NAVAL SHORE WIRELESS TELEGRAPH STATIONS.

Present policy.

All naval shore stations are under the orders of the Admiral Commanding Coastguards and Reserves (A.C.R.), and are worked by Coastguard operators.

The following is the policy under which shore stations are now being erected and organised. Three classes of stations are provided for :—

"A" class stations.

"A" class stations :—

Two of these will be erected in England. They are to be capable of signalling a distance of 1,000 miles by day or night on several wave-lengths. These stations will be supplied with 100-K.W. sets, and will be erected, one at Cleethorpes, which is close to Great Grimsby, and the other at Horsea.

Horsea will be used mainly as an experimental and instructional station.

In addition to the above a similar type of station will be erected at the North Front, Gibraltar.

All the large power stations are being supplied by cables from the dockyard or town electricity supply stations.

Duties of "A" stations.

The functions of the "A" class stations will be :—

(1) The distribution of orders and information to fleets at sea from the Admiralty.

(2) Distant communication among themselves.

"B" class stations.

(2) "B" class stations :—

Three of these are being arranged for in England. They will be capable of communicating on the same wave-lengths, and over the same distances as the most

modern seagoing installations, their primary object being to keep touch with the fleets in Home waters.

These stations will be erected at Aberdeen, Pembroke Dock, and a site not yet decided or near Harwich. They will be supplied with 40 K.W.

"C" class stations.

(3) "C" class stations :—

These are small power stations, capable of communicating 100 miles on Service wave-lengths, and so placed as to be convenient for the local work of the various Naval Ports. In addition to the ones which already exist, a station of this class is shortly to be erected at Rosyth.

Equipment.

The majority of the stations are now being equipped with 5-h.p. engines and $2\frac{1}{2}$ K.W. generators. They will have a considerable reserve of power which will be available in case of emergency. A detailed list of all Wireless Telegraph stations under the A.C.R., with the particulars of their equipment at the time of writing, will be found in the attached table.

The following notes may be of use in the case of the erection of temporary stations.

Earths, best form.

Earths.—The best form of earth is probably a ring of galvanised iron pipes or plates set vertically in the ground under the aerial, with the wires brought in taut above the ground to a centre, this centre being what is called the earthing ring, and should be about 10 inches in diameter surrounding the feeders of the aerial where it is led through the deck insulator into the office.

Alternative.

Failing this an excellent earth can be obtained by stretching bare wire along the surface of the ground in the form of a star immediately under the aerial and covering the same area, the inner ends forming the earthing ring. One leg to each point of the compass is sufficient. The outer ends can be secured to wooden pegs driven into the ground.

Aerial.

Aerials.—A large capacity is a great advantage, and the overhead part should be exaggerated for this purpose. A single mast with streamers coming down all round it in the form of an umbrella is very efficient.

Experiments at Horsea have shown that the very large aerial to be used in the "A" class stations is a very effective receiver of Service wave-lengths, but that atmospherics are very bad with it.

Some very promising experiments have been carried out with a view to overcoming this defect.

Height.

Notes.—Height of aerial is of the greatest importance where range is the principal object. Given the maximum practicable height σ should be increased by increasing the number of parts of the aerial until $\lambda\ \sigma$ is just less than the shortest L.S. required.

Insulators.

Most insulators are possessed of great dielectric strength in the solid, but fail due to leakage over the surface.

It should be remembered that it is a very difficult matter to joint two pieces of insulating material together so as to prevent leakage at the surface of such jointing when electrical tension is applied.

Jointing ebonite.

For example, if two pieces of ebonite are firmly screwed together, although the joint may be quite strong mechanically, yet electrically, leakage will take place freely over the surface of the threads.

In this case the best method of effecting a sound electrical junction is to carefully clean the ebonite surfaces at the screw threads, then warm them, and then apply Chatterton's compound which has been previously melted by heating.

Chatterton's compound is quite useless if it afterwards to be used under oil, as it dissolves.

List of Shore W.T. Stations in the British Isles.

A. Manned by Coast Guard for communication with H.M. Ships.

Station.	Type of Apparatus.	Engine.	Alternator or Rotary.	Frequency.	Range.	Wave-lengths.	Remarks.
Felixstowe -	Extempore, C tune, Mark I*.	5-H.P. oil	2½-K.W.	60	150	S, T, U	Cells, as well as engine. Full power not available if engine is not running.

Station.	Type of Apparatus.	Engine.	Alternator or Rotary.	Frequency.	Range.	Wave-length.	Remarks.
Sheerness† -	Service Mark I.	Nil	Nil	Hammer	60	Q, R, S, T, U	On dockyard mains.
Dover - -	,, ,,	1½-H.P. oil	½-K.W.	,,	60	R, S, T, U	
Culver -	,, ,,	Nil	Nil	,,	60	,,	Primary cells.
Alderney -	,, ,,	1½-H.P. oil	½-K.W.	,,	60	Q, R, S, T, U	
Portland‡ -	,, ,,	,,	,,	,,	60	,,	
Rame Head‡	,, ,,	Nil	Nil	,,	60	R, S, T, U	Primary cells.
Scilly - -	C tune, Mark I*.	5-H.P. oil	2½-K.W.	25	200	S, T, U	Cells, as well as engine. Full power not available if engine is not running.
Roches Point‡	Service Mark I.	Nil	Nil	Hammer	60	Q, R, S, T, U	Primary cells.
Port Patrick‡	,, ,,	,,	,,	,,	60	,,	,,

† Will have a 1½-K.W. 100-cycle rotary, when one is available.
‡ Will be fitted similarly to Felixstowe by April 1909.

The ranges given are reliable under ordinary conditions. With good operators, and favourable conditions, they may be doubled.

B. Manned by Coast Guard, but NOT for communication with H.M. Ships.

These Stations only communicate with H.M. Ships in cases of emergency.

Station.	Type of Apparatus.	Engine.	Rotary or Alternator.	Frequency.	Range.	Wave-length.	Remarks.
Skegness -	De Forest	2½-H.P. gas	·8-K.W.	40	50	1,000 feet	Post Office stations worked by C.G. doing ordinary telegraphic work, and experimental work for G.P.O.
Hunstanton -	,,	2½-H.P. oil	,,	40	50	,,	
Tobermory -	Marconi	4-H.P. oil	1½ K.W.	50	100	,,	Post Office stations worked by C.G. doing ordinary telegraphic work, but no experimental work.
Loch Boisdale	,,	,,	,,	50	100	,,	
Guernsey -	,,	Nil	Nil	Hammer	70	A tune, and 2,000 feet directional.	War Office station worked by C.G. for communication with Jersey and Alderney.
Jersey - -	,,	1½-H.P.	1½-K.W.	,,	50	,, ,,	War Office station worked by C.G. for communication with Guernsey.

Jersey will be completed by January 1908.
Jersey and Guernsey have directional aerials for communication with one another on 2,000-foot plain wave.

NOTES ON THE WIRELESS TELEGRAPH STATIONS USUALLY HEARD BY THE NAVAL SHORE STATIONS, AND SOME DETAILS WITH RESPECT TO THE COMPANIES WORKING THEM.

This information has been compiled by Lieutenant Loring, Lieutenant in Charge of Shore W.T. Stations, and is embodied in a report by him dated 3rd July 1907.

Companies working in Great Britain and Ireland.

1. *A.R. Co.*—Amalgamated Radiotelegraphic Company, chairman, Lord Armstrong, owns De Forest patents and Poulsen patents. Capital 500,000*l*. No public money subscribed. Shares in private hands. British capital only involved. Company formed recently.

2. *Marconi Company.*—Capital 500,000*l.*, issued 384,000*l.* Company formed July 1897. Directorate mainly British. This is the mother company. The British Company have a controlling interest in all the foreign companies working under Marconi's name.

3. *Lodge-Muirhead.*—Capital 50,000*l.*, formed in 1901. No public money subscribed. Shares in private hands. British capital only involved.

4. *National Electric Signalling Company.*—An American Company. Shares in private hands. Working the Fessenden patents.

These are the only Wireless Telegraph Companies of any importance owning stations in the United Kingdom.

N S. *North Shields.*—Belongs to the A.R. Co.

The station is situated at Cullercoats, at the mouth of the Tyne. It is equipped with a 10-K.W. De Forest set of apparatus, and works with a line of steamers running from the Tyne to Copenhagen.

The wave-length is about 2,000 feet, and the signals are at times very strong at Scilly (350 miles distant).

The station is well found, and the energy is obtained from the local town mains.

This station has also the Poulsen apparatus installed, and works experimentally with—

ESBJERG and LYNGBY,

two stations in Denmark.

The wave-length used is said to be about 3,000 feet, but signals and interferences have been received from it in the "Vernon," and by ships and stations in the Channel on a much shorter wave-length, about 1,000 feet.

The call signs of the Danish line of steamers are at present B D, O S, U S, H O, K O.

The Amalgamated Radiotelegraphic Company are about to erect a power station for Transatlantic work near Dingle, in Ireland, and the National Electric Signalling Company will probably erect a power station in the north of England on the same lines as the late station at Machrihanish (D D D).

S K. *Skegness.*—This is a station on the De Forest system erected for the General Post Office at the War Signal Station at Skegness.

The plant is worked by the Coast Guard, and consists of a 4-H.P. oil engine and 1-K.W. alternator, frequency about 50 cycles.

The mast is 100 feet high, with 8-part vertical aerial.

The station does not work with any shipping, and is used for telegraphic work between Hunstanton and Skegness. Wave length 1,000 feet.

H N. *Hunstanton.*—Identical with Skegness.

B Y. *Shoeburyness.*—Experimental Station belonging to A.R. Co., not often heard. Wave-length usually about 1,700 feet.

N F. *North Foreland.*—Marconi Commercial Station. Plain aerial about 900 feet. Range about 70 miles.

N H. *Newhaven.*—A station on the Rochefort system, belonging to the London, Brighton, and South Coast Railway Company. Works with Dieppe only, and will work with the cross-channel steamers presently. Wave-length 1,450 feet about. Range 150 miles about.

N I. *Niton.*—Marconi Commercial Station. Works on A tune, and occasionally on plain aerial. About 900 feet. Range about 70 miles. This station is about 1 mile from St. Catherine's War Signal Station.

Haven (Bournemouth).—Marconi Experimental Station, rarely heard. It is generally a receiving station for Poldhu and other experiments.

L D. *Lizard.*—Marconi Commercial Station. Small oil-engine and dynamo fitted. Works on A tune and about 1,600 feet, range about 150 miles.

P K. *Porthcurnow.*—Eastern Telegraph Company, on the Maskelyne system, works only with cable ships. Rarely heard now, range about 50 miles. Wave-length 1,000 feet, has applied for 2,000 feet.

H P. *Hartland Point.*—Very similar station to N S (North Shields). Belongs to A.R. Co., and works experimentally with O X, B Y, and N S, also commercially with the Royal Mail line of steamers from the West Indies. Wave-length 2,000 feet. Range 300 miles.

L V. *Liverpool.*—Marconi Commercial. Same class of station as Lizard.

H M. *Heysham.*—Midland Railway Company on the Lodge-Muirhead system. Works with the Irish steamers running to Belfast. Wave-length about 1,800 feet, range 100 miles.

B N. *Barrow-in-Furness.*—A private station of Vickers Maxim, works with ships on trial. Not often heard.

T H M. *Tobermory.*—Station erected by Marconi Company for General Post Office and worked by Coast Guard. Wave-length 1,000 feet, range 100 miles. 4-H.P. oil engine and 2-K.W. rotary converter. Signals off a 2° cell installation.

L S G. *Loch Boisdale.*—Ditto.

These stations do not work with ships, and are erected for ordinary telegraphic work between Western Hebrides and mainland.

Butt of Lewis and Flannan Islands.—These are two Lloyd's stations on the Marconi system. They do not work with ships and have a directional aerial. Their range is very limited.

M H. *Malin Head.*—Marconi Commercial Station of the same type as North Foreland.

C K. *Brow Head.*—Marconi Commercial Station. Oil-engine, dynamo, and secondary cells. Wave-length above 3,000 feet, range 200 miles. The aerial is directional to the S.W. Marconi ships occasionally get into touch at 300 or 400 miles. The station is not heard much east of Lizard.

R L. *Rosslare.*—Marconi Commercial Station same type of station as North Foreland.

Innistrahull off Malin Head, and *Fastnet Rock*, off Crookhaven (Brow Head), are two Lloyd's stations on Marconi system. They are of very limited power and do not work with ships.

G U. *Guernsey.*—Marconi system belonging to War Office and worked by Coast Guard. Range 100 miles, A tune and plain aerial. It is used to work with Alderney and with a station to be erected in Jersey.

It does not work with ships.

O X and C A. *Oxford* and *Cambridge* Experimental Stations of A.R. Co., recently closed. These stations had a range of about 150 miles, and usually worked on a 1,500 foot wave-length.

Other stations often heard are Lodge-Muirhead and military stations at Caterham, Elmers End, Hythe, Aldershot, &c. These stations work on various wave-lengths, which have been growing of late (1,500 to 2,500 feet). Several of them have a distinct musical note off an alternator of about 200 cycles. They use the call sign, "Steamships" and "Manchester," and have been heard by all the naval shore stations except Roches Point.

Foreign Stations.

S C H. *Scheveningen* (The Hague). Works with Marconi ships, Flushing, Queenborough boats, and other steamers of various lines.

Wave-length 450 and 650 metres, range up to 300 or 400 miles; generally heard all down the East Coast, but not in the Channel.

K N D and O R D. Either *Norddeich* or *Nauen* (Berlin), or both.—These are German power stations with a range of about 1,000 miles, wave-length about 2,000 metres.

They send press messages frequently, and work experimentally the German Navy. Heard by all naval shore stations.

F L. *Eiffel Tower* (Paris).—Works regularly with distant French Government sstation sending press, &c. Range 600 or 700 miles, and wave-length about 5,000 feet. Heard by all naval shore stations.

D P. *Dieppe* (*see* Newhaven).

O O O. *Ushant.*—Works with Hamburg-American and other stations. Range about 100 miles, wave-length about 1,000 feet.

ABSTRACT OF REPORT OF VISIT TO H.P. STATION, CLIFDEN, IRELAND, BY OFFICERS OF THE ATLANTIC FLEET.

DATED 23RD JULY 1907.

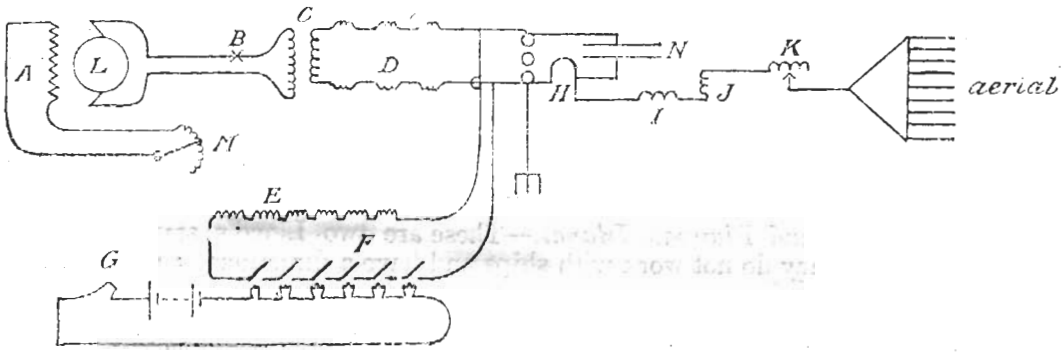
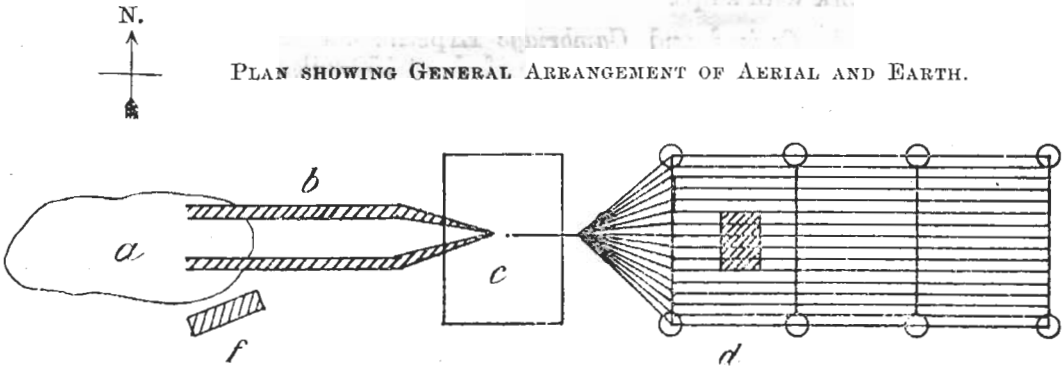


DIAGRAM OF TRANSMITTING CIRCUIT.

A = alternator field.
B = load switch.
C = transformers.
D = main chokers.
E = chokers in key circuit.
F = key contacts.
G = Morse key shown pressed.
H = mutual inductance.
I, J, K = inductance at foot of aerial.
L = alternator.
M = controller for regulating field.
N = condensers on each side running whole length of building.

B, G, and M in key room.
C, D, E, F in main compartment.
H, I, J, K in spark ball room above transformers.

Note.—When Morse key is released, key contacts F are closed, and the condensers are thus short-circuited.



PLAN SHOWING GENERAL ARRANGEMENT OF AERIAL AND EARTH.

a = lake.
b = buried earth.
c = transmitting house.
d = aerial of phosphor bronze.
f = power house.

Position.

The station is situated on flat boggy land, surrounded by hills except on the west side.

The chief buildings consist of:—

(1) Transmitting house 400 feet by 100 feet by 50 feet.
(2) Power house.

Transmitting house.

The transmitting house contains:—

(1) Key room. Morse key and secondary batteries. Power switch, and alternator field controller, ammeter, and volt meter.
(2) Spark ball room. Spark balls, oscillator, bussbars to condensers, fan motor for spark balls, cymometer.
(3) Transformer room. Transformers, choking coils, and magnetic key.
(4) Wings. Condensers.

The key and transformer rooms are on the same floor, the spark ball room being above; the condensers occupy each side of the whole length of the building.

Spark gap.

The spark balls are three in number and made of zinc, each about 8 inches in diameter, and are enclosed in a cement silencer with walls 9 inches thick ventilated by a fan; all men employed near the spark have to wear cotton wool in their ears on account of the noise. Usual spark length, 35–42 mms.

The primary leads consist of copper bands 18 inches broad; considerable heating appears, however, to take place. Oscillator.

The mutual is made of 20 large insulated wires, joined in parallel, diameter of coil about 4 feet.

Two large fixed inductances and one small variable one are placed at the foot of the aerial. The large inductances are wound with bare Marconi aerial cable laid round 4-inch Manilla; this arrangement gives a large surface, and each part takes an equal strain. The small variable tuner consists of a few turns on an 18-inch former, the aerial being connected to any turn by a straightway connection.

There are eight transformers, each giving a step up of 1 to 5. Six only are used. The primaries can be arranged in parallel or series. Oil insulation is used for these and also for the six choking coils. Small chokers are also placed in series with the magnetic key. Transformer.

The magnetic key appeared very flimsy, the spark missing several times, due to flaming at the key contacts. Magnetic key.

The whole of the wings are taken up by the air condensers. There are 70 rows of zinc plates 30 feet high, hung from the roof by china insulators; each row is 400 feet long and the rows are 1 foot apart. Capacity, ·18 micro-farad. Condensers.

The power house is situated 100 yards from the transmitting house and contains the boiler room with six boilers, and the alternator room with one 1,000-volt 500-ampère machine and several auxiliary motors. The alternator is run on the governor, the speed of 365 revolutions never being altered—frequency 25–33 cycles per second. Power house.

There is a large reserve of power not more than 150–200 ampères generally being used whilst signalling.

The aerial is directional towards Glace Bay, and consists of 50 to 60 wires suspended on 8 masts at a mean height of about 170 feet. Length, 2,000 feet; breadth, 400 feet. The feeder is fan-shaped $\lambda\sigma$ about 1,800. Aerial and earth.

The earth is also directional, and is led underground into a lake.

During the visit a programme was carried out. The power in the alternating mains was 1,000 volts and 150 ampères, being stepped up to 15,000 volts by the transformers; the voltage is again considerably stepped up by resonance effects. The circuit was direct coupled and the tension in the aerial comparatively low, consequently the insulation of the aerial is an easy matter and the feeder is led in through an ordinary Bradfield insulator. The rigging of the masts is insulated. The wave-length used was about 14,000 feet. Working of apparatus.

The great advantage of having air as the dielectric when space is unlimited is that the condensers are self-restoring; the spark was opened out to 64 mms. before the air between the plates gave way with a loud report, but no damage was done.

No information as regards the receiving circuits at this station could be obtained.