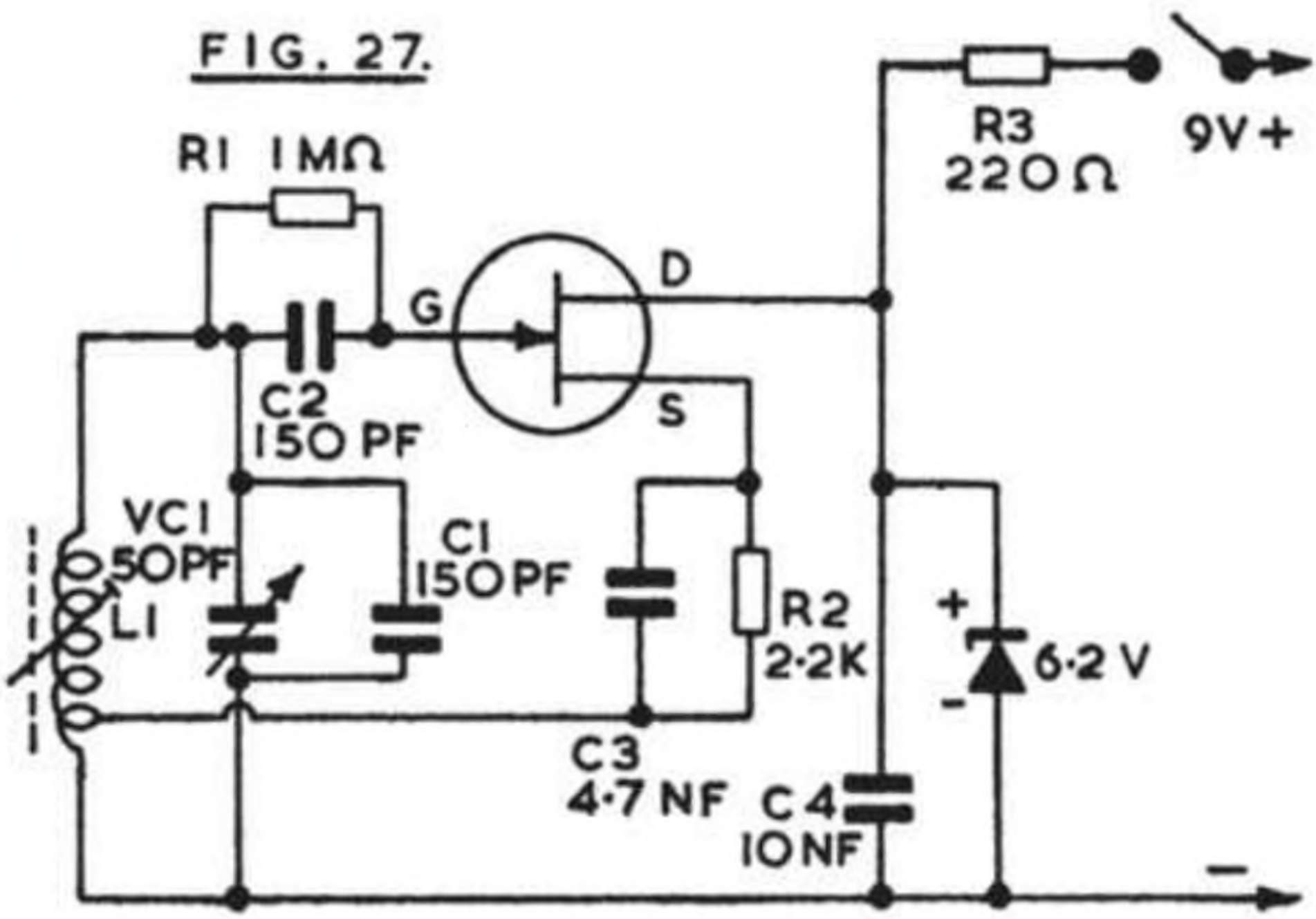
Signal Frequency SSB/CW Resolver

Many general purpose receivers will have frequency bands which cover some of the amateur allocations, but which are not able to resolve single sideband or CW (Morse) signals. With a communications type receiver intended for SSB or CW reception, a beat frequency or carrier oscillator is provided. With its aid, SSB or CW signals can be received. When a general purpose receiver is employed, the BFO or CO can be constructed as a separate unit.

The output of the BFO or CO may be taken to the intermediate frequency circuit of the receiver, as shown later. Alternatively, the beat frequency or carrier oscillator can operate at the frequency of the band being tuned. If so, no actual connection at all is necessary to the receiver, as the wanted signal and oscillator signal are both fed into the receiver aerial circuit.

This method is convenient for the low frequency amateur bands, especially 1.8-2.0MHz and 3.5-3.8MHz. It also has some advantage where the receiver tuning control is of a type which cannot easily provide critical tuning, as the latter will now depend on the signal frequency SSB/CW resolver.

FIG. 27.



The circuit in Figure 27 will operate at a fundamental frequency of approximately 1.75-2.0MHz, or 3.5-4.0MHz. The former range is suitable for both 160m and 80m, as the second harmonic of the 160m range will provide resolution on the 80m band. However, the 3.5-4.0MHz coverage is more suitable when 80m alone is wanted, or some reception on perhaps 7MHz or 14MHz, with harmonics.

For the lower frequency range, C1 is 250pF and VC1 is 75pF. L1 has fifty-seven turns in all, tapped at twelve turns from the grounded end. The winding is of 32swg enamelled wire, on a 7/16th in or 11mm diameter former, with adjustable core. Turns are side by side. To cover the higher frequency range, L1 has thirty turns, tapped at 6 turns, with wire and former as described. C1 and VC1 are as shown.

Stabilisation of the oscillator can be omitted when the current is to be drawn from a separate battery, but becomes necessary if the circuit is operated from the same battery as the receiver. Otherwise fluctuations of supply voltage, especially at other than low loudspeaker volume, will cause frequency modulation of the oscillator.

Construction of the resolver should be in a metal case, with rigid mounting of components. A reduction drive is necessary for VC1.

As the output from the oscillator passes into the receiver aerial circuit, and is amplified with other signals, very loose coupling must be used. It may be found adequate merely to place the resolver unit near the receiver aerial lead. If more coupling than this proves necessary, a lead a few inches long can be taken from the tap on L1, out of the screening box, and near to the aerial lead. The, degree of coupling is not too critical. But if this is too great, signals will be swamped by the oscillator carrier. Alternatively, very loose coupling will give too low an input to the receiver, so that strong SSB or CW cannot be resolved.

To operate the unit, tune in the wanted SSB or CW signal with the receiver. Final tuning is now done with the resolver control, at the point where the oscillator signal is heard to beat or mix with the transmission tuned in. With CW, tuning is not too critical, as adjustments around the transmission frequency will merely alter the audio pitch. But for good reception of SSB, tuning is quite critical, as the resolver carrier should replace the carrier which was suppressed before transmission as correctly as possible.

Tight coupling of the oscillator is not necessary, and should not be made to an aerial, as this could cause interference to near by listeners.

1.6MHz Beat Frequency Oscillator

To resolve SSB or CW, a BFO signal may be coupled into the intermediate frequency amplifier. In these circumstances, the BFO has to operate near the intermediate frequency of the receiver, for transmissions of all frequencies. So with a BFO of this type, signals may be received at any frequency throughout the ranges which are provided for the receiver.

Some short wave receivers have an IF of about 1.6MHz. The BFO must then be constructed for this. With most general purpose or ordinary domestic receivers, the IF is near 455/470k Hz. If so, the BFO has to be arranged with this in view. Except for this point of providing the correct frequency, both 1.6MHz and 455-470kHz BFO units are the same, and employ the circuit in Figure 28.

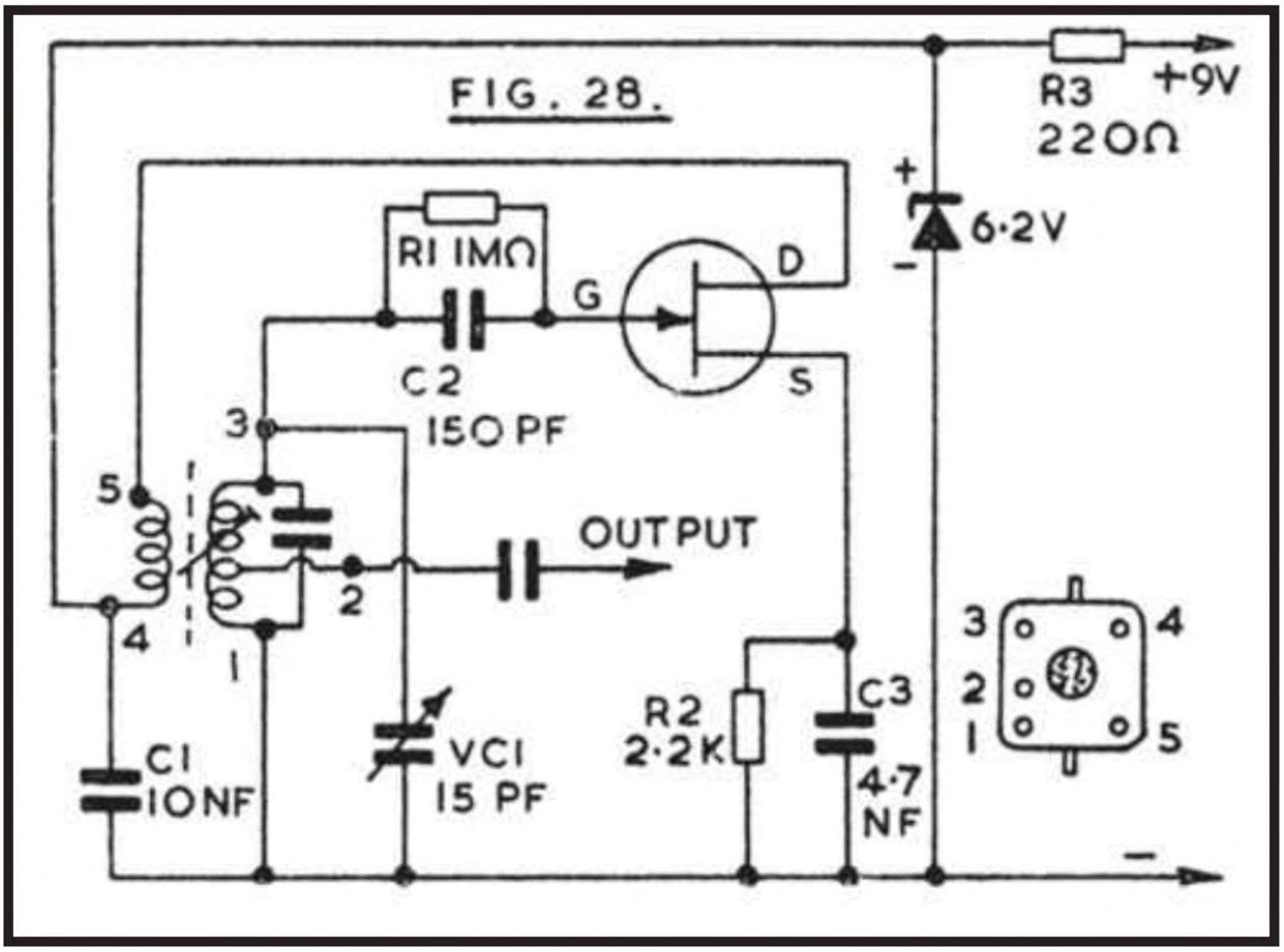
455-470kHz Beat Frequency Oscillator

A general purpose RF FET is used as oscillator, Its frequency is determined by VC1, with the associated winding and parallel capacitor. The smaller winding is for drain feedback. A stabilised supply with 6.2v 400mW Zener diode allows the unit to be run from the receiver, if wished.

For frequencies around 1.6MHz, a Denco (Clacton) IFT17 intermediate frequency transformer is used. For frequencies in the 455-470kHz range, the IFT14 is fitted. Each has the parallel capacitor present inside the screening can, in the usual way, and pin connections are shown in Figure 28.

Components may be assembled on a small insulated board, and it may be possible to fit this somewhere inside the receiver. An on/off switch is included in the positive supply lead, as the BFO must not be in use for ordinary AM reception.

FIG. 28.



A control knob is necessary on VC1, as this must be adjustable during reception. If it is not practical to include this control on the receiver, then the BFO can be constructed as a separate unit.

The best degree of coupling from 2 of the BFO coil to the receiver IF circuits needs to be found by trial. It should be, sufficient to run an insulated lead from 2, to the vicinity of the first transistor in the IF amplifier. Alternatively, a capacitor of 8.2pF can be included here, as shown, and the output lead can be connected to the receiver diode, at the final IF transformer.

If coupling is too loose, only relatively weak CW or SSB stations will be resolved, and stronger SSB will sound like badly distorted and over modulated AM. However, very tight coupling is not wanted and will tend to swamp weaker transmissions.

Operation is similar to that described for the signal frequency resolver, except that as all signals are converted to the intermediate frequency in the receiver, it is only necessary to make trifling

adjustments to VC1. For CW, VC1 will have two positions (above and below the station frequency). But for SSB, there is only one suitable frequency setting for the BFO, as if this is placed the wrong side the SSB signal, speech will be inverted, or unintelligible.

Initially, tune in an AM signal, and set VC1 to about half open position. Then rotate the core of the oscillator coil until a heterodyne is heard, and can be set to zero. Then rotating VC1 either way should cause an audio tone which rises in pitch. Check that this happens with signals on any frequency, to make sure harmonics of the BFO in the aerial circuit are not responsible.