

WIRELESS TELEGRAPHY APPENDIX, 1913.

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WIRELESS TELEGRAPHY APPENDIX, 1913.

GENERAL SUMMARY OF THE WIRELESS TELEGRAPHY PROGRESS DURING THE YEAR 1913.

(1) The Instructional work of Wireless in the Schools has progressed steadily. Telegraphists who joined as boys in the "Impregnable" are now commencing to pass for Petty Officer Telegraphists.

(2) The revision of the Signal Books is nearly completed, and it is hoped they will be in general use before the Manœuvres, 1914.

(3) The Wireless Manual, Volume 1, has been issued; Volume 2 will not be ready until the latter part of 1914.

(4) Many experiments have been carried out with the two Mark II. Sets converted to Quenched Spark, and long-distance trials were carried out between "Vernon" and "Vindictive." "Vindictive" was also attached, for some weeks, to the First Battle Squadron, in order that experience might be gained as to whether the presence of Quenched Spark in the Fleet caused more interference with the Fleet's communication than is usually caused by a Mark II. Ship. The results of the trials show that the range of the Quenched Spark Set was slightly better than that obtained by the Mark II., but that the interference caused by the former was very much worse. It has now been decided that the Quenched Spark system is not suited to Service requirements, as, owing to the large number of Ships at present in Home Waters, it is essential that many Wave-Lengths should be available for use afloat; this will be impossible with a Quenched Spark system, and as the existing Spark systems, *i.e.*, Mark II and Mark I*. Sets, appear to have been developed as far as practicable, experiments are now being carried out on a large scale to determine how far a Continuous Wave system is suited to the requirements of the Service.

(5) The High Power Station at Rinella, Malta, has been working fairly satisfactorily; it is still in a more or less extempore condition, and, owing to certain trouble with the Transmitting Condensers and Transformers, it is not yet able to transmit on full power. Communication between Rinella and North Front, also between North Front and Horsea, is fairly reliable, but communication between Rinella and Horsea is not so good; it is generally found that during the early part of the afternoon, communication between these two stations becomes difficult.

(6) The term "Battleship Auxiliary W/T Installation" has been chosen to replace the existing term "Short Distance W/T Installation." The Set referred to throughout the Annual Report, 1912, as "Short Distance Set for Cruisers" has been renamed "Cruiser Auxiliary W/T Installation." The work of designing this latter Set is nearing completion, and it is hoped that these Sets will be ready for Sea early in 1914.

(7) The work of accurately calibrating Wave-Meters is still being carried out, and the issue of the new Pattern Wave-Meter to Ships at Sea has already commenced.

(8) The Portable and Harbour Defence Sets continue to give satisfaction. A certain amount of trouble has been experienced with the Petrol Engine, owing to the fact that insufficient attention has been given to the lubrication of the engine whilst running. It is considered that when more experience has been gained in running these engines, they should prove to be thoroughly reliable and efficient.

(9) Several of the Motor Buzzer sets have been delivered and issued to ships. It is not contemplated at present to supply them to Mark I* ships.

(10) During the year the Destroyer Installation has been modified, and is now capable of transmitting any Wave-Length between 635 feet and 2,000 feet. When the new W/T Organization comes into force it will be necessary for Destroyers to be able to receive messages from the High Power Stations; the design of a special Tuner is now being prepared for this purpose.

(11) Reports from sea indicate that the present Destroyer Deck Insulator is not suitable for withstanding the high voltages experienced when sending the 2,000 feet wave on a Destroyer's Aerial; a modified design is now being prepared.

(12) The work of fitting Submarines with W/T Installations is being proceeded with. Specifications have been drawn up for fitting out "B," "C," "D," and "E" Classes, and these boats will be fitted as they come into Dockyard hands.

(13) Designs for a new Protecting Switch and Holder for Dennis Detector have been completed, and orders placed. It is hoped that when these two articles are fitted, ships will be able to "listen in" without fear of the detector being rendered insensitive whilst transmitting.

(14) A great deal of time has been spent in re-designing various portions of the Receiving Circuit; a very much more selective Acceptor has been made for trial, and 11 sets purchased for trial at sea. It is proposed to introduce a more efficient Aerial Tuner and Rejector.

(15) Good progress continues to be made with W/T in Aircraft. Three sets of special Brown's Relays are being supplied to Aircraft for experimental purposes, and it is hoped that these will render reception possible in an aeroplane whilst the engine is running.

INSTRUCTIONAL REPORT.

The following are the number of Officers and other ratings who have been instructed in "Vernon" between 1st January and 31st December 1913 :—

Senior Officers	-	-	-	-	-	11
Qualifying Lieutenants (T.)	-	-	-	-	-	19
(S.)	-	-	-	-	-	5
Marine Officers' Special course	-	-	-	-	-	2
" " requalifying	-	-	-	-	-	1
Other Officers' Short course	-	-	-	-	-	3
Gunners (T.), Scout course	-	-	-	-	-	2
Qualifying Gunners (T.)	-	-	-	-	-	15
" Warrant Telegraphists	-	-	-	-	-	14
" " Coastguard Service	-	-	-	-	-	10
Qualifying P.O. Telegraphists	-	-	-	-	-	35
Requalifying P.O.	-	-	-	-	-	29
Qualifying and requalifying Electrical Artificer	-	-	-	-	-	39
" " Armourers	-	-	-	-	-	21

The following are the number of Officers and other ratings who have been instructed in "Defiance" between 1st December 1912 and 1st November 1913 :—

Gunners (T.), Scout course	-	-	-	-	-	1
Qualifying Gunners (T.)	-	-	-	-	-	13
Qualifying P.O. Telegraphists	-	-	-	-	-	13
Coast Guards qualifying P.O. Telegraphists	-	-	-	-	-	31
Leading and Acting Leading Telegraphists	-	-	-	-	-	13
Telegraphists and Ordinary Telegraphists	-	-	-	-	-	103
Armourer ratings	-	-	-	-	-	22
Electrical Artificer, Qualifying	-	-	-	-	-	16
" Requalifying	-	-	-	-	-	38

The fourth and fifth classes of candidates for Warrant Telegraphists have completed courses in "Vernon" during the year 1913. There were 14 candidates in all, of whom 13 passed the final examination. One of these has been promoted Acting Warrant Telegraphist, and the remainder have been placed on a roster to await promotion as vacancies arise.

In addition, 10 Chief Officers and P.O. Telegraphists of the Coastguard Service completed courses in "Vernon" during the year, of whom four qualified for Warrant Rank.

TELEGRAPHIST BRANCH.

The number of Telegraphist ratings in the Service on the 1st November 1913 was as follows :—

C.P.O. Telegraphists	-	-	-	-	-	33
P.O. Telegraphists	-	-	-	-	-	227
Leading Telegraphists	-	-	-	-	-	277
Telegraphists and Ordinary Telegraphists	-	-	-	-	-	521
Boy Telegraphists (at sea)	-	-	-	-	-	155

REVISION OF SIGNAL BOOKS.

The work of revising the Signal Books is now nearly completed; a few modifications, however, have been made since the publication of the 1912 Annual Report of which the following are the principal :—

All matter dealing with W/T communication between—

H.M. Ships and Military—

Royal Fleet Auxiliaries,
Mercantile Fleet Auxiliaries,
Hired Transports,
Commercial Ships, and Shore Stations,

has been removed from Fleet Signal Book, Volume 2, and embodied in a Book which will be known as the "Supplementary Signal Book."

2. The "Wireless Signal Book for Destroyers" has been entirely re-written and will be known in future as the "Flotilla Signal Book, Volume 2." The Flotilla Signal Book, Volume 1, will be practically the same as the present Flotilla Signal Book, except that the Vocabulary section will be issued separately. The Flotilla Signal Book, Volume 2, will contain the W/T Organization for Torpedo craft, i.e., for Fleet Flotillas, Patrol Flotillas, Submarine Flotillas, and also the instructions for conduct of W/T Signalling, which latter are taken almost verbatim from the Fleet Signal Book, Volume 2.

3. The Vocabulary Signal Book.—It has been found both impracticable and unnecessary to set apart a special section of this Book for sentences, as stated on page 3 of the W/T Appendix to Annual Report 1912. The sentences, which would have been included in this section, will be found distributed throughout the Book under their various key-words.

A Wireless Committee has been sitting at the War Office during the past year, and, amongst other questions, the W/T procedure to be used by the Military was discussed; it has now been decided that the Army should adopt the Naval W/T procedure with a few necessary modifications owing to the slightly different requirements of the two Services.

SHORE STATIONS.

GENERAL.

The W/T Station at Stockton may be regarded as completed. The Destroyer W/T Station at Grimsby is now completed.

Destroyer W/T Stations at Cromarty, Inchkeith, and Tynemouth Castle, are under construction.

Inchkeith will take the place of the Destroyer Station mentioned on page 3 of W/T Appendix to Annual Report, 1912, as likely to be erected on May Island.

The Differential Interference preventer described on pages 26-29 of W/T Appendix to Annual Report, 1911, is now seldom used.

The Figure VIII. circuit described on page 3 of W/T Appendix to Annual Report, 1912, is still in use, and occasionally proves very valuable.

The new engine is now installed at Culver Cliff.

HIGH POWER STATIONS.

Referring to alterations and improvements mentioned in the W/T Appendix to Annual Report of Torpedo Schools, 1912.

Auto Transformer.—These are now in use at Cleethorpes and Gibraltar.

Magnetic Keys.—Marconi Keys have been supplied to all High Power Stations, and work much better than the old keys. The moving contacts fitted to the Marconi Keys proved unsatisfactory and a new design of moving contact has been approved. Additional spare keys have been ordered for these Stations.

Blowers.—Two additional Blowers for the Magnetic Key, of increased power, have been ordered for every High Power Station.

Receiving Circuit.—The Aerial Acceptor circuit described on page 24 of W/T Appendix to Annual Report, 1913, has been tried at Horsea with satisfactory results. Further trials have been asked for, and it is anticipated that this form of circuit will be introduced at all Stations.

Quenched Spark Experiments.—These have been discontinued.

Poulsen Experiments.—These are still in progress. (See page 31 of W/T Appendix to Annual Report, 1913.)

Masts.—All the masts at Cleethorpes, and the short masts at Horsea, have been lengthened 30 feet.

Aerial Insulation.—This varies to an extraordinary degree (2 to 200 megohms) with weather conditions. Extra insulators have been fitted to the Aerial outhauls, and a slight improvement has resulted.

Synchronous Spark Gap.—A gap of this kind is being constructed and will be tried at Cleethorpes. If this gap proves satisfactory all High Power Stations will be supplied with Synchronous Spark Gaps.

Adjustable Primary Coil.—In order to lessen the time at present taken to shift from "X" wave to "Y" wave, and vice versa, due to a different primary being used for each Wave, a Primary Coil with two adjustments, i.e., for sending on "X" and "Y" Waves has been made for trial at Horsea. This has proved satisfactory, and a Primary of similar design will now be supplied to each of the other High Power Stations.

Gibraltar.—It is under consideration to move the Instruments from the present Station at North Front into chambers excavated from the Rock itself. Three chambers will be made, one to contain the Diesel Engine and necessary auxiliary plant, one for Transmitting Instruments, and the third for the Receiving Instruments. A workshop will be placed outside the chambers.

The chambers will be in the base of the Rock opposite the present site of the Station.

The present Aerial, slightly modified, will be utilised, the Aerial Feeders being placed about 300 feet up the Aerial, and led down to pole masts outside the entrance to the chambers.

The new Station will be supplied with power from the Dockyard, as in the present case, the Diesel Engine plant being an alternative.

Plans for the new Station are being prepared.

North Front Station is now fitted to send "Z" wave.

It has been decided to build a Mark II. Station near Europa Point; this will be called the "Rock Station," and will take over the duties of "Windmill Hill," which latter is to be worked as a Commercial Station under the Colonial Government, and be available for Naval use in War time. It will be manned by Naval Ratings.

The designs for the "Rock Station" are completed, and tenders for the necessary plant are being called for.

The Station will be fitted with two insulated steel masts, 200 feet high.

Malta.—Rinella. The idea of fitting this Station with Quenched Spark has been abandoned, and the Station has been fitted with a Spark Set on the lines of the other High Power Stations, but with slightly more power. The Station has been in action since February 1913.

The Station is fitted to send "Y" and "Z" waves.

Communication with England is not at present reliable at all times by day, great trouble being experienced with atmospherics, which increase in strength as the temperature rises. The worst time, particularly during the summer months, being between 1 p.m. and 5.30 p.m.

Reports from Rinella as to communication with Ships on the Syrian Coast state that "Black Prince" at Beirut, received Rinella (transmitting on "Y" Wave with a 6 m.m. spark and a 400 cycle note) by day, strength R2 to R5, signals being seldom readable. Signals by night were strength R6 to R9, but easily interfered with by strong atmospherics. Signals from Rinella invariably weakened from noon to 8 p.m.

When Rinella was using the low note of 257 cycles, signals were strength R5 by day, and R12 by night, and could be read over atmospherics.

At Alexandretta the "Black Prince" received fragments only during the day, and reported that signals from all sources were weak. North Front, Gibraltar, was stronger than Rinella, and Cleethorpes was heard at times. When signals from England were strong, signals from Malta were weak, and *vice versa*.

It is considered that the difficulties in communication with Ships on the Syrian Coast are due to the fact that the Great Circle from Malta to Alexandretta passes over the whole of Morea, where there are deposits of ironstone; it has been found that "Z" Wave is better for communication over Morea to Constantinople, the average strength of signals received at that place from Rinella on "Z" and "Y" Waves, being R9 and R5 respectively. "Z" Wave is found to be slightly less efficient than "Y" Wave over Sea alone.

Notes of 800, 400 and 257 Cycles have been tried. The 800 Cycle note is rather easier to read through atmospherics, but less power can be obtained with this note, thus reducing the net advantage.

It is found that when Rinella is signalling, signals from other sources cannot be received at St. Angelo. Various types of Differential Interference Preventers and Circuits of a similar nature have been tried without success.

It is hoped that the use of the Aerial Acceptor will reduce this interference, and also that experienced from atmospherics.

SPARK CAMERAS.

It has been approved to adopt Captain Willis's design of Spark Camera.

Two patterns of Camera will be made, *i.e.*, a Standing Camera for use in experimental work, and a Portable Camera for use at W/T Stations for assisting to detect certain causes of trouble, *e.g.*, loss of note, and also as a method for obtaining accurate tuning.

It has been approved to supply a Standing Camera to Horsea, and one to H.M.S. "Vernon." One Portable Camera will be supplied to each High Power Station and Torpedo School (N.S. 0160/9857 of 2.7.13).

BROWN'S TELEPHONE RELAY.

A Brown's Relay, "W" type, was obtained on loan and issued to Ipswich W.T. Station for trial.

This Relay is a considerable improvement on previous types.

Ipswich reported that the Relay was received on March 12th, 1913, and was kept in use until May 20th, when it was moved to Cleethorpes W/T Station.

The working of the Relay was very satisfactory when once its peculiarities were understood.

At Cleethorpes the Relay proved still more satisfactory, being further improved by a new pair of Relay Contacts lent by Mr. Brown.

The Relay has a great power of increasing the strength of signals, and, with a very selective receiving circuit, frequently makes signals easy to read which would otherwise be inaudible.

Unfortunately the Relay magnifies sound so much that if signals are strong the noise in the telephones is almost unbearable for any length of time. The Relay can be used best as an auxiliary, and only switched on when signals are too weak to read without its assistance.

It has been recommended that two Brown's Relays "G" type to be used in series should be supplied to each High Power and Medium Power Station, excepting North Front, Gibraltar,

and Whitehall, and that four Brown's Telephones should be supplied to every High Power and Medium Power Station.

The "G" type Relay is less sensitive, but far more stable, than the "W" type, and needs little attention when once adjusted.

SERVICE INSTALLATION, MARK II.

ANTI-BRUSHING AERIALS.

Final designs for anti-brushing Aerial fittings have not yet been decided on.

Spreaders constructed of wood and aluminium (similar to those shown in Annual Report for 1911), have been issued for trial to "Lion" and "Collingwood."

Reports from these Ships state that the new Aerial is easier to handle and stow, and is as efficient as the present Service form of Aerial.

The "Lion" recommends the aluminium ring spreaders, but "Collingwood" reports that the aluminium spreaders are apt to chafe through the Aerial wire, and therefore recommends the wooden discs.

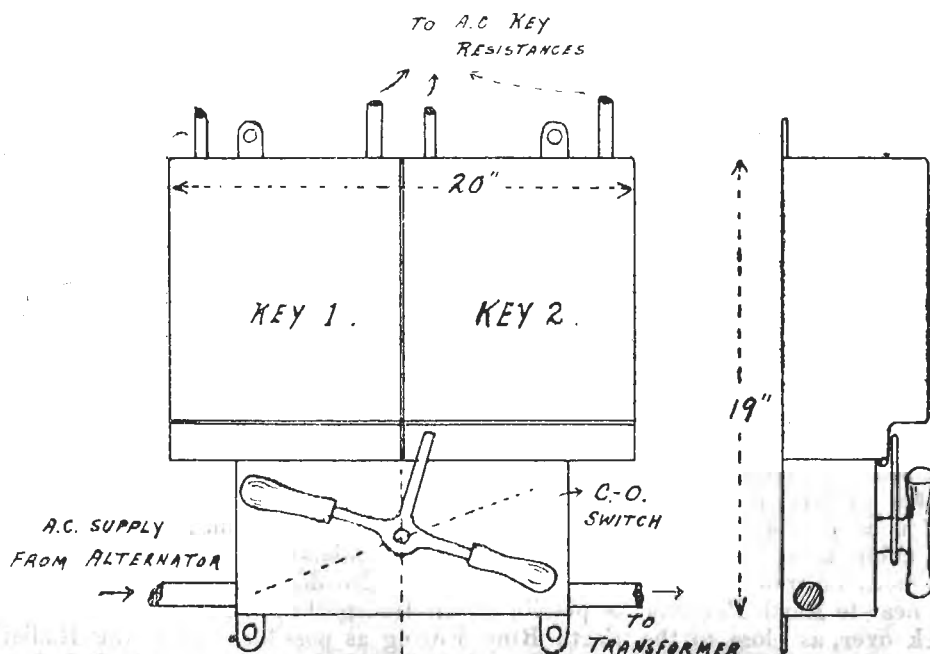
Owing to the small capacity of the anti-brushing Aerial, a considerable number of turns of Aerial coil are needed, particularly on the longer Wave-Lengths, thus raising the voltage at the foot of the Aerial. It has been found that the present design of Deck Insulator is not suitable to withstand these high voltages, and an improved design is being prepared.

It is therefore proposed to retain the present 8-fold Aerial, but to supply feeders made on the anti-brushing principle.

MAGNETIC KEYS, TYPE I, WITH CHANGE-OVER SWITCH.

A new Magnetic Key for Mark II. sets was described on pages 25-26 of the Appendix to the Annual Report, 1912. The model key described therein has now been thoroughly tested at the Whitehall W/T Station, where it carried out the whole of the signalling work for three months with every satisfaction, and required very little attention beyond the re-adjustment of the contacts, two or three times, to take up wear. It was mentioned last year that set screws were being fitted to the cylindrical-fixed contacts to lock them in position, but it was found that these set screws were not necessary, and that the key worked better when these cylindrical contacts were free to turn very slowly, thus continually bringing a new contact surface into play. Drawings and specifications of the new key are now being prepared. In these drawings two keys are shown mounted side by side on a common base, and a new design of A.C. Change-over Switch is also being shown mounted on the same base, so that the two keys and switch will form a single unit which will be designated "Magnetic Keys, Type I, with Change-over Switch."

FIG. 1.



General arrangement of Keys, Type I, with Change-over Switch.

The general arrangement is illustrated in Fig. 1, from which it will be seen that the Change-over Switch is operated by simply turning a handle and that a pointer, cast solid with this handle, overlaps one or other of the Magnetic Key covers according to the position of the Switch Handle, so that it is only possible to remove the cover of that key which is disconnected from the A.C. circuit. A spring plunger is fitted under each Magnetic Key cover, which rises when the cover is removed and so interlocks with the pointer as to render it impossible to switch the A.C. current on to the Magnetic Key so long as the cover is removed. The work of adjusting one Key may therefore be safely carried out whilst the other Key is in use, and electrical safety contacts are rendered unnecessary.

From the dimensions given in Fig. 1 it will be seen that the dimensions of the complete article are not very much greater than those of a single Magnetic Key of the old pattern. The complete article will be mounted on the instrument board so that a Magnetic Key in the cage will no longer be necessary. The existing A.C. Change-over Switch for Magnetic Keys, Pattern 826, will be rendered obsolete when this new arrangement is introduced.

As regards the Direct Current Circuit, the omission of condensers from the Key simplifies this, and in place of the present D.C. Change-over Switch for Magnetic Keys, Pattern 856, a simpler switch can be used and will be supplied. This D.C. Switch will have a circular handle giving three working positions for "Key I.," "Buzzer," and "Key II." respectively. There will be intermediate off positions between these working positions. Since this D.C. Switch will give a double-pole break, no further buzzer switch will be necessary. The direct current resistances, used in series with the Key Bobbins, will be supplied separately mounted in small perforated metal cases so that the Keys themselves will not need ventilating and may be completely closed in, thus being more sound-tight. The latest figures for the Bobbin Resistances and their D.C. Series Resistances, are as follows :—

100 volts	Bobbin Resistance	-	-	-	-	19 ohms.
"	Series Resistance	-	-	-	-	40 "
220 volts	Bobbin Resistance	-	-	-	-	57 "
"	Series Resistance	-	-	-	-	100 "

The A.C. Resistance will remain unaltered.

FIG. 2.

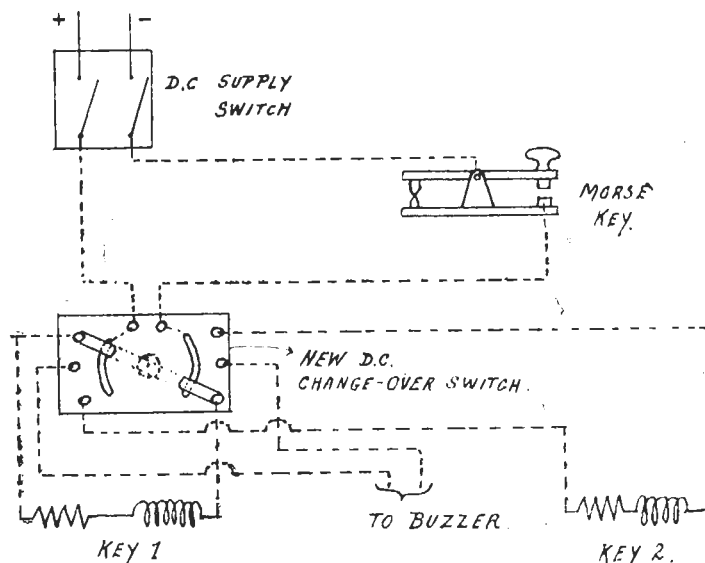


Diagram of Connections

Fig. 2 illustrates diagrammatically the connections of the Magnetic Key Direct Current Circuit with the new arrangement.

NEW OPERATING SWITCH FOR MARK II. SETS.

A new Operating Switch for Mark II. Sets was described on page 24 of W/T Appendix to Annual Report, 1912. Since then the first model has been thoroughly tested under practical conditions for several months with satisfactory results, and in future it is proposed to purchase this new design instead of existing Pattern No. 1066. The new switch which is much smaller than Pattern No. 1066, will be known as "Switch, Small Operating, for Type I.," and a Torpedo Order is being issued concerning it. Since Plate VIII. in the 1912 report was produced, the design has been slightly modified, the chief alteration being that the Switch is now being made to take leads of bare copper strip, instead of concentric cable. The use of concentric cable in the high frequency circuit is considered objectionable, since it leads to inefficiency both in transmitting and receiving. It is also desirable that the Operating Switch shall be as near to Earth Potential as possible when transmitting, and therefore it is to be fitted on the deck over, as close to the Earth Ring Fitting as possible, whilst the Radiation Meter Shunt is to be connected between the Mutual Coil and the Operating Switch instead of, as previously, between the operating switch and the Earth Ring Fitting.

FIG. 3.

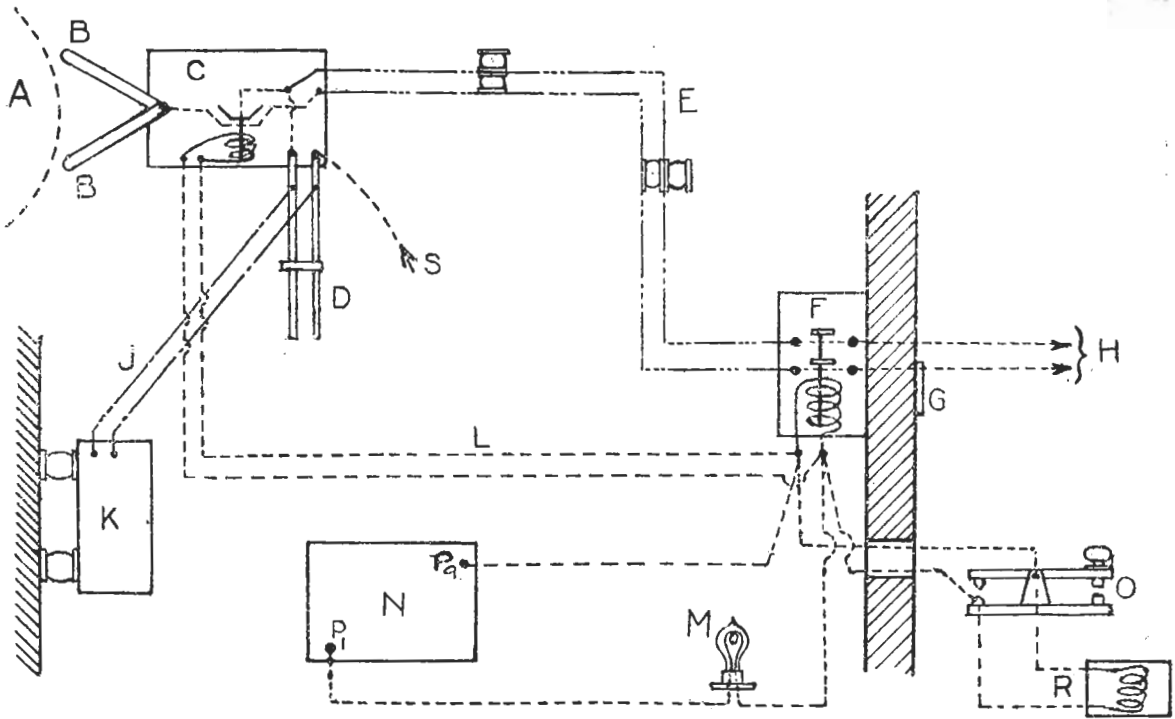


Diagram of Connections for new Operating Switch, etc.

- A. Part outline of Deck Insulator.
- B. Copper Connecting Strips from Operating Switch to Earthing Bolts in Dock.
- C. Switch, Small Operating.
- D. Radiation Meter Shunt (suitable terminals are provided on the Switch, Small Operating, to take this).
- E. Copper Strip Leads $1\frac{1}{4}$ by $1/16$ inch mounted on Porcelain Insulators, Pattern 1133, and held apart by ditto.
- F. Cabinet Switch (mounted in place of Cabinet Fitting).
- G. Terminal Plate connected to lead lining of Cabinet.
- H. Leads to Receiving Instruments.
- J. Single lead-cased cable, Pattern 254, mounted on Porcelain Insulators, Pattern 1133.
- K. Radiation Meter mounted on Porcelain Insulators, Pattern 1,133.
- L. Two lead-cased cables, Pattern 254, leading current to coil of Operating Switch.
- M. Carbon Filament Lamp (32 c.p. on 220-volt ships, and 16 c.p. on 100 volt. ships.)
- N. D.C. Change-over Switch for Magnetic Key.
- O. Morse Key.
- P₁ and P₂ Terminals on Switch N.
- R. Protecting Switch.
- S. Lead from Mutual Coil to operating switch.

Fig. 1 illustrates diagrammatically the new arrangement proposed, from which it will be seen that the Radiation Meter with its leads are to be mounted on Porcelain Insulators, Patt. 1133, and the two bare copper leads from the Switch, Small Operating, to the Cabinet are also to be mounted on similar Porcelain Insulators.

Since it is possible that when transmitting on full power the stray magnetic lines might induce considerable voltages in the copper strip leads from the small Operating Switch to the Cabinet, it has been decided to fit a second Switch in place of and instead of the Cabinet Fitting to short circuit the leads at this point when transmitting to prevent these induced voltages being impressed on the receiving instruments. This second Switch, which has been named "Switch, Cabinet, for Type I." will be worked in parallel with the "Switch, Small Operating," to which it is somewhat similar in design. Its D.C. Bobbin is provided with large terminals so that it will take several leads and act as a distributing centre for the D.C. connections to the Switch, Small Operating, and Protecting Switch. It will be noted that the coils of the Switch, Small Operating, Cabinet Switch, and Protecting Switch are all connected in parallel and controlled from the back contact of the Morse Key in the manner already described. Since these instruments are to work in parallel their resistances must be commensurate, and with this arrangement it is therefore always necessary to use the new Protecting Switch No. 1138. All three switches are designed to require a small operating current, so that on a 220 volt ship a single 32 c.p. lamp and on a 100 volt ship a single 16 c.p. lamp is a sufficient series resistance for the three Switches in parallel. The coils of all three Switches remain the same whatever the voltage, and the same coil, Pattern 1139, is used in both the Cabinet Switch and the Protecting Switch.

MOTOR BUZZERS.

The supply of the articles comprising these sets, to Ships at sea, has been practically completed, and it is hoped that the introduction of a standard Motor Buzzer set will increase the efficiency of Fleets and Squadrons when signalling on low power. In addition to the articles enumerated on pages 9 and 10 of the W/T Appendix to Annual Report of Torpedo Schools, 1912, it has been found necessary to introduce a terminal block, Pattern 1182. This forms a junction