

# A SHORT WAVE NAVAL TRANSMITTER

## Type T.N.7.

*The use of short waves on warships for transmission between ship and shore and for inter-ship communication is becoming more and more general.*

*The advantages of short wave transmission apply especially to submarine work where the fact that only a short aerial system needs to be employed is of great importance.*

*The T.N.7 transmitter has been designed, as have other transmitters of the T.N. type, especially for naval use; and their simplicity of control and efficiency make them peculiarly suitable for this purpose.*

*The transmitter, which is a medium power set with a wide wave range of 16-135 metres, is contained in a brass frame, and its components are suitably screened.*

THE Type T.N.7 transmitter has been designed as a compact medium power set for use on warships and submarines. It has an input rating of 500 watts to the anodes of the magnifiers and an average input to the anode of the drive of 200 watts. The average aerial power is 250 watts. The nominal waverange of the set is from 16-135 metres, and transmission can be effected either on C.W., I.C.W. or telephony over this waverange.

The complete transmitter consists of three main components:—

- (A) The drive;
- (B) The magnifier;
- (C) The modulator;

the circuits of which are contained in brass frames suitably screened where necessary.

The general design of the H.F. circuits is as follows. A fundamental oscillator, using an M.T.12 valve, drives the magnifier, which consists of two M.T.12 valves in parallel with their associated circuits. The aerial is magnetically coupled to the output circuit of the magnifier. An L.S.5 valve is used as the modulator for telephony, and modulates the magnifier valves by grid leak control. I.C.W. is provided for by a note-oscillator, having three frequencies of oscillation, which works into the microphone transformer of the modulator.

The H.T. supply to the set is by means of a motor generator giving 2,500 volts, and separate voltages of 16 volts and 6 volts are supplied for filament lighting, relay working, etc. Grid negative for the modulator is supplied by dry cells.

To enable a clearer idea of the transmitter to be obtained, we shall describe the components under the following heads:—

- (1) Drive and Magnifier circuits.
- (2) Aerial System.
- (3) Keying and Modulation.

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### (1) Drive and Magnifier Circuits.

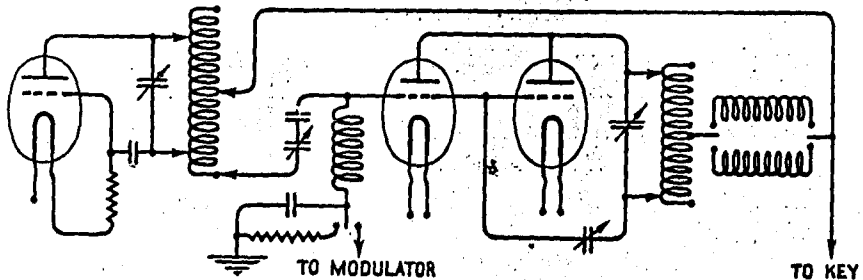


FIG. 1.

A simplified diagram of connections of the drive and magnifier circuits is given above (Fig. 1). The drive will be seen to consist of a simple oscillator with adjustable grid and anode taps to the main inductance. This inductance consists of one coil mounted horizontally, and constructed so that turns can be added one at a time by means of switches. Five values of this inductance are needed to cover the wave-range of the transmitter.

The closed circuit condensers consist of a variable air condenser and a semi-variable air condenser, of which one plate can be switched in at a time. The control of both of these is by handles on the front of the panel.

The drive is directly coupled to the grids of the magnifier valves, a third clip on the main drive inductance being connected to the grids of the magnifier through two condensers, one fixed and the other variable.

The variable condenser provides a fine control of the voltage swing on the grids of the magnifier valves at the shorter wavelengths.

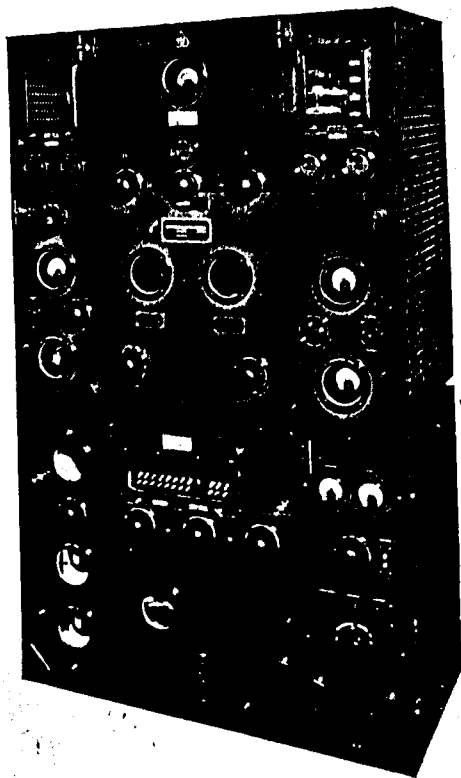
The magnifier closed circuit consists of two coils mounted astatically, H.T. being fed into the centre of the system through one or other of two air core chokes. One choke is used for wavelengths below 60 metres and the other choke for wavelengths above.

Two condensers, similar to those used in the drive circuit, are connected across the ends of the coils. Four valves of inductance are needed to cover the waverange of the set.

A slow motion movement is fitted to the variable condenser, to enable the circuit to be accurately adjusted to the drive circuit.

A hot wire ammeter is provided at the mid point of the astatic inductances for neutralising purposes. This ammeter is shunted when the set is under power and then serves as a magnifier closed circuit current indicator.

## *A Short Wave Naval Transmitter.*



*T.N.7. Transmitter  
completely assembled.*

The grid bias of the magnifier valves is set either by a fixed resistance for C.W. or by the modulator valve impedance for I.C.W. or telephony. More will be said of this later.

### **Aerial Circuit.**

The aerial is magnetically coupled to the output circuit of the magnifiers. As has been stated above, the aerial impedance is controlled by means of one of two variable condensers, in conjunction with the coils coupling to the output circuit of the magnifiers. The two variable condensers can be connected either in series between the aerial and the coupling coils or in parallel with the coupling coils. The two coupling coils also can be arranged in series or in parallel by switches.

With this arrangement of aerial control it is possible on any length of aerial to so adjust its impedance for any wavelength that, with the amount of coupling provided by the coupling coils, sufficient energy can be transferred to the aerial to fully load the magnifier valves. The only limitation with regard to the length of the aerial is that it should not be less than one-fifth of the longest wavelength to be used.

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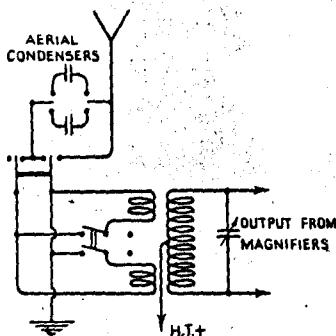


FIG. 2.

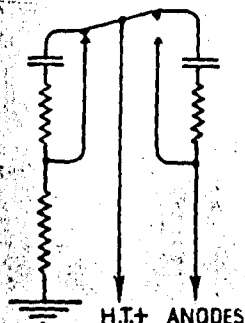


FIG. 3.

This complication of aerial adjustment is rendered necessary by the fact that the set is designed for use on warships, etc., where a variable length of aerial is not generally available.

### Keying on C.W.

Keying on C.W. is accomplished by the back load method (Fig. 3). The main H.T. supply to the set is broken by the key on spacing, when the full load of the generator is absorbed by a resistance down to earth.

The key has resistances and condensers across its contacts to eliminate sparking as far as possible.

The method has the advantage that violent fluctuations of anode voltage are avoided, as the load on the generator remains constant.

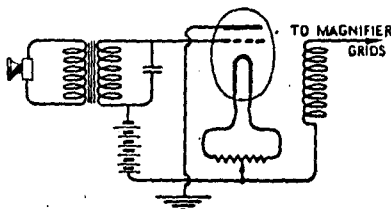


FIG. 4.

### Modulation on I.C.W. and Telephony.

As has been stated above, the grid leak method of modulation is used on the T.N.7. This method consists in controlling the input of the magnifier valves by varying the resistance of the magnifier valve grid leak.

The anode impedance of the modulator valve is used as this grid leak resistance, and the impedance is varied by applying the required modulation on to the grid of this valve. The modulator valve is connected with its filament to the grid of the magnifiers and its anode to earth in order that it may pass the grid current of the magnifier valves. The filament battery of the modulator must, of course, be insulated from earth. A diagram of connections of the modulator is given in Fig. 4.

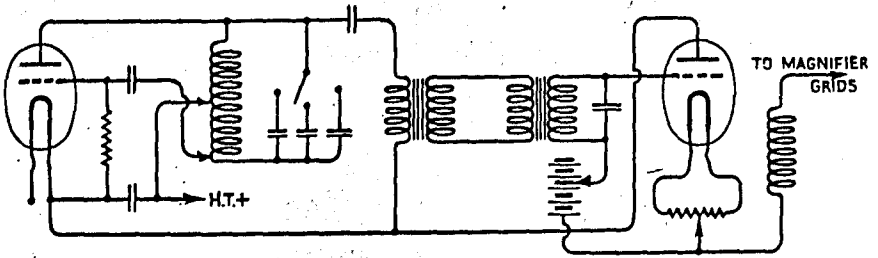
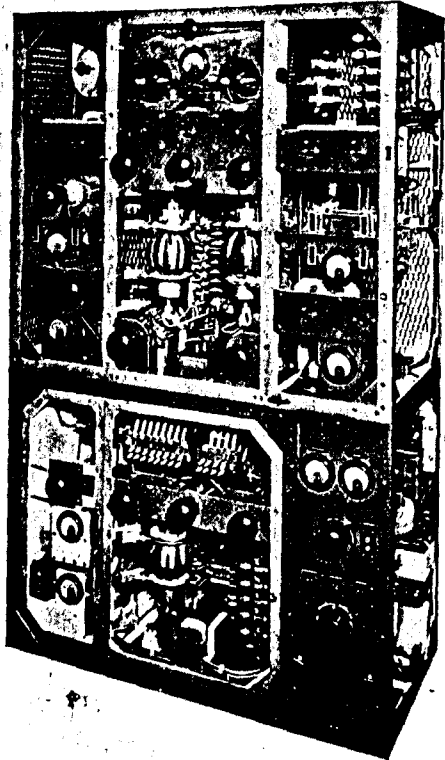


FIG. 5.

The degree of modulation obtained on telephony in this transmitter is of the order of 70 per cent.

*T.N.7 Transmitter with front covers removed to show essential circuits.*



**Note Oscillator for I.C.W.**

The note oscillator which is used for I.C.W. signalling is a simple circuit adapted to give three frequencies by the use of three condensers, which can be switched into and out of circuit (Fig. 5).