

Front view of the K.W. Vanguard Transmitter, as made up from the kit of parts (which includes an enclosing cabinet, not taken with this photograph), showing the general panel arrangement. Behind the central dial is the Gelson Signal Shifter Type 4/102, which is the drive unit for the Transmitter, running a 6146 (QV06-20) PA at up to 45 watts input, phone and CW. The switching gives full control and the Gelson VFO ample drive for the PA, on all bands.

## Constructing and Testing the New K.W. "Vanguard"

KIT COMPLETE FOR 50-WATT  
CW/PHONE TRANSMITTER,  
10-80 METRES

*MAGAZINE REVIEW*

**N**ATURALLY, the first complete Transmitter Kit to be offered on the U.K. market has created widespread interest. For one thing, if you build from specified parts, designed for their purpose, not only have you "rolled your own" in the accepted tradition of Amateur Radio, but you are likely to get a much more satisfactory result than building haphazardly from odd bits that happen to be available. Secondly, you get the finished job much more cheaply than if it were factory-assembled and tested, because the essentially costly item of labour is eliminated.

For all these reasons, therefore, we were very glad to obtain delivery of a K.W. "Vanguard" Kit for the purpose of investigating the manufacturer's claims and informing readers of the results. It was also the idea that the Kit itself, with the assembly and working instructions, should be checked for accuracy and reliability. As the Kit supplied to us was one of the earliest, it was possible to suggest some minor improvements and slight modifications, of which current buyers now have the advantage.

### General Approach

In accordance with modern ideas in the production of constructional kits, the K.W. Vanguard comes absolutely complete down to the last detail, including drilled chassis and panel, fastenings and wires. All that the buyer has to provide is the ability to use a few tools and follow instructions. A comprehensive check list is included in the pack-up, together with a full circuit diagram and physical wiring plans. Standard parts and components of reputable make are used throughout, and the four transformers required have been designed and are manufactured specially for the K.W. Vanguard.

The assembly instructions are worked out to give a step-by-step procedure and the wiring plan shows almost where each lead goes. Following the paper-work implicitly, it was found that the only tools needed for the work were three sizes of screw-driver, a pair of pointed-nose pliers, BA box spanners, some Multicore solder, and a light soldering-iron. The total time taken to complete construction, from receiving the parts as packed to the first test with power on, was 20 working hours.

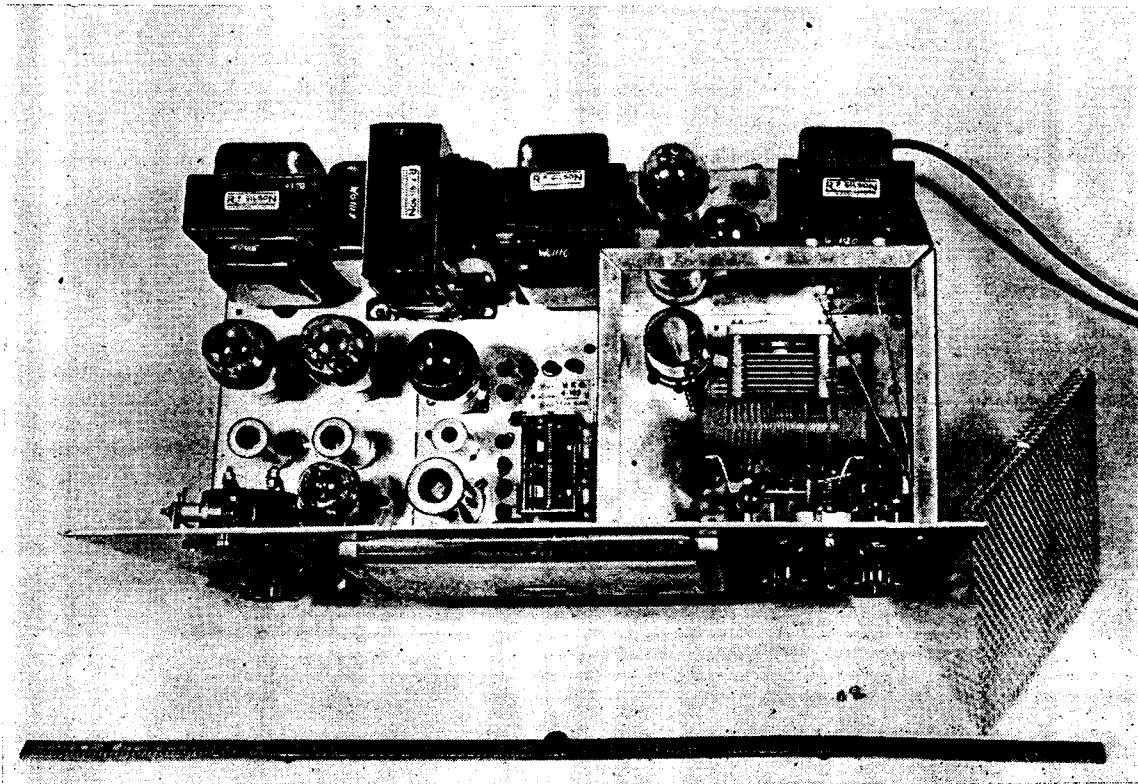
For anyone with some experience of radio construction, assembly can present no particular difficulty. The kit supplied for *Short Wave Magazine* test purposes was handed over, just as it was received, to a junior enthusiast with no previous experience of actual transmitter construction. He was simply told to go ahead with the work as laid down in the instructions supplied with the Kit, and to produce the finished Transmitter as soon as he conveniently could—without conducting any power-on tests on his own account.

The result of this exercise is shown in the photographs herewith. And it can be said that after the proper DC and continuity checks had been made, RF was obtained on the 7 mc band as soon as power was applied for the first time.

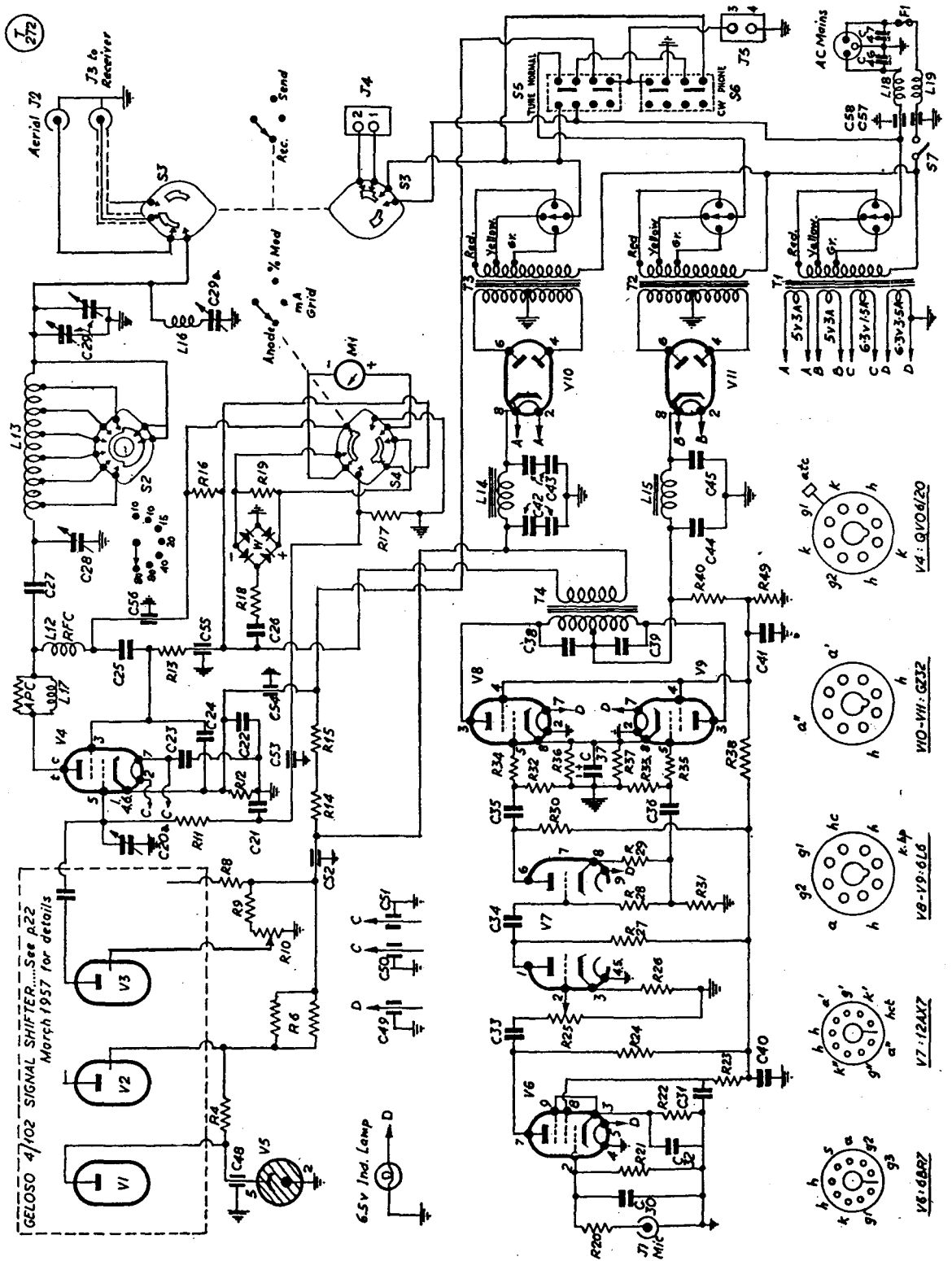
### Design of the "Vanguard"

From the circuit, it can be seen that the VFO is a Geloso Type 4/102 Signal Shifter, first described in the March 1957 issue of *Short Wave Magazine*. This drives directly, on all five bands 3.5 to 28 mc, a QVO6-20 (6146) PA, the output side of which consists of the Geloso band-switched pi-section tank assembly, rated for 50 watts.

The VFO is supplied as a pre-fabricated unit, requiring only some slight trimming adjustment to fix the band edges accurately. The 180-degree swing of the VFO pointer gives excellent band-spread; with the outer graduated scale divided into an arbitrary 100 divisions (not "degrees," as often incorrectly described), the coverage is ample and the re-setting



Looking down into the completed K.W. Vanguard, showing the PA box on the right; the output side uses a standard Geloso pi-section band-switched tank assembly, rated at 50 watts. To the left of the PA is the pre-fabricated Geloso VFO, and below the panel meter is the speech amplifier-modulator, running a pair of 6L6's in Class-AB1. The transformers used are all of Gilson manufacture, specially designed for their purpose, that for the heater supply being on the right along the rear edge of the chassis. The rectifiers are next to the left, followed by the separate transformers for modulator and PA HT supply, and on the extreme left the fixed-ratio modulation transformer, T4 in the main circuit diagram. The foot-rule gives a front-panel measurement of 19 inches. In the right foreground is the grille to enclose the PA box, with its fixing screws.



accuracy very good. Further and more detailed information regarding the VFO itself will be found in the March 1957 issue, as mentioned above.

For telephony, the QVO6-20 (which is identical to the American 6146) is plate-and-screen modulated by a pair of 6L6's in Class-AB1. The 6BR7 speech amplifier and 12AX7 driver give ample gain using any usual type of crystal microphone, so that full modulation is possible at maximum carrier level; one toggle switch controls the change-over from phone to CW, and cut-off is complete on keying.

The switching is, in fact, particularly good.

One knob, at upper right-hand on the panel (see front-view photograph) is for send-receive, controlling transmitter on-off, aerial change-over and the external relay circuit that might be used for muting the receiver. A "tune-normal" toggle switch gives control of the VFO alone for netting. Switching is simplified (and rationalised) by reason of the fact that a separate heater transformer is used, feeding all valves and not associated with the two HT transformers; hence, they can be switched in their primaries, as heaters are on all the time. One transformer runs the RF section of the Transmitter (VFO and PA) and the other the speech amplifier-modulator, each power supply section having its own rectifier.

An interesting feature of the circuit is the modulation-level indicator, contrived by rectifying the audio on the secondary side of the modulation transformer and presenting it in terms of modulation percentage on one scale of the three-range meter; the meter switch selects PA plate current, PA grid drive, or percentage modulation.

It will also be noticed that a mains input filter is provided which, constructionally, is contained in a separate screening box—see under-side view photograph. All HT and LT connections feeding into the VFO/PA circuitry are by-passed by 500  $\mu\text{F}$  feed-through condensers, as indicated by C48-C58 in the circuit diagram.

On the PA enclosure, two output coax sockets are provided; one is for the aerial connection and the other for the receiver, so that the send-receive switch throws the aerial from transmitter to receiver.

Finally, as regards the general design, the K.W. Vanguard makes up into a cabinet which is 21½ ins. wide, 10½ ins. high, by 11½ ins. deep overall. The total weight is about 60 lbs. complete, so that the Transmitter is of convenient table-top dimensions and not too heavy to move.

**Performance**

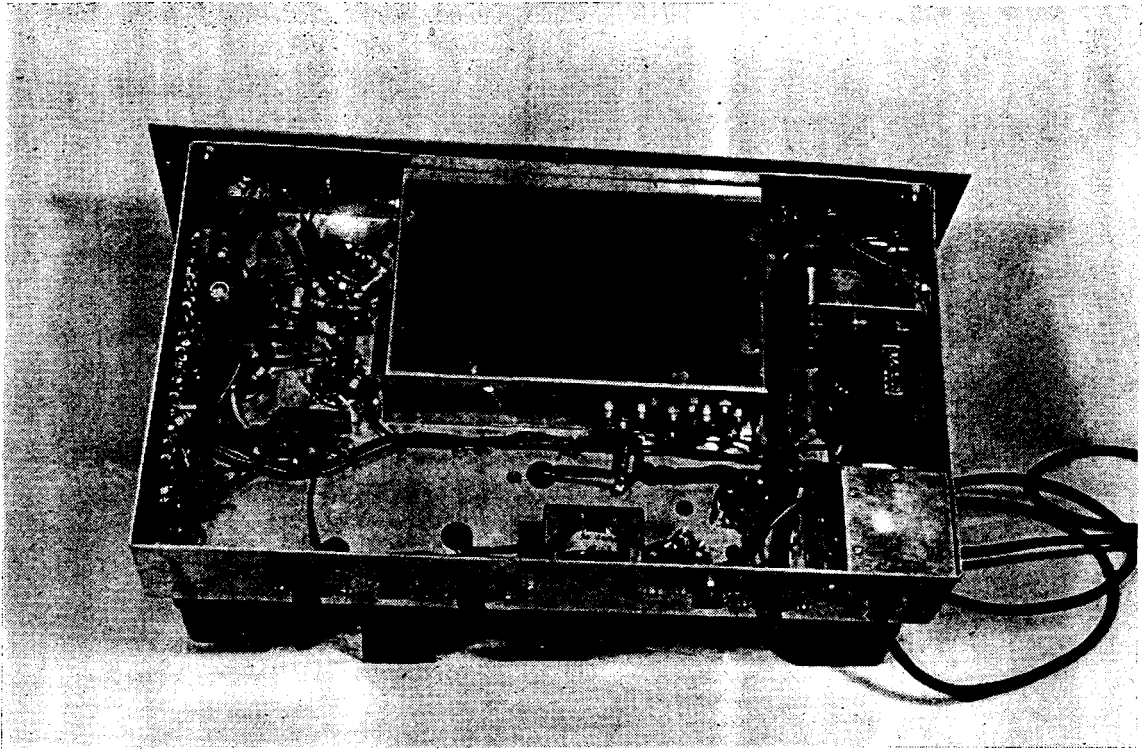
As may be expected, the Transmitter gives a most satisfactory account of itself on all bands. The keying characteristic is good and, with the crystal microphone shown in one of the photographs, speech quality is always reported as excellent, and entirely hum-free even at local ranges. The quick change-over from CW to phone is particularly useful, and the general arrangement of the switching and the layout of the panel controls make the Transmitter very convenient to operate alongside a receiver.

There is no undue heating anywhere in the

**Table of Values**

C1-C19	= Circuit complete of the K.W. "Vanguard"	C46, C47	= .001 $\mu\text{F}$ , silver mica, 500v.
C20	= Gelo 4/102	C48-C58	= 500 $\mu\text{F}$ feed-through ceramic
C20a	= 15 $\mu\text{F}$ VFO feed mica	R1, R2	= Incorporated in Gelo 4/102
C21, C22	= .001 $\mu\text{F}$ air-spaced ceramic	R3, R7	= 15,000 ohms, 3/4w.
C24, C25	= .005 $\mu\text{F}$ , silver cathode points	R4	= 2,200 ohms, 3/4w.
C26	= .01 $\mu\text{F}$ , 500v.	R5	= 7,500 ohms, 5w.
C27	= .02 $\mu\text{F}$ , silver mica, 1000v.	R6	= 2/15,000 ohm 2w.
C28	= 200 $\mu\text{F}$ , variable	R8	= 3,300 ohms, 2w.
C29	= 2/500 $\mu\text{F}$ , gang	R9, R11	= 22,000 ohms, 2w.
C29a	= 50 $\mu\text{F}$ , air-spaced	R10	= 30,000 ohms, 3w.
C30	= 100 $\mu\text{F}$ , ceramic	R12	= 33,000 ohms, 1w.
C31	= 0.1 $\mu\text{F}$	R13	= 27,000 ohms, 2w.
C32	= 25 $\mu\text{F}$ , 12v. elect.	R14, R15	= 68,000 ohms, 1w.
C33, C34	= 300 $\mu\text{F}$ , silver mica	R16	= Meter shunt
C35	= .01 $\mu\text{F}$	R17	= 470 ohms, 1/2w.
C36	= 25 $\mu\text{F}$ , 25v. elect.	R18	= 27,000 ohms, 1/2w.
C37	= .005 $\mu\text{F}$ , 800v.	R19	= 100 ohms, 1/2w.
C38	= 8 $\mu\text{F}$ , 450v. elect.	R20, R30	= 100,000 ohms, 1/2w.
C40, C41	= 8 $\mu\text{F}$ , 450v. elect.	R31	= 1 megohm, 1/2w.
C42, C43	= 2/32 $\mu\text{F}$ , 450v. elect. in series	R22	= 1,000 ohms, 1/2w.
C44	= 32 $\mu\text{F}$ , 450v. elect.	R23	= 2.2 megohms, 1/2w.
C45	= 8 $\mu\text{F}$ , 500v. elect.	R24, R27	= 470,000 ohms, 1/2w.
L15	= 3 Hy. 120 mA choke	L16	= Harmonic rejector
L17	= Anti-parasitic choke	L18	= Mains chokes
L19	= Mains chokes	S1	= PA band-change switch, in 4/102
S2	= PA band-change switch	S3	= Send-receive switch
S4	= Meter function	S5	= Net-normal switch
S6	= Phone/CW change-over	S7	= Mains socket
J1	= Mic. socket	J2	= Aerial socket
J3	= Receiver aerial	J4	= (see text)
J4	= Receiver muting	J5	= Key socket
M1	= Meter		
R25	= 1 megohm pot./meter	R26	= 4,700 ohms, 1/2w.
R27	= 2,200 ohms, 1w.	R28	= 220,000 ohms, 1/2w.
R29	= 220,000 ohms, 1/2w.	R30	= 47,000 ohms, 1/2w.
R31	= 470 ohms, 2w. or 250 ohms, 5w.	R32	= 22,000 ohms, 1w.
R32	= 22,000 ohms, 1w.	R33	= 47,000 ohms, 1w.
R34, R35	= 4,700 ohms, 1w.	R36, R37	= 33 ohms, 2w. or 33 ohms, 5w.
R36, R37	= 33 ohms, 2w. or 33 ohms, 5w.	R38	= 22,000 ohms, 1w.
R38	= 22,000 ohms, 1w.	R39	= 47,000 ohms, 1w.
R40	= 4,700 ohms, 1w.	R41	= 33 ohms, 2w.
R41	= 33 ohms, 2w.	T1	= Mains all LT's
T1	= Mains all LT's	T2	= RF HT
T2	= RF HT	T3	= Mod HT
T3	= Mod HT	T4	= Fixed-ratio mod.
T4	= Fixed-ratio mod.		
L1-L11	= Informal in Gelo 4/102	L12	= RF choke
L12	= RF choke	L13	= Gelo 300 ohm coil
L13	= Gelo 300 ohm coil	L14	= 3 Hy, 200 mA choke

Circuit of the K.W. Vanguard is shown up above, and described in the article. The transmitter is designed for CW/phone operation on all bands 80 to 10 metres, with 25-30 watts of RF output. A full kit of parts is supplied to make up the complete assembly shown in the photographs.



The construction underneath the K.W. Vanguard Transmitter, as wired out from the assembly instructions supplied with the Kit, which is complete down to the last tag-board, and includes ready-drilled panel and chassis. Under the cover of the centre box is the RF section of the Transmitter, including the VFO and the grid side of the PA. The small box at lower right contains the mains filter chokes, and along the rear chassis drop (in foreground) are the voltage selectors for the mains transformers — heater, modulator, RF section — and the key and external relay connectors.

assembly, and even after long runs all the transformers are quite cool.

The electrical and mechanical design is such that, combined with the moderate power used, a good anti-TV performance can be relied upon—though complete freedom from TVI cannot, of course, be guaranteed, in the sense that though the K.W. Vanguard itself should be TVI-proof, a nearby TV receiver with an open front-end may still be subject to shock interference. (However, this would be the fault of the receiver, not the Transmitter, though that would have to be proved to the complainant and the Post Office).

Where the owner wishes to insure himself against all possibilities, the manufacturers have produced a neat low-pass filter which fits *inside* the cabinet, drilled to accommodate it. This filter gives very good attenuation of all unwanted frequencies above about 35 mc. The harmonic trap L16,C29a inside the PA box is designed primarily for use with a low-impedance feed-line of the order 50/100 ohms. With this trap out of circuit, the pi-section

tank assembly can be made to match into impedances of from 40 to 2,500 ohms or so, on all bands; this means that by cutting it out, most types of end-on aerial can be brought to resonance, the tuning procedure then being as for the well-known "Collins coupler." Do *not*, however, try to do this with the harmonic filter connected, and remember that voltage-feed can sometimes produce undesirable effects, such as RF getting back into the speech amplifier.

### Top Band Working

We are informed by the manufacturers that they have now devised a simple modification to enable the K.W. Vanguard to be operated on Top Band, thus giving six-band coverage—of course with reduced power on 160 metres. This modification has not yet been applied to the model shown here, but some notes about it will appear in an early issue.

### Input/Output Ratings

With a line voltage of 235v. AC applied at the 0-240v. taps of the transformers, a no-load

HT voltage of 490v. was given by the RF section power pack. At 110 mA PA plate current, this voltage dropped to 415v., giving a PA input of about 46 watts. This order of DC input to the PA can be obtained on all five bands.

On an artificial load test, using a properly calibrated set-up for testing, currents up to 0.62 amps could be obtained through 75 ohms. From  $I^2R$ , this gives an output of just over 30 watts RF, and is at a maximum on 7 mc.

The paper-work supplied with the Kit includes a sheet headed "Operating and Tuning Procedure." This gives the sort of information which would be familiar enough to the experienced operator, but would need to be very carefully read by a beginner before he attempted to set up a frequency for the first time. It is understood that in due course the manufacturers intend to produce a printed handbook covering design, construction, testing and operation, all in full detail.

### Conclusion

For those wanting a moderately - priced built-it-yourself kit for a medium-power self-contained transmitter, capable of all-band operation in both modes, and making up into a very nice-looking piece of equipment, the K.W. Vanguard is the choice. The manufacturers are to be congratulated both on their enterprise and on its product; already, many Vanguards can be heard about the bands, giving a good account of themselves on the air—which, in the end, is what matters more than anything.

The K.W. Vanguard is produced and supplied in complete kit form by K.W. Electronics, Ltd., 136 Birchwood Road, Wilmington, Dartford, Kent, England, and costs £50 8s. 0d. complete, or £31 10s. 0d. less valves, cabinet and Geloso signal shifter; it is understood that all parts needed for the Transmitter are also available separately.