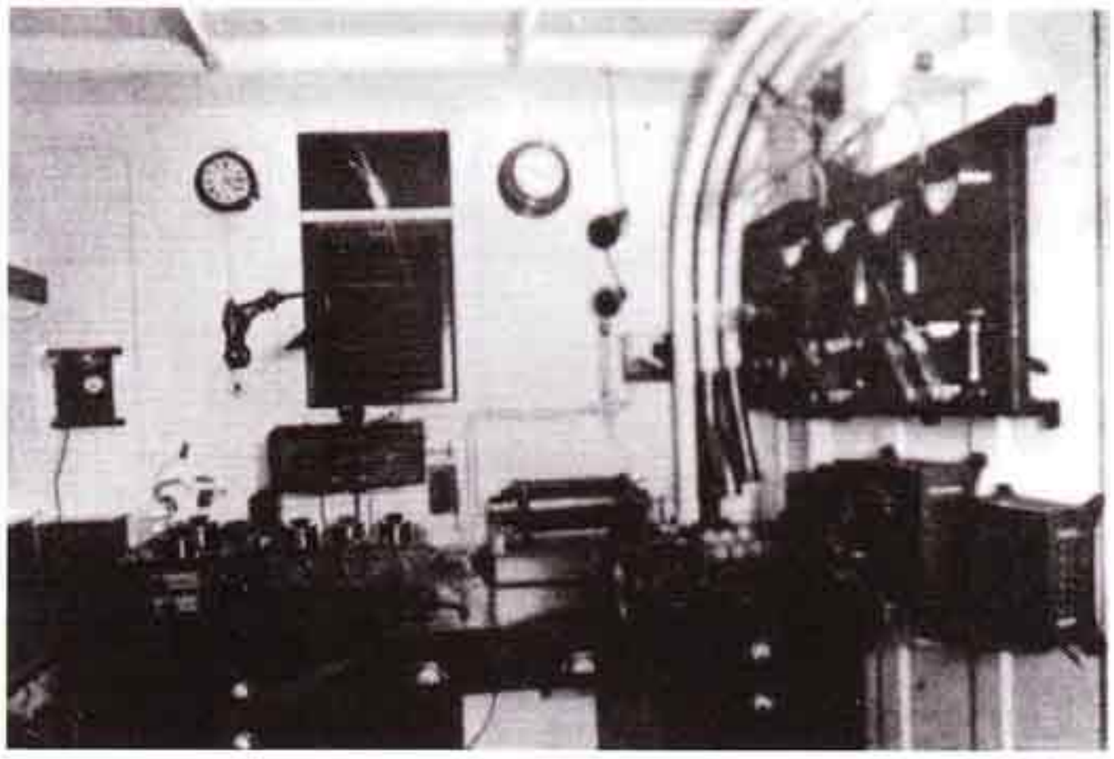
Wireless aboard *Titanic* by Ralph Barrett

The radio of *Titanic* was the most powerful state–of–the–art equipment of any vessel at sea, only equalled by that of *Olympic*.

A 1½kw transmitter was the Marconi standard on ships of that period. For *Titanic* and *Olympic* the transmitter was made more powerful by installing a larger motor–alternator, viz.5kw. It should be remembered that amplification at the receiver was not possible. Additionally the fixed spark gap of the transmitter was replaced by a rotary device. There is no evidence that the emergency transmitter was used during the disaster, since the motor alternator would turn all the time Titanic's lights were on.



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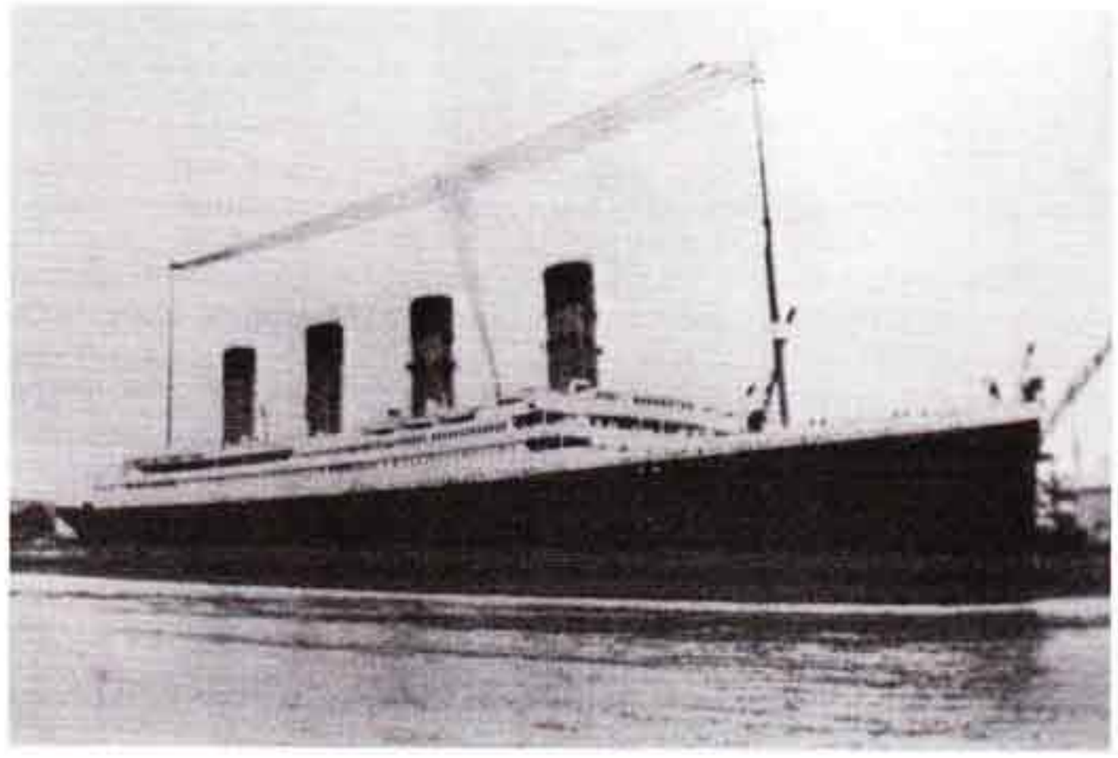

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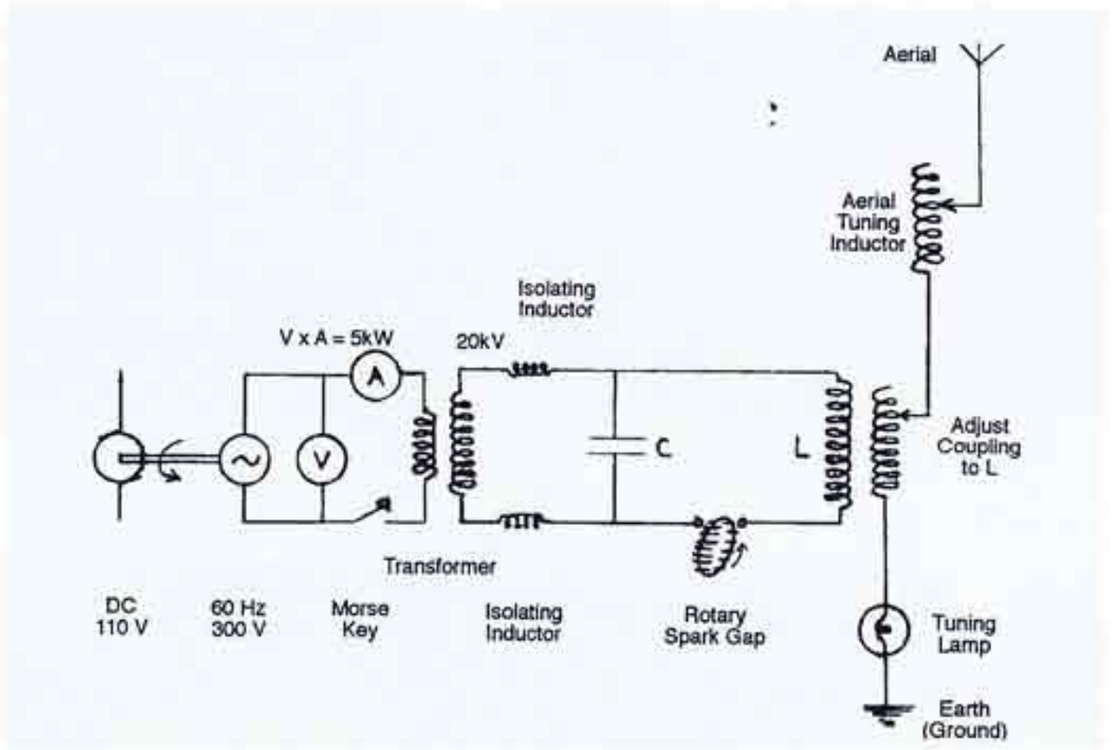

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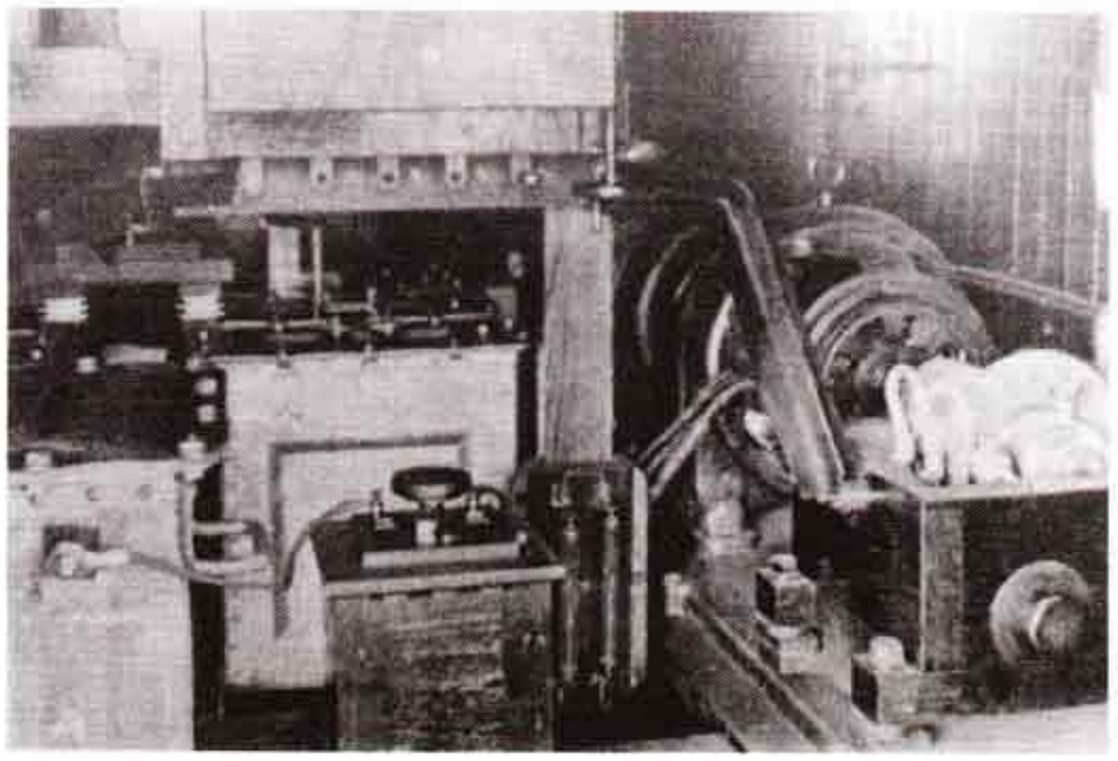

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The motor–alternator, with output of 300 volts at 60Hz, was driven from the ship's lighting supply, 110 volts direct current, which had a steam generator and an oil engine as reserve,with a battery of accumulators as a standby.

The picture of *Olympic*'s radio room shows the placement of apparatus, similar to the *Titanic*. The pneumatic tubes would convey 'Marconigrams' (radiotelegrams) from the radio or purser's office, upon the payment of a fee.

The guaranteed working range of the equipment was 250 miles under any atmospheric conditions. Actually communication could be kept up to 400 miles, while at night the range was often increased to about 2000 miles.

The aerial was supported by two masts 200 feet high, 600 feet apart, and had a mean height of 170 feet. It was used for the double purpose of transmitting and receiving on 600 meters and 300 meters. An earth connection was made to the hull of the ship.

A 100 watt reserve transmitter in the form of an induction coil can be seen on the right of the operating desk. The power supply was eight 2 volt accumulators, which would work until the 16 volts is reduced to 8 volts.

The induction coil would be connected directly to the aerial and would transmit on the frequency characteristic of the aerial, ie inherent C and L.

In the picture, fixed to the facing partition is the Marconi standard magnetic travelling band detector, with its clockwork winding handle. It was used in conjunction with the multiple tuner, below, on the desk.

The *Titanic* first sent CQD (phonetically 'seek you,' a call to all stations, and D for 'distress') then later SOS, which had been agreed at an international conference of 1908. SOS has no intrinsic meaning, but was adopted as being the easiest to send and the easiest to decipher. The idea came from 'SOE' in use by German ships, modified because the single dot of 'E' could be missed. *Titanic*'s call–sign was MGY; 'M' stood for Marconi, and is in use today for Great Britain, as well as the more usual 'G' prefix.

Retuning the aerial would be desirable if the aerial height is altered; with the aerial's approach to the water during the sinking, a series of V's was sent during this process, among the final signals heard from Titanic.

Tuning and resonance is a fundamental of all radio: Resonance is between energy of the electric field and energy of the magnetic field – stored in C and L respectively.

To describe the transmitter schematic the 300 volt output from the motor–alternator can be interrupted for signalling by a Morse key.

The primary of a transformer takes the

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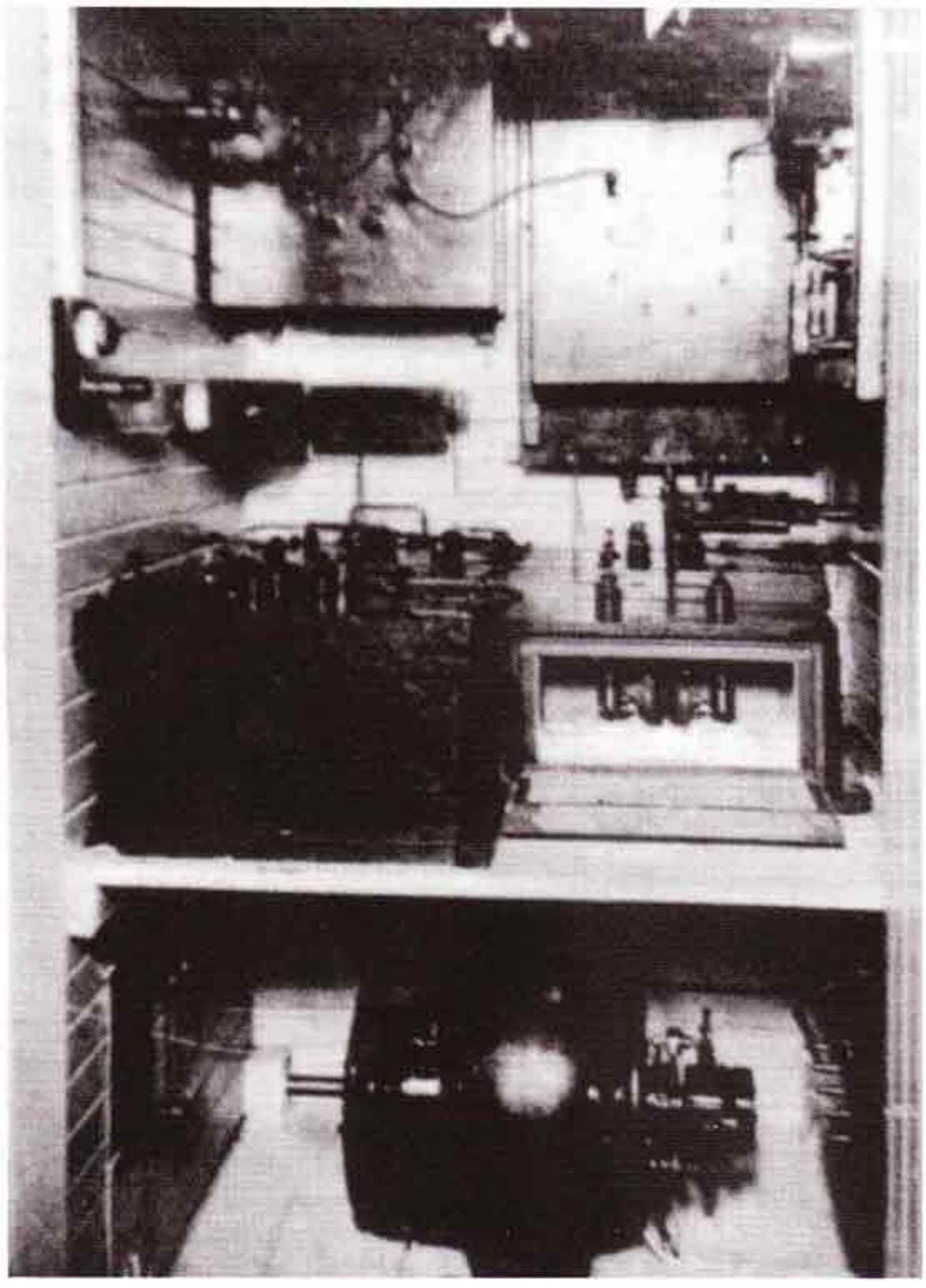

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1: Olympic's radio room, circa 1911. Three pneumatic tubes are to the right. Next, on the desk, the induction coil. The magnetic traveling band detector is central, facing the viewer. Under it is the multiple tuner, with three adjustment knobs. Under the hanging earphones is the valve receiver. To the right on the wall is a switchborad, and below is the motor–alternator stater control.

2: Titanic's wireless aerial is clearly visible in this photograph taken at Southampton.

3: Schematic of Olympic/Titanic wireless apparatus.

4: Transmitter of yacht Mahroussa. At extreme right is the studded disc, aerial tuning inductor at top, with sockets for adjustment. Underneath is the 300v to 20kV transformer; to the left is the aerial coupling unit; the knob in the foreground is the tuning lamp bypass and brightness control, to set the adjacent lamp's glow level.

5: Operating room of a 1½kw transmitter, similar to that aboard the cable ship.

5: A 1½kw transmitter's silent compartment, side open and the spark gap cover removed to show the dome–shaped electrodes.

300 volts which is stepped up to 20,000 volts, then via isolating inductors is fed to the frequency determining oscillatory circuit of C and L. A spark gap is between C and L consisiting of metal studs on a rotating disc.

The 20,000 volts is applied to C (energy of the electric field), the high voltage breaks down the air with a spark across the gap, and a surge of current is made through L (energy of the magnetic field).

The current through L induces current into a nearby coupled inductor of the aerial circuit, and so oscillations become evident in the aerial inherent capacity and the aerial tuning inductor.

At the exchange of energy between C and L of the aerial circuit, energy is lost, ie radiated away (due to Maxwell 1864). The coupling together of the stable frequency generating circuit (due to Hertz 1888) was the subject of the famous 1900 patent No. 7777 of Marconi.

A tuning lamp is provided in the earth circuit. Also note transmission on 300 meters is affected by the addition of another capacitor in the aerial circuit (a second harmonic).

One spark only is needed to put the C and L resonant circuit into oscillation. With a fixed gap, the reaction from C and L could produce another spark, an arc, by feedback, and therefore waste energy.

A rotary spark gap was invented by Marconi. A rotating steel disc having studs on it revolves between electrodes, so making a self–quenching spark gap. Additionally the number of studs will create a musical note, at the receiver, of 400Hz. Differing notes could distinguish transmitters at the receiver.

The 1913 picture from the SY Mahroussa shows the studded disc, on the shaft of the motor–alternator, in a similar manner of the Titanic.

The rotary spark gap increases the efficiency of the transmitter by about 50% over the fixed gap type.

A fixed gap, with cover removed, can be seen in the silence compartment, side open, of the pictured 1½kw transmitter.

Reception utilized the Marconi magnetic travelling band detector, colloquially known as the 'Maggie', which was connected to the aerial via the multiple tuner. The latter contained three resonant circuits; the three knobs could adjust to the incoming circuit and reject an interfering signal.

The 'Maggie' was a Marconi patent from an idea by Rutherford. A moving iron wire belt is magnetized to near–saturation by a permanent magnet, and so is non–linear to a current of the radio wave in the primary coil; then detection by rectification is had of the modulating spark of a transmission, and is heard in the telephone. A second permanent magnet erases, and so prepares the belt again. It is a recording method.

A diode valve was used in a reserve receiver, but beacause of poor vacuum in the valve, was not so sensitive as the 'Maggie'. A coherer receiver made a further reserve, and could operate paper tape inker.