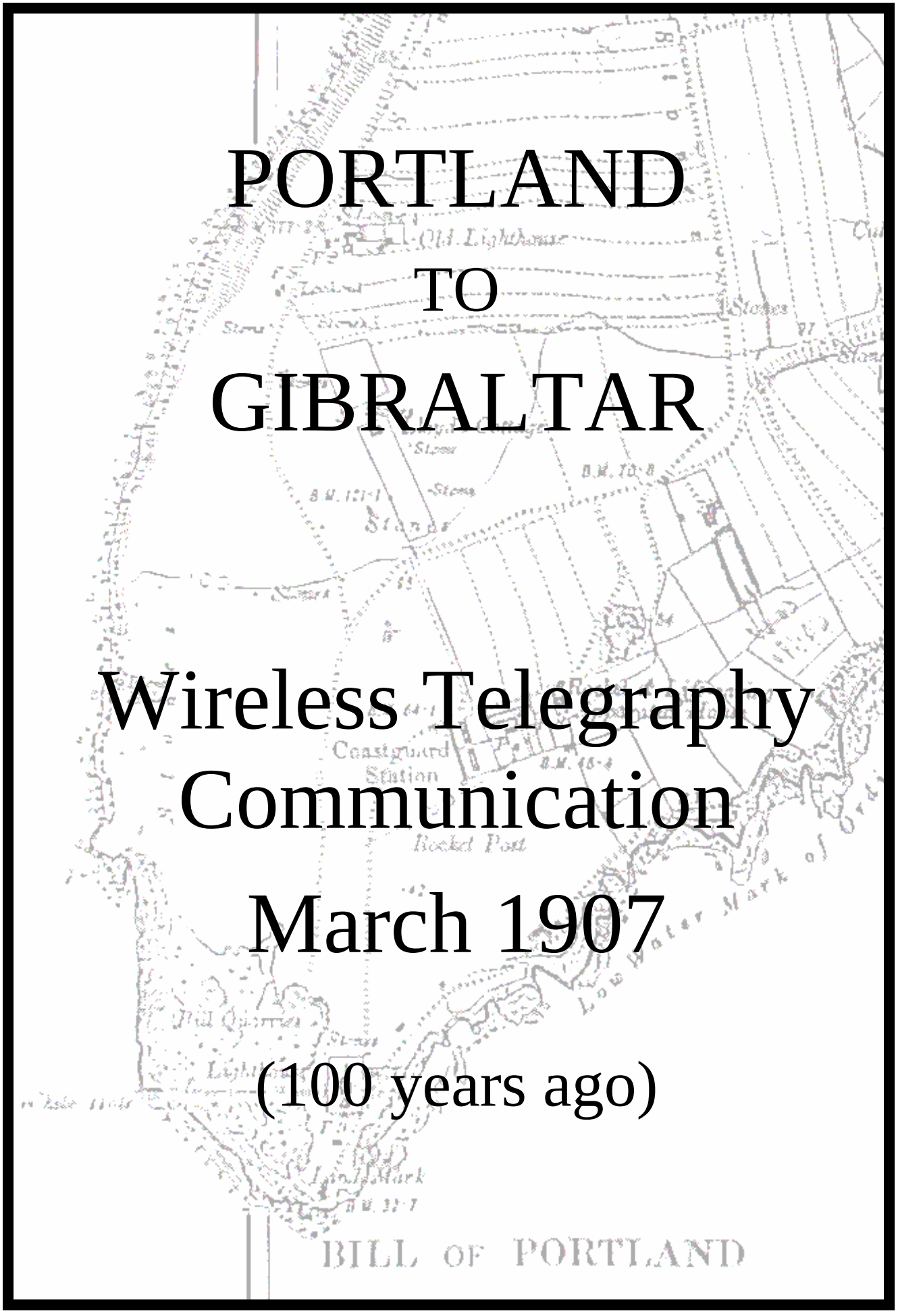


PORTLAND TO GIBRALTAR

Wireless Telegraphy Communication

March 1907

(100 years ago)

INDEX

Introduction

The object of this booklet is to outline the history of the Wireless Telegraphy Communications between Portland, Dorset and Gibraltar in March 1907 as reported in the Southern Times dated 16th March 1907.

The origins of Wireless Telegraphy Communications date from late 1890's, and in Great Britain the most influential in those early days being Guglielmo Marconi.

The earliest known history of wireless telegraphy communications at Portland relates to a series of trials ordered by the British Admiralty during 1900 to verify the effectiveness of wireless communications of 32 separate Marconi Wireless Sets prior to acceptance of the sets by the Royal Navy. These trials consisted of communication tests between two locations along the South Coast of England, one at Portsmouth, the other at Portland. After acceptance, one of these 32 Sets was subsequently installed at the Portland Bill Coast Guard Cottages, and another was installed at Gibraltar. The Coast Guard Stations throughout Britain during this period were then under the jurisdiction of the Royal Navy and manned by Naval personnel.

Further tests using Tuned Spark Transmitters were subsequently conducted during late 1900, where two separate pairs of Marconi Stations were simultaneously operated without undue interference to each other, even though the stations were in relatively close proximity. Portland and Portsmouth were also involved in this trial.

Background History

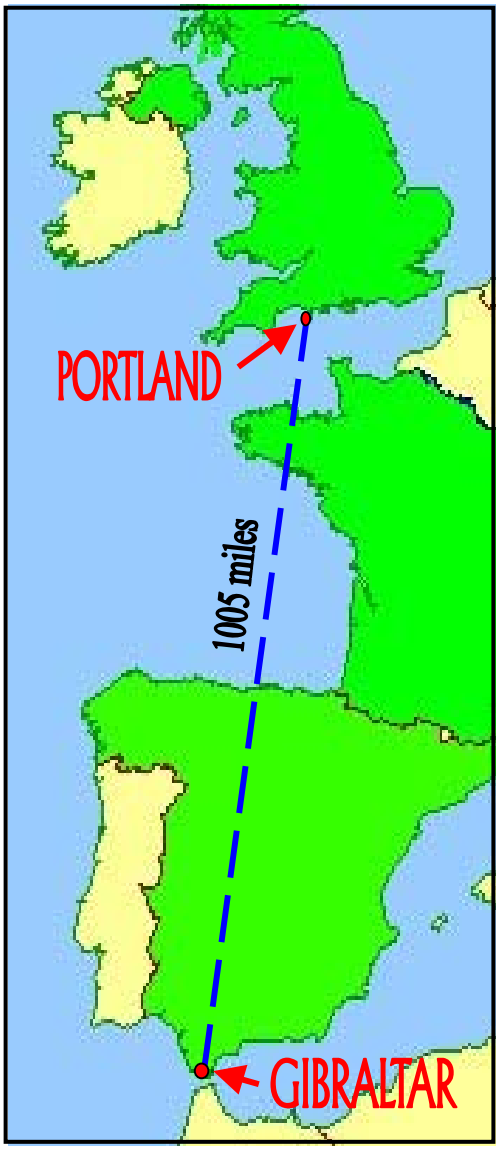
The station at Portland Bill between 1901 to 1904 would have used,

i). An Induction Coil Tuned Spark Transmitter,

ii). A Vertical Wire Aerial supported on a guyed wooden mast,

iii). A coherer receiver that was probably replaced by a magnetic detector after 1902.

The main purpose of the station at Portland would have been for communication with ships sailing in the English Channel.



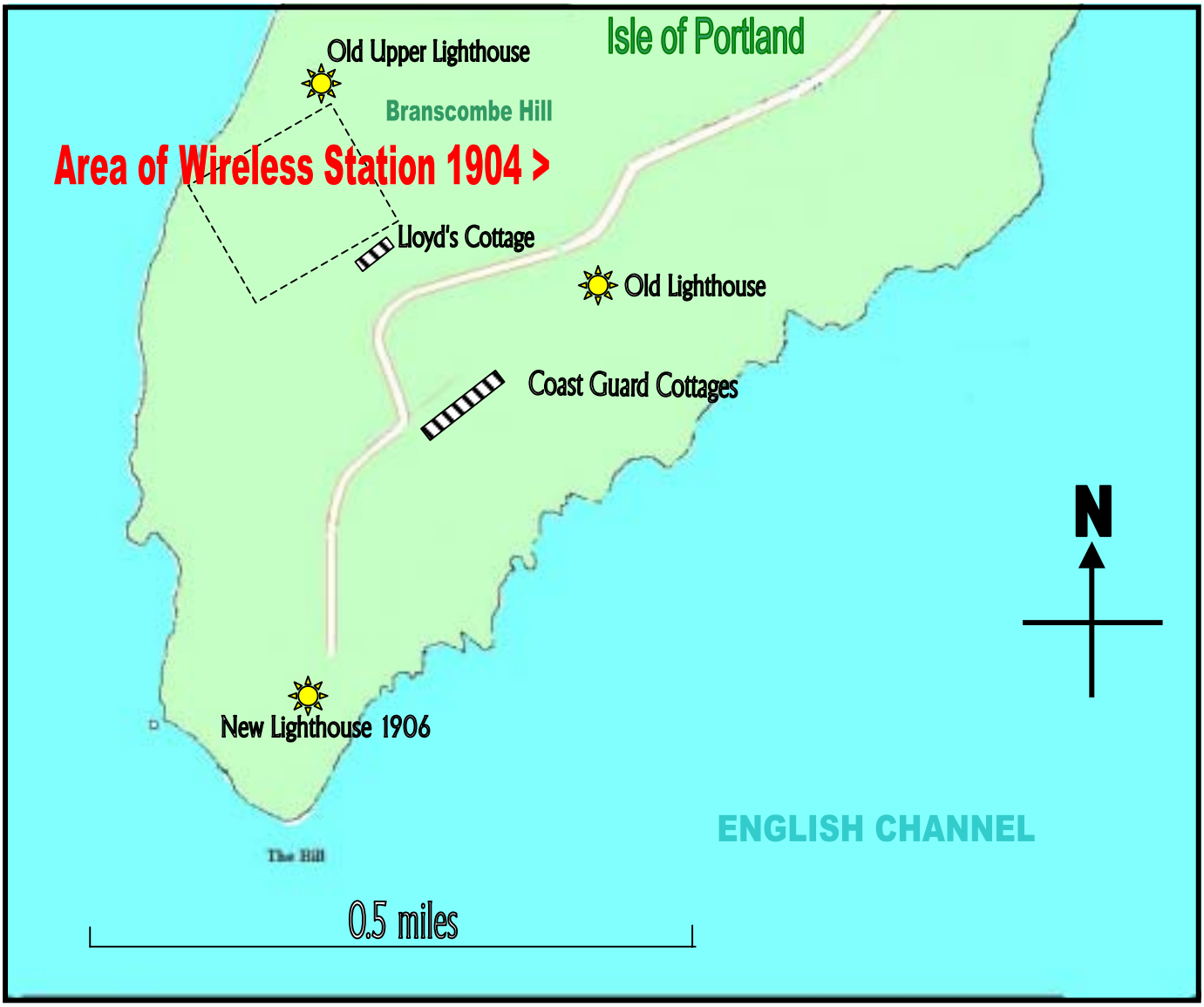
In March 1907 (most likely 5th March 1907), the Naval Coast Guard Wireless Station at Branscombe Hill at Portland Bill made radio contact with Gibraltar, a distance of 1005 miles, this being a new distance record for the Portland Station.

It is probable that the reason for the successful contact in 1907, and not before, was due to the use of a new receiver using the new Fleming Diode valve that had a higher sensitivity than earlier coherer and magnetic detectors.

Various Call Signs have been listed as being used by the two telegraphy stations,

Portland : - TWQ & TKQ by 1912
Gibraltar :- GB1, G1B & SMP by 1912.

Map of Southern Tip of the Isle of Portland, Dorset

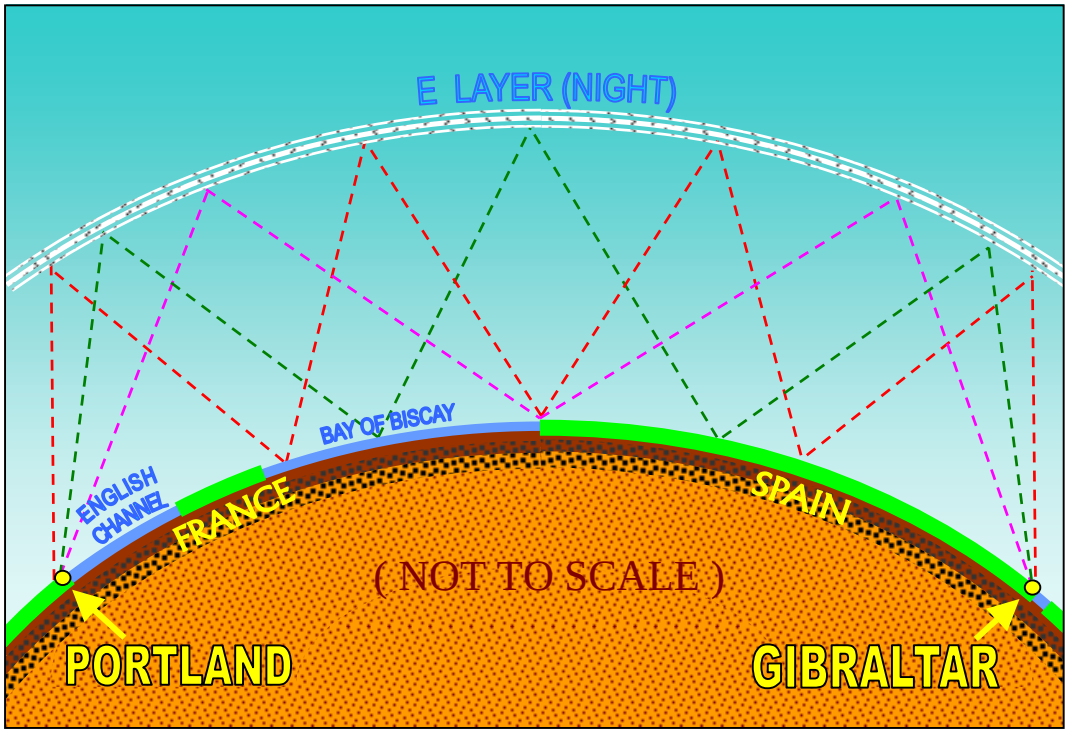


The original Wireless Station located at Portland Bill between 1900 and April 1904 was located in the Coast Guard Cottages which were at that time manned by Naval Personnel, one of the Cottages was also occupied by Signalmen employed by Lloyds of London as listed in the British Census of 1901.

In April 1904 the Wireless Station was moved further up Branscombe Hill into new premises, and presumably with higher power equipment. A wireless station has been continually active at this site until it's closedown in the 1990's.

Mode of Propagation

Since the likely wavelength used for the radio contact with Gibraltar was 340 metres, the mode of propagation would have been night time multi-path multi-hop sky wave, with the wave being returned to earth by the E layer. Ground wave propagation would have been highly attenuated by the 600 miles of land between Portland and Gibraltar, and daytime sky wave would have been completely absorbed by the D region.



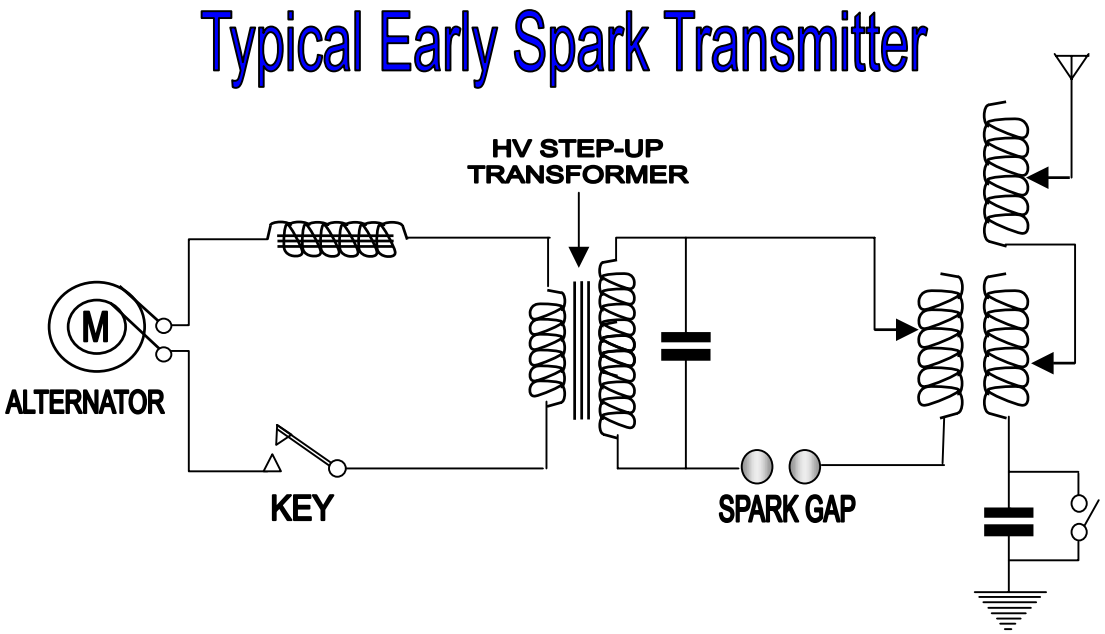
The night time critical frequency of the E layer in March 1907 would have been around 448 kilohertz, and therefore there were three main probable propagation paths between Portland and Gibraltar.

The night time E layer mode of propagation described above infers that as a general statement the Portland to Gibraltar radio contact would have been repeatable on a daily basis, and this is compatible with the information given in the announcement in the 16th March 1907 edition of the “Southern Times”.

Transmitter

The Transmitter used at Portland and Gibraltar was likely to have been a tuned spark transmitter, having a fixed spark gap, an input power of 2 kilowatts, and tuned to operating on a wavelength of 340 metres.

A tuned spark transmitter works by charging a capacitor to a high voltage, and then discharging the capacitor by connecting an inductor across it. This generates a damped oscillation, which has a frequency that is determined by the capacitor inductor tuned circuit. The spark gap and spark act as an automatic switch that allows the capacitor to be repeatedly charged and discharged, thereby producing a train of damped oscillations which can be radiated by coupling the inductor to an aerial.



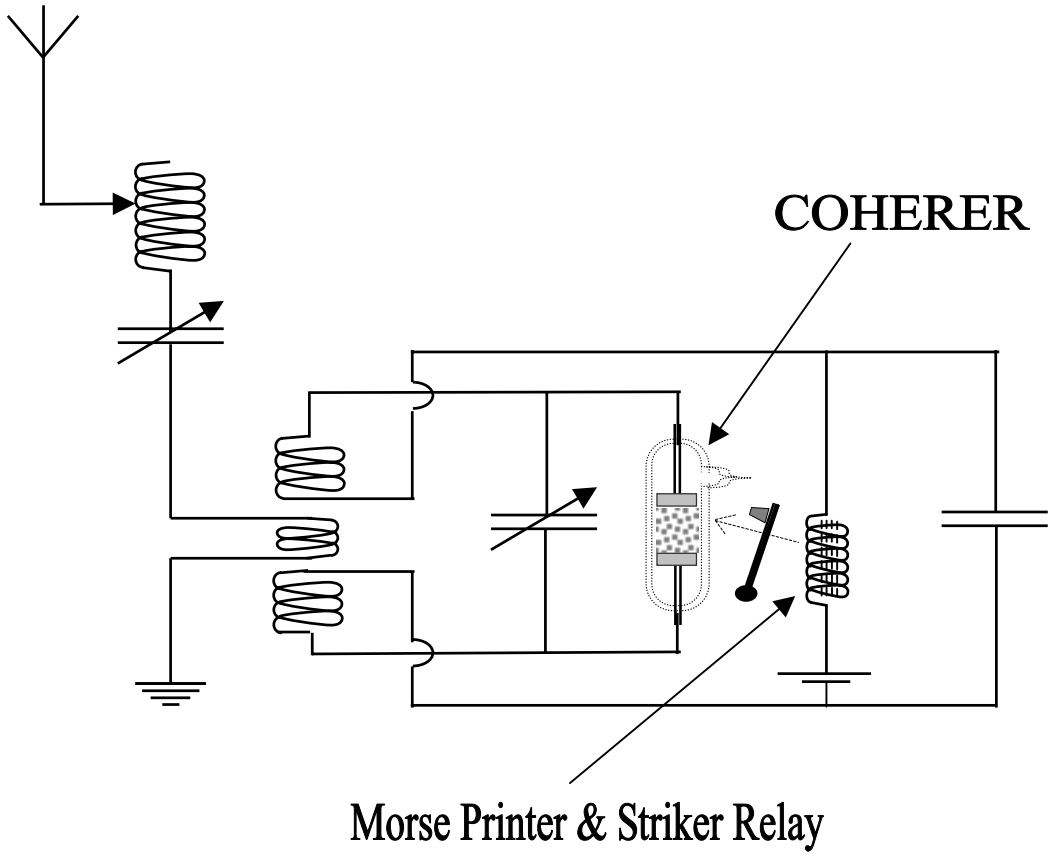
With the March 1907 Portland and Gibraltar transmitters it is likely that the high voltage was produced by an engine driven alternator and a step up transformer, and that the capacitor would have been charged to a voltage of around 40,000 volts. Such a transmitter would have been physically large and is likely to have been housed in a single storey building beneath the aerial.

Receiver

Various types of receiver were employed during this period and were all very similar in the basic construction, the only difference being in the detection method used. They all consisted of an aerial system that could be tuned to resonance at the desired signal frequency, this would have been followed either, directly by a detector, or by further tuned circuits, (to improve selectivity), followed by the final detector.

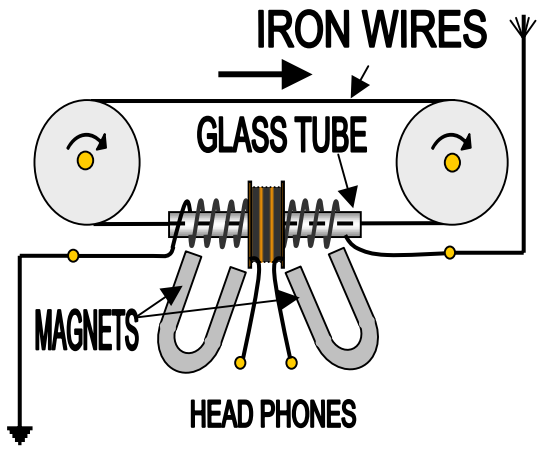
Coherer Receiver

A Coherer detector comprised of a glass tube with contacts placed at each end, and the tube was partially filled with loose nickel and silver metal filings. When a radio frequency signal was presented to the contacts of the coherer, the metal filings tended to cohere together and form a conductive path causing a sensitive relay to operate a Morse Printer, and a Striker that tapped the coherer to release the filings ready to detect the next Morse signal pulse.

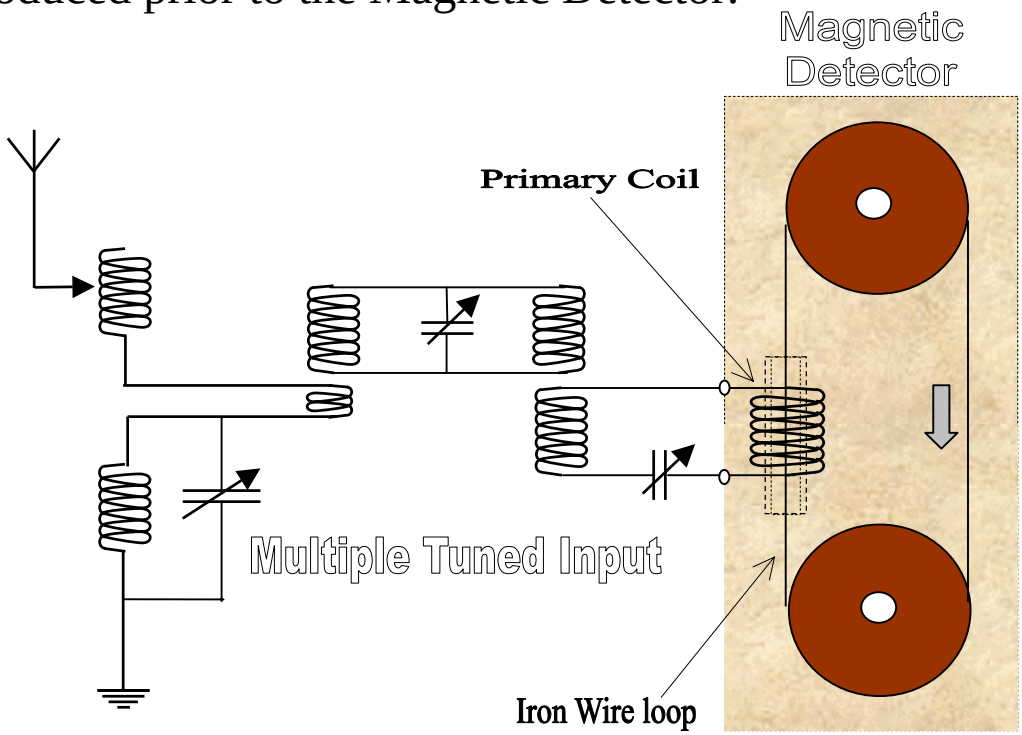


Magnetic Detector Receiver

When a signal is received a magnetic field is produced on a section of the iron wire loop by the primary coil. This moving stored magnetic field on the wires produces a current in the secondary coil that would result in a clear noise in the attached headphones.

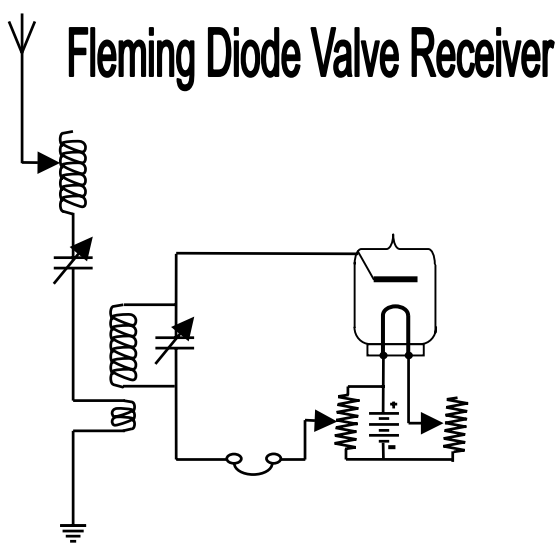


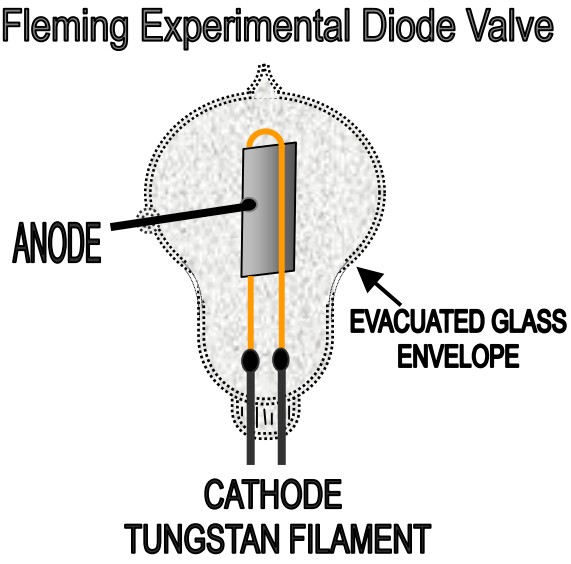
To improve the signal selectivity of the receiver extra tuned circuits were introduced prior to the Magnetic Detector.



Fleming Diode Valve Detector

The Fleming Diode Valve Detector, invented by John Ambrose Fleming in 1904, is the most likely type of receiver to have been used in the March 1907 Portland to Gibraltar wireless contact. It was more sensitive than the magnetic detector that was the standard Marconi receiver of the day. Like all receivers at that time, the Fleming Diode Valve Receiver was a detector stage only, as there was no means of signal power amplification in March 1907, this meant that the output power of the receiver was always less than the input power from the aerial. However, even though there was no signal power amplification the detector efficiency of the Fleming diode valve was high enough to enable the March 1907 Portland to Gibraltar radio contact to take place.

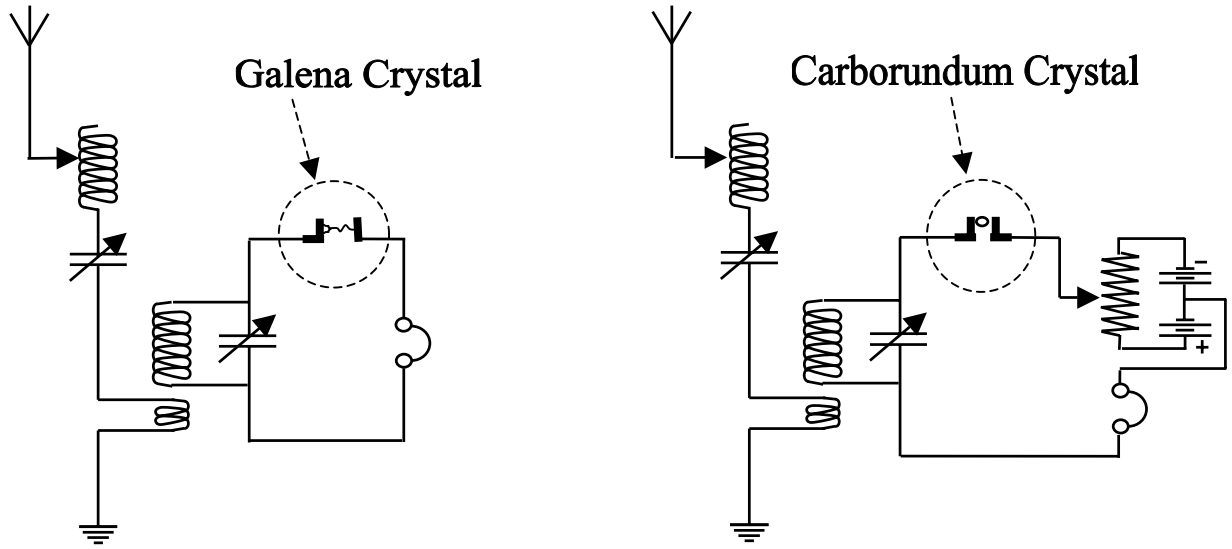




A Fleming diode valve receiver consisted basically of one or more tuned circuits, a Fleming diode valve, a variable resistor to adjust the filament voltage, a reservoir capacitor, headphones, and a variable bias voltage which could be adjusted so that the diode valve was operating on the most effective part of it's characteristic curve.

Crystal Receivers

Various types of crystals could be used for the detection of signal, although the Galena and Carborundum crystals appear to have been the most popular.



Aerial

The aerial was likely to have been a fan of vertical wires, 50 metres high, supported on two guyed wooden lattice towers, and fed against ground.

A vertical aerial was required because the main purpose of the wireless stations at Portland and Gibraltar was communication with ships at sea, and with the technology of March 1907, the main mode of propagation was ground wave.

The reason for having a fan of vertical wires rather than having a single vertical wire of the same physical height was that a fan of wires was one way of increasing the effective height of the aerial.

Mathematical Analysis

Objective

To determine whether or not the March 1907 Portland and Gibraltar radio contact was viable using the following equipment, this being the equipment that is likely to have been used.

Transmitter

An alternator and transformer tuned spark transmitter, having a fixed spark gap, an input power of 2 kilowatts, and operating on a wavelength of 340 metres.

Aerial

A fan of vertical wires, 50 metres high, supported on two guyed wooden lattice towers, and fed against ground.

Receiver

A Fleming diode valve detector stage only receiver.

Method of Calculation (re :- Carborundum Crystal Detector)

The Calculations have been conducted using technical information for the Carborundum Crystal that had a similar sensitivity to the Fleming Diode Valve.

(i) Calculate the input power to the detector produced by the transmitted signal.
(Calculates as 736nW)

(ii) Calculate the detector input power necessary to produce the minimum discernable receiver output signal.
(Calculates as 261nW)

(iii) Compare the two results and arrive at a conclusion.

Conclusion of Analysis

The results of the calculations for a Carborundum Crystal Diode Detector indicate that the input power to the detector produced by the transmitted signal was 736nW, and this is greater than the detector input power necessary to produce the minimum discernible receiver output signal. Therefore, the March 1907 Portland to Gibraltar Radio Contact was viable using a Carborundum Crystal Diode Detector. However, as a detector, the Fleming Diode Valve is comparable to the Carborundum Crystal Diode. Therefore, the conclusion is that the March 1907 Portland to Gibraltar Radio Contact was viable using the equipment described in the objective.

Acknowledgements

Information Sources

Southern Times ; April 1904 to March 1908.
Period Maps : 1900 to 1931, Weymouth Library.
Wireless Telegraphy Stations of the World,(US Navy Publications).
Various Admiralty and associated Textbooks.
Stuart Morris, various historic Portland publications.

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South Dorset Radio Society 2007