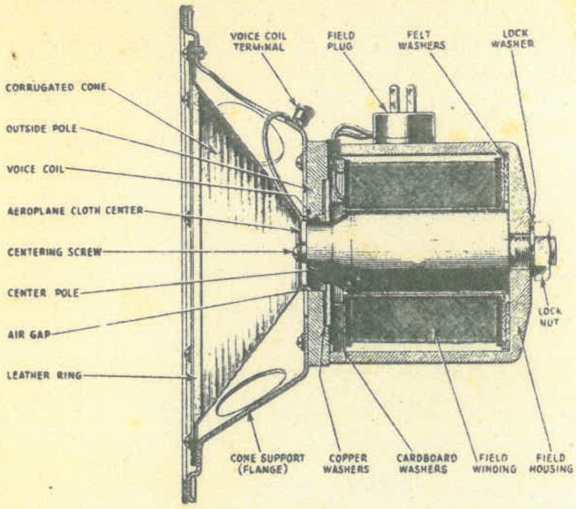

Fig. 1. General view of a typical moving coil electromagnet field loud speaker.

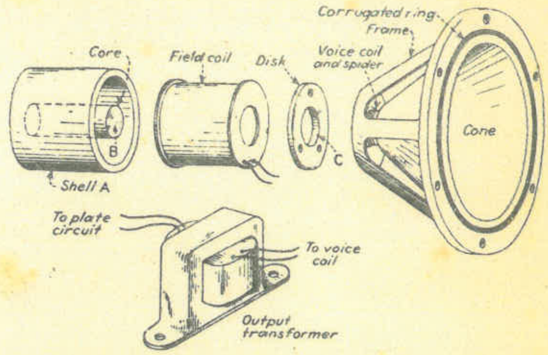

Fig. 2. Exploded view of an electromagnet field loud speaker.

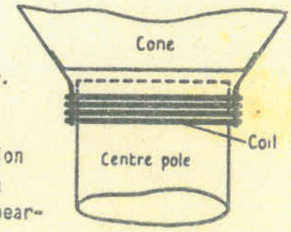

Fig. 3. Construction of the moving coil.

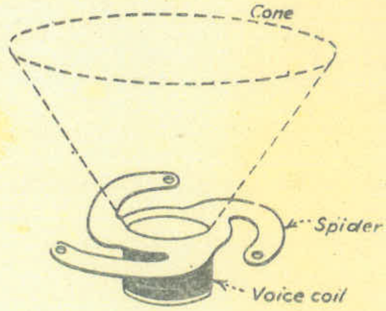

Fig. 4. Moving coil mounted on the paper cone.

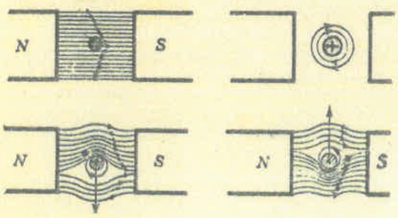

Fig. 5. Interaction between a current bearing conductor and a magnetic field.

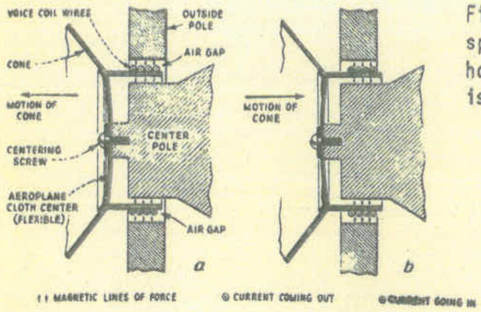

Fig. 6. Application of Fig. 5 to an actual loud speaker voice coil showing how the to and fro movement is obtained.

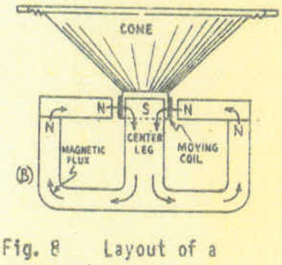

Fig. 8 Layout of a permanent magnet loud speaker.

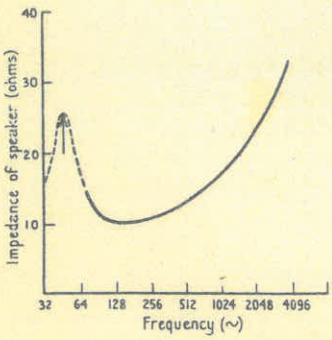

Fig. 7. Change in impedance of a typical loud speaker voice coil. The peak at 40 cycles is caused by the natural resonance of the loud speaker cone and coil.

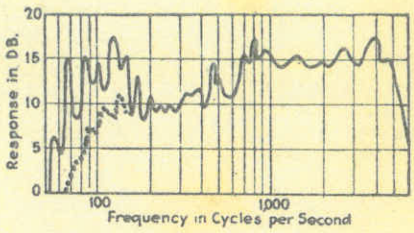

Fig. 9. Acoustic output response of a typical loud speaker. The dotted line shows the loss of bass notes due to a small baffle size.

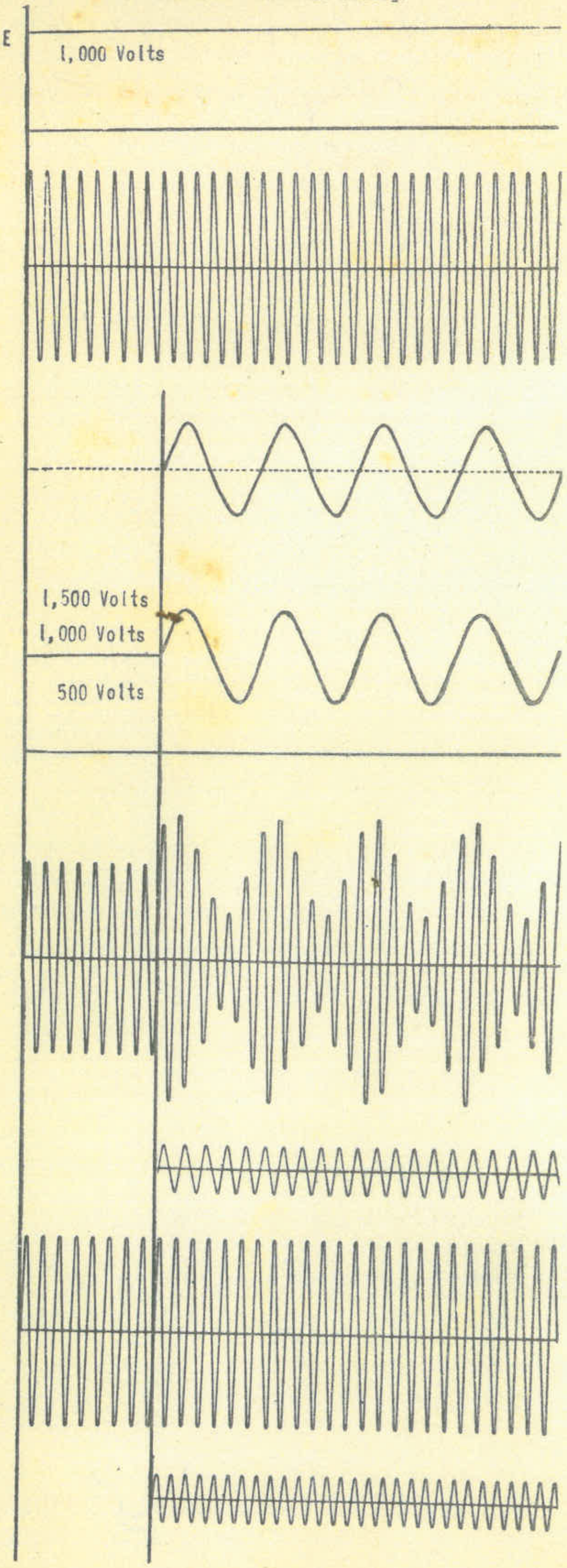

Fig. 1. Constant plate anode voltage plotted against time as a base line. The voltage is assumed to be applied to an oscillator or R.F. amplifier (for example it is 1,000 V.)

Fig. 2. Constant amplitude R.F. carrier wave caused by the constant operating voltage. The example assumes that the R.F. amplitude is proportional to the applied D.C. Superimposing Fig. 1 on the centre line of the R.F. wave shows the R.F. peak values equal to the height of the 1,000 volt D.C. supply.

Fig. 3. Section of an audio frequency wave of 4,000 cycles per second. The section taken for the discussion is 1/1,000 second duration, hence 4 complete cycles are shown. The peak voltage is 500 volts.

Fig. 4. Original D.C. constant plate voltage of 1,000 with the 500 volts peak A.C. superimposed. The voltage becomes a pulsating D.C. of maximum value 1,500 and minimum value 500 volts.

Fig. 5. Resulting R.F. wave caused when the D.C. varies as in Fig. 4. The R.F. wave peak values follow exactly the shape of the pulsating D.C. of Fig. 4 and this can be seen by superimposing. There are 24 waves in the modulated or variable amplitude section and that the percentage of modulation is 50%.

Fig. 6. Lower side band frequency of Fig. 5. Note that the amplitude of the side band is one quarter of the carrier of Fig. 2 on the unmodulated section at the left of Fig. 5 and the number of waves is 20.

Fig. 7. Carrier component of the modulated wave of Fig. 5. Note that it has not changed in any way from Fig. 2.

Fig. 8. Upper side band frequency of Fig. 5. Note that the amplitude is the same as that of Fig. 6, but that the number of waves is 28. RESULT: If the waves of Figs. 6, 7, and 8 are added together with due regard to polarity the three waves together make up exactly the modulated wave of Fig. 5 - hence the statement that a single modulated wave can be broken up and reconstituted from three waves.

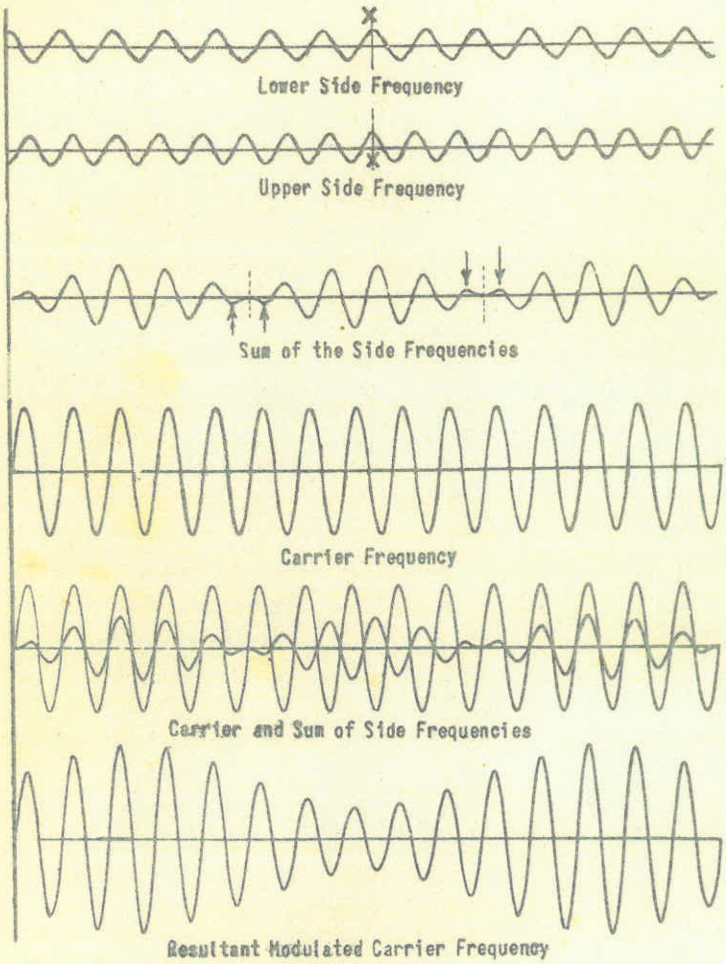

Fig. 1. Lower side band frequency f = 13. Note that the particular starting point of Figs. 1 and 2 is such that they are of opposite polarity as compared with Figs. 6 and 8 of Sheet No. 1. They are similar to a start being made at the waves marked X-X.

Fig. 2. Upper sideband frequency f = 17. The amplitude is the same as for Fig. 1.

Fig. 3. Result of beating the two waves of Figs. 1 and 2 together. Simple addition shows the shape of the resultant which has a centre beat rise of opposite polarity to the first and the third beat rises.

Fig. 4. The carrier frequency of f = 15. Note that the amplitude is 4 times that of any one side band or twice the sum of the both side bands when they are of similar polarity.

Fig. 5. Carrier frequency plus the sum of the two side bands showing relative polarities and changes in pólarities. Expressed in other words the two waves will beat together and produce a resultant wave.

Fig. 6. The resultant beat wave which is seen to be the same as an amplitude modulated wave.

SUMMARY

In the same way that any recurring wave having a shape other than a sine wave can be broken up into its constituent sine waves consisting of a fundamental and harmonics, so an amplitude modulated wave consisting of an R.F. sine wave carrier rising and falling at an audio sine wave shape and rate can be broken up into three separate R.F. waves consisting of:-

The Carrier frequency plus the audio frequency.
The Carrier frequency.
The Carrier frequency minus the audio frequency.

A modulated wave can be broken up because it is not made up of pure sine waves. To show this take the first wave shown in Fig. 6. Parts A and B will be equal if the wave is a pure sine wave. A and B are not equal, hence breaking up into three constituent waves.

COMPARISON BETWEEN SUPERHETERODYNE AND TUNED R.F. RECEPTION.

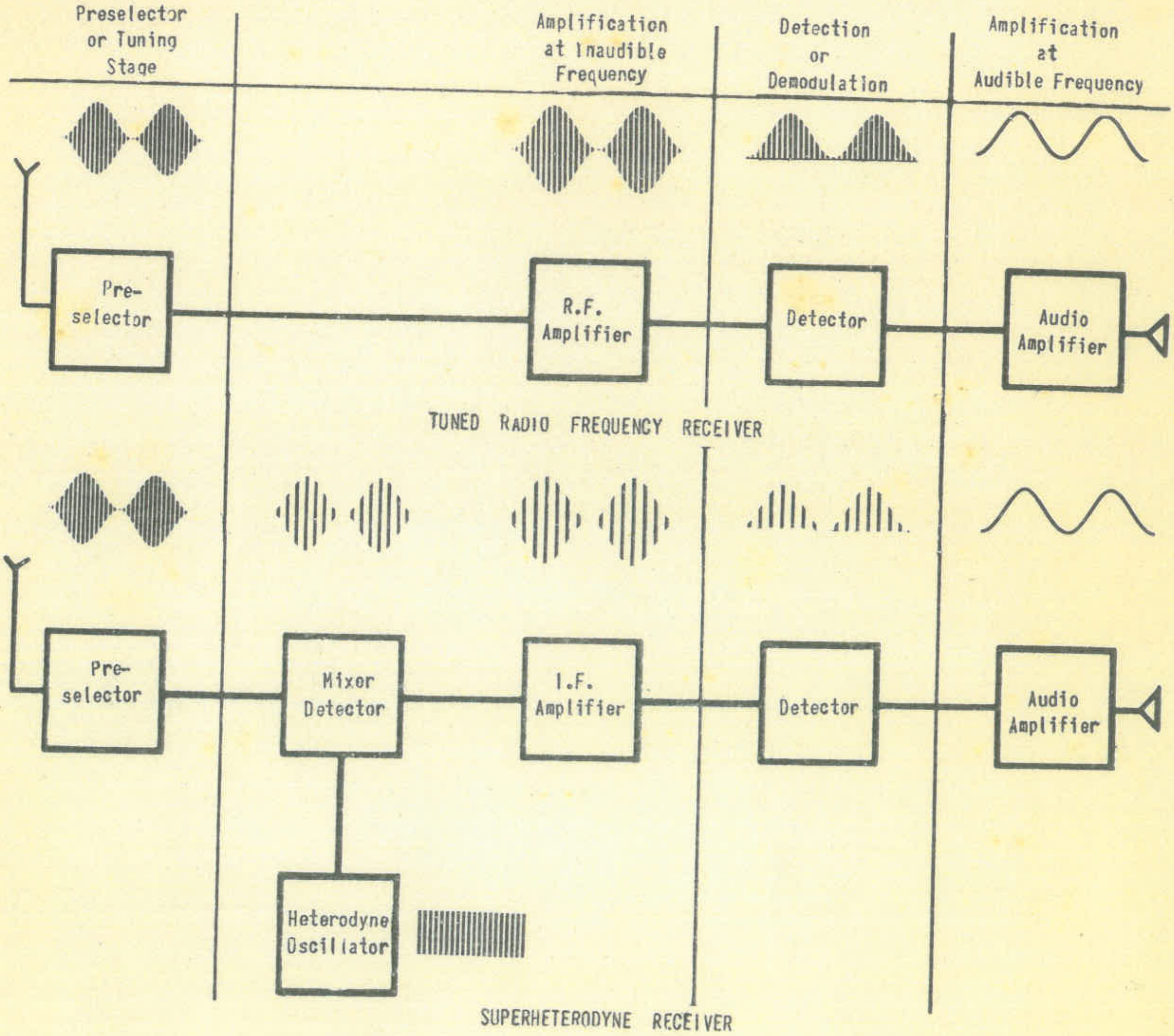

Fig. 1

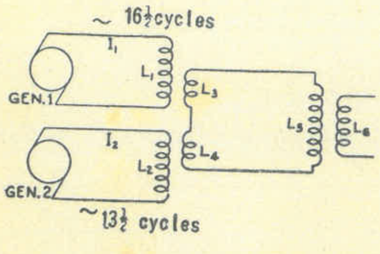

Fig. 2 Connection of two generators of 16½ and 13½ cycles respectively when feeding into a common output circuit.

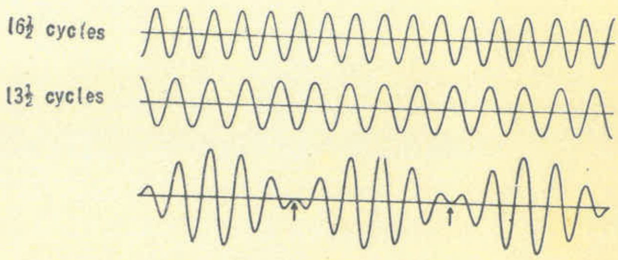

Fig. 3 Resultant of the two waves referred to in the previous figure.

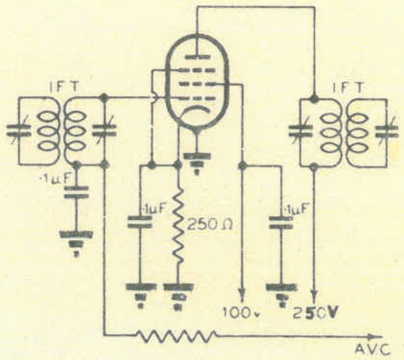

Fig. 1 - This is a fixed frequency amplifier which can therefore be designed to give any particular type of response. If selectivity and sensitivity are required, tuned circuits of high dynamic impedance with both primary and secondary tuned and with optimum coupling may be used. If quality of reproduction is desired rather than selectivity and sensitivity, dynamic impedance and coupling can be arranged to give less sideband clipping. A lower frequency for the amplifier would give greater gain and selectivity but if it is made much below 455 kilocycles image frequency interference will become increasingly serious but if it is raised to 485 kilocycles or more, code interference from the 500 kilocycle marine band will be troublesome. A frequency of about 455 to 465 kilocycles is about the best compromise for broadcast practice.

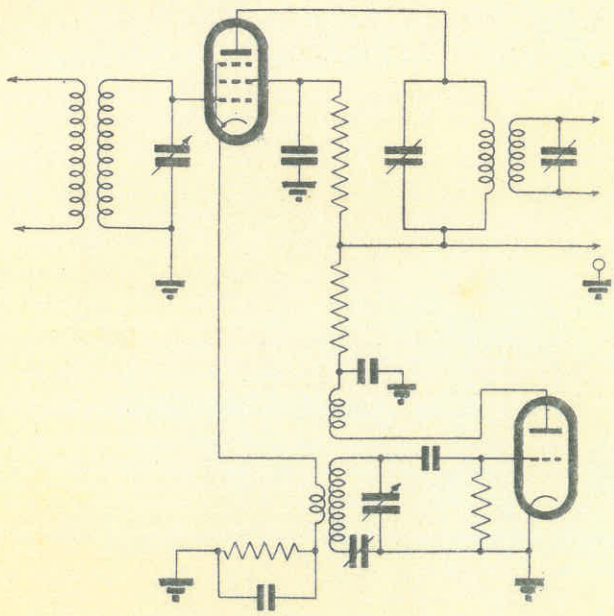

Fig. 1 -
Cathode injection.

A pentode mixer detector and separate triode oscillator. The oscillator voltage is coupled to the cathode circuit of the mixer detector thus both signal and oscillator voltages react between control grid and cathode of the mixer detector. The oscillator voltage is of greater amplitude than the signal voltage so that detection of the complex wave takes place when the signal is small even though the mixer detector valve is of variable mu characteristic. Frequency stability is good.

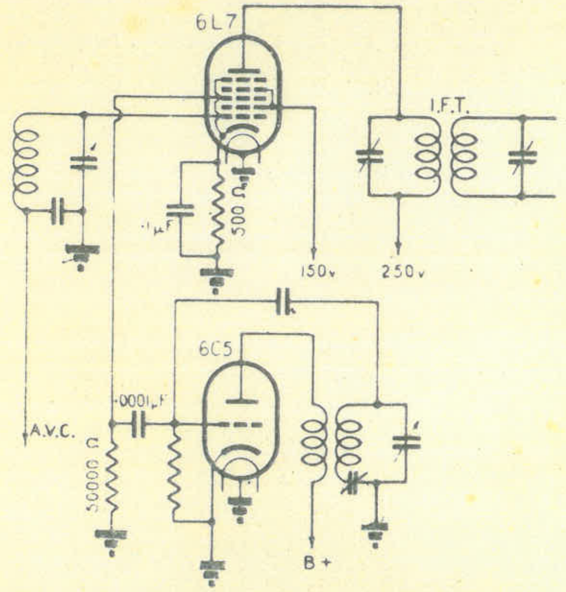

Fig. 2 -
A mixer detector and separate triode oscillator. The oscillator voltage is injected into the electron stream of the mixer valve. Both signal and oscillator voltage modulate the one electron stream thus mixing is obtained.
Frequency stability is good.

6L7-G

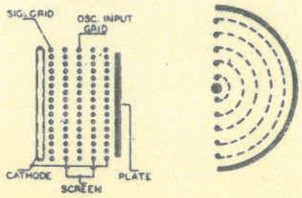

Fig. 3 -
Grid structure of 6L7.
Continental practice refers to all electrodes hence this valve is known as a heptode. American practice refers to grids only so that the valve is sometimes called a pentagrid.

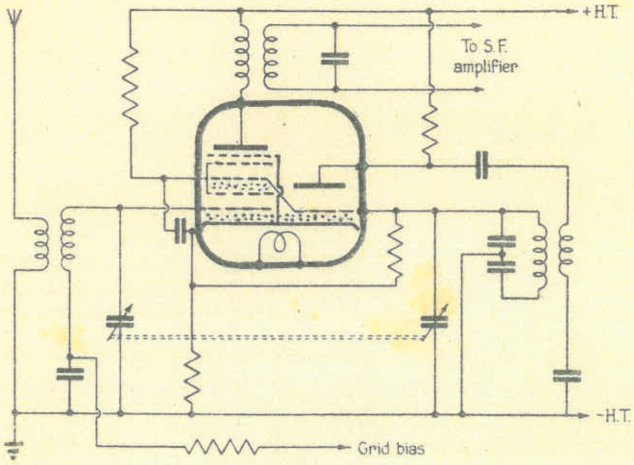

Fig. 4 -

A heptode mixer detector and separate triod inductively coupled oscillator in the same glass envelope. The oscillator voltage is injected into the mixer detector electron stream.

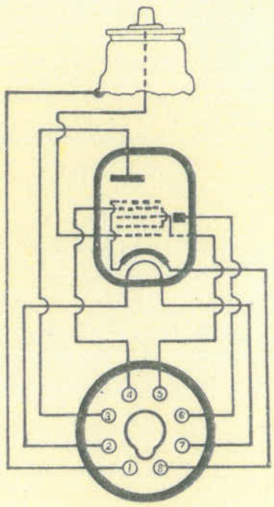

Fig. 5 -

Grid structure of the 6J8.

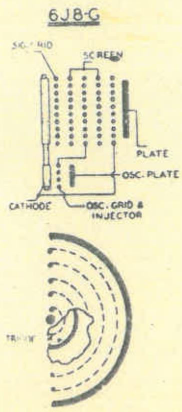

Fig. 6 -

Socket connections of the heptode-triode type 6J8.

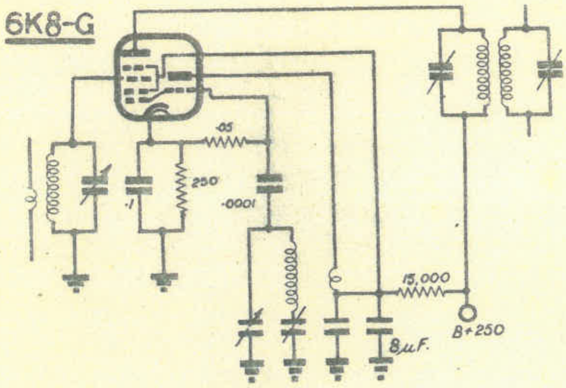

Fig. 7 -

A Hexode-triode Frequency changer. The oscillator voltage is injected into the mixer detector electron stream. Frequency stability is good.

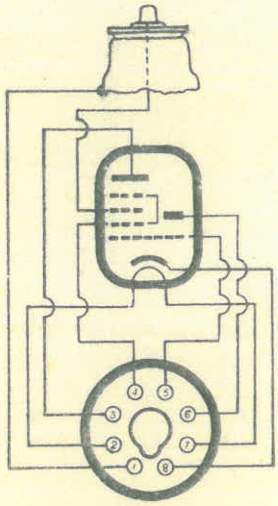

Fig. 8 -

Socket connections of the hexode-triode type 6K8.

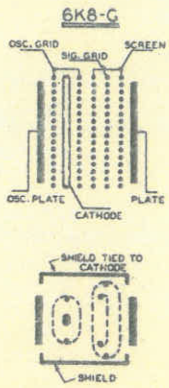

Fig. 9 -

Grid structure of the 6K8.

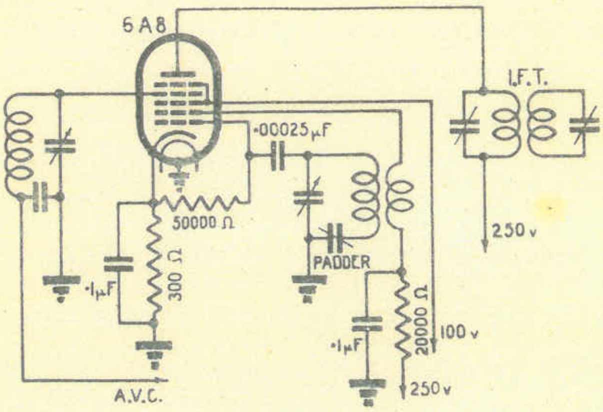

Fig. 10 -

The pentagrid converter consists of one valve, part of which works as the mixer detector and part as a triode oscillator. The oscillator grid and signal control grid both modulate the same electron stream. Frequency stability is poor for short wave reception.

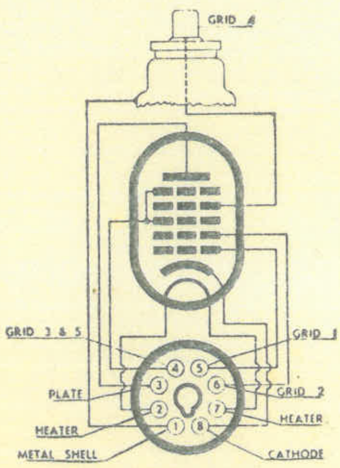

Fig. 11 -

Socket connections of the pentagrid converter type 6A8.

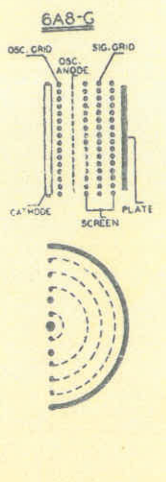

Fig. 12 -

Grid structure of the Pentagrid converter.

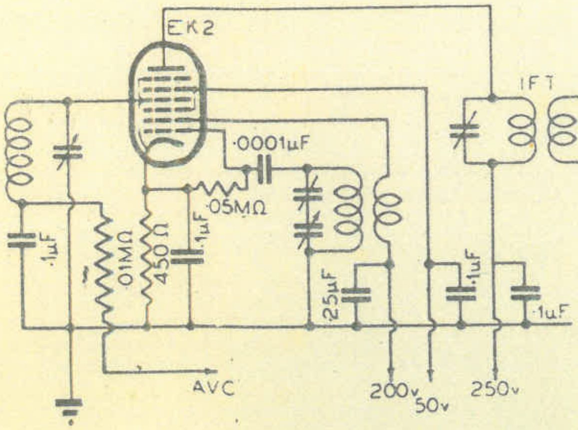

Fig. 13 -

The Octode frequency changer. Similar to the pentagrid converter but with suppressor grid added.

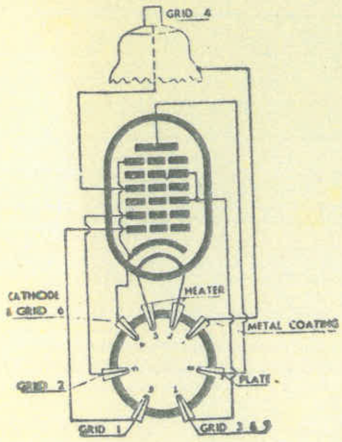

Fig. 14 -

Socket connection of the Octode. Type EK2 with P base socket.

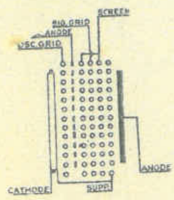

Fig. 15 -

Grid structure of the Octode.