SUBMARINE INSTALLATION.

The design of Type X. Installation described on pages 10 and 11 "W.T. Appendix to Annual Report of Torpedo Schools, 1912," was not suitable for adoption for all classes of submarines, and instructions have been given for the necessary modifications and alterations to be made at Portsmouth to the design, so that it may be adapted to "B," "C," "D," "E," and "X" classes.

Plate IV. shows the approved arrangement of the transmitting and receiving apparatus.

The Motor Alternator has an output of 1 k.w. at 100 cycles and 70 volts R.M.S. There are two patterns of this machine, *i.e.*, one to work off voltages ranging from 95 to 140 (Patt. 3158); and the other for voltages ranging from 155 to 200 (Patt. 3159).

Submarines of "B," "D," "E," and "X" classes will be supplied with the former, and those of "C" class with the latter. The wide range of voltage allowed for, admits of the installation being used, whether the batteries are being charged or not.

The Combined Starter and Field Regulator is made on the same principle as that supplied to destroyers, and admits of the frequency being adjusted to 100 cycles when the supply voltage is within the range stated.

The Regulator for Alterator is designed so that the alternating current voltage can be adjusted within 3 per cent. of 70 volts R.M.S., when the frequency is within 3 per cent. of 100 cycles.

The Primary Condenser has a capacity between 14 and 15 jars (low frequency value) and this, in conjunction with the two turns of the primary oscillator, will give a maximum L.S. of 21 with the smaller condenser value.

Tuning.—The set will be tuned to transmit "C," "D," and "E" Waves (new organization).

"C" Wave (harbour defence wave) = 6·2 L.S. = 514 feet.
"D" Wave (submarine wave) - = 9·5 L.S. = 635 „
"E" Wave (destroyer wave) - - = 13·5 L.S. = 756 „

Arrangement of Apparatus.—The original policy of having large portions of the apparatus portable has many objections; the revised fitting out specifications provide for the whole installation being fixed, although it it will be possible to remove it, if necessary, during refits.

Plate III. shows the arrangement in "E" class submarines, and is typical for all.

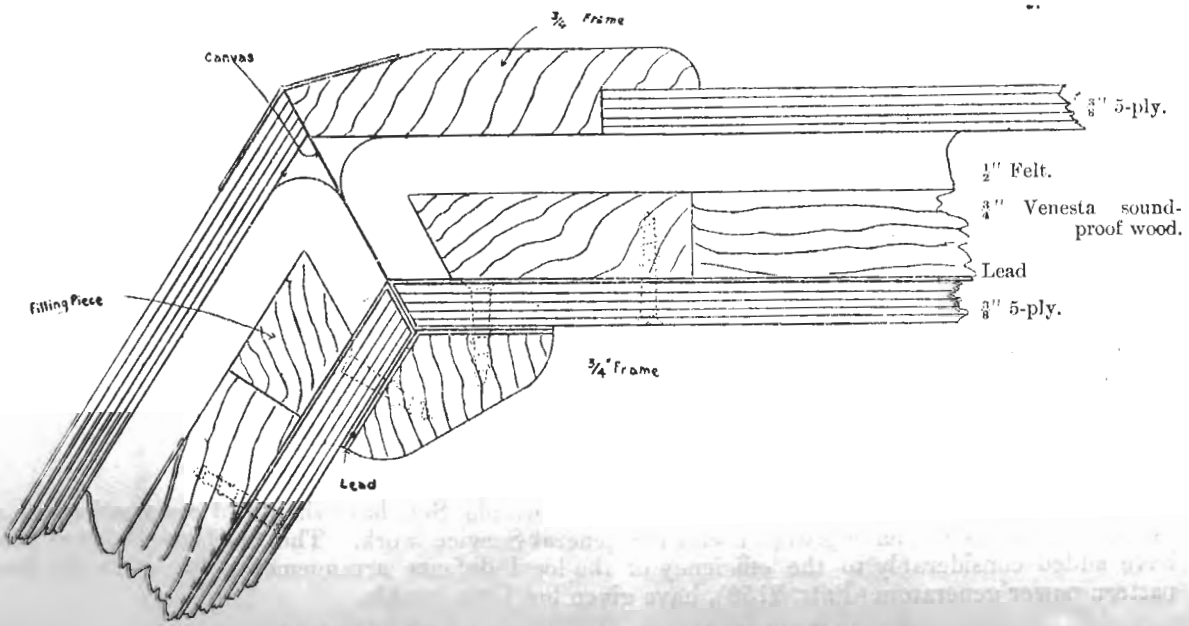
The transmitting apparatus in this class is on the after side of the cabinet, and is arranged on a board secured to the angle irons supporting the cabinet. Either a suitable collapsible screen, or an arrangement of wood battens, is fitted to prevent any one accidentally touching high tension points of the apparatus. High tension cable, Patt. 816, screened as necessary, is led along inside the boat and connects the aerial coil to the deck tube, the maximum distance in any case being about 10 feet.

The door of the cabinet is placed on the opposite side to that occupied by the transmitting instruments. A window is fitted in the door to enable the operator to see the frequency—and volt-meters. The starters for the alternator and circulator are easily accessible to the operator when the door is open.

The motor alternator and circulator are secured, with their axes fore and aft, in any suitable and accessible position in the boat.

The Silent Cabinet.—The Silent Cabinet, as far as possible, conforms to the shape of the boat so as to make full use of the maximum available space. It is of special design, and although comparatively light as compared to those of usual Service design, it is remarkably sound proof. The sides and top are 2 inches thick, built up as shown in Fig. 9, the bottom being somewhat thicker,

FIG. 9.



Section showing construction of Submarine Silent Cabinet.

so as to increase the strength. The whole cabinet is slung by an angle-iron framework from overhead, strips of felt being arranged so that at no point does the carcase of the cabinet come into contact with its rigid supports.

A window is fitted in the top of the cabinet, so that lights as necessary may be fitted above it to light the cabinet inside; thus the heat caused by internal lighting is eliminated. If additional light is required at any time, the use of a magazine hand-lamp is recommended.

The circulator supplies air for ventilating the cabinet through the operator's seat—this latter being fitted with baffles to reduce the sound. The exhaust is through the bottom of the cabinet.

If necessary the cabinet can be taken to pieces in half a day.

Rig and External Fittings.—Plate V. shows the typical rig of all classes.

In "B," "C," and "X" classes, the W/T mast is 30 feet high—in "D" and "E," 35 feet. The W/T mast is clamped to the bridge structure as shown, and both it and the stump masts can be raised and lowered with ease and rapidity, hinging down aft into stowing crutches on the superstructure.

Such an aerial as shown, can be left rove when diving, provided it is hauled taut, but it is the policy to leave commanding officers of submarines a free hand as regards the type of aerial they use and the method of working it, so long as the ordinary technical requirements are fulfilled.

Experience will show which is the most serviceable and efficient type of aerial to use, and reports from sea on the subject are required in order that the rig may eventually be standardized.

Telescopic Mast.—"Vernon" is in communication with a private firm on the subject of telescopic masts, as it is hoped that it will be possible to design a pneumatic mast suitable for submarines which can be worked entirely from inside the boat. It is thought that two such masts, with the aerial taut between them, would be the ideal arrangement.

Policy.—By April 1914, W/T apparatus will have been provided for one "B," eleven "C," eight "D," seven "E," two Commonwealth boats, one "X," and the "Vernon" (one set for design and experimental purposes).

It is proposed to allow in the Sketch Estimates 1914–15, for sets for :—

(*a*) All new boats.

(*b*) All "B's" and later not fitted.

(*c*) Torpedo Schools and Portsmouth Signal School for instructional purposes—

that is 60 sets in all.

Future Design.—In all future boats a place will be assigned for accommodating the Silent Cabinet and transmitting instruments in a permanent and suitable position. The present set is unnecessarily capacious and heavy, and at the earliest opportunity "Vernon" will carry out experiments with a view to obtaining a set of considerably reduced weight and size.

PORTABLE AND HARBOUR DEFENCE SETS.

Provision has been made for the supply of portable and harbour defence sets as shown below, but the delivery is not as yet quite complete :—

Portable Sets :—

Home Fleet	4	
Mediterranean	2	
Gibraltar	2	(For 4th Battle Squadron).
East Indies	2	
China	2	
Cape	2	
"Hermione"	1	
"Suffolk"	1	
Torpedo Schools	3	
Total	20	

Harbour Defence Sets :—

Portsmouth	11	Including 2 for Lightships, 2 belonging to Rosyth, and 2 spare for Reserve.
Devonport	6	Including 1 belonging to Rosyth.
Sheerness	7	Including 2 belonging to Rosyth.
Downs	6	For examination service.
Torpedo Schools	3	
Total	33	

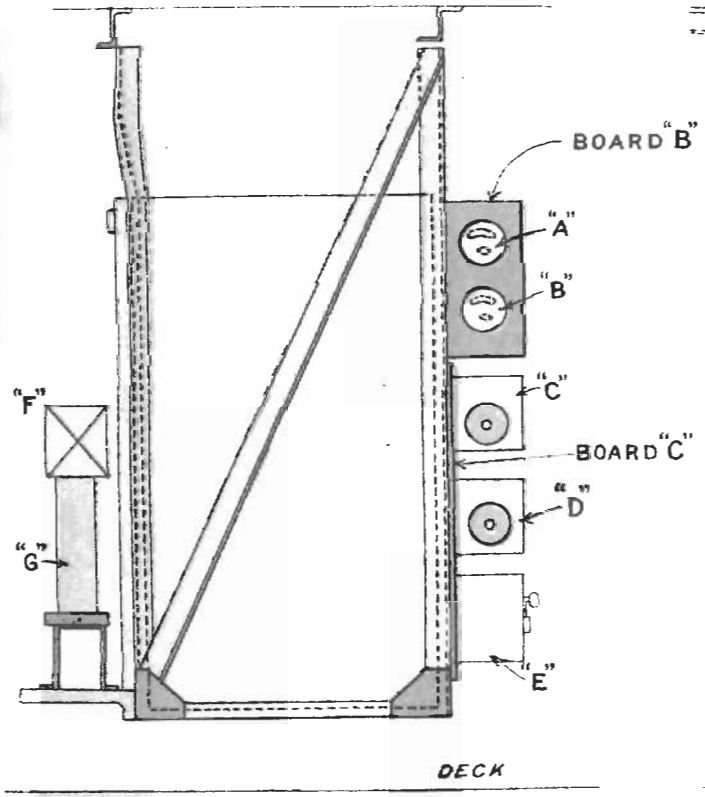
The sets continue to give satisfaction, the Portable Sets have simplified communication at calibration ranges and have proved useful for general Service work. The Harbour Defence Sets have added considerably to the efficiency of the local defence arrangements and with the later pattern power generators (Patt. 2150), have given but little trouble.

WIRELESS INSTALLATION TYPE 10 (SUBMARINE'S SET)

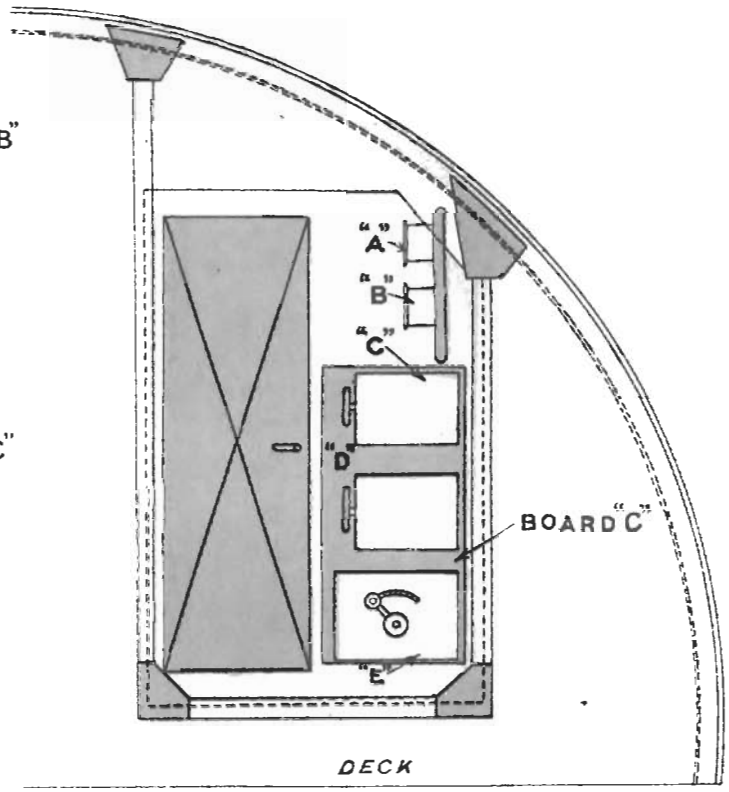
TYPICAL ARRANGEMENT.

SCALE ½ INCH = 1 FOOT.

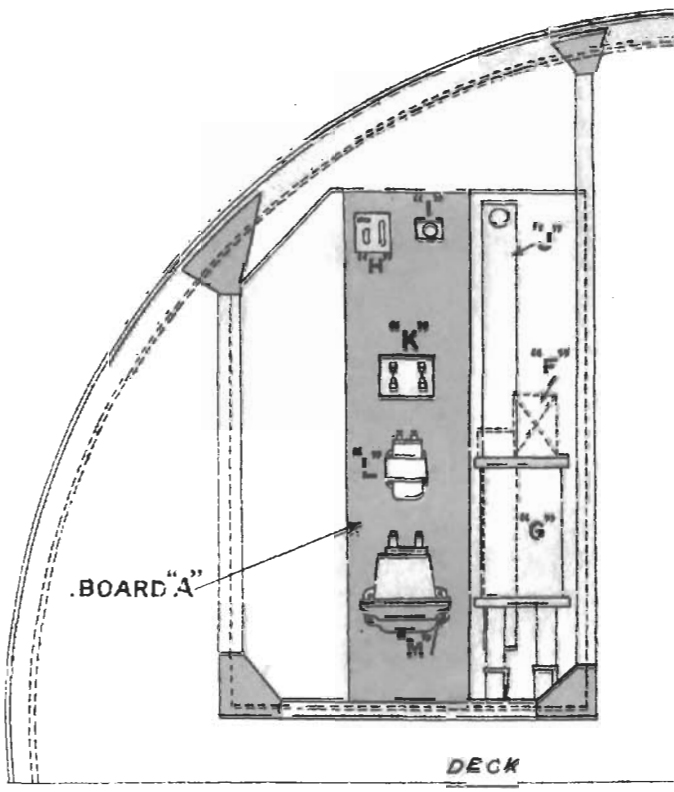
ELEVATION LOOKING TO PORT.



ELEVATION LOOKING AFT.



ELEVATION LOOKING FORWARD.



A	Frequency Meter.	F	Space for Oscillator & Spark Cap.	K	Double Pole cut out.
B	Volt Meter.	G	Container for Condenser T.	L	Impedence Coil.
C	Combined Starter & Regulator.	H	Earth Ring fitting.	M	Transformer.
D	Field Regulator & Alternator.	I	H.T. Terminal Pillar.		
E	Circulator Regulating Switch.	J	Ventilating Supply Trunk.		

To face page 18.

W/T. INSTALLATION T

DIAGRAM

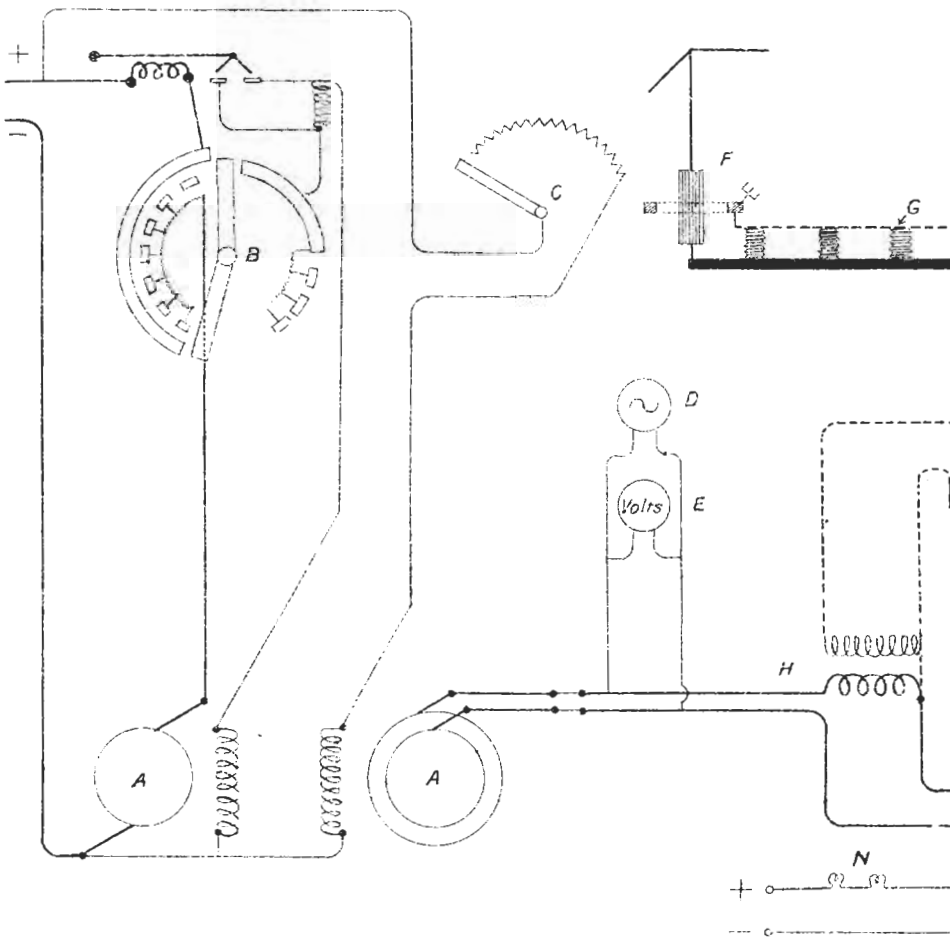
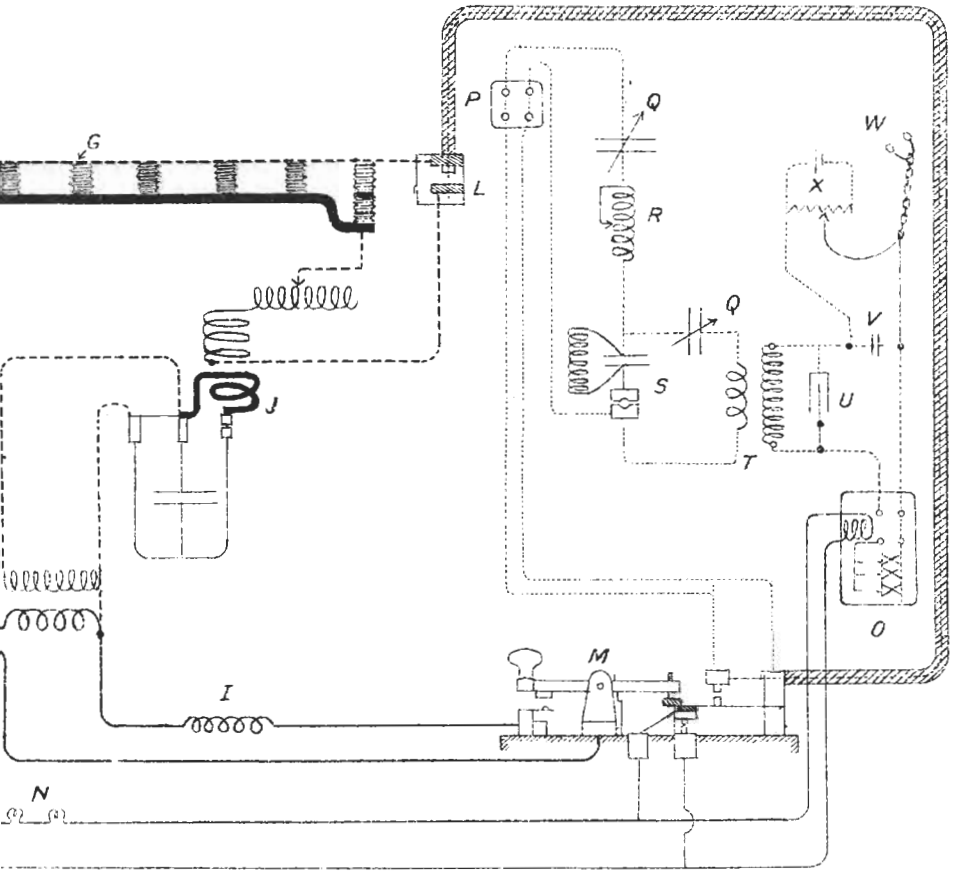


TABLE OF C

CABLE	
CABLE, LEAD CASED, PATT. 251.	
CABLE, LEAD CASED, PATT. 254.	
CABLE, CONCENTRIC, PATT. 751.	
CABLE, HIGH TENSION, PATT. 816.	
CABLE, UNARMOURED FOR W/T. PATT. 611.	
CABLE, FLEXIBLE FOR W/T. RECEIVING CIRCUITS PATT. 432.	

TION TYPE 10. (SUBMARINES.).

AGRAM OF CONNECTIONS.



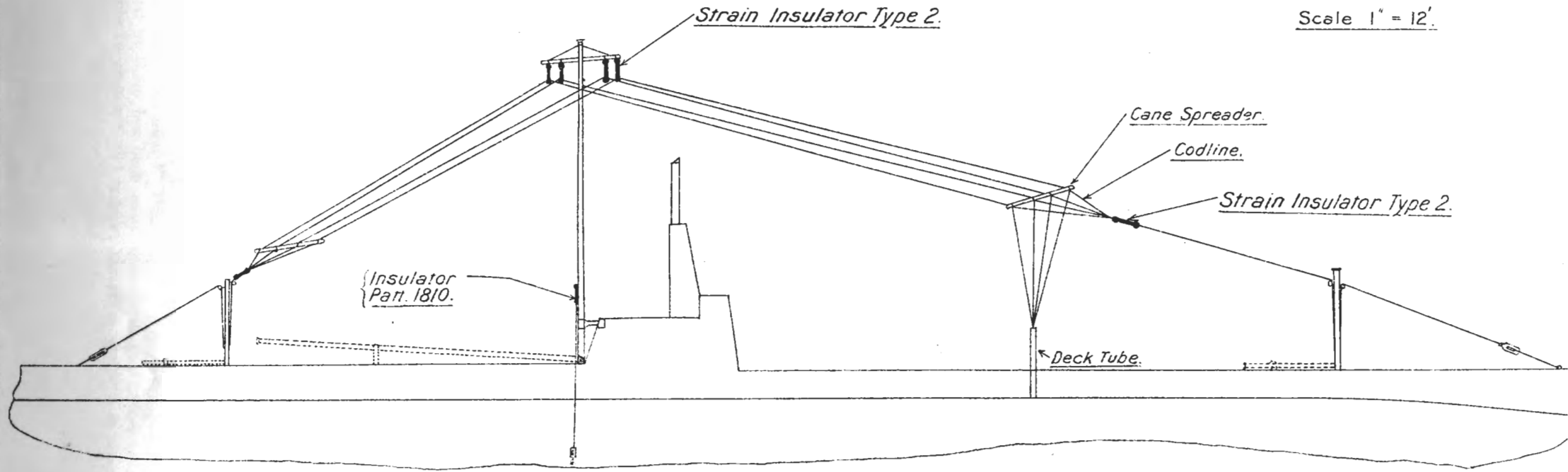
REFERENCE	
A	MOTOR ALTERNATOR
B	COMBINED STARTER & REGULATOR
C	REGULATOR FOR ALTERNATOR
D	FREQUENCY METER
E	VOLTMETER
F	DECK TUBE
G	PORCELAIN PILLARS
H	TRANSFORMER
I	IMPEDANCE COIL
J	OSCILLATOR AND SPARK GAP
K	AERIAL COIL
L	EARTH RING FITTING
M	KEY TYPE 2-4
N	LAMPS
O	DETECTOR & PROTECTING SWITCH No2 FITTED
P	BREAKDOWN FUSE
Q	CONDENSER No 7
R	FINE TUNER (P&H.D)
S	REJECTOR
T	INDUCTION TUNER (C. TYPE)
U	CONDENSER SLIDING No10 (P&H.D)
V	CONDENSER TELEPHONE (C TYPE)
W	TELEPHONE RECEIVERS
X	POTENTIOMETER

E OF CABLES

	SYMBOL

WIRELESS INSTALLATION TYPE 10 (SUBMARINE'S SET.)

TYPICAL RIG.



A few minor defects in the sets have been discovered and the Specifications have been revised accordingly; in future supplies, the following necessary improvements will have been embodied :—

Woodite Washers.—The naturally slow rate of deterioration of woodite is considerably increased in the presence of oil. "Oil dressed leather" and ebonite, in certain cases, will in future be used in lieu.

Condenser, Type "P."—Nineteen of the plates of the Condenser, Type "P." are supplied unconnected and thus inoperative. These are ready for use as replacements. The arrangement now consists of two groups of 34 plates each.

Spark Gap.—Modifications are being made to the Spark Gap in both Portable and Harbour Defence Sets, admitting of satisfactory adjustment being made.

The Primary.—The adjustable arm of the primary has been found to be the cause of considerable transmitting loss due to inferior contact. An improved design of adjustable arm is being brought out.

Alternator.—Trouble has been experienced with the brushes of the alternators, owing to a slight defect in their design; this matter is being attended to.

Buzzer, Pattern 1831.—Experience has shown that when the engine is running, the existing method of calling up the engine-man, viz., by buzzer, is unsatisfactory as frequently the noise of the engine completely drowns that of the buzzer. It has been approved to supply a bell (Pattern 400) in lieu. (N.S. 2484/3679 of 8th March 1913.)

Stowage of Petrol in Harbour Defence Vessels.—The cans are stowed on the upper deck in open racks, with tray bottom, clear of smoking places selected for Officers and Ship's Company; emergency access to the cans being provided. It is not permitted to open the cans on a wood deck, an iron saveall being provided for the purpose. (N.S. 14031/18953 of 19th December 1912.)

Carts "A" and "B."—Experience has shown that shafts and cross bars for Carts, Type 5, are too weak at the joint of the cross bar. A stouter design has been brought out, the necessary amendment being made to the Specifications. Arrangements have been made for modifying existing carts at the various Yards and Depôts. (N.S. 4499/8218 of 29th May 1913.)

Receiver for W/T Type P. and H.D.—The use of oil in conjunction with the Crystallite-Detector has been found to be both unnecessary and undesirable. The glass bottle and brush are consequently no longer supplied.

Base for Power Generator.—The gunmetal studs on Cart "B" for securing the base, and the gunmetal bolts on the Base for securing the Power Generator and Alternator, have been found to be too weak. In future supplies these will be made of steel.

Large Steel Pickets, Pattern 5.—For the sake of lightness, these have been made from tubes with solid end-pieces. The weakness consequent upon this out-weighs the advantage, and in future the pickets will be made solid throughout.

Lubricating Oil for Power Generators.— Heavy filtered mineral oil has proved to be unsuitable, for Power Generators (Pattern 2150). It has been approved to supply "Vacuum Mobiloil 'A'" in future. (N.S. 6724/11722 of 6th August 1913.)

Range of P. and H.D. Sets.—With Harbour Defence Sets fitted for Examination Service, the average range obtained by day is 35 miles; information is required from sea as to the range of Portable Sets.

Mica Block Condenser.—A Mica Block Condenser has been bought for trial in "Vernon." It is considerably smaller and lighter than the existing Ebonite Condenser, and does not require the use of Insulating Oil. If the trials prove satisfactory, recommendation will be made to supply this type of condenser in future to Portable and Harbour Defence Sets.

Instruction of W.T. Ratings in P. and H.D Sets.—A Petty Officer Telegraphist has been added to the Instructional Staff of "Vernon," "Defiance," and "Actæon," for the instruction of Telegraphist Ratings awaiting draft in the working of Power Generators in particular and in Portable and Harbour Defence Sets generally. The course is of one week's duration (G. 16370/13 of 17th June 1913).

Power Generators, Pattern 2150.—The Douglas Engine has proved itself to be serviceable, satisfactory, and reliable. Attention must be paid to its lubrication, the drip feed is not altogether reliable, and the front cylinder is apt to get starved of oil. It is, therefore, better to over, than under, lubricate, and the hand force pump should be used to supplement the supply. The handles for carrying these Engines are not strong enough and are being replaced by handles made of mild steel; this alteration increases the weight by 2 lbs.

WIRELESS TELEGRAPHY IN AIRCRAFT.

General.—Until the early part of 1912, little had been done towards the practical use of W/T in Aircraft, but about this time it was generally recognised that W/T in all forms of Aircraft was very desirable if full use of their scouting capacities was to be taken advantage of.

Both France and Germany had used W/T in Airships with varying success, but information of actual results obtained by them has been most difficult to get. Now at any rate the larger German airships are able to transmit and receive messages by W/T to distances of 200 miles, or more.

The reliable ranges and possibilities of W/T in aircraft are much confused by the many advertising booklets issued by Foreign and English Wireless firms on the subject. These booklets would lead one to believe that wonderful ranges and efficiency had been obtained by several types of apparatus, and that they were in daily use by all form of aircraft; as a fact, the majority of installations described in these booklets have never got beyond the books in which they are advertised and have never been put to practical test in aircraft. This is probably due to the lack of actual practical air experimenting facilities open to any private firms and total ignorance of the requirements. These advertisements claim to have surmounted all difficulties of both transmission and reception in aircraft of all types, but it is fairly certain that up to date no reliable reception of W/T signals in "heavier than air" aircraft with the engine running has yet been accomplished.

"Heavier than Air" Aircraft.—The pioneer of efficient W/T in these craft is believed to be M. Rouzet, until recently connected with the Eiffel Tower W/T Installation.

Early in 1912, this inventor produced a set capable of instalment in an aeroplanes: this set could only transmit signals, not receive.

Trials were carried out during the French manœuvres with very satisfactory results, a transmitting range of 45 miles being obtained.

The British Admiralty's attention was called to these experiments, and an officer sent over to see the apparatus. This visit resulted in the purchase by the British Admiralty of the only other set then in existence.

Towards the end of the year this apparatus was installed in an aeroplane at Eastchurch, with immediately successful results, and it was at once decided to purchase further sets for experimental purposes.

From this time the application of W/T to aircraft has steadily advanced, and it has been decided in future to fit all Naval seaplanes with transmitting sets, and all Seaplane Coast Stations with W/T transmitting and receiving installations.

Fitting of Apparatus in Seaplanes.—Great difficulty was at first experienced in fitting in W/T sets to seaplanes as the seaplane manufacturers did not understand W/T requirements, and in many cases it was found impossible to adapt machines after delivery to take W/T. The causes of these difficulties were:—

(1) Lack of space.
(2) Lack of facilities for driving the alternator.
(3) Lack of lifting power.

Even when the above three necessaries were not lacking it was often found most difficult to insulate the various parts of the apparatus and aerial.

Manufacturers are now getting to understand what is required, and the present policy is to supply the apparatus to the manufacturers of a seaplane, and for the manufacturer to fit it into the machine during construction, under the supervision of an Admiralty Officer. This policy has already been carried into effect, with the following seaplane manufacturers:—

(1) Messrs. Short.
(2) Messrs. Sopwith.
(3) Messrs. A. V. Roe.
(4) The Coventry Ordnance Co.

The same policy will be extended to other seaplane manufacturers in the near future.

Ranges of 50 miles and over from a properly fitted seaplane can now be relied on, and this range may easily be exceeded under favourable circumstances.

Reception of messages in seaplanes is not an accomplished fact at present, but probably will be obtained in the future.

System used.—The system used in naval seaplanes is known as the "balanced aerial" type of installation, the upper aerial in the form of an insulated triangle of wire round the planes taking the place of the "earth" in land installations, the radiating member consisting of a trailing aerial operated by a reel under control of the observer.

The amount of wire trailed depends on the Wave-Length it is desired in transmit, an approximate rule being that the length of trailer in feet below the body of the machine shall be one quarter the length in feet of the Wave which it is desired to transmit.

The tuning of the primary circuit is carried out by moving a tuning clip from one turn of primary winding to another.

The power of the set is $\frac{1}{4}$ k.w. and consists of a self-exciting alternator, synchronised spark gap of the rotating variety, a moschichi condenser and a combined primary and aerial coil.

The note emitted is musical, clear, and the correct rate of revolution of the alternator varies from 2,900 to 3,200 a minute. The alternator is driven by the main engine of the seaplane through suitable gearing or by a separate small petrol engine geared to the W/T alternator.

In both cases a clutch, controllable by the observer, must be fitted between the engine and alternator.

Practical Method of Working:—

1. The observer unreels the aerial trailer to the correct length on arriving at a height of 400 feet, or more, above the sea.
2. The alternator clutch is next engaged.
3. Signals can then be made in the usual manner.

4. On completion of a signal, the clutch should be disengaged and always left in the disengaged position when not actually signalling.
5. The aerial trailer should be reeled up at least two minutes before alighting.
6. If necessary, through a sudden forced landing when there is not sufficient time to reel up the aerial, the trailer may be cut by means of the special cutter operated by a handle close to the observer.

Organization of Wave-Lengths.—An organization of Wave-Lengths for enabling aircraft to co-operate with the fleet, with each other, and with Shore Stations, is now under consideration and will be issued in due course. Wave-Lengths of 300 feet, 700 feet, and 1,400 feet have been experimented with in aeroplanes and seaplanes, and trials will be carried out in Airships with a 2,900 feet Wave in the near future.

Advances and improvements that may be expected in the near future :—

1. All seaplanes built with a view to carrying W/T.
2. Incorporation of the existing balance wires into the planes or body of the machine.
3. Signalling from a seaplane by W/T when on the water.
4. Reception during flight.
5. Directional reception enabling a seaplane to discover its whereabouts.

4 and 5 may take some time to evolve.

Airships.—Experiments in this type of aircraft are only now in the commencing stage, but the application of W/T to these craft does not offer the same difficulty as to seaplanes.

There is much more room and consequently it is possible to carry out efficient transmission and reception.

Early transmitting experiments in the "Gamma" showed that the same form of aerial and balance as used in seaplanes was efficient for transmission from airships.

Recent experiments in the "Parseval" have shown that efficient reception may be relied on with the use of a Silent Cabinet.

The type of apparatus to be used in the "Parseval" and "Astra Torres" airships is the same as that used in seaplanes, but larger and more powerful, *i.e.*, $\frac{3}{4}$ k.w. output instead of $\frac{1}{4}$ k.w. The range of reliable transmission and reception will be approximately 150 miles.

The "Parseval" has all rigging insulated from the gas bag and this enables the car itself to be used as the upper or balancing aerial, a trailing aerial of the usual type operated by a reel is used as the radiating aerial.

The Silent Cabinet, though an experimental one, weighing only 100 lbs., is the greatest help to reception.

Further experiments with a view to constructing an equally light but stronger cabinet are required.

The "Astra Torres" will require a balancing aerial insulated from the rigging and car as the rigging in this ship is not insulated ; this may adversely affect the reception through the inductive effect of the magnetos, but it will be possible to overcome this source of interference by suitable earthing and lead casing of the magneto and magneto wiring.

Advances and improvements that may be expected :—

(1) Large airships with a special W/T office containing transmitting and receiving apparatus at a distance from the main engines.
(2) Rearrangement of aerials, and the possibility of doing away with the trailing aerial.
(3) Directional reception making it possible to determine the position of the airship.

Aircraft W/T Stations.—The following temporary W.T. stations are erected and in working order :—

(1) Central Flying School (Receiving only).
(2) Eastchurch.
(3) Isle of Grain.
(4) Cromarty.
(5) Farnborough.

The apparatus at Isle of Grain consists of a P. and H.D. set.

That at the Central Flying School is a receiving set on loan.

The stations at Cromarty and Eastchurch being made up of experimental gear are capable of transmitting to a range of 20 miles only.

Approval has been given for permanent stations to be erected at Grain, Cromarty and Kingsnorth. The two former will consist of destroyer W/T apparatus and two 50 feet masts. The latter will be similar apparatus slightly modified with two 80 feet masts.

Similar stations will be required and may be allowed for in next year's estimate.

Temporary stations will be erected during the course of the next two months at Yarmouth and Calshott.

Personnel.—The existing personnel in connection with W/T for aircraft is as follows :—

1 Officer 1 Petty officer 1 Electrical Artificer	For experimental and organizing work.
2 Petty officers 2 Leading Telegraphists 10 Other W/T ratings	For W/T stations in connection with aircraft.

This personnel will have to be considerably augmented in the near future to keep up with the rapid extension of W/T in all types of aircraft and aircraft stations. It will probably become necessary to separate the experimental branch from that concerned with the practical application of the apparatus itself.

QUENCHED SPARK.

Early in 1912, it was approved that 12 sets of Quenched Spark apparatus should be purchased for trial at sea. After parts of the finished apparatus had been designed the work was suspended for the time, for the following reasons :—

It was considered that a Continuous-Wave system was likely to be a more radical improvement on the Mark II. set than the Quenched-Spark system, which could only be regarded, in any event, as a small improvement.

Further, great difficulties had been experienced in the preliminary trials, due to the initial shock produced by the Quenched Spark, the effect being very similar to that experienced with Plain Aerial, and it was therefore found practically impossible to work this system in a fleet in close order.

These 12 sets may eventually be bought for a special purpose.

The design of the finished set is completed, with the exception of the aerial coil, top of condenser tank, and gap stand.

The gaps were modified as stated on page 17 of the Annual Report, 1912, and have worked quite satisfactorily. All were fitted with expansion chambers and it was found possible to take the gaps out of oil and cool them by means of a Mark II. Blower.

The condenser is the ordinary Mark II. Condenser, with a special top to carry the Primary and mutual coils.

A special adjustable impedance coil is used.

RIGGING INSULATORS.

Two types of insulators have been tried as alternatives to the Service egg-shaped insulators.

One, shown on Plate 10 of the Annual Report of 1911, continued to fail mechanically and has been abandoned. The other, shown on page 21, of W.T. Appendix to Annual Report of Torpedo Schools, 1912, passed all tests satisfactorily, but was no better than the egg-shaped one of the same size.

N.S. 8037/12497 of 13.8.13 ordered this trial to be closed.

Trials as to Necessity for Rigging Insulators.

The whole question of whether Rigging Insulators are really necessary or not has been reopened.

N.S. 5329/9478 of 23.6.13 ordered trials to be carried out to determine the question once for all.

One of the chief points to be ascertained is the effect on the auxiliary set of abolishing insulators. The trials are arranged to take place between pairs of ships of the following classes :—

(*a*) First class ships, fitted with auxiliary sets, whose upper rigging does not come right down on deck, such as the "Orion" class.
(*b*) First class ships, fitted with auxiliary sets, whose rigging crosses between the masts and comes down on deck, such as the "Bellerophon" class.
(*c*) Light cruisers, such as the "Liverpool" class.
(*d*) Destroyers.

Ranges are to be compared, and the mutual interference between main and auxiliary offices determined before and after short-circuiting the insulators.

COILS FOR EMERGENCY SETS.

The ten coils issued to sea, for trial, *see* A.L. 11946/16639 of 26.10.12, having proved satisfactory, except in certain small details of design, it has been approved to purchase one for each Mark II. and Mark I*. ship. The new coil is larger than the old, but has the same pattern number.

The exide cells supplied with the smaller coil will not be issued with the new coil, but a Fuller's block accumulator battery will be used instead.

WAVE-METERS.

Twenty-six of the new wave-meters, Patt. No. 1492, are now at sea, mostly in Flagships.

All ships allowed wave-meters have been supplied with a Patt. 1492, or an old wave-meter recalibrated. The shore stations are now being supplied, leaving only the reserve stocks for dockyards to be calibrated.

No wave-meters are now sent to the National Physical Laboratory for calibration. The whole of the calibration is carried out in "Vernon."

N.S. 9281/13353 of 26.8.13 authorises the supply of a wave-meter set to the submarine parent ships, "Forth," "Maidstone," "Vulcan," "Bonaventure," and "Hazard."

RECEIVING CIRCUITS.

Experimental Circuit. (*Vide* page 11, W.T. Appendix, A.R., 1912.)

This circuit has not been successful. It is not superior to tuned shunts and is far more complicated. Trials have been closed.

Hudson's Interference Preventer. (*Vide* page 13, W.T. Appendix, A.R., 1912.)

Has not proved successful. Trials have been closed.

Stranded Wire for Inductances.

Experiments have been carried out to determine the best wire for winding Receiving Inductances. They have been inconclusive owing to lack of proper measuring instruments. The experiments, so far, show that for any particular frequency one form of wire is the best. The effect of using stranded wire, in which each strand is insulated from its neighbours is to reduce the high frequency ohmic resistance. With a high frequency the eddy current losses are greater than for a low frequency. This state of affairs introduces further complications in the design of Receiving Circuits, as they have to deal with frequencies varying from 2,500,000 to 70,000 cycles per second (4 to 4,600 L.S.) at the present time, with a possibility of still lower frequencies being introduced in the future.

Condensers.

The marked inefficiency of the present Condensers using mica or ebonite as a dielectric has shown that in future designs air Condensers must be used as much as possible. A new design for an air Condenser has been prepared, and some are being issued for trial.

When large capacities are wanted, as in the Rejector and No. 1 Condenser, mica block condensers will have to be used, as air condensers occupy too much space. Trials are being carried out to obtain an efficient mica condenser for this purpose.

Copper Cases for Receiving Instruments.

These, unless at some distance from the coil they enclose, reduce the inductance of the coil, and losses are introduced due to the production of eddy currents in the copper. This fact, combined with the extra space taken up by these copper cases, prevents the adoption of these articles for the present. They will be considered in all future designs, as the advantages obtained by carefully screening each part of the receiving circuit are important, when selectivity and freedom from interference are considered.

Detectors.

A holder for the Dennis Detector has been designed, and is now being issued. It will be known as "Detector, Dennis, fitted, Patt. 309." (*See* Plate IX.)

Future Policy.

Pending the results of experiments which are about to be carried out with a Continuous-Wave System, it is not proposed to proceed with the design of a new Receiving Circuit for the present Spark System.

Certain alterations, however, to the present Receiving Circuit, are necessary.

Alterations to present Apparatus.

Nos. 1 *and* 4 *Condensers.*—An instrument called the Aerial Acceptor is on trial to replace these articles (*see* page 24).

The Aerial Acceptor at present on trial appears to be too selective for general use in the Fleet as a watch-keeping device. Should further trials, now in progress, confirm this, mica block condensers will probably be added to bring the capacity up to 10 jars, thus lowering the selectivity of the circuit.