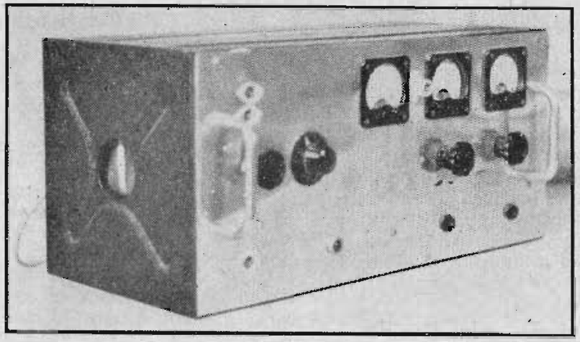
A TRANSMITTER CIRCUIT

for 160 Metres



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NOTE: To operate the transmitter described in this article a Post Office Amateur (Sound) Licence is required. Full particulars of this, and other amateur licences, may be obtained from: General Post Office, Radio and Accommodation Department, Headquarters Building, St. Martin's-le-Grand, London, E.C.1.

THE TRANSMITTER DESIGN TO BE DESCRIBED has been used by G3KEP for several years, and since then has been used with minor modifications by many other radio amateurs. All precautions have been taken in the design to ensure that no interference with broadcast and television reception is caused. Also, the mechanical layout and construction is so arranged that a frequency stability of a high degree is achieved.

Circuit

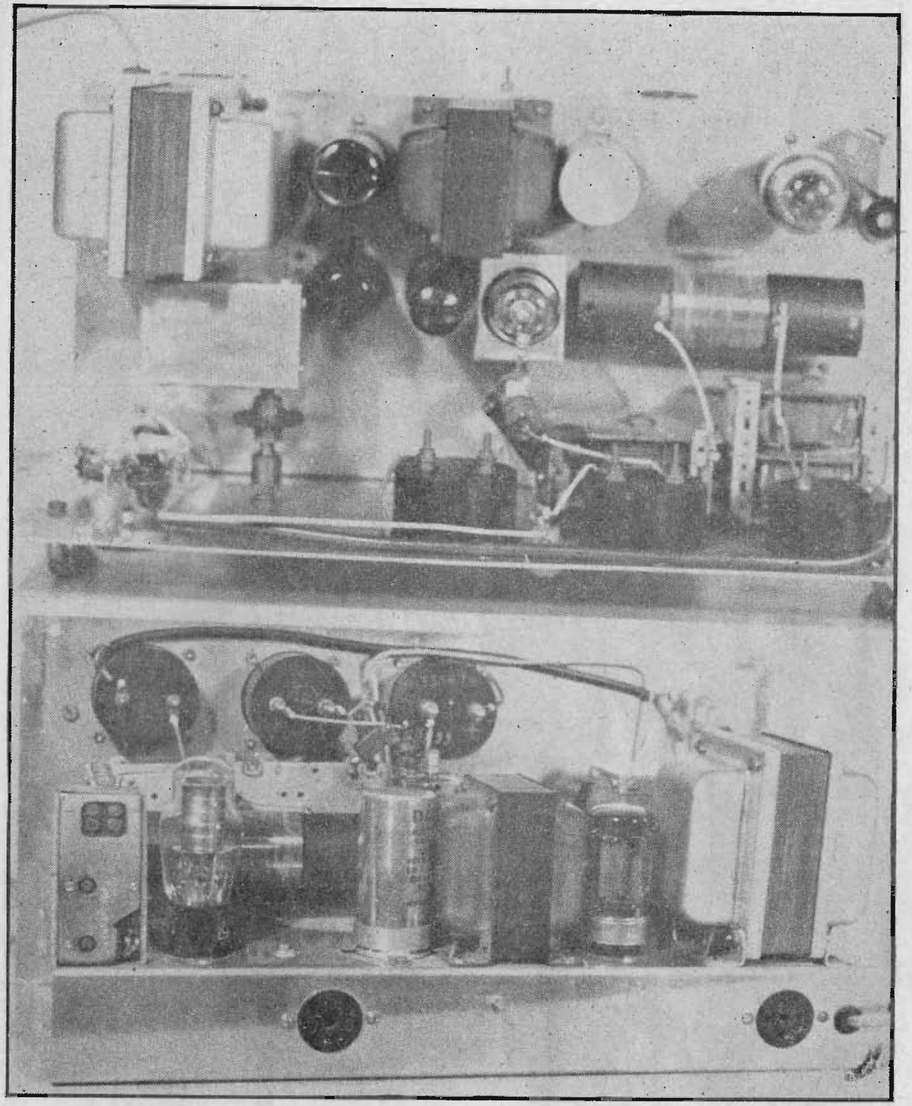
The circuit consists of a Clapp variable frequency oscillator feeding an untuned buffer amplifier, which drives the power amplifier valve. In the original design, a triode-connected 6AC7 was used in the v.f.o. stage; almost any general-purpose triode or r.f. pentode could be used in this stage. The h.t. voltage of the oscillator stage is kept constant by means of the voltage stabiliser valve V_1 connected from anode and screen-grid to chassis. Also, it will be seen that output from the v.f.o. is taken from the cathode of V_2, 6AC7. With the output taken from this electrode, the amount of "pulling" of the frequency when the output stage is tuned, is reduced.

The buffer stage employed a 6AG7 in the prototype, but a 6AC7, EF50, SP61, or EF80 should also work quite satisfactorily providing that C_{10} and C_{16} are adjusted to give a reading of approximately 1.5mA on the grid current meter, M_1.

P.A. Stage

Like the 807, and many other transmitting valves, the TT11 will stand a considerable amount of overloading without even the anode getting red hot! As the 807 is run at 150% of its recommended maximum ratings, so the TT11, rated at 8 watts input, has been run at 20 watts without *apparent* harm. This power, however, is not recommended for the 160 metre band for the simple reason that the maximum input permissible on this band is only 10 watts. Typical operation for 10 watts input is 300 volts at 33 milliamps anode current.

It will be seen that there is no cathode bias resistor in the p.a. valve. This has been omitted so as to ensure that the power amplifier is operating at its maximum efficiency. The inclusion of a cathode resistor will cause the p.a. not to draw excessive anode current when the grid drive is removed; but as keying is achieved by making and breaking the cathode circuit of



Above: Plan view of the transmitter unit. The v.f.o. screening box can be seen on the left. The power supply is built along the back of the chassis, and the voltage stabiliser valve can be seen mounted in the top right-hand corner of the picture. Round the p.a. valve is fitted another screening box, but this may not be found necessary. Below: On the back of the chassis, two valve-holders are fitted. One of these is provided so that external equipment may be fed from the transmitter power supply, and the other is the switch output to the receiver for muting

the p.a., drive will always be present at the p.a. grid, and a bias resistor is not, therefore, necessary.

Switching

Two switches are provided; one "transmit-receive," and one "net on-off" for switching

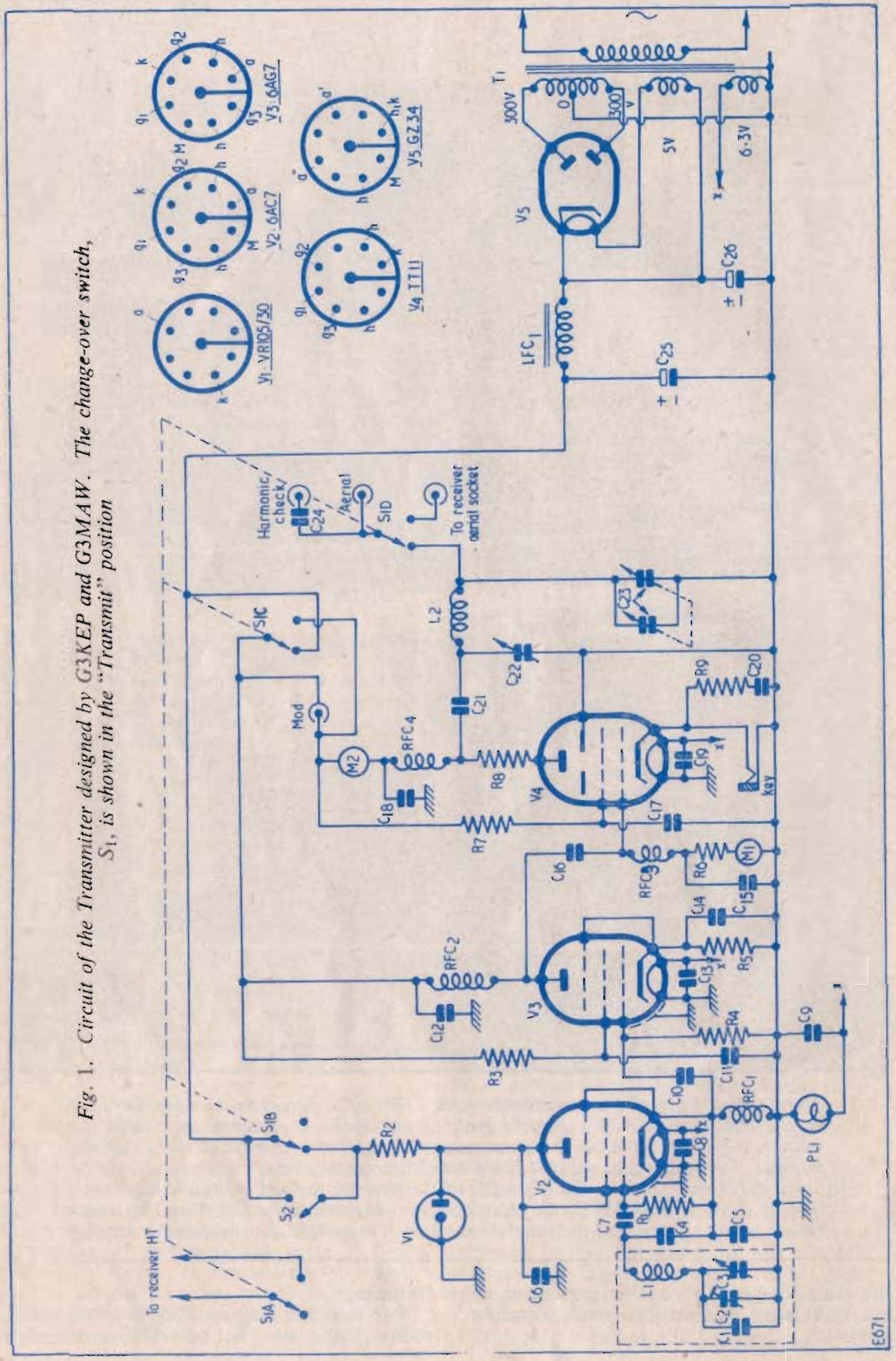


Fig. 1. Circuit of the Transmitter designed by G3KEP and G3MAW. The change-over switch, S_1, is shown in the "Transmit" position

on the v.f.o. without the p.a. A three-position switch could be used if desired for "net-receive-transmit," thereby combining both S_1 and S_2 together. The contacts on S_1A, S_1C and S_1D would be connected in the "net" position as in the "receive" position, and S_1B as in the "transmit" position. It will be noted that receiver muting is provided for in the switching. Another feature employed in the design is that when the transmitter is switched to the "receive" position, the modulator input socket is shorted across to prevent flash-over.

Modulation

Provision for applying anode and screen-grid modulation of the p.a. valve is provided. An insulated Belling-Lee co-axial socket is fitted to the front panel. This was used because of its very good insulation characteristics. During initial experiments, jack plugs and sockets were used for transferring the modulation from the modulator to the transmitter, but under peaks of modulation the insulation was found to break down.

Power Supply

A power supply is included in the unit. It employs a standard circuit, the rectifier valve being a GZ34 as shown, or any other common rectifying valve rated to have a maximum current output of at least 80mA. The mains transformer, T_1, should have ratings of 300 volts at 80mA with 5 volts for the rectifier heater, and 6.3 volts at about 3 amps. for the other valves. The smoothing condensers in the power supply must have a working voltage of at least 500 volts as the voltage across them will increase when the transmitter is switched to "receive."

Components List

SET OUT FOR EASY REFERENCE TO FIG. 1 ABOVE

Resistors (¼ watt unless otherwise stated)

R_1	100kΩ
R_2	4.7kΩ, 2 watts
R_3	22kΩ, 1 watt
R_4	47kΩ
R_5	220Ω, 1 watt
R_6	27kΩ
R_7	15kΩ, 2 watts
R_8	47Ω
R_9	390Ω

Capacitors

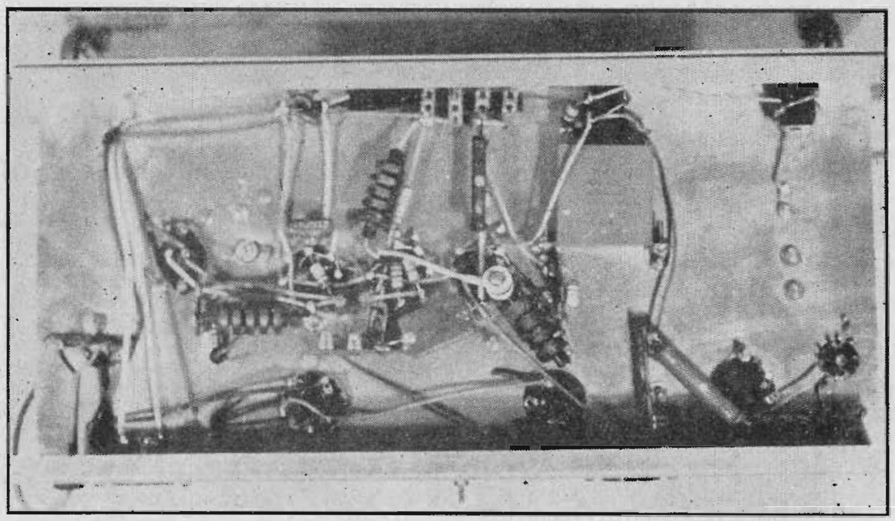
C_1, C_7	100pF silvered-mica
C_2	100pF air-spaced trimmer
C_3	50pF miniature air-spaced variable
C_4, C_5	1,000pF silvered-mica
C_6	0.1μF, 350V wkg. paper
C_8, C_9, C_{11}, C_{13}, C_{15}, C_{19}	1,000pF ceramic disc type
C_{10}, C_{16}	47pF silvered-mica
C_{12}, C_{14}	0.01μF, 350V wkg. paper
C_{17}	500pF silvered-mica
C_{18}	1,000pF, 2,000V wkg. silvered-mica
C_{20}	1μF, 350V wkg. paper
C_{21}	2,000pF, 2,000V wkg. silvered-mica
C_{22}	500pF ceramic insulated variable
C_{23}	2-gang receiving type variable 500pF per section. Both sections in parallel
C_{24}	10pF ceramic
C_{25}, C_{26}	50μF, 500V wkg. electrolytic

Coils

L_1	100 turns, 30 s.w.g. enamelled copper wire, close-wound on ¾in former
L_2	60 turns, 22 s.w.g. enamelled copper wire, close-wound on 1⅜in former
R.F.C.	2.5mH R.F. Chokes

Miscellaneous Components

M_1	0–5mA meter (Grid current)
M_2	0–50mA meter (Anode current)
V_1	Brimar VR105/30
V_2	Brimar 6AC7
V_3	Brimar 6AG7
V_4	TT11 (VT501) (RK64)
V_5	GZ34 or 5Z4G, etc.
S_1	Transmit-Receive switch, 4-pole, 2-way
S_2	Netting switch, Single-pole, Single-throw Toggle switch
Ch_1	10 Henrys, 100mA Choke
PL_1	Panel lamp, 6.5 volts, 0.3 amps



This underside view of the transmitters shows that there is plenty of space available on a chassis $7\frac{1}{2}$ x $15\frac{1}{4}$ x 2in. The three r.f. chokes, it will be noted, are not wired such that they are mounted parallel to each other. They should be mounted as far apart as practically possible so as not to cause any instability

Conclusion

The title illustration shows the exterior view of the Top Band transmitter. In this particular unit, a meter is fitted in series with the aerial to indicate aerial current. It was not considered necessary to include this in the circuit described; but if readers wish to incorporate such a meter, it should be of the thermo-couple variety having a maximum r.f. current deflection of 0.5 amps.

As explained earlier, the design has been used by several amateur stations, and has been accepted as being satisfactory in all respects. No difficulty should be experienced in getting this rig to work correctly. If, however, any readers are overcome by difficulties, the writers would be glad to answer any technical problems that might arise.

TV SETS:

LEAD FOR SAFETY

Each year the public is being introduced to bigger and better television sets. Some concern has been expressed that the greater power needed to operate these sets will generate soft X-rays which may escape, and so add to the general background of radiation to which we are all now exposed.

Happily this is a groundless fear, because a very simple technique is available to ensure complete safety from hazards of this nature. X-rays emanating at this intensity can be effectively absorbed by thin lead foil which is readily available in this country. It can be pasted, after the fashion of paper, on the inside of a cabinet before the electronic components are assembled or, alternatively, incorporated into the body of the cabinet which is often of plywood construction.

Finally, the sheet of armour-plated glass placed in front of most television tubes can be made of lead glass, following the principle adopted by atomic scientists when dealing with this problem. In this way manufacturers can ensure that the whole set is completely encased in lead and so achieve absolute security.