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# WIRELESS TELEGRAPHY APPENDIX, 1912.

## GENERAL SUMMARY OF THE WIRELESS TELEGRAPHY PROGRESS DURING THE YEAR 1912.

The Instructional work on Wireless in the Schools has progressed steadily; it is expected that those Telegraphists who joined as boys in the "Impregnable" will commence to pass for P.O. Telegraphists early in 1913.

All Signal Books are being revised, and the opportunity is being taken to modify the Wireless and Long-Distance Signal Code, and bring it up to date.

The handbook on Wireless Telegraphy referred to on page 2 of the Wireless Appendix to the Annual Report of 1911, will very shortly be issued as "Vol. I. of the Wireless Manual"; Vol. 2 of the Wireless Manual will follow later.

The design of the Mark II. set, converted to Quenched Spark, is completed, and trials have been carried out with the "Vindictive." The policy in regard to the general conversion of Mark II. sets is not settled. Until a receiving circuit is devised, which will overcome the "shock" effects, the system will not be adopted.

The High Power Station at Rinella, Malta, will be working in an extemporised manner early in 1913, the arrangement being in general similar to those of the other High Power Stations.

Experiments to design a Short Distance set for Cruisers having two wave-lengths, and a range of 20 miles, are making steady progress.

Poulsen experiments on a considerable scale are in progress. Commander Payne, who recently visited the Federal Company's Poulsen Stations in America, reports most favourably on them.

Good progress has been made in the issue of accurately calibrated wave meters.

A new type of petrol engine for the Portable and Harbour Defence sets has been purchased to replace the original type, which has proved unsuitable.

The design of a Motor buzzer set has been completed, and instruments are being purchased for supply to sea.

Destroyers are being fitted to transmit any wave between 635 and 2,000 feet.

"Defiance" has completed the design of a Submarine Installation.

A description is given of the mechanical cypher referred to on page 2 of the Wireless Appendix to Annual Report, 1911. It is under consideration to send some sets to sea for trial.

New designs for the Magnetic Key, Operating Switch, and Hand-operating key, have been got out.

Good progress has been made by Lieutenant Fitzmaurice with experiments in connection with Wireless from Aeroplanes.

*Decided  
not to  
adopt*

## INSTRUCTIONAL REPORT.

The following are the number of Officers and other ratings who have been instructed in "Vernon" between 1st January and 31st December 1912:—

Senior Officers	-	-	-	-	-	31
Qualifying Lieutenants (T.)	-	-	-	-	-	17
"          "          (S.)	-	-	-	-	-	7
Marine Officers' Special course	-	-	-	-	-	2
"          "          requalifying	-	-	-	-	-	5
Other Officers' Short course	-	-	-	-	-	5
Gunners (T.), Scout course	-	-	-	-	-	5
Qualifying Gunners (T.)	-	-	-	-	-	18
"          Warrant Telegraphists	-	-	-	-	-	3
Other Warrant Officers	-	-	-	-	-	2
Qualifying P.O. Telegraphists	-	-	-	-	-	45
Requalifying P.O.          "	-	-	-	-	-	11
Qualifying and requalifying Electricians	-	-	-	-	-	75
"          "          Armourers	-	-	-	-	-	25
Ratings of Australian Naval Forces	-	-	-	-	-	2

The following are the number of Officers and other ratings who have been instructed in "Defiance" between 16th October 1911 and 1st November 1912 :—

Gunners (T.), Scout course -	-	-	-	-	1
Torpedo ratings for Gunner (T.), Qualifying	-	-	-	-	11
Gunnery ratings for Gunner (G.), Qualifying	-	-	-	-	6
Qualifying Petty Officer Telegraphists	-	-	-	-	29
Coast Guards qualifying for P.O. Telegraphists	-	-	-	-	2
Leading and Acting Leading Telegraphists, short courses	-	-	-	-	8
Telegraphists, short courses	-	-	-	-	31
Ordinary Telegraphists, short courses	-	-	-	-	47
Boy Telegraphists, short courses	-	-	-	-	5
Armourer ratings	-	-	-	-	10
Electricians, Requalifying	-	-	-	-	51
„ Qualifying	-	-	-	-	35

It has been arranged locally that all Junior Telegraphist Ratings, Leading Telegraphists, and below, shall, on returning from Sea service, undergo the following courses, subject to their not being required for draft :—

- (a) Fifteen days in Signal School.
- (b) Ten days in Wireless Telegraphy instruction, and
- (c) Ten days Electric Light, the syllabus for this is the same as the first part of the course for Qualifying S.T.s.

The following W.T. Ratings have been under instruction in "Actaeon" during the period covered by this Report :—

C.P.O. Telegraphists	-	-	-	-	-	3
P.O. Telegraphists	-	-	-	-	-	12
Telegraphists	-	-	-	-	-	34
Ordinary Telegraphists	-	-	-	-	-	40
Leading Telegraphists	-	-	-	-	-	5

The Mark II. Installation is now completed, and is used for Instructional purposes only. It cannot be used for signalling purposes owing to the small output of ship's dynamo.

### TELEGRAPHIST BRANCH.

The number of Telegraphist ratings in the Service on the 1st November 1912 were as follows :—

C.P.O. Telegraphists	-	-	-	-	-	26
P.O. Telegraphists	-	-	-	-	-	219
Leading Telegraphists	-	-	-	-	-	205
Telegraphists and Ordinary Telegraphists	-	-	-	-	-	535
Boy Telegraphists (at sea)	-	-	-	-	-	129

The third class of candidates for Warrant Telegraphists completed their course on the 26th March 1912. All three candidates passed the final examination. The next class will commence on 30th December 1912 and end on 14th March 1913 (A.C.L. 734 of 4th October 1912).

A class of P.O. Telegraphists of the Coastguard Service will be formed in the forthcoming year, and those qualifying for Warrant Rank will be available for charge of Certain Naval Shore Stations (A.L. C.W. 16950 of 15th November 1912).

### REVISION OF THE SIGNAL BOOKS.

The work of revising the Signal Books is proceeding. The revision is taking place on the following broad principles :—

*Signal Manual.*—This Manual will contain all instructions as to Flag Signalling, and will include the Organisation of Wave-Lengths. The Wave-Lengths have been rearranged and renamed. The intervals between adjacent Service Waves are being diminished, thus allowing of a greater number of waves for the use of Fleets, &c.

*Fleet Signal Book, Volume I.* will be very similar to the present Fleet Signal Book, except that Routine Signals of an unimportant nature have been removed and placed in the Vocabulary Signal Book. It is intended principally for Visual Signalling, but the Signals contained therein may also be made by W.T.

*Fleet Signal Book, Volume II.* will contain the Instructions for the Conduct of Signalling by W.T. various Tables, Call Signs, &c., also a collection of 4-letter Consono-vowel Signals comprising those of an important and specially confidential nature likely to be used for long-distance work

in War Time. This volume is intended principally for use by W.T., but the Signals contained therein may also be made by Visual.

A Table of Operating Signals containing Signals of a Technical Nature has been included in the volume to expedite W.T. Signalling.

*Vocabulary Signal Book.*—The new feature about this book is the introduction of a section containing sentences. Signals of a Routine or Exercise Nature are now included in this book.

*Signal Hand Book.*—This will be a small book containing Instructions of a non-confidential but technical nature, such as Instructions for Telegraphy, Heliograph, Flashing, &c. The hand-book will be non-confidential, and is intended principally for Instructional purposes.

## HANDBOOK OF WIRELESS TELEGRAPHY FOR TELEGRAPHIST RATINGS OF H.M. FLEET.

The title of this book has been altered to "Wireless Manual, Vol. I." so as to bring it into line with the "Torpedo Manual, Vol. I." which is of a similar non-confidential nature. The book will be issued about the beginning of 1913, and a copy will be allowed to all Telegraphist Ratings except Boy Telegraphists.

The revised edition of the former Wireless Manual which will deal with the more advanced theory and confidential matter is under preparation, and will be issued under the title of the "Wireless Manual, Vol. II."

## SHORE STATIONS.

### GENERAL.

During the year the new station at Bunbeg has been completed and is in easy communication with the two other new stations, Wick and Scarborough, each about 300 miles distant, on all waves from "R" to "W," these stations using the old "C" tune sets returned from sea. Stations in course of construction are—

Stockton which should be completed by March 1913.

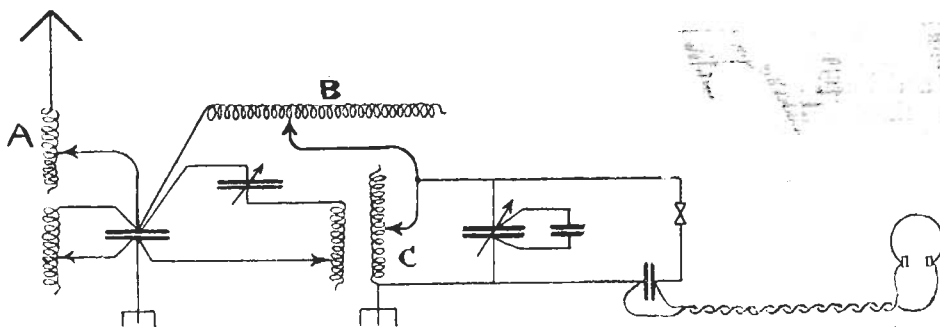
Lerwick and Grimsby (D) will be completed in the next 12 months. It is probable that a destroyer station will be erected on May Island.

Much experience has been gained with Lieutenant Slee's Differential Interference Preventer and with the modification generally known as "Figure VIII."

The original Differential Interference Preventer (*see pp. 26-29 W.T. Appendix A.R., 1911*), suffers from two great disadvantages: it requires two aerials and its adjustments are exceedingly delicate. Individual skill has a great deal to do with the results achieved at the different stations, and there is hardly a case of even the same operator being able to standardise results for the same two stations.

The circuit known as "Figure VIII." (*see Fig. 1*) is much easier to manage especially when used in conjunction with the "C" type receiving gear. For this circuit adjustments can be found which do approach standardisation, and it would appear that for service working "Figure VIII." arrangement, although far from perfect, is a useful addition to the outfit of the station.

FIG. 1.



"Fig. VIII." Interference Preventer.

The diagram (Fig. 1) explains itself, but care must be taken that the earth is connected to the left-hand terminal of the "C" type secondary and the aerial to the right-hand terminal.

It will be seen that no auxiliary aerial is employed. The action is as follows:—

When a signal is being received, the circuit from "A" through "B" and "C" to earth is greatly out of tune and the current flowing is therefore very small.

In the event of violent interference, or of atmospherics, current of an appreciable strength will flow through the path A, B, C, to earth, and will be in the opposite direction to that induced in the receiver circuit by the action of the acceptor inductance. These two can both be controlled by varying the coupling and the value of the inductance "B," and can therefore be equalised, when they will cancel one another leaving the current due to the signal only.

Rosyth station reports excellent results against severe atmospherics by earthing the main aerial and receiving on the auxiliary aerial.

### LOW POWER STATIONS.

All are working very satisfactorily. New engines are being supplied to Dover and Culver Cliff. All L.P. Stations have been fitted to send "D" and have a range of about 60 miles with this wave. The value of the primary circuit is reduced by placing a 4-jar condenser in series with the main condenser while extra inductance is inserted in the Low Tension circuit to produce a good note. In general, the aerial L.S. is reduced by inserting a series condenser of about one-third jar at two-masted stations, and a shunted circuit of two jars and about four turns of tuner at one-masted stations.

*Medium Power Stations* continue to work well. Pembroke is now working on "S" wave instead of "W" wave. This is found to be a great improvement in the organisation.

### HIGH POWER STATIONS.

Horsea Experimental sets for investigation of both Quenched Spark and Poulsen gear have been set up in the Experimental Shed at Horsea.

Referring to alterations and improvements mentioned in report on Shore Stations in the W.T. Appendix to A.R., 1911:—

*Auto Transformer.*—These have now been accepted for Cleethorpes and Gibraltar.

*Magnetic Keys.*—New keys of a moving coil type have been ordered from the Marconi Company, the first ones accepted will be sent to Malta for the High Power Station at Rinella Bay. Meanwhile the old type of key in use at Horsea has been very much improved and now works quite satisfactorily, the only real objection to it being the amount of space it occupies.

Also, a different type of key has been devised by the Officer-in-Charge of Horsea Station. Lieutenant Ford, R.N., and it is to be supplied to Cleethorpes for trial.

The design appears promising.

*Receiving Circuit.*—The special receiving circuit at Horsea is not very satisfactory; its superiority over the standard set is very slight in sensitiveness while it is no more selective and is rather clumsy to work with.

*Roof Insulator.*—The top of the aerial tower has been reconstructed so as to reduce the strain on the deck insulator with entirely satisfactory results.

*Anti-Brushing Gear.*—Fitting of this device to Horsea aerial is now being carried out.

*Quenched Spark Experiments* have been proceeded with at Horsea, but were delayed for some time owing to pressure of work in "Vernon" and "Vindictive," and further, by alterations in the gaps which were proved to be necessary by experience gained by the "Vindictive's" cruise.

The experimental set was first fitted with air-blast gaps, but these gaps were found to last such a short time that no useful results or data could be obtained.

A set is now erected in which 10 closed gaps are used with a primary capacity of 150 jars, this is one unit, or one-twelfth of the final Q.S. set for the station, wherein 120 gaps will be employed, and takes about 6.5 K.W.

For further details, see page 19.

*Poulsen Experiments.*—Besides the Q.S. set, a Poulsen installation has also been placed in the experimental shed at Horsea, see page 19.

*Cleethorpes.*—This station continues to work well; considerable trouble has, however, been experienced from faulty working of the magnetic key.

The aerial coil has been slung outside the tower in order to lessen the strain on the deck insulator; this is found satisfactory.

It is intended to increase the height of the masts by 30 feet.

The power plant is being duplicated in order to render the station independent of the Grimsby cable.

The new plant consists of an oil engine and dynamo, capable of supplying the maximum power which the station can use, and also an auxiliary set for lighting, &c.

This plant should be complete about July 1913.

*Gibraltar.*—During the year, the North Front aerial has been completely refitted, swivels and new pattern aerial insulators being inserted. In addition, the old aerial insulators have been utilised to insulate the aerial hangers at the upper ends of the aerial wires, and a wire cage placed at the top of each wire to absorb brushing.

The results are extremely satisfactory, the new increased insulation preventing all sparking to earth and the production of heavy induced currents in the steel wire hangers, while the cages, which were devised by the officer in charge, stop all brushing.

The duplication of the power supply, and the protection of the North Front station, are under consideration. The efficient protection of the present station being almost impossible for various reasons, it has been recommended that the entire plant should be moved into chambers in the rock itself, and a duplicate power plant installed in addition.

Two positions of such a station are possible, one at the base of the rock and another in the galleries about 700 feet up. The aerial would, under this scheme, remain as at present. It is probable that with the station in the upper position there would be a considerable reduction in the

efficiency of the station, and it is recommended that experiments be carried out to test the efficiency before deciding on this arrangement. Either position would be fairly safe from shell fire and immune from aerial attack.

*Malta.*—But little has been done during the past year towards the completion of design for the final Q.S set at Malta High Power Station; this is due to pressure of work in other directions and to delay in the experimental work in connection with Quenched Spark apparatus.

It has been determined, therefore (A.L. M. 8163/12 of 10.8.12) to fit up an extempore spark set in the station, and this should be working by January 1913. The turbo-generators have arrived at Malta and are being set up in the Dockyard Power Station; with the temporary installation only a proportion of the power available can be used, but the station should be capable of communicating with England and Gibraltar, and will be able to signal to ships in any part of the Mediterranean. Certain spark gap accessories have been sent out from the Home High Power Stations, and an extempore spark gap is being made at Malta. The primary capacity for the final set is to be used, and the turbo-alternators will supply power to a 5-1 transformer. Suitable impedance coils are being made in England.

For the final set there are still to be designed:—The spark gaps and tanks, the transformer, and the oscillator.

## TRANSMISSION OF D AND P TUNES WITH MARK II. AND MARK I\*. INSTALLATIONS.

### *Transmitting Condenser for Mark II. Sets.*

A condenser Short Wave Pattern, No. 800, is now supplied for sending these waves with Mark II. sets. It consists of an ebonite condenser somewhat after the style of that described under the above heading on page 11 of last year's Appendix to Annual Report, in paragraph (c). This fits into a support, Patt. 1129, which clips on to the front of the condenser tank. Connections, Patt. No. 1180, consisting of two bent copper tubes and two terminals, are supplied to join up the condenser to the terminals of the main condenser, the series parallel clips being removed.

With the extra impedance coil described in G. and T. Orders of June 1909, approximate resonance is obtained at 360 cycles.

### *Aerial Circuit for Mark II. and Mark I\*. Sets.*

Considerable difficulty has been experienced in getting efficient results from these aerials on D and P tunes. It is of the first importance that ships should get the best results possible, especially on D tune.

For P tune the series condenser method is undoubtedly the best, but for D tune the best method varies according to the aerial and trunk leads in different ships. It cannot be laid down which method will give the best results in any particular ship. The two methods are the Harmonic method, described on page 12 of last year's Appendix to the Annual Report, and the series condenser method. Some ships find it easy to tune by one and not by the other. Those that get good results by one method should retain it, and those that are getting indifferent results, should try the alternative method.

A common fault found when tuning with a series condenser is that, however small the added capacity, the  $\lambda\sigma$  of the aerial will not come below about 15 mic jars. Under these conditions, of course, the harmonic method must be used.

## ANTI-BRUSHING AERIALS.

Final designs for anti-brushing gear have not yet been arrived at.

The gear described on page 13 of the W.T. Appendix to Annual Report, 1911, was fitted to form the feeders in "Vernon's" aerial and found fairly satisfactory; it was then decided to try similar fittings for a whole aerial instead of only in the feeders, and aeriels of this nature were fitted in "Vernon" and "Vindictive," thus expending all the special aerial wire and fittings obtained.

These aeriels seem quite satisfactory.

In the "Vindictive," in the port aerial, annular wood disc spreaders were used; these spreaders were made of 6-ply wood, five inches in diameter, grooved and slotted round the rim to take 20 wires and a binding wire, with a  $2\frac{1}{2}$ -inch diameter hole in the centre.

In the starboard aerial, copper disc spreaders were employed, these are described in the Annual Report for 1911 as are also the other fittings used.

Twenty-wire tubes were used throughout, except for a short 40-wire length at the deck insulator which was fed from the lower ends of the after legs of the aerial. Considerable power was used during an experimental cruise in June and July, but no brushing at all was observed except a slight amount across the strain insulators of the after legs in damp weather.

The deck insulator brushed freely (two broke down and had to be replaced) and there was some brushing, with occasional heavy sparking across the rigging insulators. This aerial was constructed on the 7th June, it was examined on the 20th August, when it was found that the wood spreaders in the roof portion of the aerial were inclined to split, but none needed replacement; a thick coating of soot was found on the after spreaders. One copper spreader was missing, the remainder were intact. Since then "Vindictive" has carried out another cruise and met a fair proportion of bad weather, but the aerial is still in good condition.

The capacity of these anti-brushing aeriels is found to be of much the same value as similar sized aeriels of the usual type. They are very easy to handle and can readily be stowed, made up, and ready for placing aloft.

The cone spreaders and metal disc spreaders are, however, difficult to fit, and different articles are now being made for trial and will be issued to sea-going ships.

A number of wood spreaders are on order, in these, 2-ply wood is being used, the material being teak. The metal spreaders on order are very similar to the wood discs in shape and size, and are being made in Navalium, a very light alloy.

End spreaders, branch fittings, and swivels, of a new type are also being made of this special metal.

A further quantity of the special phosphor bronze wire has been purchased and, on delivery of the new fittings, will be issued to selected ships for comparative trials of the various new and old spreaders.

### DESTROYERS' INSTALLATIONS.

The following destroyers have been fitted during the year :—

"Acheron."	"Druid."	"Jackal."
"Archer."	"Forester."	"Lapwing."
"Ariel."	"Goshawk."	"Lizard."
"Attack."	"Hind."	"Phoenix."
"Badger."	"Hornet."	"Sandfly."
"Defender."	"Hydra."	"Tigress."

All these installations are working satisfactorily. This brings the total number of destroyers fitted to 123.

Reports show that the introduction of the "C" type receiving set has greatly increased the range of destroyers.

*New Wave-Lengths.*—N.S. 6993/12216 of 13.8.12. In connection with the reorganisation of wave lengths it has been decided to make all destroyers capable of transmitting any wave between 635 and 2,000 feet; arrangements have been made for converting all existing combined spark-gap and oscillators Patt. 258, and for fitting future destroyers with a modified type of spark-gap and oscillator, so that these wave lengths can be obtained. An aerial coil will also be supplied.

### IMPROVEMENTS IN TRANSMITTING CONDENSERS.

The condenser is now clamped between gun-metal frames instead of wood boards, as latter used to grip the edges of the plates causing them to buckle; the gun-metal frame also allows of better circulation of oil.

The condenser tank is fitted with a removable wooden batten; this is placed over the base of the combined spark-gap and oscillator and screwed hard down; a woodite washer on the upper side of the base forms an oil-tight joint.

### COMBINED SPARK-GAP AND OSCILLATOR.

(See Plate I.)

*Base.*—Spark-gap and oscillator are mounted on a gun-metal base which carries the woodite washer referred to previously; the introduction of gun-metal in lieu of ebonite for the base prevents warping with the consequent leakage of oil. The H.T. terminals are led up through porcelain insulators. The oil indicator has been abolished and replaced by an improved form of oil filler.

*Spark-gap* is enclosed in a red glass cylinder mounted on a Fermite washer; this allows of spark-gap being seen, and also prevents short circuiting of spark-gap due to copper dust lodging on base. The spark-gap is kept in place by two insulated holding-down bolts.

*Primary* consists of  $5\frac{1}{2}$  turns of copper rod mounted on three insulated supports. A switch is fitted to short circuit all except the top turn; this allows of the correct coupling being obtained when transmitting the short waves. Tuning is arranged for by means of the adjustable vertical contact blades and tuning clips shown.

*Accessories for Oscillator Type 4.*—To enable existing oscillators to be converted so that they will be capable of transmitting the new waves, the following accessories will be supplied:—

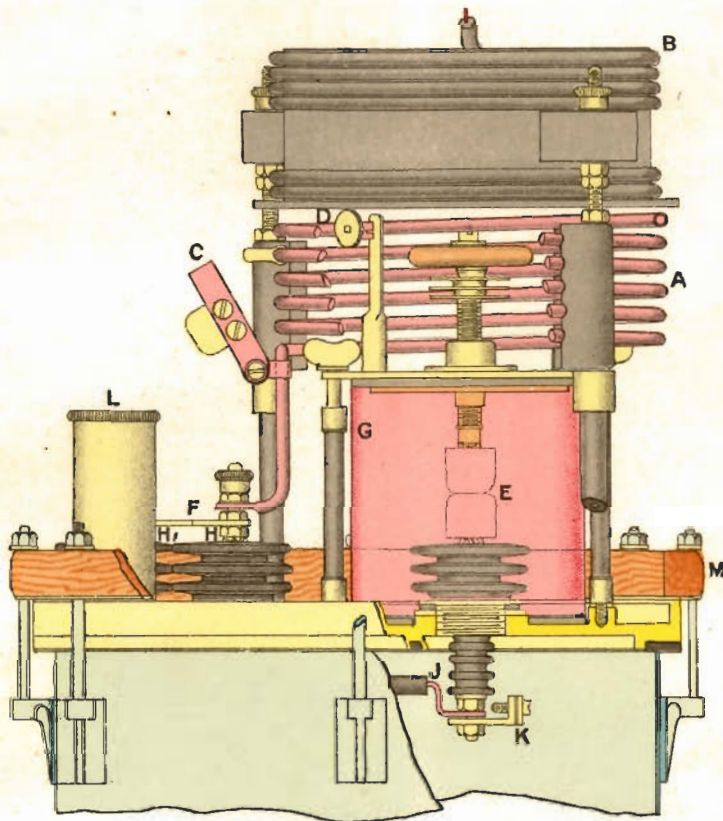
- (1) Primary coil fitted with three ebonite chocks, a short circuiting switch and two tuning contacts.
- (2) Two adjustable vertical contact blades.
- (3) A tuning clip.
- (4) Three brass bolts, fitted with nuts and washers, to replace existing supports for the mutual coil.

These articles will be fitted by the destroyer depôt ships.

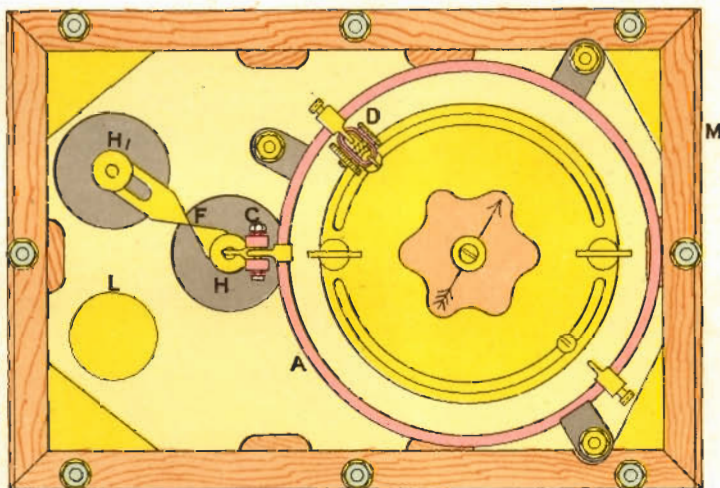
*Aerial Coil.*—For transmitting long waves an aerial coil is supplied. This consists of an ebonite cylinder with holes drilled along the top and bottom; this coil will be wound with Patt. 611 wire, each turn being kept in place by a lashing rove through the holes in the ebonite. There are sufficient holes to allow of 58 turns being wound, but the actual number required in any particular vessel will be determined when tuning the secondary. This coil will be short-circuited by a piece of 611-wire when transmitting on the short waves.

**OSCILLATOR AND SPARK GAP.  
TYPE 4:- (DESTROYER SETS.)**

ELEVATION.



PLAN.

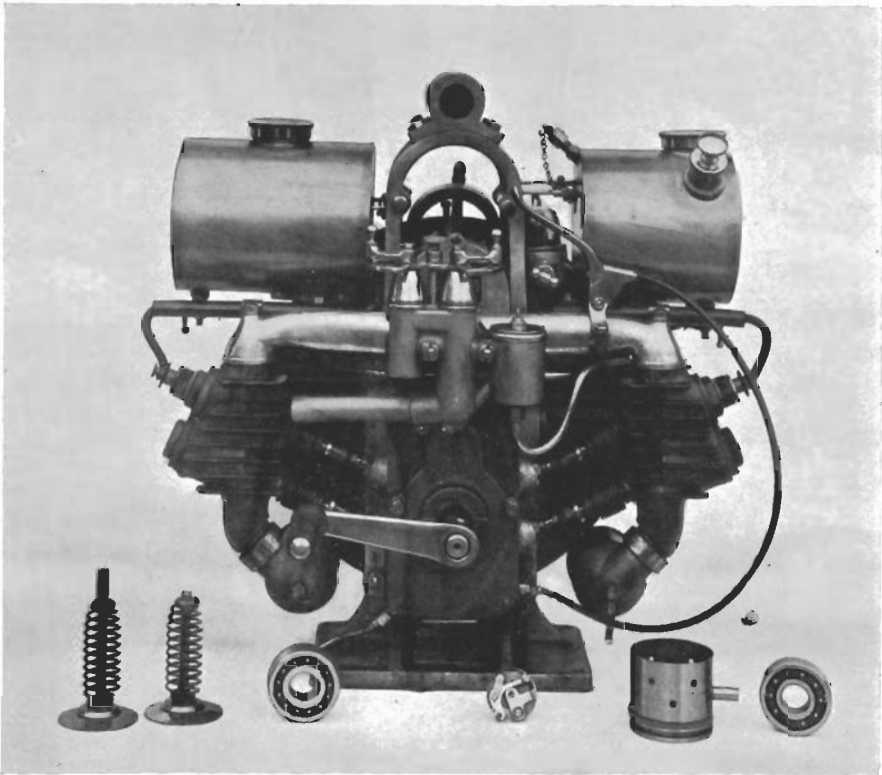


REFERENCE.

A	PRIMARY COIL.	G	RUBY GLASS CYLINDER.
B	MUTUAL COIL.	HH	HIGH TENSION TERMINALS.
C	SHORT CIRCUITING SWITCH.	J	CONNECTION TO H <sub>1</sub> .
D	TUNING CLIP.	K	CLAMPS FOR CONDENSER TABS.
E	ADJUSTABLE SPARK GAP.	L	OIL FILLER.
F	SAFETY SPARK POINTS.	M	SECURING CRADLE.



POWER GENERATOR  
FOR PORTABLE WIRELESS SET.



SPARE PARTS IN FRONT OF ENGINE FROM LEFT TO RIGHT.

1. Exhaust Valve.
2. Inlet Valve.
3. Ball Bearing, Flywheel Side.
4. Magneto Contact Breaker Disc.
5. Piston with Ring and Gudgeon Pin.
6. Ball Bearing, Timing Wheel Side.

*Insulators.*—Three insulators are to be fitted in the forestay of all T.B.D.'s.

Hempen aerial outhauls will be replaced by wire outhauls; 8 Patt. 1810 porcelain insulators will be issued to each vessel for dividing and insulating the wire outhauls. Each complete insulator consists of two porcelains in series.

*Ventilation.*—(G. 16908/12/16848 of 12.7.10.) In order to improve the ventilation of the office when steam is down and the circulator therefore not available, it is approved to alter the window on the starboard side of the office so as to open, hinging either at the side or the top.

*Instrument Board.*—This has been modified so as to accommodate the new circulator starter.

*Fitting of W. T. in Vessels of Patrol Flotillas.*—(G. 10024/12/26119 of 11.11.12.) The following vessels are to be fitted with type 4 W.T. installations, viz.:—

4 vessels in the 6th Flotilla.  
7 " " " 7th "  
15 " " " 8th "

Wavemeters will be supplied to the depôt or parent ships of these flotillas.

## PORTABLE AND HARBOUR DEFENCE SETS.

A considerable number of these sets have been issued during the last few months. Generally speaking they appear to give satisfactory results, but the following alterations have been found necessary:—

*Masts.*—The experiments with wood masts referred to on page 16 of W.T. Appendix to Annual Report, 1911, have not proved satisfactory; it is found however that the addition of a fourth set of stays greatly facilitates the erection of the masts and removes all danger of buckling the tubes. A fourth set of stays is being supplied to all portable masts.

*Stay Adjusters.*—Existing stay adjuster are too weak and fail to grip the wire properly when adjusted. An improved form of tent stay adjuster is being supplied.

*Receiving Boxes.*—The contacts at the earthing switch frequently fail to make good contact owing to the springs losing their temper; it has been decided to modify this switch in future designs, and to short circuit the connections in existing boxes as directed in G. and T. order.

*Power Generators.*—(N.S. 9107/13363 of 28.8.12.) The original petrol engines Patt. 1612, have not proved at all satisfactory, owing to faulty design and weakness of connecting rods and bearings, they are being replaced as they become defective by power generators Patt. 2150, see Plate (II.). These engines have given very good results, and provided ordinary care is taken should prove most reliable. Instructions for power generator Patt. 2150 are issued with each engine. Boxes for tools and spare parts will be supplied.

*Alternators.*—Trouble is sometimes experienced in exciting the alternators, this may be due to a dirty commutator, but it can be overcome by increasing the pressure on the D.C. brushes.

*Carts A. and B.* have now been delivered and are quite satisfactory.

*Earth Connection.*—If the portable set is erected in a position where a good earth connection can be obtained, it is recommended that this should be used in preference to the lower capacity aerial.

*Harbour Defence Sets.*—The harbour defence sets have been used during the mobilisation of the extended defences of the Naval Ports for communicating with the vessels engaged in the examination service and have proved quite satisfactory.

When using these sets it is most important that all sets should be carefully tuned to the same wave length; providing this is done little interference will be experienced from commercial wave lengths. Destroyers however interfere seriously and cannot be cut out at close range.

*Induction Coils.*—If the vessels carrying H.D. sets are provided with dynamos, it is advisable to supply a coil as stand by, but with the improved power generators, breakdowns should seldom occur.

*Erecting Portable Masts.*

(1) Drive pickets well in and at the same distance from heel of mast, *i.e.*, at three tubes length unless mast is erected on a slope when due allowance must be made.

(2) Raise mast a few feet off the ground with canting arm and see that the canting arm-stays are properly adjusted.

(3) Put one hand to attend each set of stays to steady the mast as it goes up; it is unnecessary to accurately adjust the side and back stays before the mast is up.

Providing this is done, no difficulty should be experienced in erecting the masts; they have been erected hundreds of times in the "Vernon" without ever damaging the tubes or fittings.

REPORT BY H.M.S. "ACTAEOX."

Trials are in progress with P.H.D. sets and a 500 feet wave-length. No satisfactory results have yet been obtained, owing to the continual breakdown of the motor engines supplied. These breakdowns are due to want of experience in management, excessive vibration, and the weakness of construction of many of the important parts.

Several cases of fracture due to vibration have occurred in the following parts:—

Ends of supply and exhaust pipes.  
Clamp securing carburetter.  
Petrol supply pipes.  
Oil leads.

The control for these engines is unsatisfactory for the following reasons:—

The governor cannot be depended on.  
Levers for petrol and air supply shake out of position due to vibration.  
Owing to the unsatisfactory working of the governor, control has to be exercised by holding air and petrol levers in the required positions.

These engines are of the P.H.D. type, made by Dixon Brothers and Hutchinson, Limited.

### SHORT-DISTANCE SETS.

*Ships fitted.*—The following ships are at present (December 1912) fitted with five-mile Short-Distance sets:—

“ Africa.”	“ Colossus.”
“ Agamemnon.”	“ King Edward VII.”
“ Bellerophon.”	“ Lord Nelson.”
“ Dominion.”	“ Neptune.”
“ Dreadnought.”	“ Thunderer.”
“ Hibernia.”	“ Vernon.”
“ Hercules.”	

The policy is to fit Cruisers with a 20-mile set when a satisfactory design has been brought out, and to fit Battleships with the 5-mile set. The classes of ships to be fitted are not yet settled.

*Reports from Sea.*—Reports from sea show that the existing Short-Distance sets have been working with moderate satisfaction during the past year, and their utility was fully exemplified during the recent Manœuvres.

By A.L.G. 19047/12/19757 of 21.8.12, a report was called for from C.-in-C. Home Fleets, the object being to ascertain the precise requirements of Short-Distance sets for Battleships and Cruisers in view of recent developments in W.T., and experience gained in the use of the existing Short-Distance sets at sea. From the reports of the various Flag Officers, it appears that the consensus of opinion at sea, is as follows:—

1. That there should be two different types of Short-Distance sets, one for Battleships and the other for Cruisers.
2. That the minimum possible range that would meet requirements should be 5 miles for Battleships and 20 miles for Cruisers.
3. That provided that it was practicable to increase these ranges without great sacrifice of selectivity, then the Cruisers should have a maximum range of 30 miles, but no increase in the Battleship range is necessary.
4. That complete mutual immunity from interference between the Main and Short-Distance sets is more desirable than range.
5. That Battleships and Cruisers should not work on the same wave-length; opinions however being divided as to whether each set should have more than one wave-length.
6. Feeling is strongly against complications in design, but provided that Telegraphists are supplied to work the sets, then complications are not considered to be of any great consequence.

With regard to paragraphs 4 and 5 of the above, the C.-in-C. Home Fleets does not consider that complete mutual immunity can be obtained, and deprecates any reduction in the ranges quoted. Further, he considers two wave-lengths, at least, for each installation essential, one wave-length being common to both types.

The “Vernon” recommended to the D.N.O., dated 8th November, in reply to D.N.O.’s 2764/151, that in order to give effect to the above, the Battleships set should be left untouched for the present, the Cruiser set being designed for a range of 20 miles and 2 wave-lengths, one of which should be the same as the Battleships wave.

*Improved Sets in Battleships.*—The sets now being fitted into battleships include several small improvements and modifications to instruments, &c., such as the use of the Box Screening type “C” and the Hand Operating Key, as laid down in the revised Specifications for Short-Distance Sets.

*New Design of Sets for Cruisers.*—In anticipation of the 20-mile Short-Distance Set being brought into existence, Silent Cabinets and Aerial Trunks are being fitted in the approved Cruisers when they come in hand for refit, and an additional deck space, 2 feet 6 inches by 4 feet in size, outside the Cabinet, has been reserved to accommodate the proposed new transmitting apparatus.

*Rigging Insulators.*—To avoid mutual interference between the Short-Distance and the Main Sets in ships, it has been decided to double the number of Porcelain Rigging Insulators at present fitted so as to increase the insulating effect.

## WOODITE WASHERS.

It having been pointed out that Woodite washers become very soft after being immersed in hot oil for some time, tests have been made in "Vernon" to see whether any other material could with advantage be used instead of Woodite for washers in condenser tanks, &c. Samples of Woodite were tested some years ago under oil and gave satisfactory results, but the oil was not heated, and apparently Woodite has a very much shorter life under hot oil than it has under cold oil.

In the tests recently made, samples of Woodite, Dexine, Dermatine, and various qualities of oil-dressed leather were suspended over a vessel of oil so that half of each sample was immersed in the oil, the other half being in the air. The vessel with these samples was placed in an electrical oven, in which the temperature fluctuated from about 50° Fahr. at night time to 160° or occasionally 170° Fahr. in the day time. The samples were left for one month, and at the end of this time it was found that that portion of the Woodite which had been immersed in the oil had almost entirely dissolved and lay at the bottom of the vessel in the form of a black jelly. The Dexine and Dermatine samples had also to a great extent dissolved, the oil having converted them into a black jelly-like substance. In the case of all the samples of oil dressed leather, however, the material after the test appeared to be just as good as it was before.

It is considered that this test proves conclusively that oil-dressed leather is much superior to Woodite in any position where it is likely to be brought into contact with warm oil, and therefore it is proposed in future to specify washers of oil-dressed leather in specifications where at the present time Woodite is specified.

## MOTOR BUZZERS.

In view of the continued success of the motor buzzer at sea, it has been decided to supply all ships fitted with Type I. installations with these buzzers. (N.S. 6550/10057 of 27.6.12.)

The motor buzzer will eventually supersede the buzzer transmitter. No further supplies of the latter are being obtained.

The theoretical considerations governing the action of the motor buzzer are undoubtedly very complicated, and they have not yet been fully investigated, but, generally speaking, the action appears to be as follows:—

When the outer brush rests on a conducting segment of the wheel, the charging circuit through the inductance is completed; current flows in this circuit, but does not immediately attain its maximum value owing to the inductance. When an insulating segment is brought under the outer brush, the inductive circuit is broken, and a high voltage is therefore created across the transmitting condenser, thereby charging it. This voltage depends on (1) speed of break; (2) inductance in the circuit.

The transmitting condenser remains charged until the outer brush approaches a conducting segment, when a spark occurs at the brush, and an oscillatory discharge of the condenser takes place. The process of charge and discharge is then repeated.

It will be seen that the spark occurs at the moment when the outer brush makes contact, and not at "break."

This sparking is severe at full power, and in course of time burns away the outer brush, but it must not be regarded as harmful.

After a long series of experiments in "Vernon" it has been found that the following are what may be termed the critical points in design:—

- (1) Insulating segments in wheel. These should be as small as possible compatible with non-sparking over at full power, *i.e.*, when no series resistance is being used in the charging circuit.
- (2) Inductance. Generally speaking, a large low resistance inductance of the order of Henries is required. Iron core inductances of low resistance wire are used.
- (3) Brushes. These should be made of some tough springy material and as thin as possible;  $\frac{1}{16}$ th phosphor bronze has been found to work satisfactorily. The best position for the outer brush is midway between the centre and top of the wheel.

## DESCRIPTION OF MOTOR BUZZER.

(See Plate III.)

*Motor.*— $\frac{1}{4}$ -B.H.P. shunt motor mounted on a teak base.

*Starter.*—Combined starter and controller, mounted inside the silent cabinet; the controller gives three speeds, viz., 2,000, 2,500 and 3,000 revs. per minute. By altering the speed of the motor the note can be varied, but when endeavouring to obtain the maximum range it is better to run the motor at full speed.

*Wheels.*—These are fitted with ten insulating segments, the insulation consisting of thin mica strips secured in place by brass wedges at the sides. The wheels are insulated from the armature shaft by means of an ebonite bush. Separate wheels are required for 220 and 100 volt ships, those for the latter having smaller insulating segments. The correct amount of insulation was determined by fitting two brushes in series on the outside of the wheel; by moving one brush up or down the amount of insulation was varied at will.

*Brush Holders.*—Consist of vertical brass columns, mounted on adjustable bases and carrying the brush holders. The outer brush consists of  $\frac{1}{8}$ -th phosphor bronze and the inner brush of gauze wire.

*Series primary Switch.*—An electrically operated series primary switch has been introduced for the following reasons; when the wheel is stopped the outer brush may be resting on a conducting segment, thus completing the primary circuit. Oscillations of the aerial due to incoming waves will therefore tend to set up oscillations in the primary, and energy will be wasted which would otherwise pass into the receiving circuit. The switch is mounted on the teak base board and operated by the motor starter, so that when motor is switched on switch completes the primary circuit breaking it when motor is switched off.

*Resistance Board.*—A resistance board is supplied to allow of the strength of signals being reduced by inserting resistance in the charging mains. Seven lamps are mounted on the board, viz., 2  $2\frac{1}{2}$ -c.p., 1 16-c.p. and 4 50-c.p. lamps, and by means of plugs the lamps can be arranged in series and parallel, or for full power all the lamps can be short circuited.