

FLEET WIRELESS TELEGRAPHY EXERCISES.

Carried out in Mediterranean, August 1908.

(Commander-in-Chief's Memorandum No. 542 of 14th September 1908.)

First exercise.

In the first exercise four ships, the "Queen," "Prince of Wales," "Glory," and "Goliath," represented the Battle Fleet; the "Bacchante" and "Lancaster" represented cruisers; and the "Suffolk" a commercial shore station.

The battleships passed 16 messages to the cruisers, all of which were received correctly; and four messages to the "Suffolk," who received two correctly.

The cruisers passed 13 messages to the Battle Fleet, all of which were received correctly.

The "Suffolk" passed three messages to the Battle Fleet, through "Goliath," of which two were received correctly. A mistake was made in the coding of the third message.

Second exercise.

In the second exercise three ships, the "Queen," "Glory," and "Ocean," represented the Battle Fleet; and nine other ships represented cruiser and shore Stations.

A transposition cypher was used in connection with the Signal Book Codes.

"Queen" sent 39 messages. All received correctly, except one error in signalling.

"Queen" received 29 messages, one error in coding. 31 other Service messages were sent, one of which was not passed on, the remainder being received correctly.

Exercise messages.

149 exercise messages were also sent. There was a greater percentage of mistakes in the exercise messages, as it frequently occurs that steps are not taken to verify exercise messages which appear to be incorrect, and in some cases these messages were not decoded until a considerable time after they were received.

EXTRACTS FROM REMARKS OF COMMANDER-IN-CHIEF.

Land effect.

During the exercise, the difficulty of communicating with Malta across the Sicilian mountains, when approaching the Straits of Messina from the north, was very apparent.

Badly coded messages.

Badly coded messages were a frequent source of delay. A Service message of 30 groups, for instance, was considerably delayed by interference, and this message could have been as clearly coded in 20 groups, which would have minimised delay and chances of error.

Necessity for brevity in signals.

It is absolutely essential that W.T. messages be worded as concisely as is consistent with clearness. For example:—

- (a) Such expressions as "Your Signal of 10.30 p.m. G.M.T., of Thursday last, the 4th of October," should be worded as "Your 22.30, Oct. 4."
- (b) Words such as "Submitted," "Reply," should be omitted when there is no risk of creating uncertainty by doing so.

The manner in which press telegrams are at present signalled by W.T. clearly shows that in many cases no care is taken to properly prepare messages for transmission by W.T.

More attention is to be paid in future to the preparation of messages, whether in code or "en clair."

Checking of messages.

When a message is not understood, the receiving ship should ask for it to be checked and repeated, as mistakes often arise through the receiving ship making I.M.I. only, and the sending ship then repeating the message without checking it.

Causes of mistakes.

Mistakes frequently arise through insufficient attention being paid to—

- (a) The formation of block letters in writing out coded messages.
- (b) All available information being turned over from the operator on watch to his relief.

BREVITY NECESSARY IN SIGNALS.

EXTRACT FROM HOME FLEET MEMORANDUM NO. 28, 29TH OCTOBER 1908.

In order that Officers should get into the habit of making signals to be sent by W.T. as short as possible, the following instructions are to be observed:—

Messages by W.T. are to be expressed in as terse a manner as is possible, consistently with clearness.

Superfluous matter is to be carefully avoided. The following are examples of unnecessary matter at present commonly found in W.T. messages :—

- (a) "Hannibal" having called up "Cæsar," begins her message by—"Hannibal to Cæsar stop Captain to Captain stop."
- (b) "Isis" having called up "Dreadnought," begins :—"Captain to Commander-in-Chief stop."
- (c) Very often long signals are made by vocabulary hoists, when their purport can be transmitted by one hoist from the Supplementary Code.

The words "Submitted," "I request that you," and similar expressions, are in future to be omitted from W.T. signals between Officers in the Home Fleet.

The word "Submitted" may be left out in addressing signals to ships under the command of the Commander-in-Chief, Channel Fleet, who has issued orders similar in effect to those contained in this Memorandum.

EXPERIMENTS WITH EXTEMPORISED WIRELESS IN SHEERNESS PORT DEFENCE FLOTILLA.

In the latter part of 1907, and the beginning of this year, the "Actæon" fitted extemporised wireless installations to certain torpedo boats and other vessels in the Sheerness Port Defence Flotilla.

Experiments were made with a 550-foot wave and an 850-foot wave. With the latter good results were obtained between the "Actæon" and the "Gossamer," T.B. No. 114 and T.B. No. 117.

Provision has been made in the Estimates for 1909-10 for a W.T. set suitable for Harbour Defence purposes, and experiments are now in progress for the preparation of the design.

LOCAL EFFECTS OF LAND.

(Home Fleet W.T. Memorandum No. 27, "Dreadnought," 2nd October 1908.)

The following information as to the local effect of land on Wireless Signalling, in certain places, is supplied from the Home Fleet. Similar information relating to other places should be obtained and recorded whenever the screening effect of land is experienced :—

Queensferry.—Ships anchored within half a mile of the Forth Bridge have difficulty both in sending and receiving long-distance W.T. signals.

Ballaclulish.—The strength of W.T. signals is reduced by about 50 per cent. in all directions except between south and west.

Oban.—Signals from the direction of Belfast are much weaker in the inner anchorage than in the outer, but signals to the N.E. are equally clear.

Cromarty Firth.—Signals to ships to the west and S.W. are very weak.

Ullapool.—Signals are much screened except between S.S.W. and north. With Mark I. gear no communication can be obtained with the East Coast of Scotland, Ballaclulish, or Oban, but clear signals have been exchanged with ships at Belfast.

REPORTS FROM SHORE STATIONS ON ATMOSPHERICS.

SUMMARY OF REPORT OF 9TH NOVEMBER 1907 FROM ESSEX HILL W.T. STATION, ALDERNEY.

It was observed that Clifden often has great difficulty in communicating with Glace Bay, owing to interference and atmospherics. On one occasion messages took 24 hours to get through.

It has been noticed on several occasions that the signals from Glace Bay are strongest at Alderney when unreadable at Clifden. This is probably due to the disposition of atmospherics. Somewhat similar results were noticed when working with ships at Tetuan; signals got gradually stronger, then died away.

EXTRACT FROM FELIXSTOWE'S REPORT ON "OBSERVATIONS OF ATMOSPHERICS."

The disturbance is usually greater throughout June, July, August, and September.

It is most often bad at night, coming on at sunset, and sometimes ceasing quite suddenly at daylight.

The wave-lengths of atmospherics vary under different conditions, and by using the rejector it is sometimes possible to cut them out almost entirely on one tune when signals are quite unreadable on another.

Generally speaking, it may be said that with the glass falling, atmospherics of a long wave-length may be expected.

Clear atmosphere, but sky overcast, showing signs of rain : atmospherics of fairly short wave-length, affecting "Q" and "R" tunes mostly.

Atmosphere hazy in hot weather : atmospherics of uncertain wave-length.

The disturbance from a passing heavy cloud, hail or snow storms is totally different in nature, causing a sound in the telephones not unlike a tapper when the relay is running away. At these times there is nothing to do but to earth the aerial, when a spark, sometimes an inch long, may be got off the aerial to earth, and some unpleasant shocks.

MAIN TOPGALLANT MASTS TO BE FITTED IN LIEU OF GAFFS IN SHIPS FITTED WITH MARK I. INSTALLATION.

It has been approved for a properly stayed topgallant mast to be fitted in lieu of the Wireless Gaff on board certain classes of H.M. Ships whenever the latter carries away or becomes defective. (A.L.G. 5068/10544, 22nd May 1908.)

PRÉCIS OF REPORT ON WIRELESS TELEGRAPHY WORK CARRIED OUT IN CONNECTION WITH THE SUPPRESSION OF PIRACY IN CANTON DELTA. DECEMBER 1907—JANUARY 1908.

At the end of 1907, the Commander-in-Chief in China, in order to bring himself into closer touch with vessels of the Patrol in Canton Delta, and to facilitate communication between the vessels themselves, decided to fit certain of them with Wireless Telegraphy.

W.T. office.

The Destroyer "Hart" was first fitted, experimentally, to determine the simplest extempore arrangement which would give the destroyers a reliable signalling range of 50 miles.

A house was built on the upper deck consisting of a framework of 1-inch angle irons, bolted together with $\frac{1}{2}$ -inch bolts and nuts; roof of the house and back of instrument bench boarded in with 1-inch planking.

The whole covered with painted canvas.

Dimensions.—Length, 6 feet; breadth, 5 feet; height, 6 feet 6 inches; weight of house and instruments, 638 lbs.

Mast.

A 50-foot bamboo topmast was substituted for the small topmast originally fitted, and 12-foot bamboo spreaders were fitted on ensign and jack staffs.

Aerial.

This allowed of a four-fold aerial, 170 feet long, with 12-foot spread. This aerial, with a single feeder from masthead to office, has a natural wave-length of 1,100 feet.

Range.

Using plain aerial, with a 10-inch induction coil worked off the dynamo, communication with the "King Alfred" was maintained over 50 miles of land, including hills 2,000 feet high.

"Cadmus" and
"Clio."

A little later the two sloops, "Cadmus" and "Clio," were fitted with Service Mark I. (for sending "Q" tune only). Bamboo topmasts were supplied and four-fold aerials, 200 feet long, L.S. about 60 mic-jars, were fitted. The "Cadmus" was also supplied with tuned shunts.

Destroyers fitted.

About the same time the "Fame," "Virago," and "Handy" were fitted on the same lines as the "Hart." All destroyers used plain aerial.

All vessels used magnetic detectors with tuners; and old key condensers were used as telephone condensers.

At no time was there any difficulty in communication between "Cadmus," at Canton, and "King Alfred," at Hongkong (distance 70 miles). From 9 a.m. to 10 p.m. daily there was never more than a few minutes' pause between signals.

Destroyers on the West River were in communication with "King Alfred" direct as far as Kumchuk (68 miles), but could not communicate direct from Samshui (90 miles) on account of high land intervening, signals being passed through "Cadmus" at Canton.

Cutting out
interference.

During the first part of the operation the "Cadmus" frequently had much difficulty in reading signals from destroyers on account of interference from the Chinese W.T. Stations at Canton, 2 miles distant, working with a 350-metre wave-length (destroyers' wave length, 1,100 feet). To remedy this, tuners wound with Pattern 611 wire were sent to destroyers, and their wave-length was adjusted to "Q" tune by trial with "Cadmus" at Canton.

When receiving on "Simple Resonance," signals from destroyers on "Q" tune were considerably weaker than signals on their natural wave-length, but "Q" tune signals received with 25 jars plugged up in the rejector were better than signals of the 1,100 feet tune with any arrangement. After destroyers' wave-length had been adjusted to "Q" tune, "Cadmus" had no further difficulty with interference from the Chinese W.T. stations. The use of "Q" tune by destroyers also facilitated signalling, as all vessels were then on the same wave-length.

Operators were lent from "King Alfred," "Tamar," "Monmouth," and "Kent." Operators. Six non-signal ratings under instruction for the rating of telegraphist were also employed.

During the operations it was very noticeable that when ships at Hongkong were experiencing very bad atmospherics, ships a few miles inland, with the same height and size of aerial, could detect no atmospheric disturbance at all. From this it appears that atmospherics at Hongkong are very local and travel a very short distance. Atmospherics.

It has been decided to fit the "Cadmus" and "Clio" permanently with Mark I* installations, and to allow three of the destroyers to retain their present installations.

EXTRACT FROM THE COMMANDER-IN-CHIEF'S CHINA, REPORT ON
CHINESE WIRELESS TELEGRAPHY IN THE CANTON DELTA,
DATED 22ND FEBRUARY 1908.

There are at present two stations in working order in Canton Delta, one in Canton City and one in Danes Island. These were originally experimental stations, but have now been taken over by the Navy.

There will be 10 Stations, viz. :—Danes Island, Bogue Forts, four in West River, two in East River, and two in North River.

All the instruments for these stations have been ordered from the Telefunken Company.

In addition to these shore stations, the patrol vessels are to be fitted with Wireless Telegraphy.

Transmitting gear consists of large type accumulators, mercury turbine interruptor, large induction coil, seven large Leyden jars, and multiple spark gap.

The Leyden jars and multiple spark gap are contained in a wooden case, round which is wrapped the oscillator inductance. Aerial and primary circuits are directly coupled; coupling used is from 8 to 10 per cent. The wave-length at present in use is 350 metres. Coherer and inker are used for receiving.

The Telefunken Company attempted to introduce telephonic receiving instruments, but the operators petitioned the Viceroy to spare them the indignity of wearing a telephone head-dress, and the Viceroy forbade the use of it in ships and shore stations.

Multiple vertical aeriels are used.

A spark gap of 1 mm. is inserted in the transmitting circuit between the oscillator and the aerial, to avoid having to disconnect the transmitting circuit when receiving. The Telefunken Company's representative stated that when reading signals at the extreme range of a station, no difference could be noticed, whether this spark was in use or short-circuited. The rate of signalling is necessarily very slow, as all official messages have to be made in the groups of figures representing the Chinese characters, and since as many as 8,000 characters are used in telegraphy, a code book has to be resorted to for coding and decoding messages.

All instruments and details of the installation appear very good, and the authorities are apparently anxious to make the fitting of ships and stations a success.

WIRELESS TELEGRAPHY IN THE JAPANESE NAVY.

EXTRACTS FROM REPORT FROM COMMANDER-IN-CHIEF, CHINA, 5TH JUNE 1908.

The "Kimura" system (plain aerial and coherer receiving instruments) is still in use in the Navy.

During the last year extensive experiments have been carried out to decide whether it would be desirable to introduce an "Oscillator" system into the Navy.

There is not sufficient money available to equip ships and shore stations with a satisfactory high power system, and 100 to 150 miles is generally considered a sufficient signalling range for ordinary purposes. The authorities will not sanction the formation of a separate Wireless Telegraphist branch, but consider that two of the ship's Signal Staff, who have had some instruction in Wireless Telegraphy, are sufficient to carry on the work satisfactorily in each ship, while the care of the instruments is the work of the Torpedo party.

Taking into consideration the fact that very little money would probably be available to arrange an oscillator system, and that this system, if supplied, would have to be worked by men with very little knowledge, it was decided that it would be preferable to continue using "plain aerial," which is very satisfactory at moderate ranges and

requires little knowledge on the part of the signalmen operators. Two "receiving Boxes" and two mercury turbine interrupters are supplied to each installation. The interrupters are worked with a load up to 15 ampères (80 volts).

It is expected that orders will shortly be given to arrange three or four wave-lengths in ships, special receiving transformers being supplied for each tune. (A large number of jiggers have already been prepared.)

Wave-lengths.

Wave-lengths in use at present are :—

Shore Stations	- - - - -	600 to 700 metres.
Ships	- - - - -	450 metres.
Destroyers	- - - - -	200 "

Aerials.

Four-fold vertical aerials are still in use, but it is expected that when orders are given to tune ships to certain wave-lengths orders will also be given to fit roof aerials:

Call signs.

All ships in the Navy have two-letter call signs, all shore stations have two-figure call signs.

Torpedo boats.

It has been decided that torpedo boats are not to be fitted with Wireless Telegraphy, though all destroyers are fitted.

Wireless Telephony.

Experiments in Wireless Telephony are being carried out by Professor Kimura, but up to the present not much progress has been made.

MARK II. SHIP ESTABLISHMENT.

Permanent Stores.

Pattern No.	Article.	Denomination of Quantity.	Ships.	Remarks.
2332	Arm rest - - - - -	No.	1	To be issued till present stock is exhausted.
451	Ammeter, hot wire, A.C., 0-100 ampères.	"	1	
455	Ammeter D.C., 200 ampères 220 volts	"	1	To ships with— 220-volt machines.
454	" " 400 " 100 "	"	1	100 " "
453	" " 500 " 80 "	"	1	80 " "
2327	Aerial and earthing terminals - -	"	1	
492	Blower, 80 volts - - - - -	"	1	80 " "
493	" 100 " - - - - -	"	1	100 " "
494	" 220 " - - - - -	"	1	220 " "
496	Blower, starter for, 80 volts - -	"	1	80 " "
497	" " " 100 " - - - - -	"	1	100 " "
498	" " " 220 " - - - - -	"	1	220 " "
470	Bolts, spring, for securing instruments	"	20	
217	Control pedal and catch - - - -	"	1	To be issued till present stock is exhausted. New design in preparation.
1000	Circulator, 80 volts - - - - -	"	1	Ships fitted, 80 volts.
1001	" regulating switch - - - - -	"	1	" "
2344	" 100 volts - - - - -	"	1	To ships with 100-volt machines.
2345	" regulating switch - - - - -	"	1	" "
515	" 220 volts - - - - -	"	1	To ships with 220-volt machine.
516	" regulating switch - - - - -	"	1	" "
2346	Ventilating hose - - - - -	Lengths	2	
443	Cut-outs, D.P. for concentric cable -	No.	1	

Mark II. Ship Establishment.—Permanent Stores—continued.

Pattern No.	Article.	Denomination of Quantity.	Ships.	Remarks.
446	Change-over switch D.C., 80 volts -	No.	1	To ships with 80-volts machine.
447	" " " 100 " -	"	1	To ships with 100-volts machine.
448	" " " 220 " -	"	1	To ships with 220-volts machine.
449	" " A.C. - -	"	1	
489	Coil impedance - - -	"	1	
478	Condenser, tank for - - -	"	1	
273	Concentric cable - - -	Yards	—	As required.
452	Frequency metre, 320-380 cycles -	No.	1	
2293	Insulators, deck - - -	"	1	
2326	" " " fitting for - - -	"	1	
462	Key resistance - - -	"	1	
469	Kicking coils, 80-100 volts - -	"	4	For 80 and 100-volt machines.
508	" " 220 " - - -	"	4	For 220-volt machines.
216	Lever and Bowden wire - - -	"	1	To be used till present stock is exhausted. New design in preparation.
459	Magnetic key, Mark II., 80 volts -	"	1	80-volt machines.
460	" " " 100 " -	"	1	100 " "
461	" " " 220 " -	"	1	220 " "
431	Motor alternator, 220 volts - -	"	2	220 " "
427	" " 100 " - - -	"	2	100 " "
423	" " 80 " - - -	"	2	80 " "
433	Field regulator for motor :— 220 volts - - -	"	1	220 " "
429	100 " - - -	"	1	100 " "
425	80 " - - -	"	1	80 " "
434	Field regulator for alternator, 220 volts	"	1	To ships with— 220-volt machines.
430	" " " 100 " "	"	1	100 " "
426	" " " 80 " "	"	1	80 " "
432	Starter for motor alternator, 220 volts	"	1	220 " "
428	" " " 100 " "	"	1	100 " "
424	" " " 80 " "	"	1	80 " "
514	Radiator, 220 volts - - -	"	1	220 " "
228	" 100 " - - -	"	1	100 " "
227	" 80 " - - -	"	1	80 " "
215	Send-recvie switch - - -	"	1	To be issued till present stock is exhausted. New pattern in preparation.
421	Safety switch for screen - - -	"	2	
422	" " " fittings for	Set	1	
442	Switch, D.P. relay, 220 volts - -	No.	1	220-volt machines.
441	" " 100 " - - -	"	1	100 " "

Mark II. Ship Establishment.—Permanent Stores—continued.

Pattern No.	Article.	Denomination of Quantity.	Ships.	Remarks.
440	Switch, D.P. relay, 80 volts - -	No.	1	80-volt machines.
484	Spark gap, Mark II. - -	"	1	
487	" " stand for - -	"	1	
488	" " transmission gear for. - -	Set	1	
439	Transformer, high frequency - -	No.	1	
450	Voltmeter, hot wire, 500 volts -	"	1	
2328	Switch, D.P., single-way telephone -	"	1	
49E	B. 8. Cocks, bib, for oil tank, $\frac{3}{4}$ -inch -	"	1	
306	E. 5. Clocks, deck with second-hand (d) 8-inch face.	"	1	Patt. 305 will be issued in lieu until present stock is exhausted.
507	F. 1. Air escape - - - (d)	"	1	
1831	Buzzers, terminal - - - (d)	"	3	
1784	Coils, spark in case - - - (d)	"	1	1 in addition when W.T. expert is borne. See allowance of oil insulating.
28	Cans, oil, 2 gallons - - -	"	20	
485	Coil, aerial - - - (d)	"	1	
486	" mutual - - - (d)	"	1	
464	Coils, protecting - - - (d)	"	2	
477	Condenser, transmitting - (d)	"	5	
2174	" Telephone - - - (d)	"	1	
2282	" No. 1, Mark II. - (d)	"	1	
2274	" No. 2, " - (d)	"	1	
2290	" No. 3 - - - (d)	"	1	
2291	" No. 4 - - - (d)	"	1	
525	" No. 5 - - - (d)	"	1	
229	Detector, magnetic, double wound (d)	"	2	Patt. 2067 to be issued until stock is exhausted. 1 in addition where W.T. expert is borne.
2340	Earthing clip - - - (d)	"	1	
444	Fuze holders - - - (d)	Set	2	
466	Horns, protecting - - - (d)	"	1	
1056	Keys, single current, P.O. B. - -	No.	4	
2065A	Key side lever, Mark II. - -	"	1	
2279	Inductance, adjustable, Mark II. (d)	"	1	
222	Insulators, strain - - - (d)	"	8	
2066A	Leyden jars, fittings for - (d)	"	30	30 in addition where W.T. expert is borne.
1025	Magnetic key, Mark II., spare parts for :— Bobbin for Patt. 459 - - -	"	1	For 80-volt supply.
1029	" " 460 - - -	"	1	" 100 "

Mark II. Ship Establishment.—Permanent Stores—continued.

Pattern No.	Article.	Denomination of Quantity.	Ships.	Remarks.
	Magnetic key, Mark II., spare parts for—continued.			
1033	Bobbin for Patt. 461 - -	No.	1	For 220-volt supply.
1026	Shunt resistance for Patt. 459 -	"	1	" 80 "
1030	" " " 460 -	"	1	" 100 "
1034	" " " 461 -	"	1	" 220 "
1027	Series resistance for Patt. 459 -	"	1	" 80 "
1031	" " " 460 -	"	1	" 100 "
1035	" " " 461 -	"	1	" 220 "
1028	Condensers for Patt. 459 - -	"	1	" 80 "
1032	" " 460 - -	"	1	" 100 "
1036	" " 461 - -	"	1	" 220 "
	Motor alternator:—			
291	Outfit for 80 volts - -	Sets	2	" 80 "
292	" " 100 " - -	"	2	" 100 "
293	" " 220 " - -	"	2	" 220 "
490	Motor alternator, slings for - -	"	1	
505	Oil container - - -	No.	2	
506	" indicator - - -	"	1	
231	" pumping outfit - - -	Set	1	
463	Oscillator primary - - -	No.	1	
2335	Receivers, telephone - -	Prs.	4	2 pairs in addition where W.T. expert is borne.
2336	" headgear for - -	Sets	4	2 in addition where W.T. expert is borne.
—	Repair outfit for thermo-galvanometer	"	1	
221	Tension springs for aerial - -	No.	4	
465	Terminals, high voltage - -	"	8	
2181	Tuner - - - -	"	1	
467	Transformer, high-frequency switch for.	"	1	
	Wavemeters:—			
2294	Box A - - - -	"	1	} 1 in addition where W.T. expert is borne.
2295	Box B - - - -	"	1	
2296	Thermo-galvanometer - -	"	1	
2297	Condenser - - - -	"	1	
2188	Inductances - - - -	Set	1	
287	Centre fitting for aerial - -	"	2	
286	End fitting for aerial - -	"	4	
527	Copper piping for W.T. connections	Length, 15 feet.	2	
2072	Resistance for spark coil - -	No.	2	
510	Reference tables, small size - -	"	1	
511	" " large size - -	"	1	
512	Writing tablet for small size -	"	1	

Mark II. Ship Establishment.—Permanent Stores—*continued.*

Pattern No.	Article.	Denomination of Quantity.	Ships.	Remarks.
513	Printed card for large size - -	No.	12	
2076	Trays for 6 Leyden jars - -	"	1	
2077	" 15 " - -	"	1	
103	Box, teak, containing tools - -	"	1	<i>See Rate Book for articles contained in box.</i>
20	Oil can - - - -	"	1	
400	Funnel for oil filling gland - -	"	1	
1223	F. 2. Batteries, test, 1 cell - - -	"	1	
1918	Pushes, pear-shaped - - -	"	1	

Consumable Stores.

8A	E. 2. India-rubber vulcanised sheet, (xx) 2 feet by 2 feet by $\frac{1}{8}$ inch.	Sheets	1	
42A	E. 7. Knotting - - - (x)	Galls.	ZZ	ZZ. To be obtained from carpenter. X. First supply. V. Maintenance.
—	Oil, insulating, special - - (xx)	"	80 X 40 V	
447	E. 8. Wax, paraffin - - (xx)	Lbs.	4	
7	E. 11. Brushes, painters' tool sash, No. 2 (x)	No.	1	
22	Skins, chamois leather - - (x)	"	2	
981	E. 12. Cloth, flour, emery - - - (x)	Sheets	ZZ	ZZ. To be obtained from gunner; <i>see</i> p. 250, &c.
982	" " - - - (x)	"	ZZ	
1148	Dusters, feather - - - (xx)	No.	2	
1798	F. 1. Back contact of hammer - - (xx)	"	1	
500	Blower, spare parts for:— 80 volts - - -	—	1	For 80-volt supply.
501	100 " - - -	—	1	" 100 " "
502	220 " - - -	—	1	" 220 " "
535	Contacts for Morse key - - (xx)	Box	1	
1790	" " key, signalling, (xx) Pattern 2065A.	"	1	Box to contain 6 pairs. 1 box in addition where W.T. expert is borne.
1815	Foil, tin - - -	Lbs.	6	
445	Fuse replacements, boxes of -	No.	1	
528	Flexible conductor for send- (xx) receive switch.	Lengths	2	Each 6 feet.
1899	Hoods, ebonite - - -	No.	16	16 in addition where W.T. expert is borne.
1807	Insulators, ebonite, long - -	"	16	16 in addition where W.T. expert is borne.
2066	Jars, Leyden, without fittings -	"	30	30 in addition where W.T. expert is borne.
263	Magnetic detector:— Spare parts for— - - - For component parts, <i>see</i> Appendix to Rate Book.	Set	1	

Mark II. Ship Establishment.--Consumable Stores--continued.

Pattern No.	Article.	Denomination of Quantity.	Ships.	Remarks.
	Magnetic key, Mark II., spare fittings:—			
1037	Box to contain spare fittings (xx)	No.	1	
1038	Moving parts with bearing (xx) and upper guide.	„	1	
1039	Contacts, moveable, lower (xx)	Set	1	
1040	„ „ upper (xx)	„	1	
1041	„ fixed lower (xx)	„	1	
1043	„ „ upper (xx)	„	1	
1044	Lower guide - - (xx)	No.	1	
1045	Bearing gland for upper (xx) guide.	„	1	
1046	Special spring for moving (xx) parts.	„	1	
1047	Washers, Thackray - - (xx)	Set	1	
	Motor alternator:—			
295	Brushes, spare, for 80 volts -	„	2	For 80-volt supply.
296	„ „ „ 100 „ -	„	2	„ 100 „ „
297	„ „ „ 220 „ -	„	2	„ 220 „ „
	Spares for Oil indicator, Patt. 506:—			
	Tubes, glass, plain, in lengths (xx) from 12 to 13 inches, external diameter $\frac{1}{2}$ inch.	No.	2	
468	Porcelain high-tension insulators -	„	12	
1799	Screw adjusting - - - (xx)	No.	1	
2286	Springs, spiral, for side lever key, Mark II.	„	1	
524	Spark gap, Mark II., spare plugs for	Box	4	12 pairs in each.
289	Spreaders for feeders - - (xx)	No.	50	
288	Spreaders, intermediate - - (xx)	„	40	
—	Rods, ash, 1-inch diameter, 4 feet long	„	4	
	Send-receive switch, Patt. 215:—			
520	Bowden wire, inner member - (xx)	Lengths	1	To be issued till present stock is exhausted. New design in preparation.
521	„ „ outer „ - (xx)	„	1	
522	Lever control pedal and catch:— Bowden wire, inner member - (xx)	„	1	
523	„ „ outer „ - (xx)	„	1	
	Tank for condenser:—			
479	Insulators, porcelain, for terminals	No.	4	
480	„ internal - -	„	4	
481	Washers, woodite, large - -	„	1	
482	„ „ small, and rings	Sets	1	
483	„ „ Belleville type -	„	2	
	Telephone receivers:—			
264	Diaphragms for - - - -	No.	8	
	Wire, copper:—			
1972	Double cotton, covered 13 L.S.G. -	Lbs.	3	
519	Aerial for W.T., 3 strands, 19 L.S.G.	Yards	3,000	Old wire to be returned as copper, old. 1,000 yards in addition where W.T. expert is borne.
2111	Bare soft, 20 L.S.G., on 1-lb. reels	Reel	2	

Mark II. Ship Establishment.—Consumable Stores—continued.

Pattern No.	Article.	Denomination of Quantity.	Ships.	Remarks.
726	Cable electric :— Unarmoured - - - -	Yards	12	
611	„ - - - -	„	200	300 yards in addition where W.T. expert is borne.
202	Wavemeter condensers :— Containers, glass, for - -	No.	1	
526	Insulated cord in 20-yard (xx) lengths.	Lengths	1	
—	F. 2. Cells, Delafon - - - -	No.	5	
2292	Compound, Chatterton's - -	Lb.	1	
1731	Ebonite :— Sheet, unpolished, 1 inch thick -	Square feet	2	2 square feet in addition when W.T. expert is borne.
—	Sheet, unpolished, 1 foot 6 inches by 1 foot 6 inches by $\frac{1}{2}$ -inch.	Sheets	2	2 in addition when W.T. expert is borne.
1737	Rod, 2 inches diameter 24 inches long.	No.	2	
1812	Wire :— Platinum, $\frac{1}{4}$ inch diameter - -	Oz.	—	If required, to be specially demanded.
1182	Clips for aerial and mutual coils :— Clips, permanent, large size -	No.	6	
1183	„ „ small size - - - -	„	6	
1184	„ spring, large size - - - -	„	2	
1185	„ „ small size - - - -	„	2	
1186	Handles for clips - - - -	„	6	
1187	Top fitting, female, for clips -	„	3	
1007	Porcelain inlet, spare, for spark gap, Patt. 484.	„	3	
216A	Porcelain arm, spare, for S.R. switch	„	3	To be issued till present stock is exhausted. New design in preparation.
1156	Porcelain insulator, H.T., small size	„	6	
1188	Vacuum tubes - - - -	„	2	

MARK I*.—ESTABLISHMENT.

Permanent Stores.

Pattern No.	Article.	Denomination of Quantity.	No. allowed per Ship.	Remarks.
2327	Aerial and earthing terminals -	No.	1	Fitted by Dockyard.
2332	Arm rest - - - -	„	1	Stock to be exhausted, no more to be purchased.
1171	Ammeter D.C. (100 volts) - -	„	1	For ships fitted with— 100-volt machines.
1170	„ „ (80 volts) - - - -	„	1	80 „ „
1831	Buzzer, terminal - - - -	„	3	
1223	Battery test, 1 cell - - - -	„	1	
—	Cable clamps - - - -	Pairs	2	
28	Cans, oil, 2-gallon - - - -	No.	2	

Mark I*. Establishment.—Permanent Stores—continued.

Pattern No.	Article.	Denomination of Quantity.	No. allowed per Ship.	Remarks.
2344	Circulator (100 volts) - -	No.	1	} For ships fitted with 100-volt machines.
2345	„ regulating switch - -	„	1	
2346	„ ventilating hose - -	Length	1	
22	Cut-out, 50-ampère S.P. - -	No.	1	} New ships to have Admiralty Pattern cut-out.
23	„ „ D.P. - -	„	1	
1000	Circulator (80-volt) - -	„	1	} For 80-volt ships.
1001	„ regulating switch - -	„	1	
306	Clock, deck with second hand (8-inch face).	„	1	
1784	Coils, induction, 10-inch, in case -	„	1	
2174	Condensers, telephone - -	„	1	
2282	„ No. 1 - - - -	„	1	} Patterns 2172 and 2173 to be issued in lieu till stock is exhausted.
2274	„ No. 2 - - - -	„	1	
2290	„ No. 3, aerial - - - -	„	1	
2291	„ No. 4 - - - -	„	1	
525	„ No. 5 - - - -	„	1	
540	Coil, mutual - - - -	„	1	
536	„ aerial, No. 1 - - - -	„	1	
537	„ „ No. 2 - - - -	„	1	
538	„ primary - - - -	„	1	
1196	„ impedance, adjustable (100-volt)	„	1	For 100-volt ships.
1197	„ „ „ (80-volt)	„	1	For 80-volt ships.
539	Condensers, transmitting - -	„	5	3 and 2 spare.
1008	„ tank for - - - -	„	1	
1022	„ tray for - - - -	„	1	
1191	„ transmitting, auxiliary -	„	3	
1004	Coils, protecting, and safety discs -	Pair	1	
1183	Clips, permanent, small size -	No.	12	} Fittings for aerial coils.
1185	„ spring „ - - - -	„	2	
1186	Handles for clips - - - -	„	6	
1187	Top fitting female for clips -	„	3	
229	Detectors, magnetic - - - -	„	2	1 in addition where W.T. expert is borne.
2340	Earthing clips - - - -	„	1	
2320	Frequency meter, 100 volts - -	„	1	For ships fitted with— 100-volt machines.
2325	„ „ 80 volts - - - -	„	1	80 „ „
2293	Insulator deck - - - -	„	1	To be fitted by Dock-yard.
2326	Fittings for deck insulator -	Set	1	
2279	Inductances, adjustable, Mark II. -	No.	1	
1005	Insulators, bench, Mark I*. -	Pair	1	
2065A	Key, side lever, Mark II., in case -	No.	1	1 in addition where W.T. expert is borne

Mark I*. Establishment.—Permanent Stores—continued.

Pattern No.	Article.	Denomination of Quantity.	No. allowed per Ship.	Remarks.
1056	Key, single current, P.O., Pattern B	No.	3	
274	Lever and control pedal and catch	..	1	
1918	Pushes, pear-shaped	..	1	
228	Radiator (100 volts)	..	1	For ships with— 100-volt machine.
227	.. (80 volts)	..	1	80
2072	Resistance for spark coil	..	2	
2335	Receivers, telephone	Pairs	4	
2336	.. .. head gear for	..	4	New pattern head gear.
2316	Rotary converter, 100 volts	No.	2†	
2317	.. .. field regulator for	..	1	} For 100-volt ships.
2318	.. .. starter for	..	1	
2321	.. .. 80 volts	..	2†	
2322	.. .. field regulator for	..	1	} For 80-volt ships.
2323	.. .. starter for	..	1	
2328	Switch D.P., single-way telephone	..	1	
259	.. send-receive	Set	1	
1024	Safety screen and switches for Mark I*.	No.	1	Existing ships.
1194	Safety screen	..	1	} Future ships,
—	.. switches for screen	Set	1	
533	Switch change-over, 3-pole	No.	1	} For ships fitted with two rotaries.
534	.. .. 2-pole	..	1	
1009	Spark gap	..	1	
	Spare parts for spark gap :—			
	Plugs	—	—	} When burnt down these to be returned and new ones drawn in lieu.
	Wheels	—	—	
	Gauges for spark gap	—	—	
2299	Spark gap silencer	No.	1	
1014	.. auxiliary motor (80 volts)	..	1	For ships fitted with— 80-volt machines.
1010	.. .. (100 volts)	..	1	100
1158	.. .. starter for (80 volts).	..	1	80
1159	.. .. starter for (100 volts).	..	1	100
	Spark gap auxiliary motor, spare parts for :—			
1015	Shaft, complete (80 volts)	..	1	80
1011	.. .. (100 volts)	..	1	100
1016	Set of spare field coils (80 volts)	Set	1	80
1012	.. .. .. (100 volts)	..	1	100
1019	Spare parts, box for	No.	1	
1162	Transformer, Mark I*. (100 volts), with high-tension switch and safety horns.	..	1	100

† Certain ships will have only 1 rotary.

Mark I*. Establishment.—Permanent Stores—continued.

Pattern No.	Article.	Denomination of Quantity.	No. allowed per Ship.	Remarks.
1163	Transformer, Mark I*. (80 volts) with ditto.	No.	1	80-volt machines.
2181	Tuner - - - -	..	1	
2294	Wavemeters, Box A - - -	..	1	} To flagships only. 1 additional where W.T. expert is borne.
2295	.. Box B - - -	..	1	
2297	.. condenser - - -	..	1	} To flagships only. 1 additional where W.T. expert is borne.
2296	.. thermo-galvanometer -	..	1	
2188	.. inductances - - -	Set	1	

Consumable Stores.

7	Brushes, painters', tool sash, No. 2 -	No.	1	
1798	Back contact of hammer - -	..	1	
2319	Brushes, spare, for rotary converter, 100 volts.	Set	1	For ships fitted with—
2324	Brushes, spare, for rotary converter, 80 volts.	..	1	80 " "
1013	Brushes, carbon, for auxiliary motor (100-volt).	..	1	For 100-volt ships.
1017	Brushes, carbon, for auxiliary motor (80-volt).	..	1	For 80-volt ships.
517	Bowden wire, inner member -	Lengths	1	
518	.. outer " - - -	..	1	
2292	Compound Chattertons - - -	Lbs.	1	
—	Cells, Delafon - - - -	No.	5	
282	Container glass for wavemeter condenser.	..	1	If supplied with wave-meter.
1790	Contacts for key side lever, Mark II.	..	6	
1148	Dusters, feather - - - -	..	2	
	Detector, magnetic, spare parts for, viz. :—	Set	1	
471	Box - - - -	No.	1	
472	Spare primary and secondary windings.	Set	2	
473	.. band - - - -	..	2	
474	.. glass tubes - - -	Box	1	
475	.. main spring - - -	No.	2	
476	.. key for winding - - -	..	1	
	Ebonite :—			
1731	Sheet, unpolished, 1-in. thick -	Sq. ft. sheets	2	
—	.. 1½ ft. by 1½ ft. by ½ in. -	..	2	
1737	Rod, 2 in. diameter, 24 ft. long -	No.	2	
1815	Foil, tin - - - -	Lbs.	6	
1899	Hoods, ebonite - - - -	No.	16	
8A	India-rubber vulcanised sheet, 2 ft. by 2 ft. by ¼-in.	..	1	
1807	Insulators, ebonite, long - - -	..	16	
1156	.. porcelain, H.T., small -	..	6	

Mark I*.—Establishment.—Consumable Stores—*continued.*

Pattern No.	Article.	Denomination of Quantity.	No. allowed per Ship.	Remarks.
2286	Key, side lever, Mark II. spring for -	No.	2	
—	Oil insulating, special - - -	Gallons	6	
264	Receivers diaphragms for telephone receivers.	No.	8	
22	Skins, chamois leather - - -	"	2	
501	Spreaders, ash, 12 ft. by 3 in., tapering to 3 in.	"	2	
—	Seccotine in tubes - - -	"	1	
1799	Screw, adjusting (S) - - -	"	1	
2286	Springs, spiral, for side lever key, Mark II.	"	2	
289	Spreaders for feeders - - -	"	20	
491	" " " aerial - - -	"	30	
2300	Spare spark plugs for spark gap silencer, Patt. 2299.	"	4	
2301	Bushes, ebonite, for ditto - - -	"	2	
1018	Spare belt and belt connection for auxiliary motor.	"	1	
1314	Varnish, insulating - - -	Gallon	1	
1188	Vacuum tubes - - -	No.	2	
447	Wax, paraffin - - -	Lbs.	4	
726	Wire, unarmoured - - -	Yds.	12	
611	" insulated - - -	"	200	
2111	" bare soft, 20 L.S.G. on 1-lb. reels.	Reels	2	
519	Wire, copper aerial, 3 strands of 19 L.S.G.	Yards	800	
1972	Wire D.C.C., 13 L.S.G. - - -	Lbs.	3	
—	" copper flexible, for primary connections.	Ft.	6	