WIRELESS TELEGRAPHY APPENDIX, 1909.

CONTENTS.

GENERAL SUMMARY OF WIRELESS TELEGRAPHY PROGRESS DURING THE YEAR 1909.

The Service Mark II. apparatus has been working at Sea throughout the year with satisfactory results. With very few exceptions all ships to which this set is appropriated have now been fitted.

The Service Mark I*. apparatus has been installed in a large number of Ships and is working well.

Practically every ship in the sea-going Fleets now has a modern Wireless Installation, the modern battleships and first class cruisers having the Mark II. apparatus and the remainder having the Mark I*. sets.

For both Mark II. and Mark I*. sets new switches have been designed which will supersede the old Send Receive Switch. The new switches are known as Operating Switch Mark II. and Operating Switch Mark I*. respectively. The principle is identical in both cases, viz.: an electrically controlled switch, worked off the sending key, which bridges over a break between the mutual coil and transmitting earth whenever the sending key is pressed, simultaneously breaking the connection from the mutual coil to the receiving instruments. The Receiving circuit is thus always joined up except while the sending key is actually down, and a signal in course of transmission can be interrupted by the receiving ship. The Operating switches are now being delivered and should be in use at sea early in 1910.

Experiments have been made with many new forms of Detectors. One of these, the Crystalite Detector, is used in the "B type receiving sets," 45 of which are being sent to sea for further trial.

All new Destroyers are fitted with the Destroyer installation and there are about 45 of these sets at sea.

The High Power Shore Stations at Horsea, Cleethorpes and Gibraltar and the Medium Power Stations at Pembroke, Aberdeen and Ipswich have been completed and their efficiency and utility have been demonstrated by practical work.

The Organisation of Wireless Signalling is now in full working order in Home waters with very satisfactory results.

Difficulties having occurred at Gibraltar, due to signals from the High Power Station there interfering with the Military land telephones, the regular working of this station has been stopped, pending the efficient screening of the telephone cables; and that part of the Organisation which refers to the transmission of Admiralty messages to ships in the Mediterranean, and to ships in the Atlantic south of Gibraltar, has been suspended temporarily. Meanwhile every opportunity is taken to carry out experiments from both Gibraltar and Horsea, with a view to perfecting the arrangements and apparatus at all the High Power Stations.

Designs for a High Power Station at Malta are well advanced, and it is hoped that this station will be working by the end of 1910.

Eleven Short Distance sets have now been purchased and will shortly be installed in ships of the Home Fleet for trial.

The Electrolytic Detector has been discarded and the short distance sets will be fitted with Crystalite Detectors.

Designs for Portable and Harbour Defence sets have been completed and a number of these sets are now being purchased.

The Portable and Harbour Defence sets are practically identical, except that the mast, which is supplied in the Portable set for landing expeditions, is not required in the Harbour Defence sets used afloat. One of the Harbour Defence Sets at each Port will be provided with a mast in case it is necessary to erect a set ashore.

A Wireless Installation for the Naval Airship has been designed.

Experiments have been carried out with Baron von Lepel's system of Wireless Telegraphy. The results so far obtained do not show the system to be reliable, but experiments are still in progress, and more promising results have lately been obtained.

Further experiments have been carried out with the De Forest Wireless Telephone and have confirmed the previous experience as to this system being at present unreliable and unsuited to Naval requirements. Further trials will be carried out on the receipt of certain new apparatus now on order.

The Wireless and Long Distance Signal Code and the Destroyers Wireless Signal Book have been issued to the Fleet and supersede the old instructions for the Conduct of Wireless Telegraphy Signalling and the Supplementary Signal Code.

Steady progress has been made in the instruction of the Telegraphist Branch. Very satisfactory reports have been received from sea as to the knowledge and ability shown by the Boy Telegraphists drafted from the "Impregnable."

INSTRUCTIONAL REPORT.

The following number of Officers and other ratings have been instructed during the year :—

Qualifying Lieutenants (T)	7
Marine Officers (Special)	6
" " (short course)	18
Gunners (T)	4
Higher Telegraphist ratings	80
Armourers and Electricians	45
Coast Guard ratings	29
Total	189

The following new apparatus has been set up in "Vernon" since last year :— Additional apparatus installed.

Two Service Mark I*. Installations.

TELEGRAPHIST BRANCH.

The numbers of Telegraphist ratings in the Service on the 22nd November 1909 were as follows :—

C.P.O. Telegraphists	16
P.O. Telegraphists	144
Leading Telegraphists	111
Telegraphists	219
Ordinary Telegraphists	75
Boy Telegraphists	192
Total	757

It has been approved to introduce the rank of Warrant Officer Telegraphist, the numbers allowed being 16 at present. Warrant Officer Telegraphists. A.C.L. No. 106 of 29/11/09.

Classes for candidates for the rank of Warrant Officer Telegraphist will commence early in each year in "Vernon." Six candidates will be taken annually for this course.

The advantages of the present system of training the Telegraphist Branch are exemplified by the reports on the Naval Manœuvres of 1909, *see* page 4. Satisfactory results of training of Telegraphist ratings.

REPORT BY CAPTAIN OF "IMPREGNABLE" ON TRAINING OF BOY TELEGRAPHISTS, DATED 2ND DECEMBER 1909.

Since the last report dated 20th October 1908 (*vide* p. 3, W.T. Appendix, A.R., 1908), 142 boys have been classed up for Wireless Telegraphy.

Of these, 9 have failed at various stages of the course and been rejected ; 43 have been drafted ; and 90 remain under instruction on 1st December 1909.

The improvement in progress in Morse has been very marked, and compared with the first year of the Wireless Telegraphy School the rejections have been very few.

The most suitable number of boys to form a class is 15 from an Instructional point of view, but since April 1909, only 10 boys have been classed up per month.

It is considered that a great improvement in the practical ability of the boys may be expected now that a Mark I*. Installation is to be fitted in "Impregnable."

It is important that it should be distinctly understood that the boys are not sent to sea as Trained Operators; the course in "Impregnable" consists almost entirely of elementary theoretical instruction, and by the Admiralty Instructions, it is intended that the practical knowledge should be obtained at sea.

ORGANISATION OF WIRELESS TELEGRAPHY.

Extracts from a Report dated 25th February 1909, on Exercises carried out by Channel Fleet.

On the 20th January 1909, weekly test exercises between the Admiralty Station and the Channel Fleet were commenced. For the first of these test exercises certain ships were detailed to read the messages and to re-transmit them visually to the Flagship, nothing else being attempted. For subsequent exercises the practice has been extended to the whole organisation and on the 7th and 14th February the following "lines of communication" kept up communication simultaneously without appreciable difficulty:—

(*a*) Messages from Whitehall received and replied to. ("X" tune.)
(*b*) Messages transmitted to Scilly for Admiralty. ("W" tune.)
(*c*) Messages transmitted to Rame Head, Culver or Portland for Admiralty. ("U" tune.)
(*d*) Messages passed from Flagship to ships in harbour representing detached cruisers, using the buzzer; and messages passed between Flagship and ships away from Portland. ("S" tune.)
(*e*) Messages passed between a ship in company and a scout, using the buzzer. ("D" tune.)
(*f*) Commercial signals from Bolt Head intercepted by ship of the Battle Fleet detailed for "Q" tune, and signals were exchanged on "Q" tune between a ship of the Battle Fleet and ships not in visual touch. ("Q" tune.)
(*g*) A ship in company was detailed to interrupt on "P" tune (short commercial wave). ("P" tune.)

Extract from Remarks on Wireless Telegraphy in the Red Fleet during Naval Manœuvres, July 1909.

Results obtained.

On the whole the results obtained were an advance on former experiences. The organisation of Naval Wireless Telegraphy, laid down in Admiralty Letter M. 01135 of 16th November, 1909, was generally successful.

Necessity for short distance set.

The want of a short distance W.T. set of apparatus separate from the main set was felt, and it is most necessary that this should be provided as soon as possible. During the thick weather when the communication between the Flagship and cruisers was constant, such a set was essential to the rapid transmission of orders to the battleships.

Increase in personnel required.

The want of sufficient personnel was felt. It would have been a great advantage if it had been possible to keep the W.T. in "Temeraire" and "Superb" in full operation when the faster battleships went ahead of the remainder of the Fleet, but in order to give the cruisers the bare number of men sufficient to keep constant watch, it was necessary to deplete ten battleships.

Extracts from a Report on Wireless Communication during Manœuvres, by Lieut. R. Fitzmaurice, Wireless Officer to Mediterranean Fleet.

Good results attributed to training of Telegraphist Branch.

A great advance in reliability, accuracy and rapidity in W.T. communication was noticed over previous manœuvres, entirely due to the greater experience, knowledge, and training of the Telegraphist Branch and the energy and zeal which they displayed.

Cutting out interference.

Interference by the enemy was continuous both by high and low power ships, but the enemy's signals were able to be sufficiently weakened by a big rejector to carry out accurate and rapid communication on the 2,950 feet wave length selected by the Blue and White Fleets as their standard tune. It was not once found necessary to change tune.

Unnecessary signals.

It is most desirable that small ships should be further impressed that signals by W.T. should be as few as possible and only important ones made at all. A great many messages were made by ships of the Scout class which were quite unnecessary and tended to delay the main W.T. communications.

It is urgent that a Mark II. ship be supplied with a Mark I*. rotary converter, both as a stand-by in case of breakdown and to save unnecessary wear and tear of the high power gear. The Mark I*. rotary used with the Mark II. condensers and an ordinary induction coil has been found by practical experience to be most efficient up to a range of 300 miles on all tunes by day and night. Supply of rotary converter to Mark II. ships recommended.

The new organisation of wave lengths appears to work exceedingly well, but it is submitted that St. Angelo and Windmill Hill Stations may be altered to "S" tune instead of "U." Owing to their geographical position and isolation they do not interfere with Fleet communications when on "S" tune, but are a considerable help to it, and at a time of pressure like the Messina earthquake and the Adana massacres it was found necessary to put St. Angelo on to "S" tune observing that the "Exmouth" is the only Mark II. battleship on the Mediterranean Station. Organisation of wave lengths.

Though the apparatus was continually in use during the manœuvres, no instruments gave any trouble or failed with the exception of the "send-receive" switch. This broke down on the first day and always fails when most required. Failure of send-receive switch.

The size of the Wireless Office and Silent Cabinet is too small and makes examination and repair of instruments and the shifting of tunes a difficult and lengthy operation. The operators are also confined in an unnecessarily small space. Larger offices required.

"Vernon's" Remarks on Lieut. Fitzmaurice's Report.

It is satisfactory to note that the good results are attributed to the knowledge and training of the Telegraphist Branch. This bears witness to the wisdom of the policy of introducing the Telegraphist Branch into H.M. Service.

The interference method used in the Red Fleet is not at present known in "Vernon."

In view of the fact that a new type of buzzer, capable of producing a musical note and signalling to a range of 20 miles, is now under consideration for the purpose of signalling between ships at short ranges, it is not considered necessary or desirable to issue a 1½ Kw. rotary to Mark II. ships for the purposes mentioned.

It may be necessary for St. Angelo and the Low Power Station at Gibraltar to look out for "S" wave under certain circumstances, but it is not understood why under ordinary circumstances they should not conform to the rules laid down for Naval Shore Stations. For the present it is recommended that no change be made in the organisation of the wave lengths.

A new type of switch (operating switch) is being introduced to replace the send-receive switch.

Re size of offices. This point has been taken into consideration in new ships whose offices are being made larger than the "Exmouth's."

Details of Naval Shore Stations.

Station.	Position.	Range.	Engine. H.P.	Cell Volts.	Cell Amp.	Dynamo.	Rotary.	Masts, No. and Height.	Connected to G.P.O.	Approximate. λ	Approximate. σ	Approximate. λσ	Remarks.
Cleethorpes -	3 miles S. of Grimsby - -	1,000	100 Kw., 3-phase, 2,200-volt.					1/180, 4/160, 4/60	Day and night	50	15	750	
Horsea - -	Horsea Island - - -	1,000	From mains					4/160, 8/60	,,	50	15	750	
Whitehall -	On roof of Admiralty - -	300	25 Kw., 200-volt, direct					1/180, 2/160, on domes.	,,	40	4	160	Can do 400 miles on W. to S. tunes.
Aberdeen - -	5 miles W. of Aberdeen -	500	25 Kw., 6000/100, 3-phase					2/180	,,	40	2·8	96	
Ipswich - -	Ipswich, near Railway Station	500	25 Kw., 440, direct					2/180	,,	40	2·8	96	
Pembroke -	Pembroke Dock - - -	500	25 Kw., 220, direct					2/180, 2/60	,,	60	2·6	156	
Felixstowe -	On beach S. of Town - -	200	5	65	30	Old 4-pole rotary		1/160, 4/50	,,	60	2	120	Often doing trials.
Sheerness -	Garrison Point Fort - -	100	1½ Kw., 220-volt, 100 cycles					1/140, 4/40	,,	70	2	140	Does not take private telegrams from ships.
Dover - -	On top of hill W. of Town -	100	1½	75	10	½ Kw. Destroyer		1/140, 1/50	,,	70	2	140	
Culver Cliff -	On top of cliff - - -	100	10	100	70	5 Kw. ,,		1/150, 4/50	,,	60	2	120	Being refitted as stated. Ready February.
Portland Bill -	Near Lighthouses - -	200	5	120	30	"C" tune rotary		1/150, 4/50	8 a.m. to 8 p.m.	70	2·5	175	
Alderney - -	On Essex Hill - - -	100	1½	100	10	½ Kw. Destroyer		1/150, 4/50	Day and night	50	1·6	80	
Rame Head -	Near extreme point - -	200	5	120	30	"C" tune rotary		1/160, 4/50	,,	70	2·5	175	
Scilly - -	On Telegraph Hill, St. Mary's	250	5	120	40	,, ,,		2/160	,,	40	2·4	96	Usually doing trials.
Cork Beg - -	E. side Cork Harbour entrance	200	5	120	30	,, ,,		1/170, 4/50	,,	60	3	180	
Rosyth - -	Half mile N.W. of Forth Bridge.	200	5	120	30	,, ,,		1/160, 4/60	,,	60	3	180	Completed by January.
Port Patrick -	On cliff N. side of Town -	200	5	120	30	,, ,,		1/160, 4/50	,,	80	2·5	200	
Wick - -	S. of Town - - - -	250	10	100	50	5 Kw.	"C" tune	2/160	—	40	2·5	100	These three stations will be commenced in April. Ready about September.
Scarborough -	W. of Town - - - -	250	5 Kw., single-phase				2000/100 v.	2/160	—	40	2·5	100	
Bunbeg - -	15 miles S. of Bloody Foreland	250	10	100	50	5 Kw.	"C" tune	2/160	—	40	2·5	100	

NAVAL SHORE WIRELESS STATIONS.

General Progress.

High power stations.

Three of these have been in working order since the middle of the year ; one at Cleethorpes, one at Horsea, and one at Gibraltar. A similar station will be erected at Malta in the course of 1910.

Cleethorpes is being used entirely for Admiralty work, in accordance with the Organisation of Wireless Signalling described in Art. II. of Wireless and Long Distance Signal Code Book. That part of the organisation which refers to the transmission of messages between Admiralty and ships in the Mediterranean and in the Atlantic (south of Gibraltar) is suspended during further experiments.

N. 01123 of 30.10.09.

Medium power stations.

The stations at Pembroke, Aberdeen, and Ipswich are now complete and take their part regularly in the organisation. They have proved themselves quite capable of working at the ranges for which they were designed.

Lower power stations.

The positions of these stations and the area they cover is shown on Plate I. which supersedes Plate V. of W.T. Appendix, A.R., 1908. The three stations in red will be ready about September 1910.

Details of the Naval Shore Stations are given in the table, on opposite page.

General Notes on Shore Stations.

Watch-keeping.

All medium and low power stations keep continuous watch.

Spark gap. Detectors.

All low power stations have Revolving Spark Gaps.
All stations except Culver Cliff and Sheerness have Crystalite Detectors.

Aerial.

With one-masted stations the best aerial is made by stretching four fans from the masthead to poles 50 feet high at the corners of a square.

At two-masted stations it is found that the aerial can be improved by using three or four cylinders instead of two. Horsea aerial is rather small for the power available. It may prove desirable later to add two additional masts and increase the aerial.

Extracts from Report, dated 26th May 1909, of Experiments with High Power Stations at Horsea and Cleethorpes sending to "Furious."

Result of trials satisfactory.

The results of these first trials of the high power stations at Horsea and Cleethorpes are considered to be extremely satisfactory, and prove the stations to be fully capable of doing the work for which they were designed.

Day range sending to ships.

From the experience gained, it is considered that, when sending to ships, the stations have a reliable day range of 1,300 miles, if the Perikon detector is used for receiving. Day ranges of 1,300 miles have been obtained with the Magnetic Detector also, but it is considered that the reliable day range to ships using this instrument should not at present be assumed to be greater than 1,000 miles.

It will be understood that the range at which signals can be received depends, to a great extent, on the size and spread of the aerial in the receiving ship, thus in large cruisers greater ranges may be expected, whereas in smaller ships than the "Furious" ranges less than those given above must be assumed.

Night range.

Signals were distinctly stronger at night, but as the limit of distance at night was not obtained an approximate estimate only can be given. It is considered that the range at night will probably be about double that by day.

Range of communication between two high power stations.

Reports from Gibraltar show that a high power station aerial is very much better than a ship's aerial for receiving, so it may safely be assumed that the range of communication between two high power stations would be far in excess of the 1,000 miles mentioned as the reliable day range for ships. Probably communication over a distance of 2,000 miles could be maintained under ordinary working conditions.

Communication between Gibraltar and Horsea.

Communications between Horsea and Gibraltar should be absolutely certain, day and night, except in the case of severe thunderstorms, when, for the safety of the operator, it might become necessary to earth the aerial.

Proposal for further trials.

On account of the station at Cleethorpes only being completed on the 10th May, it was impossible to carry out any very extensive experiments for comparing the relative merits of the two stations as regards range. In order to do this it would appear desirable to carry out further trials (in which Gibraltar could be included) later in the year.

Greatest distance.

The "Furious" was at no time distant more than 1,300 miles; at this distance, while lying under the lee of the high land at Madeira, in a bad position for receiving, the "Furious" easily read the day signals from Horsea on the Perikon and on the magnetic detector. Day signals from Cleethorpes were, however, very weak. At night, signals from both Cleethorpes and Horsea were quite loud.

Stations now in working order.

After the experience gained, the stations may now be considered to be in working order and ready to take their place in the Wireless Telegraphy Organisation, but it is desired to point out that in order to get the stations ready in time for these trials a certain amount of apparatus has had to be extemporised, and to make the stations permanent and reliable these parts will require to be properly designed and made, also certain other parts will require slight modifications, but all these can be gradually embodied without putting the stations out of action.

Précis of Reports on

EXPERIMENTS CARRIED OUT WITH HORSEA W.T. STATION.

Experiments between Horsea and Gibraltar, July 12th to August 5th.

Exhaustive experiments were carried out:—

(1) To obtain the best arrangements of the transmitting circuit at Horsea.

(2) With the best arrangements to test the reliability of communication between the stations.

As a result, the best arrangements were found to be as follows:—

Spark Length.	Coupling.	Wave Length.	Impedance.	Supply Volts.
10 to 12 m.m.s.	3 per cent.	12,200	·25 Milli-Henries.	430

As regards (2) the experiments showed that:—Communications under all ordinary conditions of weather, day and night, between Horsea and Gibraltar may be considered quite reliable. Considerable interference by Clifden was experienced at Horsea.

Trials between Horsea and Mediterranean Fleet 12th to 21st August.

From the results of these and previous experiments in which St. Angelo has watched signals sent from Horsea and Gibraltar, the following conclusions have been arrived at:—

(1) That at present with ships using the Magnetic Detector signals from Horsea cannot be relied on to be received in the Mediterranean.

(2) That St. Angelo can receive Gibraltar's signals reliably by day and night.

With further experience and the use of the Crystalite Detector there is no doubt that the reception of Horsea's signals in the Mediterranean will improve considerably, but whether they will be reliable at Malta by day and night under the severe atmospheric conditions to which Malta is subjected especially during the autumn months, appears very doubtful, and can only be satisfactorily settled by further experiments.

Report on trials between Horsea and 5th Cruiser Squadron, 12th to 21st September.

These reports, taken in conjunction with a report received separately from H.M.S. "Inflexible," indicate that the reliable range of Horsea to the westward, to ships receiving on a large aerial with the magnetic detector, is at present about 850 miles by day and 1,500 miles by night.

Much useful information has been obtained from these trials as to what arrangements of the transmitting apparatus at Horsea are most suitable, and as a result of this experience certain improvements can now be made in the aerial and in the transmitting circuit.

It is considered that, except when strong atmospherics are experienced, a reliable range of 1,000 miles by day and 1,600 miles at night may be confidently anticipated when these improvements have been effected, and ships have obtained a little more experience in receiving this wave length.

Further information obtained during these trials.

The "Inflexible" reports receiving Horsea's signals on the M.D. up to 2,230 miles at night. Clifden's signals were then two points stronger than Horsea's.

Gibraltar North Front, and St. Angelo, Malta, and ships of the Mediterranean Fleet were also looking out during this programme.

At Gibraltar, the signals were consistently strong and clear.

St. Angelo received nothing reliable in the daytime.

The Mediterranean Fleet at Lemnos and Kios (1,200 miles overland) received nothing in the daytime. The results obtained by "Bacchante" at night were promising.

Further trials between Horsea and Mediterranean Fleet 25th October to 21st November 1909.

The results obtained by ships of the Mediterranean Fleet during the first week of these trials showed considerable improvement in the reception of signals from Horsea by ships when the Perikon detector was used. On the other hand, the note was reported to be useless for reading through the very strong atmospherics which prevail in the Mediterranean at this time of the year by day and night. (For report of further trials *see* page 57.)

Remarks on H.P. Stations.

Musical note.

The 250 cycle note for which the H.P. Station Installations were designed has proved of little value for reading through atmospherics, but by closing up the spark gap to 5 m.m.s, two sparks a cycle are obtained, and a clear high note results. This 500 cycle arrangement, as now used, limits the spark length to 5 m.m.s and therefore the power radiated with this arrangement is limited at present.

Improvements in transmitting circuit.

With a view to improving the transmitting circuit the following action is being taken:—

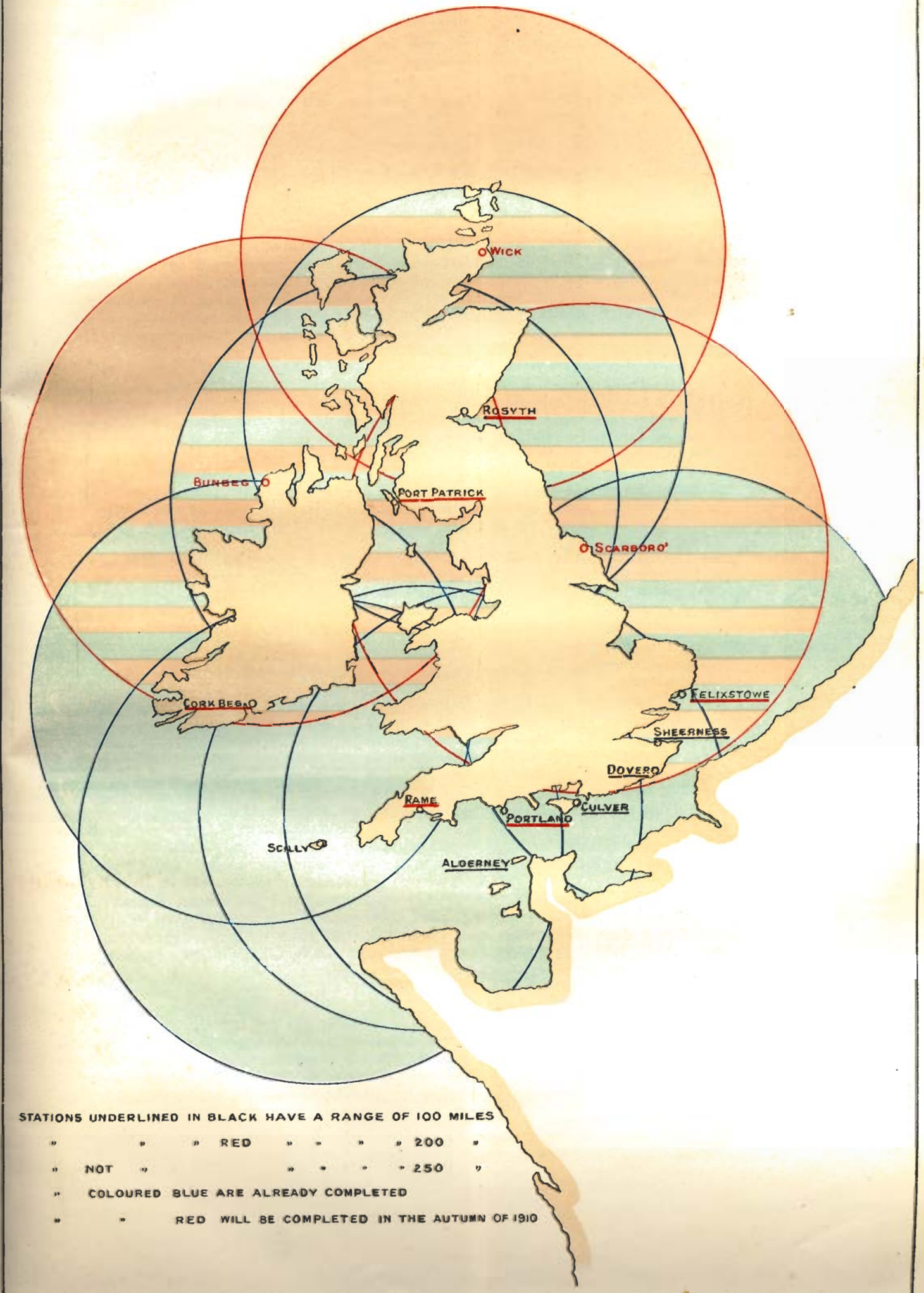
(1) In order to improve the note without curtailing the power radiated, an auto-transformer is being introduced into the circuit so that 500 volts can be used for the wireless transformer without unduly overloading the alternator. This will allow of a 500 cycle note being maintained on an 8 m.m. spark.

(2) A new design of magnetic key having carbon instead of copper contacts is being introduced.

(3) More efficient primary, mutual and aerial coils are being constructed.

(4) Copper wire will be used for the earth wires which are at present galvanised iron.

W/T LOW POWER SHORE STATIONS.



STATIONS UNDERLINED IN BLACK HAVE A RANGE OF 100 MILES

" " " RED " " " " 200 "

" NOT " " " " " 250 "

" COLOURED BLUE ARE ALREADY COMPLETED

" " RED WILL BE COMPLETED IN THE AUTUMN OF 1910

Interference by High Power Station at Gibraltar North Front with the Fortress Electrical Communications.

When Gibraltar started working, the military authorities reported that the high power station seriously interfered with the telephone system, shocks being experienced by operators, instruments being damaged and communication becoming impossible.

The station was therefore ordered to cease sending temporarily, and suggestions were forwarded for screening all telephone wires in the vicinity either with lead cased cables or screening wires.

Pending the completion of the screening arrangements, Gibraltar sends experimentally for 1 hour daily.

Malta High Power Shore Station.

General scheme.

This high power shore station will be very similar to the existing stations at Horsea, Cleethorpes, and Gibraltar, which are described on pages 9 to 12 of W.T. Appendix, A.R., 1908. The station will probably be finished early in 1911. It will transmit a 12,000 feet wave with approximately the same range as the other three stations, and will be used for communication between Malta and Horsea and between Malta and ships in the Mediterranean. The station will have a reserve of power available and is being so arranged that extra masts can be added, a larger aerial obtained and the range extended to reach a similar high power station at Aden should it prove desirable to erect such a station later.

Site.

The station is being built at the head of Rinella Bay and is very near to St. Angelo; special arrangements are being made to prevent mutual interference between the two stations. Considerable difficulty was experienced in finding a suitable site combining a satisfactory earth connection with proximity to the Dockyard Electrical Generating Station from which power to work the station is being taken. The earth connection at Rinella Bay will be one of the best obtainable in Malta, as part of the site consists of a low lying layer of vegetable soil, over sand through which the salt water percolates freely, and it will be possible to have the earth plates partly below sea level. The area covered by the earth connection is, however, rather limited, and the station is in a hollow. The aerial will be supported on five masts, 220 feet high, covering an area of 500 feet square; it will be fed by vertical feeders at the centre.

Power supply.

The 250 cycle alternators are being placed in the Dockyard Electric Generating Station and will be motor driven; the current from them is being taken part of the way underground and part of the way by means of overhead wires. The pressure used will be 1,500 volts. The use of overhead transmission and the comparative shortness of the distance ($1\frac{1}{2}$ miles at Malta compared with $3\frac{1}{2}$ at Horsea) have made this arrangement preferable to the three phase transmission adopted at Horsea, &c.

The supply for auxiliary purposes is being taken direct at 440 volts.

Transmitting instruments.

Internally, the station will be practically identical with the one at Horsea, &c.

Ebonite condensers of the same pattern as those used for Mark II. sets are being used in lieu of the glass plate ones which have given a certain amount of trouble at the other high power stations. Fourteen tanks are supplied; of these, twelve will form the working condenser, and the other two will be spare. The tanks will stand in two long lead troughs; the spares will stand in position and be so arranged that, in the event of a breakdown, the damaged tank can be disconnected and a spare joined up in lieu in a few seconds. The capacity will be 480 jars (oscillating), and the spark length 16 to 18 m.m.s.

For both primary and secondary oscillating circuits a special cable is being used. This cable will be built up from a large number of parts of 40 L.S.W.G. enamelled copper wire, especially stranded round silk and cotton hearts in such a manner that every wire will be similarly situated and of the same length, and will therefore take its fair share of current. The primary coil contains about 30,000 parts in parallel. This cable is being adopted because it has been found that there is considerable loss in the copper pipes, &c. in use at Horsea. The primary coil there, although made of many parts of 16 L.S.W.G. copper wire, gets very hot, especially when a loose coupling is being used.

A small instrument board is situated by the silent cabinet, and provided with instruments that will show the operator the ampères and volts of the 250 cycle supply current, the current in the aerial and the exciting current of the alternator in the Dockyard.

This exciting current will be controlled by a field regulator placed near the silent cabinet and worked by a handle inside the cabinet.