into

Table of Values

Figs. 1 and 2. The light-powered Audio Oscillator.

C1, C2 = .01-.05 μ F
R = 50,000 ohms (see text)

G = Mullard OC70 Junction Transistor
Ph = HR Headset
P = Selenium photo-cell (Exposure meter insert)

T = 4:1 intervalve transformer

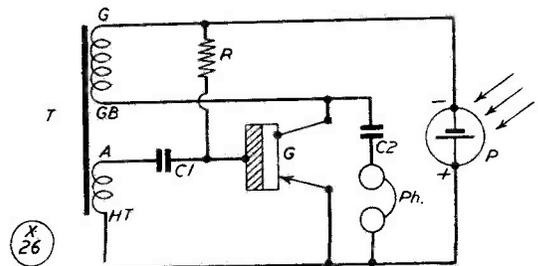


Fig. 1. An LF oscillator which works with ordinary daylight as the sole source of power! A strong audio note is heard when the photo-cell is exposed; if the p-e cell is shown to an electric lamp, the note can be heard with 50-cycle AC modulation superimposed. The "easy-oscillation" characteristic of the Mullard OC70 junction transistor is such that it will also go off on a cell consisting of wet blotting paper between a piece of aluminium foil and a penny.

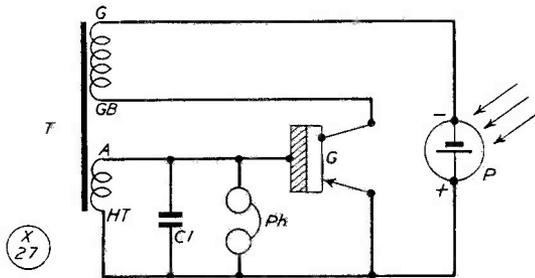


Fig. 2. An even simpler version of the light-powered LF oscillator shown in Fig. 1. The audio output is actually somewhat greater than that given by a crystal microphone and so can be used as a test signal. Though at this stage such an oscillator is no more than a "scientific toy," it would seem feasible to obtain sufficient μmA output from a number of photo-electric cells in series-parallel to get a good point-contact transistor oscillating at RF; this would make possible an ultra-QRPP transmitter suitable at least for local working on the 160-metre band, using daylight as the power supply!

a relaxation type of oscillation, with rather a spiky waveform. The pure note obtained when using C1 can be varied in pitch by altering this capacity.

Failure to obtain oscillation may be caused by the feed-back being the wrong way round. Change round the connections to either the primary winding or the secondary winding (but not both).

Once satisfactory oscillation has been obtained the photo-cell can be brought in to replace the dry cell, making sure of course that the correct polarities are observed. The polarity of the photo-cell should be checked when testing it with the milliammeter. A good loud note will be heard in the phones if the cell is put near the window or, alternatively, exposed to artificial light. In the latter case a certain amount of mains hum may be noted from the ripple in the light from the lamp—if, of course, the mains supply is AC. When the light was switched on and off from the door, the note could be heard starting and stopping in the headphones, although they were at the other end of the room. *Note that this is with no other supply than the light falling on the cell.*

An Alternative Economical Supply. The oscillator will perform equally well using a simple cell consisting of an aluminium milk bottle top and a penny separated by a piece of wet blotting paper! A connection to the inverted aluminium top is the negative pole and the wire soldered to the penny makes the positive side. The penny is pressed on to the aluminium, separated from it by the blotting paper, and a little water is poured into the bottle top. (For best results the cream is cleaned off the top with a detergent and the penny brightened with a weak acid or metal polish.) Using ordinary tap water this cell has kept the oscillator going for several days and continued until the water dried out. Adding a few drops of water duly started it off again.

The Future

The oscillator as described has been shown to be capable of driving a speech-amplifier modulator

via its normal (crystal) microphone input. In fact, it gives rather more audio output than the particular crystal microphone in normal use. It is useful to have such an oscillator for providing an audio signal for setting up a phone transmitter. Also, if suitably keyed, the oscillator would make a good Morse practice set.

However, it would not be realistic to suggest that the light-powered oscillator in its present form is much more than a scientific toy. Nevertheless, as such it demonstrates most convincingly the extraordinarily low power requirement of a junction transistor. If a transistor of this type which also has good HF properties (for example, the barrier layer transistor) can be produced commercially, then a light-powered 0-V-0 or 1-V-1 receiver—and even, perhaps, a QRPP transmitter—will become a practical possibility. The main problem in achieving such results at present is to obtain sufficient output from the photo-electric device to drive a point contact transistor. It must be remembered that at very low powers the point-contact compares unfavourably with the junction as it requires a larger standing power input to reach useful working conditions. This comes about because of the back leakage current through the collector, even with no bias on the emitter. This current may be 50 times as great in a point as in a junction type transistor.

New Type Photo-Electric Cell. Already a sun-powered transmitter, using a point-contact transistor in the 100 mc oscillator stage, has been shown in America. The distance covered was only a few yards, although the maximum range of the transmitter had not been fully investigated. The light cells used for this transmitter were of a new type, consisting of a large surface germanium $p-n$ junction with the p layer sufficiently thin to pass light into the junction locality. It is claimed that cells of this type may be of sufficiently high efficiency to make direct conversion of the sun's energy into



"... Prefer QRP and when I get some phosphor bronze wire will go all-transistor at this station ..."

electrical energy seem a practical proposition in the future. Power output of these cells is said to reach 60 watts per square metre, which is an improvement of more than ten times over the selenium cell.

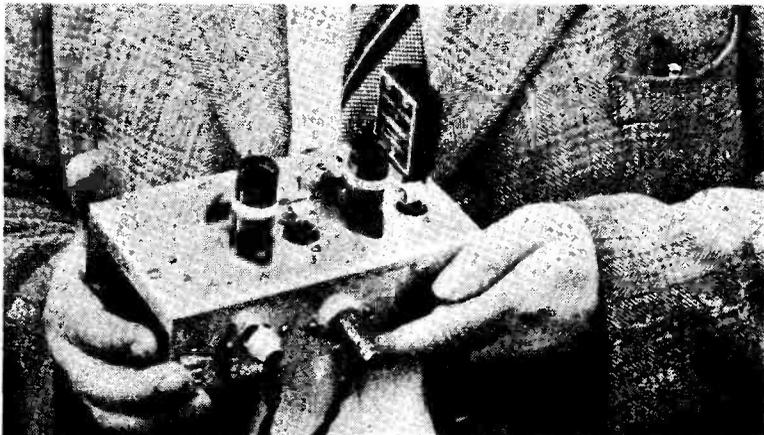
Local Calling Circuit

It is often the case that one wants a word with old G—— down the road. He is fully operational on the same bands as you are, and you frequently have long contacts with him. However, the chances of raising him with a casual call over the air are exceedingly remote, and in spite of all the complex communication equipment at both stations, recourse has to be made to the GPO telephone service.

How simple it would be if a calling circuit could be instituted over which local amateurs could raise each other. Some time ago the writer was building and testing a transistor receiver. G5UI (a CW-only Top Band station about 6 miles away) happened to come up on the frequency and it was noted that his keying produced something like an 0.2 mA change in the collector current to the detector stage. It occurs to one that another stage of amplification should be enough to set a relay clicking, and so to sound off a bell circuit. A transistor receiver uses so little power that it could be run 24 hours a day from a small metal rectifier power pack without affecting the electric light bill—the few milliamps involved are no more than the normal leakage current.

Practical Considerations. To make this practicable one must envisage the possibility of false triggering by, for example, a high powered commercial station. There is a well-known system whereby all ships keep continuous watch on the international distress frequency even when the operator is off duty. An automatic alarm system is triggered by the Morse symbols SOS. Perhaps some such scheme (using of course a different code!) could be developed, although it does seem a little too complex for our purpose.

Another idea that would seem more practical is for the calling station to put out a predetermined tone modulation. The transistor receiver could have a tuned LF stage responding only to this note. A relay operated by this stage could set off a bell, buzzer, lamp or similar device. To avoid false response the relay could be slugged and would only go over if the tone persisted for some seconds. Chance modulation at this note by some unwanted station on the frequency would therefore be unlikely to pull the relay over. The overall sensitivity of



The G3CCA two-stage TTX: the transistors are in line with the Eddystone miniature coils, and are mounted across 4-pin holders. This little transmitter, which can be operated either VFO or CO, has worked some of the GDX on Top Band recently reported in this feature; and on August 12, under bad conditions and through heavy static, its signal on 1850 kc was reported RST-458 in Holland. (By the way, the hands are those of G3IZS, another well-known TTX operator — we could not get all of him in without losing the detail of the transmitter).

the receiver system could in any case be reduced to the minimum consistent with reliable calling from the desired station.

Transistor Communication

Activity during the holiday period has not been high but new records are still being made and old ones broken. The most outstanding results are both cross-Channel. GC/G and G/PA.

On August 12 a cross-band test was arranged between G3CCA and G3IZS, both of Leicester, with the Dutch stations PAØCG and PAØQU. In spite of very bad static conditions, PAØCG (on 3501 kc) gave G3CCA (on 1850 kc) a report of RST-458. This is the first instance of G-TTX signals being received on the Continent, and will be of great interest to the TTX fraternity. The success achieved was largely due to the excellent co-operation from the Dutch side—PAØCG built a Top Band converter (!) specially for the occasion. It was a pity that these tests, to which the Buckingham TTX group also listened, were spoilt by totally unfavourable conditions. However, it is hoped to arrange further such attempts, when solid contacts should be obtained if conditions are reasonably good.

The GC/G contacts have been made on 1.8 mc by GC2CNC (Jersey, C.I.) running an OC50 in the base-tuned circuit, with but 20 mW input. He has worked G2HAJ (Southampton), G2NJ (St. Ives, Hunts.), G3IMX (Coves, I.o.W.) and GC3HFE in the sister Island. The QSO with G2NJ rates about the best so far achieved in terms of miles-per-watt, and we hope to hear more of GC2CNC's activities.

New Stations Active with TTX

We have heard directly or indirectly that the following stations are now using TTX equipment: G2DMN (near Hinckley) has a phone/CW transistor transmitter using GET2's in a CO/PA arrangement. G3HGY and G3JUC, both of Coventry, are also active with transistor transmitters using the base-tuned circuit. G2DMN and G3JUC are on 1850 kc while G3HGY is close by, on 1830 kc.

Other Notes

There have been several enquiries on how to obtain commercial transistors, such as the G.E.C. GET2 and Mullard OC51. Any local radio dealer—though he cannot be expected to have them in stock—should be able to get them for you by putting an order through in the usual way. The British types listed on p.328 of our last issue are readily available. If there is any difficulty, apply direct (for the GET series) to General Electric Co., Ltd., Osram Valve and Electronics Dept., Magnet House, Kingsway, London, W.C.2. For the Mullard types, the address is: Mullard, Ltd., Industrial Valve Dept., Century House, Shaftesbury Avenue, London, W.C.2.

Requests for phosphor bronze wire are still coming in. This wire is suitable for the Home-Made Transistors described in the April issue of *Short*

TRANSISTOR CONTACT RECORD

TRANSISTOR STATION	Band mc	Phone CW	Input mW	Dist. miles	Station Reporting	RATING m.p.w.
GC2CNC, Jersey	1.8	CW	20	235	G2NJ, St. Ives, Hunts.	11,750
G3CCA, Leicester	1.8	CW	62	278	GM3EFS, Alexandria, Dunbartonshire	9,000*
G3CCA, Leicester	1.8	CW	62	230	PA0CG, The Hague	7,360*
G3IZS, Leicester	1.8	CW	50	278	GM3EFS, Alexandria, Dunbartonshire	5,550
G3CCA, Leicester	1.8	Ph.	62	142	G6QB, Bexhill, Sussex	4,540*
G3IZS, Leicester	1.8	CW	50	142	G6QB, Bexhill, Sussex	2,840
G3JRH, Heston, Middx.	3.5	CW	35	31	G6VC, Gravesend, Kent	890

NOTES:

Col. 7 is the Power-Range Rating, expressed as miles per watt. Thus, a report at 100 miles with an input of 50 milliwatts (mW) rates 2,000 miles per watt.

* Denotes transistor receiver in use for QSO; power-range rating doubled.

† Denotes transistor transmitter in use by reporting station; power-range rating doubled.

Entries for "Transistor Contact Record," under the headings shown, are invited from operators using transistor equipment. This Table is not competitive; it is intended to record progress in transistor communication. Entries included above are new contacts reported since the last appearance of this Table, in the July issue.

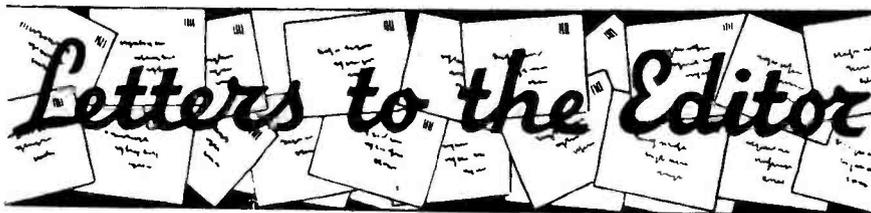
Wave Magazine. Should you want some of this wire for this purpose please send a stamped addressed envelope to "Transistor Topics," c/o The Editor, *Short Wave Magazine*, 55 Victoria Street London, S.W.1. For the October issue, all news of activity, equipment, progress and results with transistors should be sent to the same address to arrive not later than September 16.

THIS YEAR'S MCC

The Ninth MCC—or, to give it in full: The *Short Wave Magazine* 9th Annual 1.8 mc Club Transmitting Contest—takes place during the weekends November 20-21 and November 27-28 next. Will all Club secretaries please note that this time the rules will *not* be circulated by post, but will be published in "The Month with the Clubs" in our October issue. It is hoped that, as in previous years, we shall have a good entry, and that some at least of the active Clubs not previously represented will come on and see what they can do. Non-Club stations, meaning the normal occupants of the Top Band, should note that they also can be in on this, as their contacts with Club stations count for points.

BBC's FM-VHF DEVELOPMENT

As widely announced in the daily press—with the usual technical misrepresentation by the *Morning Dirtsheet* and the *Evening Screech*—the BBC has secured authority to proceed with the construction of nine FM stations, sited in various parts of the country, to operate in Band II, 88.0-95.0 mc. Four of these stations will have an effective radiated power (ERP) of 120 kW and the other five will radiate 60 kW. Programmes carried at each station will be the Home, Light and Third, and the first station to come into regular operation will be Wrotham, Kent, in May 1955. The remaining eight stations will take about 18 months to complete. Wrotham has been in experimental operation for some time.



Letters to the Editor

Letters published are those which seem to us to be of general interest, but should not be read as necessarily being in accordance with our own views on the subject. We welcome readers' comments.

"CRYPTIC PHONES" AND "CRAZY CALLSIGNS"

SIR.—I have read with interest and amusement "Old Timer's" comments (p.349, August issue) on operating procedure, and his plea for plain English on fone—or 'phone? As an operator of only 12 months' standing I am not yet on fone but I do send "R.R." But I think the cream is in the last three lines of his article. What is DX? Can he mean "long distance?" And without reaching for a Call Book, who or where is OH, SM, LA, YU, I and DL—and is it permissible to use these prefixes in print without mystifying the ordinary listener?

G. P. Walford, G3JLM, 71 Fourth Avenue, Garston, Watford, Herts.

SIR.—I feel that "Old Timer's" rather sweeping criticisms of the use of phonetics and the Q-code when using 'phone cannot go past unchallenged. After all, the object is to obtain 100% communication with the station being worked, rather than to amuse any SWL's who happen to be listening! As an example, imagine a contact with a European phone whose knowledge of English is limited. During the QSO, you tell him "You are partly readable, old man, with fair signal strength, rather heavy interference, and deep fading." And what is the result? He won't understand a word of it! But if you say "Your signals are R4, S7, with QSB and QRM" he understands perfectly. By all means, drop the Q-code for inter-G or local working, but things are very different when in contact with foreigners. Some of them just won't learn to speak English! Despite the OT's nausea on hearing phonetics being used,

I find them almost essential when working on a crowded band, with the accompanying interference level. If I omit to use phonetics, stations come back to G3KHC, G3KAC, G3GHC, G3GAC, G3JHZ and sometimes even G3JHC—which happens to be my callsign! So with all due deference to OT and his years of experience, this station will continue to use both phonetics and the Q-code (except when working British stations) without a thought for the perplexed SWL, who will get much more entertainment from the Light Programme.

B. Jenkinson, G3JHC, 129 Shakespeare Street, Stoke, Coventry.

SIR.—In the August issue, "Old Timer" discusses phonetics on 'phone and says we let ourselves down by employing them. The writer was using wireless gear in 1917 and telephones in 1915. The alphabet in those days ran "Ack, Beer, Charlie, Don" and was used successfully by all concerned. During the last war, American phonetics had to be introduced, the phonetic alphabet becoming "Able, Baker, Charlie, Dog," etc. Used by the armed forces all over the English-speaking world, I suggest that they should be satisfactory to the amateur fraternity. Should I wish to raise a station—say, my brother in Bristol—I call G2BTD by using the words "George Two Baker Tare Dog." This is clear to all concerned, the caller, the called and the listener who may be tuned to our frequency. If by some mischance the uninformed SWL thinks that I am talking about bakers and dogs, I would say that where there is such blissful ignorance, why bother about the shop-window? Taking the "Old Timer's" own instance, DL4AI, he says "No

one mentions Germany." Surely, DL is for Germany, so why say it twice?

W. Vinicombe, GM8RV, 6 O'Connell Street, Hawick, Rox.

QSL's FOR SWL's

SIR.—As a keen amateur transmitter, I am also a listener every time I switch the receiver on. Quite a number of amateurs these days forget this, so why not give the SWL's a break with cards? I have always QSL'd 100% and this includes listener reports. A good deal of interest in Amateur Radio is developed by QSL'ing listeners, and it is up to licensed amateurs to foster this, as well as helping in other ways. My own returns are only about 40% but I am pleased with my collection.

G. V. Haylock, G2DHV, Ravensbourne Amateur Radio Club, Downham, Kent.

SIR.—In answer to SWL Williams (see p.350, August) who suffers the "loss" of 30% of his reports, I should like to put forward my views as a transmitting amateur located in a "rare county" for 160-metre working: as a result, I receive comparatively large numbers of reports from SWL's seeking county certificates. Where return postage is enclosed, I send a card immediately; where no postage is sent, a card is included in the next batch going to the Bureau, provided an SWL identification number is quoted. I am not, however, prepared to send cards direct to SWL's who report hearing my signals on a single occasion and neither enclose return postage nor give any sort of identification enabling me to send a card through this or that bureau. Such reports are normally useless, and SWL's might find that their percentage

of replies would increase if they sent a report more comprehensive than that which can be accommodated on the usual SWL card. Further, unless I have been making alterations to my speech equipment, I feel more kindly disposed to the senders of CW signal reports, partly because they are less common and partly because of a feeling that a listener who has taken the trouble to learn Morse is deserving of encouragement and can probably be relied upon to give an accurate report.

W. H. Borland, GM3EFS, 79 Bank Street, Alexandria, Dunbartonshire.

SIR,—I was once a listener myself (that does not mean that I spend all my time calling CQ nowadays) and before the war the walls of my study at school were decorated with 14 mc cards from OA, W7, VK, ZL and so on, gathered with an 0-V-1 receiver. Now I am a target; I hesitate to think what would happen if I used 'phone, since I don't radiate a particularly powerful signal. Since the war, out of all my collection, I have had precisely one SWL report for 7 mc, and one for 14 mc, that were any use at all — and these came from SWL's of proved reputation. Why should I reply to a report that my signals on an unspecified band at an illegible time were 579, when I was working a station three times as far away in the same direction? In fact, I have tried to reply to every SWL report received, pointing out, more

or less patiently, why the report was of no use to me.

J. Roscoe, G4QK, 24 Ballards Way, South Croydon, Surrey.

QRP RESULTS WITH THE "T2FD"

SIR,—As the "introducer" of the T2FD aerial system to many readers of SHORT WAVE MAGAZINE I usually hear only the moans when it refuses to work as it should. It is therefore a pleasant change to get a letter from someone who likes it! GD3HQR writes to tell me that he has had a 40-metre version up for some time, using a 100-ohm 5-watt terminating resistor and "chain store" 100-ohm twin feeder. With 2-3 watts input to two 1299's in parallel, he has worked, on CW or 'phone, 19 European countries with an average RST-559 report. The high end of GD3HQR's T2FD array is only 20 ft. up, direction NE/SW. These results may encourage other QRP men with small rigs and little space for erecting a full-size aerial.

N. P. Spooner, G2NS, 7 Foxholes Road, Southbourne, Bournemouth, Hants.

MEASUREMENT OF NOISE FACTOR

SIR,—I was greatly interested in the article by G3BKQ on a "Low Noise High-Gain Converter for 430 mc" in the July issue. The author is to be congratulated on his design and workmanship. I would suggest, however, that the figures quoted for the noise-

factor may be somewhat optimistic. The CV2171, though nominally usable at frequencies up to 500 mc, has an inherent limitation due to the capacitance and inductance present inside the envelope itself. These will resonate at a frequency near 500 mc, and as a result far more noise-power will be available from the load resistor than will be indicated by the elementary formula. In any particular design of generator there may be other resonances present due to stray inductance and capacity outside the valve. I have made comparative measurements of noise factor on a receiver, using three different noise generators. Two of them were fitted with the CV2171, and the third used a coaxial diode designed for operation at frequencies up to 1500 mc. At 400 mc the CV2171 generators gave figures which were respectively 3 dB and 4.5 dB optimistic compared with that obtained using the coaxial generator. Measurements were not taken at 430 mc, but at this frequency the discrepancy would almost certainly have been even greater. I would suggest, therefore, that the noise-factor of the G3BKQ 70-centimetre converter is probably of the order of 8 dB. These observations do not, of course, impair the usefulness of the CV2171 noise generator for comparative measurements on different receivers at any one frequency.

I. J. Richmond, B.Sc., 27 Woodfield Avenue, Farlington, Cosham, Hants.

RSGB NATIONAL CONVENTION

The Radio Society of Great Britain holds its national convention during the week-end September 17-19, in Bristol. An ambitious programme has been arranged, and the convention station will sign GB3NCB on the 1.8, 3.5 and 14 mc bands; a commemorative QSL card will confirm all contacts.

Arrangements are in the hands of a local committee of RSGB members, with G3ERQ in charge of publicity. The convention dinner will be held at the Victoria Rooms on the Saturday evening.

M.V. "ARIES" HOME AGAIN

The return crossing of the Atlantic by the powered yacht *Aries* (Capt. C. Harcourt-Smith, R.N. ret'd., Venner Electronics, Ltd.) was completed on August 7, when *Aries* made fast in Dartmouth Harbour. She is the first vessel of her class and rating to achieve the double crossing.

UNREASONABLE REQUEST

Quite often, we get asked for a list of the States accepted for the American WAS Certificate, or for a tally of U.K. counties for our WABC—"because I am going to apply for WAS (or WABC)," as the case may be. This note is inspired by the fact that just recently we had a demand for *both* lists by one enquirer, without so much as an s.a.e. being enclosed. To comply with such a request involves time and typing effort in supplying the sort of information that can quite easily be got from (a) Any good reference book, (b) Any school atlas, (c) Any public library, or (d) Any issue of the *Radio Amateur Call Book* (for the States of the American Union). There are 48 States to get for WAS. For the 60 U.K. counties required for WABC, there is a total of 93 from which to choose.

VFO for Two Metres

DESIGN, CONSTRUCTION AND SETTING UP OF A STABLE CRYSTAL-MIXER VHF DRIVER

C. C. STEVENS (G6XH)

For many years now, we have consistently been advocating stabilised transmitters on the VHF bands. Until recently this has meant crystal control, since it did not seem possible to get anything like the required degree of stability by using an SEO driver. With the general adoption of the Zone Plan, CO drivers met the operating requirement, because single-channel or net working has never been accepted amateur procedure on VHF. However, times have changed. With the level of activity which develops in some Zones when the band opens for EDX—though not this year, yet!—and the recent appearance of non-amateur stations in the 144-145 mc shared area, easy frequency changing has become, if not a pressing need, at least a desirable facility in the modern VHF station. This is not to say that the VFO-chasing technique commonly used on the LF communication bands is becoming the new procedure on VHF—far from it. The idea of being VFO-controlled on Two Metres is to be able to move within one's own Zone in order to avoid interference—that, and nothing more. There are several VHF stations already using a VFO in that sense. The VHF-VFO described in this important article will be of great interest to every VHF operator; its performance can be proved on air test by anyone able to hear or work G6XH. The details he gives in his article will enable any careful and experienced constructor to produce a similar unit—with a warm-up drift of less than 7 kc and a calibration accuracy of better than 3 kc on the 144-146 mc band.—Editor.

THE writer has been using a VFO on the two-metre band for the past few months, and as it has turned out so successful, it is thought that an account of the reasons which led to its construction, and also of the methods employed, may be of interest to other two-metre operators—as well as to those who are interested in VFO design generally.

Crystal Control or VFO ?

As a low-power operator in the vicinity of London (Chorley Wood, Herts), it was soon discovered that a fixed crystal frequency in the correct Zone, although possibly satisfactory during periods of low activity, was very far from being so when conditions became good and the band opened up. A number of high power (some very fully modulated) signals then make their appearance, and the necessity of being able to shift frequency to avoid interference becomes very apparent.

Since building this VFO the problem of non-amateur stations on the band has made it clear that it may soon be a *necessity* to be able to change frequency.

There appear to be two solutions :

- (1) Acquire a number of spot frequency crystals in the Zone.
- (2) Use some form of VFO.

As regards the first, an article on the advantages of using overtone crystal oscillators ⁽¹⁾ had convinced the writer before he started transmitting on two metres that in order to reduce the possibility of TVI he would use an oscillator at 18 mc. It may be added that this procedure has always been followed and no TVI has been encountered.

The possibilities therefore exist either (a) To buy a number of 18 mc crystals, or 18 mc overtone crystals, both of which would prove expensive, or (b) To attempt to find suitable surplus 6 mc crystals which would be prepared to oscillate on their third overtones. Despite what has been said elsewhere on this topic, it has been found that by no means all "surplus" FT243 crystals will work on their overtones, and although some were found which gave a signal in the two-metre band, none could be found for the correct Zone. The search is made more difficult by the fact that the difference between the overtone frequency and the appropriate multiple (three in this case) of the calibrated frequency varies from crystal to crystal so that it is practically impossible to choose a crystal by virtue of its nominal frequency. As an example, the writer had a crystal ground for him to 6032 kc which might have been expected to go off on an overtone corresponding to about 6030 kc — but it actually comes out at 18045 kc, corresponding to 6015 kc and giving output on 144.36 mc. This was the last attempt to get into Zone G by overtone crystal ! Something else had to be done.

We thus come to the use of a VFO in some form. The design and construction of a VHF-

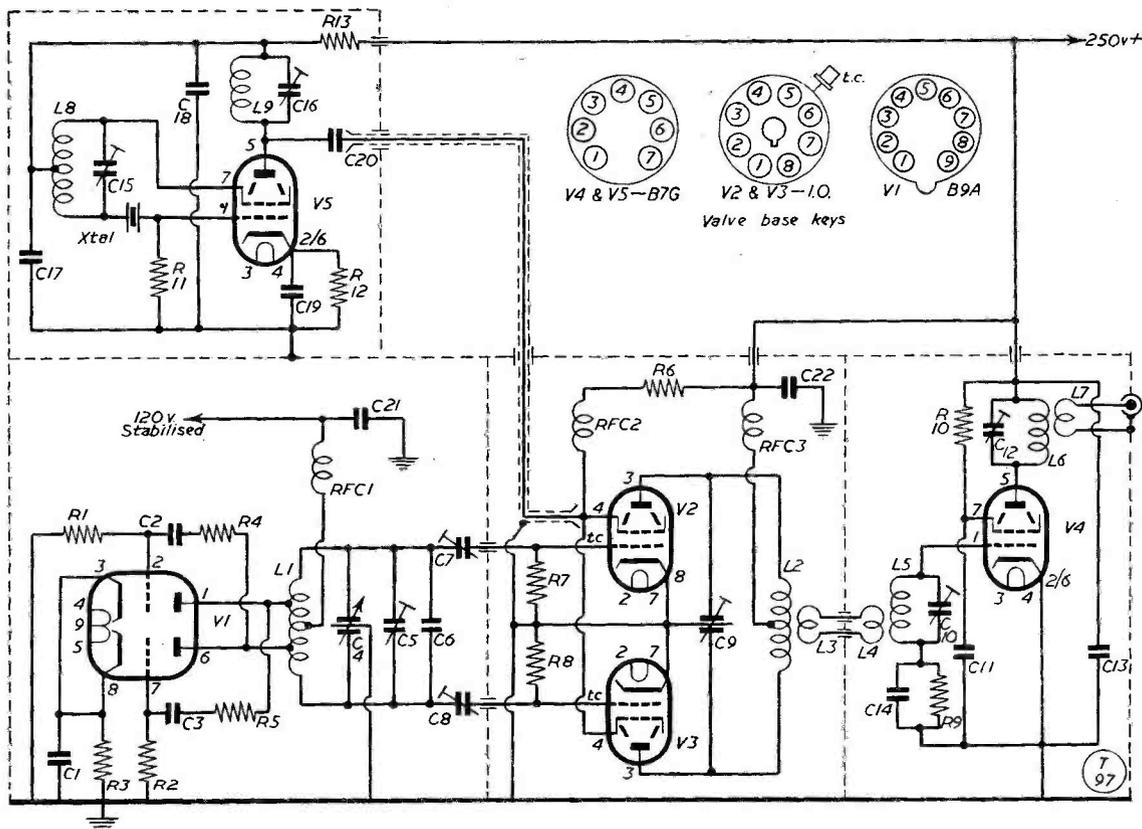


Fig. 1. Circuit complete of the VHF-VFO designed and described by G6XH. V5 is the crystal-oscillator section, feeding the mixer screens in parallel. V1 is the variable-frequency oscillator, using the Kallitron circuit — as in the oscillator section of the original G21Q converter — with C4 as the VFO tuning control. It is essential that the output stage V4 be properly screened and lightly coupled, with the circuits L5, C10 and L6, C12 peaked for the middle of the band area to be covered. If carefully constructed, this VHF-VFO will give a T9 drive with negligible drift after warm-up; the curve at Fig. 2 shows the measured drift during the warm-up period. If a good dial mechanism is used for C4, frequencies can be set up very accurately.

mixers, i.e., an LFO sweep of 1185-1335 kc.

These frequencies were chosen for a try-out of the circuit, and as they have proved completely successful and given no trouble from unwanted frequencies, no alteration to them has subsequently been made. If it should be desired to cover only the relevant Zone then a reduced sweep of LFO would be permissible, thus allowing a more open scale.

The stability of the VFO is such that it would be practicable to arrange for a zone of, say, 200 kc at 144 mc to be spread over the major portion of the tuning scale. In the writer's case an "Indigraph" dial (pre-war variety) is used; it is possible to estimate to better than one-fifth of one division with this dial, which has 100 divisions. As the tuning range extends from 144.0-145.12 mc one division corresponds to 11.2 kc average over the whole dial, and by interpolation frequencies

can be set up to about 2 kc, which, it will be agreed, is near enough on the two-metre band!

The Circuit

The circuit is shown in Fig. 1 and it will be seen that the push-pull oscillator valve (using the Kallitron circuit⁽⁵⁾) is a 12AT7. A 6N7 was originally tried, but the 12AT7 was found to cause less than half the initial drift which occurred with the 6N7. It is possible that a 6N7G might give better results than the metal type, but one was not available to try. The anodes of the 12AT7 are tapped as far down the tank coil as they will go consistent with obtaining a good note, in order to obtain as much stability as possible⁽⁶⁾.

C6 is a fixed parallel capacity suitably chosen so that C4 will cover the required frequency sweep, and C5 is a 3-10 $\mu\mu\text{F}$ trimmer mounted to be adjustable through the front panel to set

the 144 mc point in synchronism with the BC221 crystal harmonic (on 18 mc).

A pair of EL32's recommended by G6LI⁽²⁾ were used as mixers, (the grids and anodes in push-pull and the screens in parallel), the coupling to them from the 12AT7 being made as light as possible consistent with sufficient output, to reduce inter-action back on to the LFO. A pair of 30 $\mu\mu\text{F}$ concentric trimmers C7 and C8 were sufficient when set at minimum—hence, a low value has been specified for them. The screen voltage of the EL32's is not critical and the value of R6 shown gives the minimum anode current without incurring loss of output. With the screens at earth potential the valves tended to develop spurious oscillations.

The overtone crystal oscillator uses an EF91 in the author's favourite overtone circuit, the screen acting as anode in a standard Squier arrangement, with the anode tuned to whichever harmonic of the overtone is required—in this case the first. The use of electron coupling from the oscillator proves satisfactory in reducing the effect of loading the crystal, particularly with inactive ones requiring considerable feed-back. Output at 19:335 mc is fed via C20 (50 $\mu\mu\text{F}$) and a length of screened lead to the parallel screens of the mixers.

The push-pull tank circuit of the mixers is tuned to approximately 18 mc, and is link coupled *as loosely as possible* to the grid coil of an EF91 operating as a doubler to 36 mc. It was thought desirable to avoid, if one could, the passage of unwanted signals into the main transmitter by providing the highest possible selectivity, by means of loose coupling, to an additional stage after the mixers; obviously, it was convenient to use this stage to double to 36 mc and so avoid any instability trouble or the necessity to neutralise this stage, V4; coupling is made just sufficient to give adequate drive to the EF91 and if this is done the tuning of L2,C9 and L5,C10 will be very sharp, thus ensuring maximum rejection to unwanted frequencies. The pass-band required to cover 144-146 mc corresponds to 18-18.25 mc at L5,C10 and it has been found that if this circuit is peaked to about 18.09 mc the output from the VFO is reasonably flat over the range corresponding to 144-145.2 mc. It should be emphasised that this doubler stage must be *completely shielded* from the mixer stage; if this is not done it will be impossible to control the drive to it by the link coupling L3,L4, and it will probably be found that there is sufficient drive to the grid of V4 with the link uncoupled! The writer experienced no

trouble from this as soon as an adequate shield was fitted under the chassis, separating completely the tuned circuits and components of the mixer and doubler stages. It is in fact desirable to shield as much as possible the four sections of the VFO, *i.e.*, LFO, mixers, doubler, and crystal oscillator, so that the mixing of the frequencies is kept under control; it is also desirable to keep the HT and LT leads separated for each stage up to their inlet point on the VFO unit, but no special decoupling or shielded wiring was used.

Constructional Notes

For economy reasons an old chassis and shielding case measuring 8" wide by 10" deep by 7" high was used, and the components mounted and circuits arranged in the most convenient manner utilising existing valve holes, etc., whenever possible.

All valves were mounted above the chassis together with the main tuning condenser C4 and LF coupling condensers C7 and C8, and the medium wave choke RFC1. The EL32 mixer valves have top grid caps and the leads from C7, C8 to them remain above chassis.

No special shielding was used other than that previously mentioned, *viz.*, vertical strips of aluminium below the chassis dividing it into four compartments.

While it is desirable to make the construction as rigid as possible, no extraordinary precautions were taken in this direction and do not appear necessary. The tuning condenser C4 is a miniature dual "surplus" type, and if no flexible coupler is used it is advisable to mount it directly on the front panel, so that it is floating mechanically with respect to the chassis and any slight movement due to pressing on the panel does not cause a relative movement between the fixed and moving plates. L1 should be mounted well clear of any metal part of the chassis which may not be completely rigid, and of the heat from V1. A convenient method of shielding this coil is by mounting it in an old 2" diam. BC dual-range screening can.

The mixer tank condenser C9 is mounted below the chassis and as it should not be touched after initial tuning up, no exterior control has been provided; it is a miniature type similar to C4 and adjustment by screw-driver is made possible by cutting a slot across the spindle face.

No special comment is necessary on the doubler and crystal oscillator stages. Any suitable variable condensers may be used for

C10, C15, and C16, either the concentric trimmer type, or the miniature pre-set type being convenient, as they do not need to be accessible from outside.

Lining Up

The lining up process proved unexpectedly simple and quick to do.

The first operation is to get the LFO working correctly on its required frequency range. If the values for L1, C4, C5, C6 are used as shown there should be no difficulty in finding the correct frequency, but if no GDO or absorption meter is available for these low frequencies (and if one has to rely on listening for this oscillator on the medium wave range of a BC receiver) make sure that it is in fact the fundamental and not a harmonic that has been found. This can usually be verified by checking that there is no evidence of a louder signal around 600 kc—but if there is an IF gap which makes the matter uncertain, it will be necessary to check that there is no 3rd harmonic around 1800 kc.

The bandspread can be adjusted by altering C6 and making a corresponding change in the number of turns on L1. With the values given it will be found that the range is approximately 1335-1195 kc, corresponding to 144.0-145.12 mc, but with a different crystal frequency the LF range must be adjusted appropriately. L1 will require a few more turns if a 2" diam. shielding can is used.

Having made sure that the LFO is working correctly, set it to that frequency which will give 18 mc when it is subtracted from the crystal frequency, *i.e.*, 1335 kc in this case, using a 19.335 mc crystal. The overtone oscillator should now be tuned up.

It will be seen that the feedback turns on L8 are proportionately more than are usually recommended, but it has been found in many trials with ordinary "surplus" crystals as overtone oscillators that more turns than normally specified *are* necessary. With a very unwilling specimen it may be found that instead of the crystal oscillating on its overtone there is more tendency for self-oscillation to occur. This is a sign that the crystal is no good for this purpose; when, however, a reasonably active one has been found there should be no sign of self-oscillation over the sweep of C15 for which the crystal oscillates. Make sure that the crystal is indeed going off on its overtone only, as active crystals may tend to oscillate (although perhaps very weakly) on their natural fundamental at the same time, at certain settings of C15. This is *very* undesirable as the third

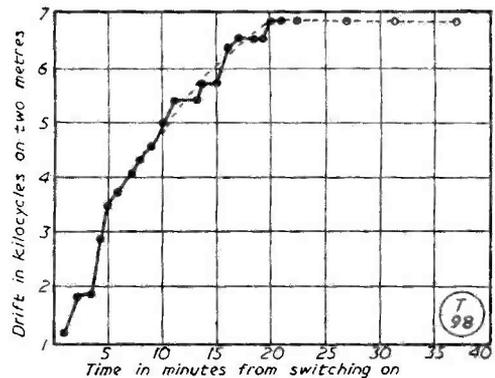


Fig. 2. This curve shows the drift against the warm-up time for the G6XH VHF-VFO as described. After 20 minutes, the frequency remains perfectly steady.

harmonic is quite close to the overtone and would lead to trouble in the mixers! Great care should therefore be taken to make sure that there is no sign of oscillation on the fundamental. C16 may now be tuned to resonance, indicated by a dip in anode current, and another check should then be made that the overtone is the only mode of oscillation taking place. Much time can be saved if the circuits L8,C15 and L9,C16 are checked with a GDO prior to tuning up.

Having got both V1 and V5 operating correctly, adjusting C9 should indicate the presence of an 18 mc signal, as shown by a flash lamp bulb coupled by a single turn to L2. A receiver equipped with an S-meter can now be very helpful because the required 18 mc can quickly be found and lining up watched on the meter. The values given for L2 and C9 do not permit tuning as high as the image frequency (20.6 mc), and once a point of resonance has been found there should be little doubt that it is the correct one—but this should of course be verified on the receiver, absorption meter, or GDO.

If a GDO is available (and it is so useful a piece of apparatus that no amateur experimenter should be without one), L5,C10, and L6,C12 can already have been roughly tuned to 18 mc and 36 mc respectively. L4 should now be lightly coupled to L5 and the anode current of V4 should show evidence of drive. It is now that the output link L7 can be coupled by a short length of co-ax cable to the main transmitter.

The writer's two-metre transmitter embodies a 6AG7 first stage connected in a similar circuit to V5, the Squier circuit operating on

18 mc, and the anode being tuned to 36 mc. The 36 mc output from the VFO was at first coupled into the 36 mc tank circuit of the 6AG7 (the Squier being detuned to stop the crystal oscillating), but it was found that the drive from the VFO was not sufficient; the link was then transferred to the preceding 18 mc screen circuit of the 6AG7, and in this way ample drive was obtained, the amplification of the 6AG7 providing the additional gain despite the Squier circuit not being tuned to 36 mc.

Once drive has been obtained to the transmitter it will be found very easy to finish the tuning of the VFO circuits to obtain maximum drive, making sure that the coupling of L4 to L5 is at the *least possible* without causing any drop in output. The tuning of C9 and C10, which should now be very sharp, should be set to the middle of the required tuning range, and adequate drive should be available throughout the VFO sweep to replace the original crystal drive.

Operating Conditions

The supply for the HT to V2, V3, V4 and V5 is 250v. V1 is supplied from a 120v. stabilised (S130) line.

The cathode currents are as follow:—

V1	4.5 mA (both halves together)
V2 and V3		3.6 mA each
V4	7.9 mA
V5	7.5 mA

Total currents:—cathode 23.5 mA; heater 1.3 amps.

Stability and Calibration

As previously mentioned, the drift on 144 mc is about 7 kc from start, and a curve showing how this occurs is given in Fig. 2. This curve was obtained by tuning the VFO to 18 mc and the audio beat between it and the 18th harmonic of the BC221 crystal checked by comparing it against piano notes. After 20 minutes the changes taking place are small and difficult to measure with the apparatus available.

It is possible by closely coupling the BC221 to the two-metre receiver to get sufficient signal from harmonics of its variable oscillator to obtain beat notes with the 4th harmonic of the 36 mc output of the VFO, and in this way to calibrate the tuning scale to the limits of accuracy of the BC221. Any correction necessary from time to time, due possibly to ageing of the components or change in room temperature, is done with C5 against the BC221

crystal harmonic on 18 mc.

The ultimate stability of the VFO is obviously dependent on that of the LFO, and it is probable that with care the initial drift could be reduced, e.g., by using negative coefficient condensers in the tank circuit of V1. The correct proportion would have to be found experimentally. Another field for experiment would be that of using an overtone crystal on 38 mc with a 2 mc LFO. Such choice of frequencies would halve the effect of the LFO drift, which would, however, itself tend to be higher on 2 mc.

Use of a VFO such as this increases one's appreciation of the 144 mc area of the spectrum (the writer found himself thinking in kilocycles for the first time on this band), and the limitations even of the BC221 become apparent!

Finally, the author can thoroughly recommend this type of VFO, from the construction of which he has had much enjoyment. There should be no trouble from unwanted frequencies, but do check on this as carefully as possible before going on the air!

REFERENCES

- (1) Short Wave Magazine, July 1951, p. 278 "The Overtone Crystal Oscillator Against TVI" by E. J. Pearcey (G2JU).
- (2) RSGB Bulletin, Jan., Feb. 1953 "Mixer Master Oscillators" by W. H. Allen, M.B.E. (G2UJ).
- (3) Short Wave Magazine, Feb. 1954, p. 714 "Crystal-Mixer VFO," by J. N. Walker (G5JU).
- (4) QST, July 1940 "A Heterodyne Exciter" by Bliss & Bailey.
- (5) Radio Engineers' Handbook (Terman), p. 509
- (6) Ibid., p. 485.

"IMPROVED TWO-METRE CONVERTER"

In the article by G5RZ in our August issue, it should be noted that in the Table of Values on p.334, the following corrections are necessary: R8 (*omitted*) should be 56 ohms; L4, L5, are similar coils, wound as given opposite L4; for L6 *read* L7; L6 should have been given as 6 turns 20 SWG tinned, spaced wire diameter, wound on a $\frac{3}{8}$ in. slug tuned former; RFC (above R2 in the circuit diagram) is not critical, and can be about 20 inches of 30 SWG enamelled wire wound on a ceramic resistor. These omissions are greatly regretted by G5RZ and we sincerely hope that nobody has been flummoxed by them.

WELL, we had hoped to start off this time with a chronicle of stirring events brought about by that "spell of C5 conditions"—and a tale of success arising from the VHF expedition undertaken by HB9PQ and his party during August week.

The fact is that, except for an occasional EDX opening of short duration and the odd burst of GD_X, conditions have remained generally poor. The Swiss story is particularly unfortunate. Opening on August 1st, by the 5th HB9PQ reported that up till then they had achieved only one contact on two metres—with a local HB. At the end of the week, HB9PQ wrote to say that they had been making three contacts a day on 144 mc, but only with that same HB9BZ. Another set-back was the sudden illness, in camp, of HB9NL, who had to stay in bed for four days of the eight they were up on the St. Gotthard. However, in spite of everything, they ran the two-metre equipment for a total of 120 hours, so that it must have been a great disappointment not to be able to raise a single DX signal on the band. The only time they were off the air at all was between midnight and 0500 BST, for sleep, cooking and attending to the patient. None of the schedules arranged *via* 3.5 and 14 mc came to anything—the two-metre band remained obstinately shut tight.

In the circumstances, we must applaud the enthusiasm, persistence and determination of the Swiss boys, who certainly tried all they knew and would have given us and themselves a wonderful time had conditions relented at all. One is sure HP9PQ will not mind if we quote him *verbatim*: "It was a week without success, hi . . . only the same Swiss station worked each day . . . perhaps you could send me some hear report . . . Over all we hold up our humour and a few hours before the end the 2m. Tx made QRT. . . he was running 120 hours . . . we had a wonderful QTH . . . we are hoping that HB9IV will have more chance on August 28-29 on Mt. Rigi."

The latter reference is to the

VHF BANDS

A. J. DEVON

Conditions Still Poor—

No Luck for the HB's—

Much Portable Activity—

Doings Round the Stations—

Notes, Reports and News—

Contest scheduled for the week-end before you see this, of which we were not favoured with necessary information in time for the August issue—once again, it was the responsibility of U.S.K.A. (the HB amateur organisation) to lay this on, and we hope, for the sake of all concerned, that EDX openings did develop for it. (*As A.J.D. always has such shocking luck with contest conditions, perhaps it is as well advance information was not given here!*—Ed.)

For the RSGB's portable event on August 15, weather and conditions were fairly good, and during the morning and early evening there was quite a lot going on, with a few Continentals getting into the Midlands. Some of the portables were putting out very good signals having regard to the distances involved, and G5YV (Leeds) mentions G2BAT/P as being strong all day—though we are not quite certain where the latter was on this occasion.

General News

On the evening of August 4, the G1's and southerly GM's were

calling G2DVD, G3EHY, G3GHO, G3WW, G4MW, G6NB, G6RH and G8OU, without apparently attracting attention—so the band was open to that extent. G3IUD (Wilmslow) gives July 11-12 and 19 as openings, and G3IOO (Oswestry) remarks that he was able to receive PE1PL four days out of five on the daily 1245 BST schedule with G5YV; signal level varied between RST-229 and 549.

We all know, or know of, GW2ADZ, lately of Oswestry—"lately" because he is on the move to North Devon, where he will become G2ADZ, starting up from Morthoe, not far from Ilfracombe; he says "I hope it will prove interesting; it will be a change not to be hemmed in by hills." To anyone who knows Morthoe, it certainly should be interesting, as from parts of that delectable village it is clear away in all directions, from high ground. So we shall expect to hear a thumping signal from G2ADZ when he gets settled. GW2ADZ has been an outstandingly successful station on both VHF bands, as the records show; it might be added, by way of a valediction on his Oswestry activities, that on the evening he and EI2W had their 70-centimetre contact for the EI/GW "First." GW2ADZ also worked G2WJ—and could have worked a few more SE'ly stations, as steady carriers were being heard from that direction.

From GI3GQB (Newtonards) we have a listing of the following G1 frequencies, which will be of interest to many GD_X artists: 2FHN, 145.00; 3AXD, 144.075; 3CWY, 144.05; 3FIJX, 144.05; 3FZQ, 144.40; 3GQB, 144.132; 3IJM, 145.20; and G15AJ, 144.18 mc. GI3GQB explains that these are not necessarily dead accurate, but they will show where to search for the G1 contacts so many people want so much.

It will have been noticed that in our very complete listing of "Two-Metre Firsts" there is no entry for G/GI—indeed, we have asked once or twice for the claimants to step forward; now G5CP (Chesterfield) says that it should be attributed to G3BW/

G12FHN (which was what we thought when originally compiling the list). So if either or both of them would be good enough to thumb back through the log, and give us the date, we shall be very pleased to enter it on the next appearance of that Table. (The contact would probably have been about four years ago).

Another noteworthy "First," but in rather a different context, is the news that VS2DV and VS2DQ have made the first amateur two-metre QSO in Malaya, the distance being 40 miles. On the face of it, this might not seem much, but to anyone who knows the difficulties of getting going with no signals on which to listen or local co-operation of any kind, it is something of an achievement even to find the band, let alone make a QSO—so good luck to VS2DV and VS2DQ, and we hope they will be followed by other VS operators.

G3WS (Chelmsford) is off the air for a few weeks because he is in Yugoslavia on business; naturally, he hopes to meet some YU's and find out what, if anything, is cooking on VHF in that part of the world. And we also shall be interested to know what he finds.

Over the 75-mile sea path, G15AJ/GM3DIQ keep in regular contact, with signal levels on the S9-mark irrespective of weather, time or conditions.

Referring back to the GW2XV/P foray to Snowdonia—when he was expected to be a very much stronger signal than, in fact, he turned out to be—Gerry has since found a fracture in his coax feed line which might well have been there during the Snowdon operations; this would explain it, anyway.

G3WW rightly draws attention to the fact that the Kallitron oscillator, as used by G2HCG for his SE-VFO and by G6XH for his XM-VFO (see "VFO for Two Metres" in this issue), was first given by G2IQ; it is the oscillator section of his now world-famous "6J6 Converter," published originally in *Short Wave Magazine* exactly five years ago! So once again we bend our head

TWO-METRE ACTIVITY REPORT

(Lists of stations heard and worked are requested for this section, set out in the form shown below, with call signs in alphabetical and numerical order).

G3IUD, Wimslow, Ches.

WORKED: G2ATK, 2BAT/P, 2DCI, 2DVD, 2FCL/P, 2FJR, 2FOS, 2HCJ/P, 2XV, 3AGS, 3AGS/P, 3A0O, 3ASC, 3ATZ, 3AUC, 3AUC/P, 3AYT/M, 3BKQ, 3BOC/A, 3BPJ, 3BW, 3CCF, 3CUZ, 3DA/P, 3DQO, 3EHY, 3EPW, 3FH, 3FMI, 3FRY, 3GB, 3GCG, 3GHO, 3GMX, 3GOP/P, 3GXR, 3GYV, 3HXS, 3HYH, 3HZK, 3IGK, 3IOO, 3IPH/A, 3JF, 3JVF, 3JWJ, 3PY, 3RP, 3WS, 4JJ/P, 4SA, 5AU, 5EB, 5BM/P, 5DS, 5MA/P, 5ML, 5YV, 6FK, 6RH, 6WF, 6XM, 8BP, 8QY/P, 8SB, 8SB/A, 8SB/P, 8VN.

HEARD: G2A1W, 2BMZ, 2DRA, 2HIF, 3FUM, 3GOP, 3HHY, 3HTY, 3HWJ, 3JFR, 3YZ/P, 6L1, 6OS, 8UQ/P, PE1PL. (July 3 to August 15).

G2DHV, Blackheath, London.

HEARD: F9CQ, G2A1W, 2MV, 3AEX, 3DIU, 3GZM/P, 3GWB/P, 3IUV, 3ISA/P, 3ITS/P, 4AU, 6AG/P, 6NF, 6TA/P. (Sunday August 15 only).

G2DVD, Slinfold, Sussex.

WORKED: F3JN, 8MX, G2ABD, 2ATK, 2BMZ, 2BPC, 2HCG, 2HDZ, 2MV, 2TP, 2UN, 2XV, 2YB, 2YC, 3ARL/P, 3AWY, 3BKQ, 3DO, 3FAN, 3FD, 3FEX, 3FOS, 3FRC, 3GGJ, 3GHI, 3GHO, 3GSM, 3GXG, 3HBR/A, 3HCU, 3HST, 3HZJ, 3IAM, 3IUD, 3IPB, 3JEP, 3JFR, 3JHM, 3WV, 4AJ, 4MW, 4PS, 5BC, 5DS, 5MA, 5NF, 5SZ, 5TP, 5TZ, 5US, 5WV, 5YK, 6AG, 6GR, 6JP, 6LX, 6NB, 6OH, 6TA, 6XH, 6XM, 8OS/M, 8OU, GW3EJM, 8KW/P. (July 14 to August 13).

G3FYY, London, N.W.2.

WORKED: F8MX, G2ABD, 2BBN, 2BPC, 2FXG/A, 2DD, 3BFP, 3DVQ, 3FD.

3GHI, 3GXG, 3HYF, 3IAM, 3ISA, 3IXE, 3JMA, 3MI, 6TA/P, 6XH, 6XM, 8KW/P, 8UQ, 8UQ/P. (July 15 to August 12).

GW5MA/P, Nr. Amlwch, Anglesey.

WORKED: G2ATK, 2FJR, 2HCJ/P, 2HGR, 2XV, 3BA, 3BKQ, 3CCF, 3CCH, 3CUZ, 3DA, 3DO, 3EPW, 3FMI, 3GHO, 3HTY, 3HYH, 3IOO, 3IUD, 3IUV, 4SA, 5YV, 6NB, 6PJ, 6YU, 8OU, 8SB/P, GD3UB, G13FZO, 3GOB, 5AJ, GM3EGW, GW3GOP/P.

HEARD: G6RH. (July 31 and August 1).

G5MA/P, Nr. Cusop, Hereford.

WORKED: G2A1W, 2ATK/M, 2CVD, 2DCI, 2HCJ/P, 2HIF/P, 2NV, 2OI, 3AGS/P, 3ASC, 3CRH, 3DO, 3EHY, 3EPW, 3ERD/P, 3FKO/P, 3GHO, 3GNJ, 3GOP/P, 3GWB/P, 3GZM/P, 3HHY, 3HSD/P, 3IOB, 3IUD, 3IP, 3NL/P, 3YZ/P, 4PR, 4SA, 5ML/P, 5YV, 6FK, 6NB, 6WF, 6ZH, 8QY/P, GW3GWA/P, 5BM/P. (August 15 only).

G2CZS, Chelmsford, Essex.

WORKED: F8GH, G2ALNP, 2ATK, 2BCB, 2CD, 2FXG/A, 2HCG, 2MV, 2WJ, 2YB, 3ABH, 3AEX, 3ANB, 3BRX, 3BSU, 3EGV, 3EMU, 3FAN, 3FKJ, 3FYV, 3GGJ, 3GHI, 3GNJ, 3GVC, 3HWF, 3IIT, 3IUV, 3JMA, 3SM, 3WP, 3WV, 4AJ, 4KO, 5MW, 4OT, 5GX, 5MA/P, 5MR, 5TZ, 5UM, 6LX, 6YP, 8KW, 8KW/P, 8LN, PE1PL.

HEARD: F8MX, G2BMZ, 3EPW, 5UF, 6NB. (June 21 to August 11).

GM3DIQ, Stevenston, Ayr.

WORKED: G3CCH, 3IUD, 5YV, 6XM, G13GOB, 5AJ.

GM2BUD, 3DDE, 3BDA, 3FYR, 3IBV, 3INK, 3NG, 4PW, 6SR, 6WL, 6ZV, 8AH.

HEARD: G2FJR, 2FZU, 3BW, 3WW, 6NB, GM3EGW. (July 16 to August 11. 79 hours operating).

G4SA, Drayton, Berks.

WORKED: G2AHY, 2ASF/P, 2FCL, 2FJR, 2FWW, 2HCG, 2HCJ/P, 2HGR, 2IQ, 2YB, 3CUZ, 3DA, 3DO, 3ERD/A, 3EGG, 3FUM, 3GMX, 3GNJ, 3GKZ, 3HHY, 3IOO, 3Y2/P, 5AU, 5DF, 5MA/P, 5RZ, 5SK, 5YK, 5YV, 6FK, 6FO, 6NB, 6WF, 6XM, 8PX, GW2ADZ, 3GOP, 5MA/P. (During July - August 15).

G3GHO, Roade, Northants.

WORKED: F3JN, 8GH, 8MX, G2ABD, 2ATK, 2DDD, 2DVD, 2FNW, 2HCG, 2IQ, 3AGS, 3BA, 3BJQ, 3BNC, 3CKQ, 3DLU, 3EGG, 3FQS, 3FSG/P, 3FUW, 3GFW, 3GHI, 3GHU, 3GWB, 3HVO, 3IEY, 3IOO, 3ISA, 3IUK, 3JFR, 3XC/P, 3YZ/P, 5ML, 5SK, 5YV, 6FK, 6LX, 6NB, 6OU, 6OZ, 8VN, GD3UB, GW3EJM, 5MA/P, 8SU.

HEARD: G2BAT, 3AGA, 3GOP/P, GW3FAN. (July 16 to August 11).

G8VN, Rugby.

WORKED: G2ATK/M, 2FNW, 2FXK, 2XV, 3ABA, 3BA, 3BJQ, 3CHR, 3CKQ, 3DLU, 3DG, 3FMO, 3FUW, 3GHO, 3GHU, 3HHY, 3IUD, 3IU, 5MA, 5ML, 5SK, 6FK, 6YU.

HEARD: F8MX, G2ABD, 2A1W, 2BVV, 2DVD, 3BKQ, 3CUZ, 3FH, 3GNJ, 3GWL, 3HBB, 3IOB, 3IOO, 3IUK, 3WV, 4SA, 5TZ, 5YV, 6NB, 6RH, 6XM, GW5MA/P, ON4BZ. (July 14 to August 14).

in the direction of Sheffield, hoping that the eye of the maestro will fall upon these lines.

GW5MA/P, G5MA/P Again

Since last we wrote, Bob has been stirring the two-metre air from two different, and widely separated, portable locations. For the week-end July 31/August 1, he journeyed all the way to Anglesey, and from a place called Amlwch (as a matter of fact, your A.J.D. can pronounce it, and that is correct spelling) he worked a total of 33 stations, to the great delight of most of them, for Anglesey is a rare county; the site for GW5MA/P on this occa-

sion was "on high ground with a perfect outlook... parked the car off the road at the highest spot." The best QSO was a good CW exchange with G8OU at 222 miles, other nice GDX contacts being with G2FJR, G2XV and GM3EGW, all near the 200-mile mark; G6RH (Bexley, Kent) was heard and called without response, and G4CI heard and called GW5MA/P without getting him back; for Bob himself it was an interesting trip, because he worked GD, GI and GM for the very first time on Two.

Then, for the field day on August 15, G5MA/P appeared from a spot on the English side

of the Hereford-Brecon border, and worked 39 different stations in a point-scoring contest, with G2A1W as the only Londoner who could be raised from a site poor for that direction.

Lists covering these two exploits appear in the Activity Report, and once again a great many VHF men are grateful to Bob for his untiring efforts to find new GDX locations in rare counties—incidentally, the one-way distance to the Anglesey site is 263 miles, and the weather that week-end was not too good either.

Claims and The Tables

Once again, we see daylight between G5YV and G3BW in All-Time Counties—but the other way round this time, as Harold got GW5BM/P for Brecon and GW5MA/P for Anglesey to put him up two. It seems that G3BW and G5YV have recently had a personal QSO, and naturally the talk turned to working counties!

Though the All-Time list is right up to date with all claims—and one new entrant, G13GQB with 27, which is good going from Northern Ireland—we are not showing Annual Counties this time because it closed for the year at midnight on August 31, and we want to give final placings in next "VHF Bands." So will all those with last-minute claims for this Table please send them in; closing date is the dead-line for the next issue. Incidentally, all claims received for Annual Counties with this month's mail are being held for the final appearance—so there is no need to claim again unless you have anything new between last month's dead-line and August 31.

Naturally, we go on with Annual Counties for another year, and the new Table duly opened on September 1st! We do not expect a rush of claims in the first month, but please do put yours in as soon as you have got 14 or more, so that the new Table can be published as soon as possible. Our leading stations should be able to knock off 14-15 counties in the first week or so, no trouble at all.

Some Station Reports

Nice to hear from G6NF (Shirley, Surrey), one of the more



Both active on VHF from Cardiff—on left, GW8UH, with GW5BI, discussing the 12-element stack at G5BM, Cheltenham.

distinguished OT's and now one of the regulars on the 70-centimetre band; he has a total of 13C worked on 430 mc, with some nice GDX in the shape of G3GZM (Shropshire) and GW2ADZ for Montgomeryshire. G6NF has recently had to alter his frequency to 435.66 mc to avoid QRM! And he now has a CC converter instead of the SEO job.

G2CZS (Chelmsford) encountered F8GH and F8MX during August 2-5, and remarks that he found G6UH's article in our last—"Element Length for VHF Beams"—both helpful and instructive (several other correspondents make the same sort of comment, and admit to being a bit dim about how to get the best out of a VHF aerial system). The next requirement seems to be some instruction on matching and lining-up. We will fix.

On the subject of aerials, G2DVD is still very happy with his new stack—see this space last month—and continues his search for G3BW and the other interesting ones in the North. G3IER (Cheltenham) reports a contact with G3HXN, in the village of Cambridge (*Glos.*), and a new

station just on with 1-watt to an EF91. Despite a feeder broken in one leg, G3IER has worked six new stations, including GW8KW/P giving Brecon on this occasion; when the feeder is replaced, G3IER hopes to be fully operational again.

We now have a report from G3JDD (R.A.F. Watton) covering the period when he was signing GM3JDD/P at Carter Bar, Roxburghshire, with G3CYY, whose gear it was; they worked nine different G's, mainly in the North, during the period 1840-2140 on July 19. G4SA (Drayton, Berks.) is glad to find that he has now worked all the Welsh counties, with G5MA scoring for several of them, of course. G3GHO (Roade, Northants.) gives July 19-20, August 8 as good evenings, with ON4BZ worked on the latter occasion. G3DO (Sutton Coldfield) claims for the Tables and is now up to 241S worked; new ones for him have been GW5MA for Anglesey and Monmouth, and G5BM/P for Hereford.

G3FYY (London, N.W.2) mentions August 4 as the bright spot for him, when he was able to work F8MX (Paris) in spite of it being an unfavourable direction

TWO METRES
ALL-TIME COUNTIES WORKED
LIST

Starting Figure, 14
From Fixed QTH Only

Worked	Station
69	G5YV
	G3BW
64	G6NB
62	EI2W (209), G3BLP (630)
59	G3EHY
58	G8OU
57	G2OI (349)
56	G4SA, G8SB
55	G2HIF, G3GHO, G3WW, GW5MQ
53	G2AJ (519), G2HDZ (416) G3CCH, G4CI, G5BM
52	G2NH, G3IOO, G5BD, G6XX
51	G5DS (553)
50	G3ABA, G3FAN
49	G3IUD, G5MA
48	G2FJR (273)
47	G5WP
46	G4HT (476), G5BY, G5ML (280), G6YU (205)
45	G2XC, G6XM (356)
44	G3BK, G3HAZ (262)
43	G2AHP (456), G3BA, G3COJ, G4RO, G5DF
42	G3GSE (424), G8DA
41	G2FQP, G3DMU, G6CI (184)
40	G2DVD, G3BNC, G3CGQ, G5JU, G8KL
39	G2IQ, G3GBO (434), G3HBW, G3VM, G8IL (325)
38	G2FCL (234), G3APY, G3DO (241), G3WS (183)
37	G2DDD, G2FNW, G2FZU (180), G6TA (300)
36	G2HOP, G3CXD, G6CB (312), G8IP
35	G3DLU, G3FZL, G3HCU (224), G3HWJ
34	G3BJQ, G3BKQ, G8I3
33	G5MR (215)
32	G2FVD, G8VR, G8QY
31	G3FYY (164), G3HXO, G3IER (105), G5RP
30	G3FRY, G3GOP (208), G3GVF (129), G3IRA, G5NF, G8VN (12), GM3EGW, GW8UH
29	G2CZS, G3AGS, G3AKU, G3FIJ (194)
28	G3FIH, G8DL, GM3BDA
27	G3DAH, G3ISA (160), G6GR, G13GQB
26	G2DCI, G3AEP, G3CFR (125), G3SM (211), G4LX, G4MR (189), GM3DIQ
25	G3JMA, G5SK
24	G3FD, G3FXG, G3FXR
23	G3CWW (260), G5PY, G6PJ, GW3GWA
22	G3AGR (135), G3ASG (150), G3BPM, G3HIL
21	G2AOL (110), G3IWI, G6XY
20	G3EYV, G3HSD, G3YH
19	G3FEX (118), G3GCX, G5LQ (176)
17	G8NM, GC2CNC
16	G3FRE
15	G2BRR, G3IWA
14	G2DHV, G3CYY

Note: Figures in brackets after call are number of different stations worked on Two Metres. Starting figure for this classification, 100 stations worked. QSL cards are not required to verify for entry into this Table. On working 14C or more, a list showing stations and counties should be sent, and thereafter added to as more counties are worked.

due to local obstructions; G3FYY is going ahead with his VHF-VFO, but will not go as far as making any of the necessary alterations to the main transmitter until he is sure the band is not going to open! G8VN (Rugby) considers that both activity and conditions were better during the period, and has found stations up to 150 miles distant audible most evenings—three new ones have been worked, and G3AZT locally is recommencing activity, which will make four two-metre men in the immediate neighbourhood.

John of G8OU (Ashted) is a bit despondent about the chances of working SM this disappointing season—a contact he needs to get into the front row in Counties Worked—but goes up to 58 in All-Time Counties. G3WW (Wimblington, Cambs.) has, as usual, been doing a good deal of visiting, and is now getting ready for 70 cm with the G3HAZ Tripler (in. and working) and the G3BKQ 430 mc Converter (in hand); a nice two-metre QSO for him on August 4 was GM3BDA, giving East Lothian.

GM3DIQ (Stevenston, Ayr) reports a most extraordinary case of extreme QSB on G3CCH (Scunthorpe): At 2215 BST on July 25 he was 449, still the same at 2325, and then over a period of about five minutes built up to "a colossal S9+." readable on his key thump; a call from GM3DIQ raised G3IUD (Wilmslow, Ches.), who was 579, and who then faded from S9 to S1 and out as he signed. Clarke had some G phone contacts on August 4, and was hearing G3WW at 559—but no luck with a call.

G5CP (Nr. Chesterfield, Derbyshire) is now running an 829B with two 3-element Yagis stacked and hopes to be on most evenings at 6.30-7.30 p.m.; he reports G5HK, also near Chesterfield, as a newcomer to the band.

G13GQB (Newtonards) and G15AJ are now running the full 150w., both using 8012's in push-pull with 1,400 volts on the plate—which, says Bill, they take quite calmly. (Note: The 8012 is a VHF triode, with grid and plate pins brought out separately on both sides of the bulb; it needs

a good 15-20 mA of drive in Class-C RF service, and a pair in push-pull should give about 80 watts RF out. 8012's are easy to buy; two are about a third of the price of a single 829B.—A.J.D.) G13GQB is on every evening. 144.132 mc, from 10.30 p.m. or so until midnight, and his best direction is to the South-East; on the 70-cm front, Bill has the G3HAZ Tripler and the G3BKQ Converter (from the recent designs in *Short Wave Magazine*), with which he is very pleased.

G5BM (Cheltenham) was /P on the lovely Black Mountains above Talgarth in Brecon on August 15, and during the previous week operated from Woodbury Common in S. Devon—conditions were "very poor and local activity practically nil, most disappointing." Six stations were worked, but at no great distance, GW8UH in Cardiff being about the best.

Continental Tour

Henry of EI2W, home from a trip through Central Europe, gives a lot of interesting detail in his report. In Italy, about 50 stations are said to be equipped for VHF, with I1FA probably the best-known. In the Saarland, 9S4AX is on and puts out a good signal; there are four LX's in regular operation; and OE7AT is a prominent two-metre man, who also works portable from Mt. Pfaendler near Lake Constance.

In Switzerland, there are no less than 27 stations equipped for the band, spot frequencies ranging from 144.00 (HB9LE) to 145.55 mc (HB9AA). Henry found the HB's to be well organised for VHF, and their gear is beautifully constructed; he was able to make contact with the St. Gotthard party, and we have a photograph of him with HB9PQ and HB9NL at Lucerne.

Through his private grape-vine, EI2W recommends that the LA's to look out for, as being the most EDX-worthy, are LA1KB (Larvik), 144.32; LA4VC (Oslo), 144.28; LA8RB (Sandefjord), already known to G's, on 144.80; and LA9T (Moss), on 144.30 mc.

Since his return from this fascinating tour, Henry has been active again from Dublin on Two, but until August 16, conditions were poor; on that evening, he worked GM3BDA. "putting out a strong cackle from a hen-roost in E. Lothian," for a new county; then G3DLU (Compton Bassett, Wilts) was raised for the first time, and several G1/GM's were S9 in Dublin. On the evening of August 17, in spite of atrocious weather conditions, there was a very successful three-way EI2W-GI3FZQ-GI3GQB over 100-mile paths—a thing which, says Henry, would hardly have been possible three years ago, when their equipment was far less developed than that now in use.

Comments out of Context

"I monitored the band the other night, and not a thing to be heard; so I put out a nice snappy CQ on CW, and then tuned—what did I hear? No fewer than seven stations all calling CQ on CW. What's the matter with them? Don't they love me any more!" (G3GHO). . . . "I have been hearing G6NB again, but he seems to be on a different frequency, a fact which I don't think will help us in making contact; he is one G station I am determined to raise before the winter sets in!" (GM3DIQ). . . . "Why do so many VHF opera-



"... He says it gives better results ..."

tors refuse to QSL even when sent cards direct? My present returns are barely 50% of all cards sent out. Could we have labels or something to make it easier?" (G2CZS). . . . "I wish that stations calling CQ when conditions are only poor to fair would use CW, and that some of the phone-only men would listen for CW calls" (G8VN). . . . "Please ask stations beaming NW and working their locals to sign sometimes on CW, as a large number of weak carriers are audible here from time to time" (GI3GQB). . . . "I have now worked 50 stations on 70 cm" (G6NF). . . . "Many interesting ragchews have been had on 3.7 mc phone" (G3WW). . . . "— was accorded very generous hospitality by the Swiss chaps; I ascended Mt. Pilatus, 7000 feet, and found a 220v. AC power point at the very top" (EI2W).

should be registered. Since this Award was instituted six years ago, 170 parchments have been claimed.

And so we come to the end of it for another month—and it should be noted that in spite of poor conditions and allegations of low, or no, activity there is steady progress in the Tables and plenty of useful and interesting short-haul contacts can be heard going on at all sorts of odd times. Even if we can't see an EDX break, or a spell of consistent GD conditions, there is no reason why the VHF bands should not be kept healthy, and there are new stations coming on all the time.

Closing Date

Before the next dead-line, we have a breathing space: The closing date for the October issue is **Monday, September 20**. Please send all your VHF news, views, ideas, comments, criticisms and suggestions to: A. J. Devon, "VHF Bands," *Short Wave Magazine*, 55 Victoria Street, London S.W.1. Don't forget your closing score for 1954 Annual Counties (and the opening one for the new Table!). With you again on October 8, all being well.

SEVENTY CENTIMETRES

ALL-TIME COUNTIES WORKED

Starting Figure, 4

Worked	Station
23	G3BKQ
15	G2XV, G4RO
13	G3IOO, G6NF
11	G5YV
9	G2HDZ
7	G2HDY
6	G3JMA
5	G3FUL, G3IRW
4	G2DDD, G3JGY

On working four Counties or more on the 70-centimetre band, a list showing stations and counties should be sent in for this Table, and thereafter new counties worked notified as they accrue

Reminders

We are still in business for VHFCC certificates — and the requirement remains the same: 100 cards confirming two-way contacts on any VHF band(s) from 50 mc (6 metres) up, sent in, with a check list, for the attention of your A.J.D. The cards

VHF WEATHER REPORT

PERIOD JULY 17 TO AUGUST 13

ST. GOTTHARD EXPEDITION

A. H. HOOPER (G3EGB)

ONCE again, a limited selection of VHF DX with no major spells to report.

The general sequence of weather has been ascertained from the *Daily Weather Report* of the Meteorological Office, London. For the first week ridges of high pressure alternated with frontal activity, while south of the British Isles the fine weather of an anticyclone was being enjoyed. Then followed a period of bad weather which extended southward to the Alps and Pyrenees. The extension of anticyclonic conditions eastwards over France, Switzerland and then Austria which set in on July 31 must have been good news for our Swiss friends, labouring up the St. Gotthard Pass with their gear. However, with an anticyclone over the Continent and the hope of VHF DX once again we here in G found ourselves on the edge of things. From August 5 yet another depression, and the onset of a slow break up of conditions for HB. For the final week yet another series of depressions proved to be our lot!

The usual assessment has been made of the results of radio-soundings reported in *The Daily Aerological Record* of the Meteorological Office. The estimated effect of discontinuities aloft in radio refractive index upon VHF propagation along certain paths from South-East England is set out in Table I. Entries therein are more frequent than of late, with a southerly bias, but without anything especial in the way of DX. The time factor is important in some cases. On the evening of July 20 there was a change over from one air mass to another and from SE England there is thought to have been first S and SW'ly extensions followed by a stronger NW'ly opening soon after midnight. For a similar reason the entries for August 1 do not apply until after about 2200 GMT.

Propagation between GI and GM appears to have been well above average on July 18 and August 3, 11.

The less spectacular but nevertheless welcome night-time extensions due to radiation cooling are given, as usual, in the first line of the Table.

The graph of MSL barometric pressure values is continued in Fig. 2. As for last month, pressure is considerably less than the "critical" value of 1018 mb. on occasions of entry in Table I, and soon we may have to decide whether to discard even this slight indication of DX chances.

Swiss Weather

Given elsewhere in this issue (although unknown at the time of writing) will be whatever results the HB's achieved on the St. Gotthard Pass. It is hoped that, as for last year, HB9PQ will be for-

warding at a later date a full account of their work. In the meantime let us look at the weather conditions in general terms.

The picture over Europe is one of a WSW'ly current of air sweeping over the British Isles and Continental coastline and slackening inland towards the Alps to the light, variable winds of a high pressure belt. At 10,000 feet aloft, the upper limit of our interest, the overall airflow was similar and it appears that we in the UK were in a different (cyclonic) regime. These cyclonic conditions had

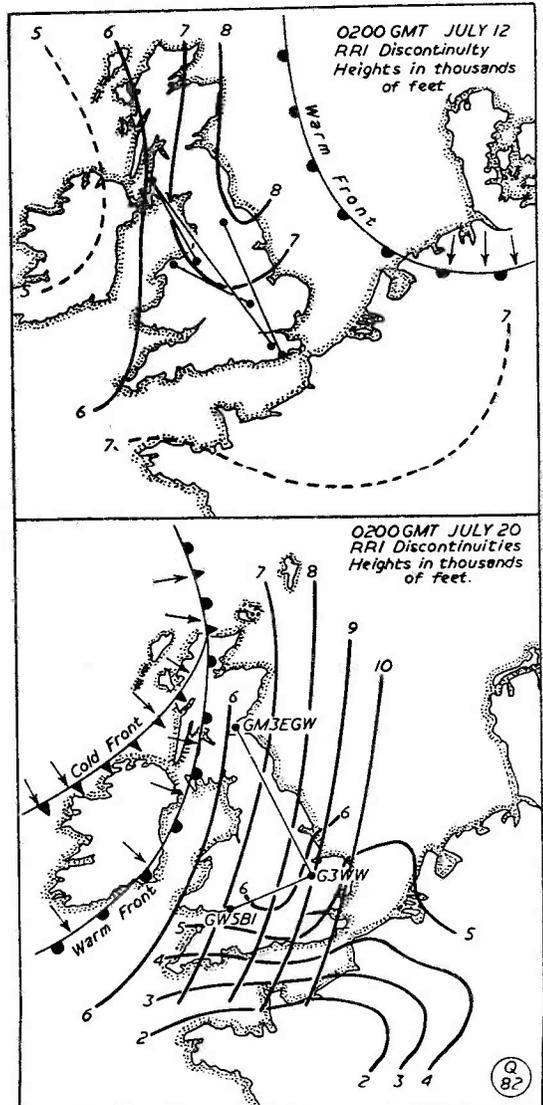


Fig. 1. On the two occasions shown here, reflection from layers at unusually high levels is thought to have occurred. On July 12 (above), the phenomenon coincided with an abnormally low value of surface pressure; on July 20, a double structure is shown over southern England.

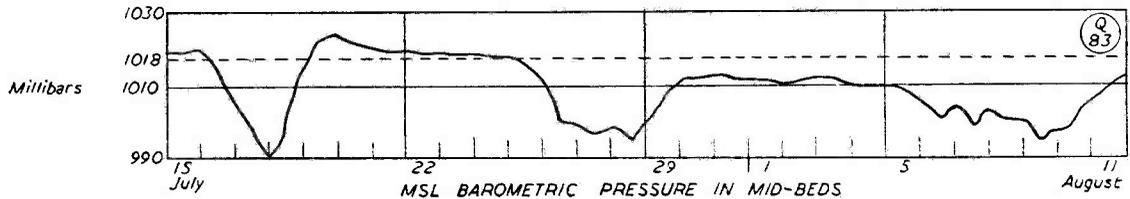


Fig. 2. This the second month during which a consistently low barometer reading has coincided with indications that VHF DX should have been good. For this reason, results from July 30 to the end of the period will be of particular interest and reports are specially requested.

to anomalous propagation can no longer be accepted as reliable. The difficulty has been repeated again this month and we can only wonder whether, in the course of time, many cases of this kind will occur and we shall have to discard the measure.

Owing to a slight date overlap with A.J.D.'s report last month some of the results of July 19 are already known. The chart for this occasion also is given in Fig. 1. It is a more complicated situation than usual and worth careful scrutiny. In a ridge of high pressure ahead of a warm front approaching from the North-West, a RRI layer had formed. From about 5,000 feet above the South Coast is sloped down to 2,000 feet over northern France. The term "warm front" is a label for warmer, moister air flowing over the sloping surface presented by cooler air beneath. The boundary between the two masses of air forms the frontal surface which in this case sloped gently upwards from its indicated surface position to about 8,000 feet over East Anglia. The RRI layer, sloping similarly from 6,000 feet over Anglesey to 10,000 feet over south-eastern England,

is still further aloft and so is in the warm air. Thus, in the overlapping area we have two layers in entirely different air streams.

With QSO's for Cambs./Newcastle and Fife/Yorks. and reception of GM3EGW at G3WW the upper layer was undoubtedly effective and the highest midpoint reflection was from about 8,000 feet. Later reports will no doubt show how effective was the lower layer for southern sector paths. We shall never know for certain which of the two layers was of greater value for the Cambs./Cardiff path. From the impression of an improvement during that evening reported from Wimblington it seems more likely to have been the upper layer. One wonders whether G5YV, who reports reception of both GM and GI on this occasion, noted a fade-out of the latter signals as the front approached from the North-West.

The writer is grateful for permission of The Director, Meteorological Office, London, to make use of information gained from the official publications mentioned.

COURSES FOR THE R.A.E.

In addition to those notified on p.321 of the August issue of *Short Wave Magazine*, we have been asked to announce the following courses, to be held in preparation for the Radio Amateurs' Examination in May next year.

Wembley, Middlesex. As last year, classes will again assemble at Wembley Evening Institute, Copland Street, Wembley Hill, starting on Monday, September 20, when radio instruction will be given from 8.00 to 10.00 p.m. A class in Morse will also be held, 7.00-8.00 p.m. on the same evenings. Enrolment can be any evening during the week September 13-17, and the instructor-in-charge is A. J. Bayliss, B.Sc., G8PD.

Ilford. At the Literary Institute, Cranbrook Road, Ilford, adjacent to Gants Hill station on the Central London line. The Morse and Codes of Practice class commences on Monday, September 20, 7.30-9.30 p.m., for those wishing to take the G.P.O. Morse Test up to R.A.E. standard, and will run for six months. The radio theory class, for the Amateur Examination, opens on Wednesday, September 22, 7.30-9.30 p.m. each week, and will last for eight months. The fee for each Course is 10s., or 17s. 6d.

for those taking both; these fees are for the whole period. Enrolment can be at the address given on any evening September 6-8, or those interested can apply to: C. H. L. Edwards, A.M.I.E.E., G8TL, 10 Chepsow Crescent, Ilford, Essex.

Glasgow. Through the Education Committee of the Corporation of Glasgow, a Course for the R.A.E. is to be held at Allan Glen's School, 134, Montrose Street, C.4, commencing on Tuesday, September 14, and then each Tuesday evening, 7.00-9.30 p.m. The fee for the Course, which starts with elementary theory and works through to R.A.E. standard, is 10s. Instructors are A. M. Fraser, GM3AXX (Theory) and J. A. Sey, GM8MJ (Practice). Intending students should enrol, at the School, on September 7 or 8, any time between 7.30 and 9.30 p.m.

THE LICENCE TOTALS

As at the end of June, the 13½ million licences in issue included 3,411,046 for TV receivers and 236,057 for sets fitted in cars. The increase in TV licences during the month of June was 31,680. These figures make it that there are still three times as many BC sound receivers in use as there are TV sets licensed.

WE should like to find an expert who could tell us something about the phenomenon of rain-static. It seems to us that this noise is far more prevalent nowadays than it ever used to be; in fact it is now unusual to find any heavy downpour of rain that does not give forth an appalling racket when it falls on an outside aerial. Other interesting points arise: We have found on occasions that the noise comes on when rain is *not* falling actually on the aerial, but maybe a mile or so away. We have heard it start up suddenly and have dashed outside to take observations; there has usually been a cloud overhead, and the rain has often arrived within seconds or minutes. But that noise *has* started before any actual particles of charged rain have made contact with the aerial. How exactly is it caused? With two longish wires up, we have found a terrific noise on one, but silence on the other, although rain has been falling on both — this seems to indicate that the directional effect comes into play and that the disturbance is some distance away, after all.

ICI ON PARLE ANGLAIS

A friend of ours revives an old grievance of ours. It is hard enough to bear English crooners who sport a fake-Bowery accent, but when it spreads to normal conversation on the amateur bands, things are going too far. We will quote: "The word 'tube' or 'toob' is unimaginative; 'valve' is more expressive and it's *English*. 'Name' has a distinguished Latin pedigree and is shorter than 'handle.' Why don't these chaps talk about 'binding posts' and fill their cars with 'gas?' But perhaps they reserve that for 80-metre phone." We agree with every word. Unless an Americanism is *preferable* to the English word, why use it? We hear a lot of talk about antennas and grounds, shields and high-voltage lines. But how we look forward to a description of an "auto-tour" by one of these types—after denting his fender he had to raise the hood to look at



the motor and see if it was carburating properly! We don't expect to hear our American friends talking with an English accent — why should the reverse be heard so often?

WANDERING PREFIXES

The same friend has suggested that we should try to get the authorities concerned to alter one minor regulation; he refers to the habit of adding an oblique stroke and the prefix of the "quest" country *after* the call-sign. If a W2 is operating from, say, KC4-land, it would be much more logical to sign as KC4/W2 . . . than, as at present, W2 . . . /KC4. There is now some likelihood that listeners to a CQ call might abandon him as soon as they hear that "W2," without waiting for the exotic prefix to follow. Presumably the authorities class these special cases with Portables or Mobiles, which sign /P or /M, and would hardly be likely to alter the regulations for what is, to them, such a trifling matter.

QRPPP!

We came across a strange character who is better known as a musician than as an amateur. He thought that the now popular abbreviation QRPP must bear the same relation to QRP that *pianissimo* bears to *piano*—and he was quite right. But he wants to see another P added, as in the heading to this paragraph. He says this

transistor stuff is all "pansy business" — why, they still use batteries for power! No one can achieve the real QRPPP until they transmit with one of the good old galena crystals, or, better still, "Hertzite" (remember that one?), with no externally applied power at all. We have challenged him to show us how, and it seems that he is starting off by running a crystal receiver on his local BBC station and using it (the station is *very* local) to charge a vast bank of condensers, which he will then use as a power supply for his QRPPP outfit. He regards BBC-charged condensers as legitimate, but man-made batteries as definitely "out." We await developments — if any — with interest. (See details, in "Transistor Topics" in this issue, of the transistor audio oscillator, powered by an ordinary photo-electric cell, which works on daylight only! It is but a short step to the concept of an RF oscillator on 1.8 mc run from a bank of p-e cells in series-parallel.—Editor.)

INACTIVITY

How can we tell what the 21-mc band is really worth, when the general activity level continues to be so low? One recent week-end, when we imagined conditions to be really foul, we suddenly heard two tremendous signals spring out of nowhere. One was a ZB1 and the other a CR6, and both signals were a good S9. This made us wonder what would have happened if a VU, a VS6, a VS9 and, say, ZS7, 8 and 9 had all taken it into their heads to put out a trial CQ on that apparently "dead band" at the same time. We know conditions are *bad*, but this continued inactivity makes them seem far worse than they really are. Once a definite improvement begins, stations will appear from left, right and centre, giving us the impression that conditions are changing much more rapidly than is really the case. What a pity that we can't start this snowball effect without waiting too long—it would give the 21-mc band, in particular, a real shot in the arm, and would cheer everybody up at once.

NEW QTH's

This space is available for the publication of the addresses of all holders of new U.K. callsigns, as issued, or changes of address of transmitters already licensed. All addresses published here are reprinted in the quarterly issue of the "RADIO AMATEUR CALL BOOK" in preparation. QTH's are inserted as they are received, up to the limit of the space allowance each month. Please write clearly and address on a separate slip to QTH Section.

DL2VC, Lt. K. Pattison (*ex-MD2KP*), Berlin Signal Squadron, B.A.O.R. 2.

DL2VK, Cpl. D. Wilson, Berlin Signal Squadron, B.A.O.R. 2.

DL2VZ, J. Walker, No. 1 A.S.S.U., B.A.O.R. 15.

DL2WJ, V. Bevan, No. 1 A.S.S.U., B.A.O.R. 15.

EI9V, C. C. Hunter, Glanworth, Co. Cork.

G3HMK, F. Partlett, Burford, Little Baddow, Chelmsford, Essex.

G3JAG, J. A. Crux, 392 Bury Road, Rochdale, Lancs. (*Tel.: Rochdale 48536.*)

G3JFU, V. Bennington, 7 Walton Road, Leverington, nr. Wisbech, Cambs.

G3JIB, D. F. Shaw, 3 Butterworth Street, Heyside, Royton, Oldham, Lancs.

G3JIP, J. W. Hill, 68 Kings Road, Walton-on-Thames, Surrey.

G3JJS, A. Bagley, Astbury Cottages, Parkgate Road, Saughall, nr. Chester.

G3JLE, R. J. P. Boby, 38 Goodyers Avenue, Radlett, Herts.

G3JNL, P. Wendel, 38 Castlegate, Newark, Notts.

G3JOH, G. Theaker, 193 Wingfield Road, Bilton Grange, Hull, Yorkshire. (*Tel.: Hull 13547.*)

G3JTH, W. J. G. Hector, Longras, St. Mary's, Isles of Scilly.

G3JTQ, R. F. Griffiths, 96 Saxon Avenue, Hanworth, Feltham, Middlesex.

G3JTR, J. H. Beadle, 56 Ballial Road, Welling, Kent.

G3JTU, P. C. Gilkes, 43 Anderson Road, Erdington, Birmingham, 23.

G3JTV, E. Bruckshaw, 15 Meal Street, Heaton Norris, Stockport, Cheshire.

G3JUA, D. Vaughan, 32 White Meadow Drive, Thornton, Liverpool, 23, Lancs.

G3JUE, R. F. Reader, 20 Meads Close, Ingatstone, Essex.

GM3JUF, A. McEachen, 240 Gladsmuir Road, Willington, Glasgow, S.W.2.

G3JUT, J. Jones, 22 The Pippin, Calne, Wilts.

CHANGE OF ADDRESS

EI9A, D. F. Cornwall, Strand Street, Kanturk, Co. Cork.

G2BFQ, M. E. Edwards, 58 Bessborough Road, Harrow, Middlesex.

G2JB, J. H. Payton, Waltham Tea Gardens, Skinners Lane, Waltham, nr. Grimsby, Lincs. (*Tel.: Waltham 2271.*)

G2TN, A. L. Daines, 116 Pelham Road, Gravesend, Kent.

GM3AUD, R. A. Reid, Mackenzie House, Avoch, Ross-shire. (*Tel.: Fortrose 369.*)

GM3BHO, J. R. Orr, 9 Marina Road, Prestwick, Ayrshire.

G3BPQ, E. Smith, 46 Leam Street, Ashton-under-Lyne, Lancs.

G3BTE, J. R. Hall, 78 Windmill Road, Bangor, Co. Down.

G3BVT, J. Entwistle, 7 Tower Street, Darwen, Lancs.

G3CMH, Yeovil Amateur Radio Club, D. L. McLean, 55 Cedar Grove, Yeovil, Somerset.

G3CVH, W. G. Snodgrass, Groarty C. Primary School, Londonderry, Co. Derry.

G3DMP, J. Booth, 18 Dodworth Drive, Kettlethorpe, Wakefield, Yorkshire.

G3DQC, J. Salter, 218 Totteridge Road, High Wycombe, Bucks.

G3EGR, A. T. Felgate, Crown and Horns Hotel, East Ilsley, nr. Newbury, Berks.

G3FAU, V. Cundall, 23 Shackledell, Leaves Spring, Stevenage, Herts.

G3FFY, M. H. Stedman, 17 Tyler's Close, Godstone, Surrey.

G3FHI, W. A. W. Launder, B.Sc. (Eng.), 9 York Crescent, Babacombe, Torquay, Devon.

GW3FPF, P. F. Jones, 123 Wellington Road, Rhyl, Flintshire.

G3FSZ, Mrs. J. Salter, 218 Totteridge Road, High Wycombe, Bucks.

G3GUA, H. Morey, 109 Dene Way, Newbury, Berks.

G3HBV, D. T. Jennings, 37 Rowlands Avenue, Waterlooville, Hants.

G3HHT, J. A. Bassford, 314a A.M.Q., R.A.F. Station, Henlow, Beds.

GM3HLQ, C. P. Callanan, Hallbyres, North Street, Strathaven, Lanarks.

G3HLW, D. A. Pilley (*ex-ZB1HLW*), 13 St. John Street, Aylesbury, Bucks.

GM3HMU, W. L. McIntyre, 6 Inchinnan Road, Renfrew.

G3ICX, E. O. Wright, A. C. T. (Birm.), A.M.I.Mech.E., 65 Fox Hollies Road, Walmley, Sutton Coldfield, Warks.

G3IQF, R. A. Fowler, The Bungalow, Trevarrian, nr. Newquay, Cornwall.

G3IQM, R. I. Sills, 38 Montfort Crescent, Sherwood, Nottingham.

G3JFF, M. J. Matthews, 11 Westerland Terrace, Kingswear, S. Devon.

G3JNK, R. Wallwork, 94 Charles Street, Newark, Notts.

G4OK, H. Bailey, 28 Church Street, Wath-on-Dearne, Rotherham, Yorkshire.

CORRECTION

G3AEF, D. J. Sole, 22 Lincoln Road, London, N.2.

The Other Man's Station

GM3GAB



THE station of GM3GAB—Q. Kirker, 24 Rosslyn Avenue, Rutherglen, Glasgow—was first licensed in 1951, and was soon active on most amateur bands. The main interest at GM3GAB is in the construction of gear for all bands from 80 metres to 70 centimetres, and in the photograph can be seen a number of items.

Alongside the speaker on the sloping wall, upper right, is the aerial coupling panel, the equipment "outside" consisting of (a) Ground plane aerials for Ten and Twenty, (b) A 66-foot end-on wire for the lower frequency bands, (c) A two-metre beam consisting of three stacked 4-ele Yagis, and (d) A 32-element beam for the 430 mc band.

On the shelf below the aerial panel is the BC-

348 receiver, modified to cover 10 metres, and on the bench is a G2IQ two-metre converter; for 70 centimetres, the receiver is a modified ASB8.

The main transmitter runs push-pull 807's in the final, modulated by 807's in Class-B zero bias. The transmitter itself consists of three separate Clapp drive oscillators, into the buffer-PA unit covering from Eighty to Ten. Activity is mainly on 20-metre CW and phone, and DX is worked as and when it comes. Another interest at GM3GAB is portable operation in the summer months.

Though we are not told so, it looks like an attic or roof-space shack at GM3GAB—and what could be better, particularly if he can pull the ladder up after him!

Short Wave Magazine covers the whole field of Amateur Radio

THE MONTH WITH THE CLUBS

By "Club Secretary"

(Dead-line for Next Issue : SEPTEMBER 15)

IF an eight-year spell is sufficient to establish a tradition, then we may describe "MCC" (the *Magazine* Club Contest) as one of the traditional annual events in the Contest Calendar. It has taken place in the autumn of each year since 1946, and although the rules have been modified from time to time, it has settled down to a well-established pattern.

This year will see the Ninth MCC and the rules will remain unaltered, while the event will again take place during two consecutive week-ends. The hours of operation will be 1430-1830 GMT on Saturday, November 20 and Sunday, November 21, and again the following week-end, on November 27 and 28.

The rules will be published in full in this section next month, instead of being circulated to Club Secretaries, as hitherto. Those who have not entered previous events are reminded, in advance, that the object is primarily to work Club Stations; that all operation takes place on the 1.8 mc band; and that contacts with non-Club stations are allowed, but rate at a very low scoring value compared with inter-Club contacts.

Watch-This-Space in the October issue for full details, but, meanwhile, note the dates given above.

Club News is pretty scarce, as one might expect during the holiday season. In some places, however, full activity seems to be maintained throughout the year, even the members being surprised at their own large attendances!

Amateurs on holiday do not, in general, seem to take note of the existence of local Clubs. We repeatedly hear cases of near-misses and regrets at not having realised that a meeting was actually occurring within a mile or so of the "digs" in which G3... was kicking his heels on a wet day.

Outside Activities

Perhaps the weather is being kinder to outdoor events by now. At the time of writing an improvement seems to be in sight—but who knows? *Clifton* held their second D-F Contest on July 25 in very unsuitable weather; G3HZI won this event.

Reading was having its annual outing, to Swanage and Sandbanks, on August 29—we hope the weather was right. *Slade*

was booked for the fourth D-F Test on August 15, and for a preliminary in the RSGB national D-F contest on August 29.

Warrington has organised a visit to the Port Radar Station, Gladstone Dock, Liverpool. Many other visits to places of interest have been recorded or mentioned in the last few issues.

Edinburgh proposes to arrange visits to places of interest during the winter months.

Resumed Sessions

Grafton starts up again with an ordinary meeting on September 10, at which visitors and new members will be specially welcomed. The A.G.M. will take place on September 17.

Deadline for next month's reports is :

First post on Wednesday, September 15,
addressed "Club Secretary,"

Short Wave Magazine

55 Victoria Street, London, S.W.1.

Ravensbourne starts its winter session on September 22, and thenceforth every Wednesday at 8 p.m., in Durham Hill School (Science Room), Downham.

Edinburgh meets also every Wednesday, 7.30 p.m., in the Clubroom at 16 Bothwell Street, Edinburgh 7. An event planned for the opening of the winter session is a lecture on 420 mc Receivers by A. Reading, and also a short lecture on NBFM by GM8FM.

Leicester is thriving, particularly with its Experimental Transistor Group; a list of lectures for the

NAMES AND ADDRESSES OF SECRETARIES REPORTING IN THIS ISSUE

CLIFTON : C. H. Bullivant, G3DIC, 25 St. Fillans Road, London, S.E.6.
 EDINBURGH : D. B. R. Black, 16 Edina Place, Edinburgh.
 GRAFTON : A. W. H. Wennell, G2CJN, 145 Uxendon Hill, Wembley Park, Middx.
 LEICESTER : W. N. Wibberley, 21 Pauline Avenue, Belgrave, Leicester.
 QRP SOCIETY : J. Whitehead, 92 Ryden's Avenue, Walton on Thames.
 RAVENSBORNE : J. H. D. Wiltshaw, 4 Station Road, Bromley, Kent.
 READING : L. Hensford, G2BHS, 30 Boston Avenue, Reading.
 SLADE : C. N. Smart, 110 Woolmore Road, Birmingham 23.
 SOUTH MANCHESTER : M. Barnsley, G3HZM, 17 Cross Street, Bradford, Manchester 11.
 WARRINGTON : G. H. Flood, 32 Capesthorpe Road, Orford, Warrington.
 WREXHAM : V. E. Bear, Greenfield, Summerhill, Wrexham.

autumn and winter session will be available shortly. Many books have been added to the Club Library, and an up-to-date list is in preparation.

The **QRP Society** is organising a radio exhibition to be held in Walton-on-Thames on October 30, in St. Mary's Parish Hall. Displays of amateur and commercial equipment will cover a wide field, and an amateur station will be on the air.

The annual Inter-Club Top Band Telephony Contest, organised by **Warrington**, will be held on September 26, and is open to all transmitting and receiving members of neighbouring societies. Further details available from the Hon. Sec.

News in Brief

CLIFTON: September 3, 10, 17 and 24; 7.30 p.m. at 225 New Cross Road, London, S.E.14.

READING: October 9, Mullard Film; October 30, Lecture on Electronics, by Mr. Edwards of A.E.I. Research Laboratory.

SLADE: September 3 and 17, at Church House, High Street, Erdington. Subjects — Balancing of Rotors, and Inter-Planetary Travel.



The Grafton Radio Society's field day, held in June, was much enjoyed by all members able to make the outing to Hampstead Heath. In this photograph, G2CJN is at the microphone, and (left to right) are SWL Elliott, G3IES and G2AAN, Grafton's president.

SOUTH MANCHESTER: September 10, Design of Transformers and Chokes (G3DQU); September 24, Power Pack Design (G3HZM); October 8, A.G.M.

WARRINGTON: September 7 and 21, Kings Head Hotel, Winwick Street, Warrington.

WREXHAM: Every Friday, 8 p.m. at The Guildhall, Wrexham. Business meeting on first Friday, talks on the other Fridays from September onwards.

COURSES IN ELECTRONICS AND COMMUNICATIONS ENGINEERING

The South-East London Technical College, Lewisham Way, S.E.4, offers a series of important and interesting Courses in various subjects connected with electronics, radio and telecommunications. The Head of the Department of Electrical Engineering and Applied Physics is C. W. Robson, Esq., B.Sc., M.I.E.E., A.M.I.Mech.E., and to him application for details should be made.

We are also asked to draw attention to the excellent Courses on Radio and TV Servicing offered by the Northern Polytechnic, intended chiefly for junior service engineers and employees in the Trade, who will soon be faced by the problems connected with the introduction of Band III television and FM broadcasting. Full details can be obtained from the Secretary, The Northern Polytechnic, Holloway, London, N.7.

W. CRUNDALL, G3BUZ

We much regret to have to announce the sudden death, on July 21 at the early age of 27 years, of William Crundall, G3BUZ, of Lower Dicker, Sussex, where he lived with his parents.

HIRE PURCHASE FACILITIES

With the recent removal of restrictions on credit trading, several firms in the radio field are offering attractive hire-purchase terms. One of these is Watts Radio, Ltd., who have opened new premises at 8 Apple Market, Kingston-on-Thames, Surrey, and who offer H.P. facilities to postal customers as well as to callers. Generally speaking, goods can be supplied on a 10% deposit.

XTAL XCHANGE

This space is available free of charge for those who wish to exchange crystals. Buy-or-sell notices can *not* be accepted under this heading. Notices should be set out in the form shown below, on a separate slip headed "Xtal Xchange —Free Insertion," and all negotiations conducted direct.

G2PX, 3 Overton Drive, Wanstead, London, E.11.

Has crystals 1879, 1892, 1916, 3540, 3589, 5290, 7115 kc, ½in. pins, and 7225 kc in FT-243 mounting. Wants octal based 1000 kc bar for BC-221.

G3IOZ, The Gables, Kilsby, Nr. Rugby, Warks.

Has 6497.9 and 6522.9 kc crystals, ½in. pins, and 7150, 7175 kc in FT-243 mounting. Wants frequencies for 3.5 mc band, any mounting.

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6AK5	8/6	6Q7GT	10/-	8/9	866A	10/6	KTW61	6/3
6AM6	6/9	6SH7	5/6	7/93	2/6	KTZ41	5/9	5/9
6PF6	7/6	6SK7	6/9	EA50	1/6	RK34	2/3	1/9
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616	10/6	6V7	5/9	8/-	ECC11	3/6	VP133	6/6
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Valve holders. Amphenol I.O., M.O., 87G, 9d.; B8A, B8B, B9A, UX4, UX5, UX6, 1/-; Ceramic for RK34, 1/3. Carbon-track Potentiometers 2M., 1M, 1/6 each; 100K, 5K, 1/3; small; Megohm, 1/9. Wire-wound 3 watt 3k. 1/3 each. Trimmers 50pF, 8d. each 50-50 double, 10d, each. Phillips concentric 11d.; air-spaced ceramic 25 pF with 1/2" spindle length 9d. The Big Switch 230v, 15A, rotary, Diamond type 1/6. 2000 volt test, 1000 v.w. 6 μF condensers 3/9, plus 1/- postage on single condensers. 2; Thermocouple meters (ex-equipment) 2.5 and 3.0 amps, 5/-; Send 3d. for our full bargain list. Please add postage to orders under £1.

2a, BURNLEY ROAD

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OFFICIAL APPOINTMENTS

TECHNICIANS GRADE 1 (RADIO) required by EAST AFRICAN POSTS AND TELECOMS ADMINISTRATION on probation for pensionable employment. Salary scale (including present temporary allowance of 35% of salary) £742 rising to £1,134 a year. Outfit allowance £30. Free passages. Liberal leave on full salary. Normal tour 4 years. Candidates should possess a thorough knowledge of the working and maintenance of modern HF radio telegraph equipment and VHF multi-channel radio-telephone equipment. G.P.O. staff should apply through departmental channels.—Write to the Crown Agents, 4 Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience and quote M2C/32424/SQ.

ASSISTANT LECTURER (ELECTRICAL ENGINEERING) required by NIGERIA for two or three tours totalling 36 months. Appointment either (a) On temporary terms with salary scale (including expatriation pay) £807 rising to £1,453 a year plus gratuity at rate of £100/150 a year, or (b) With prospect of permanency with salary scale (including expatriation pay) £750 rising to £1,315 a year. Outfit allowance up to £60. Free passages for officer and wife. Assistance towards cost of children's passages or grant up to £150 annually for maintenance in United Kingdom. Liberal leave on full salary. Candidates, with H.N.C. in Electrical Engineering must have had sound training in radio receiving and transmitting work and must be able to teach feeder and aerial theory; theory and practice of all types of recording apparatus and general audio and acoustic theory. They should have had wide experience in the industry, and experience of teaching.—Write to the Crown Agents, 4 Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience and quote M2C/40373/SQ.

TECHNICAL INSTRUCTOR (BROADCASTING) required by the NIGERIAN BROADCASTING SERVICE for two tours of 12 to 15 months each, with possibility of permanency. Salary scale (including expatriation pay) £1,307 rising to £1,453 a year plus GRATUITY at rate of £150 a year. Outfit allowance of £60. Liberal leave on full salary. Free passages for officer and wife. Assistance towards cost of children's passages or grant up to £150 annually for maintenance in U.K. Candidates should have instructional experience and must have reached B.B.C. Grade C minus, or equivalent.—Write to the Crown Agents, 4 Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience and quote M2C/30513/SQ.

SITUATIONS VACANT

THE British Electrical and Allied Industries Research Association have vacancies for student apprentices; also for laboratory assistants for building and operation of electronic recording equipment, for use in researches on electrical discharges in gases, circuit-breakers, etc.—Write to Laboratory Manager, E.R.A. Laboratories, 5 Wadsworth Road, Greenford, Middlesex.

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