

SERVICE MARK I*. INSTALLATION.

Improvements have been introduced in the Service I., and 114 ships will, in 1908-9, be fitted with certain new apparatus. The installation will be known as Service I*.; there will then be three types of transmitting apparatus in the Service, viz. :—

Service II. for all new large ships.

Destroyer installation for destroyers.

Service I*. for many existing ships and all new ships not large enough to be fitted with Service II.

The "C" tune II. installations at present afloat will be withdrawn, and Service II. substituted.

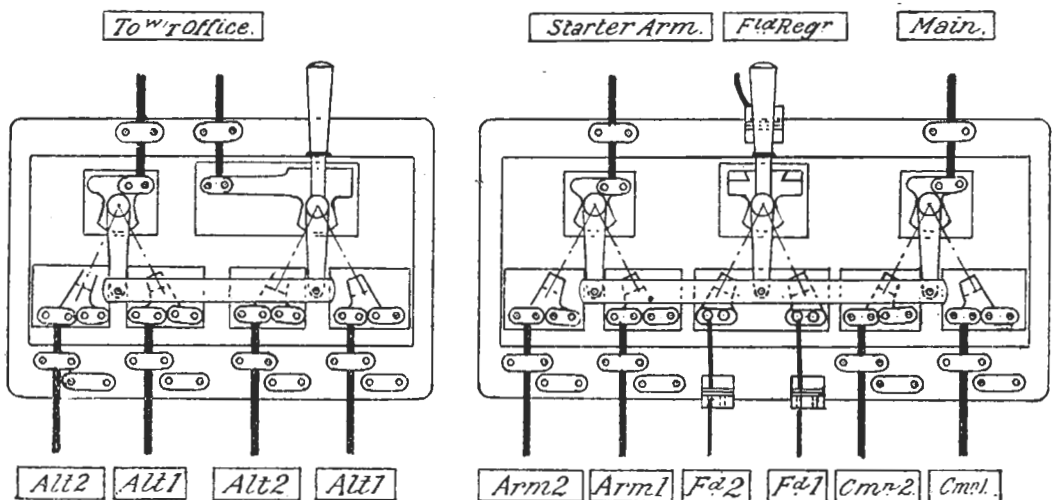
The main features of the Mark I*. installation are the supply of a transformer; ebonite condenser; primary of copper tubing, and a spark gap of the revolving type in order that a musical note may be obtained with the low frequency $1\frac{1}{2}$ -K.W. rotaries, which are being retained. A change-over switch and additional rotary converter, also an adjustable mutual, and aerial coils wound with copper wire, are included. The installation is small enough to fit into a scout's office, and is protected by a small screen and suitable safety switches. All wave-lengths, from 700 to 6,500 feet, can be transmitted with this installation.

A detailed description of the Service I*. installation is given in the handbook. Plate VII. shows the general arrangement of instruments in a scout with the minimum sized office; in large ships there is much more bench space. The aerial coils, A and B, are omitted from the plan of the bench for the sake of clearness. The arrangement of these coils depends upon the position of the deck insulator; if it is not found possible to put them inside the screen they must be placed somewhere else in the office, a clear sparking distance of at least 5 inches being allowed between the high-tension side of the secondary circuit and earth. Only high frequency current shocks can be obtained from this part of the circuit. The auxiliary condensers, K, are for use when sending out the harmonics "D" and "P" tune as described in pages 41 and 43 of this report.

Plate VIII. shows the wiring of Service I*. installation. The principal additions to the existing wiring outside the office, which are required, are the wiring for the second rotary when its position has been selected, and the wiring of the change-over switches. Care must be taken to connect the lead casing of the cables to the frames of the instruments by good soldered connections.

Inside the office—the double pole change-over switch (not shown in the Plate) at present in use in the A.C. circuit may be retained provided there is sufficient room on the instrument board. Cable pattern No. 546 is used for the key leads inside the cabinet as it is flexible twin wire, and reduces the number and size of holes to be made in the casing of the cabinet. If the auxiliary field regulator, K, is not supplied the lead 798A must be run to the silent cabinet and on to the field of the motor, so that the additional instrument can be afterwards inserted in the position shown. The transformer block, X, should be placed as near the transformer as possible.

DETAILS OF CHANGE-OVER SWITCHES.



The above diagram shows the details of the change-over switches. It will be noticed that a double set of clips is provided; one set only is required for use at present, and the leads in the diagram are shown joined up to the left-hand connections.

General arrange-
ment of office.

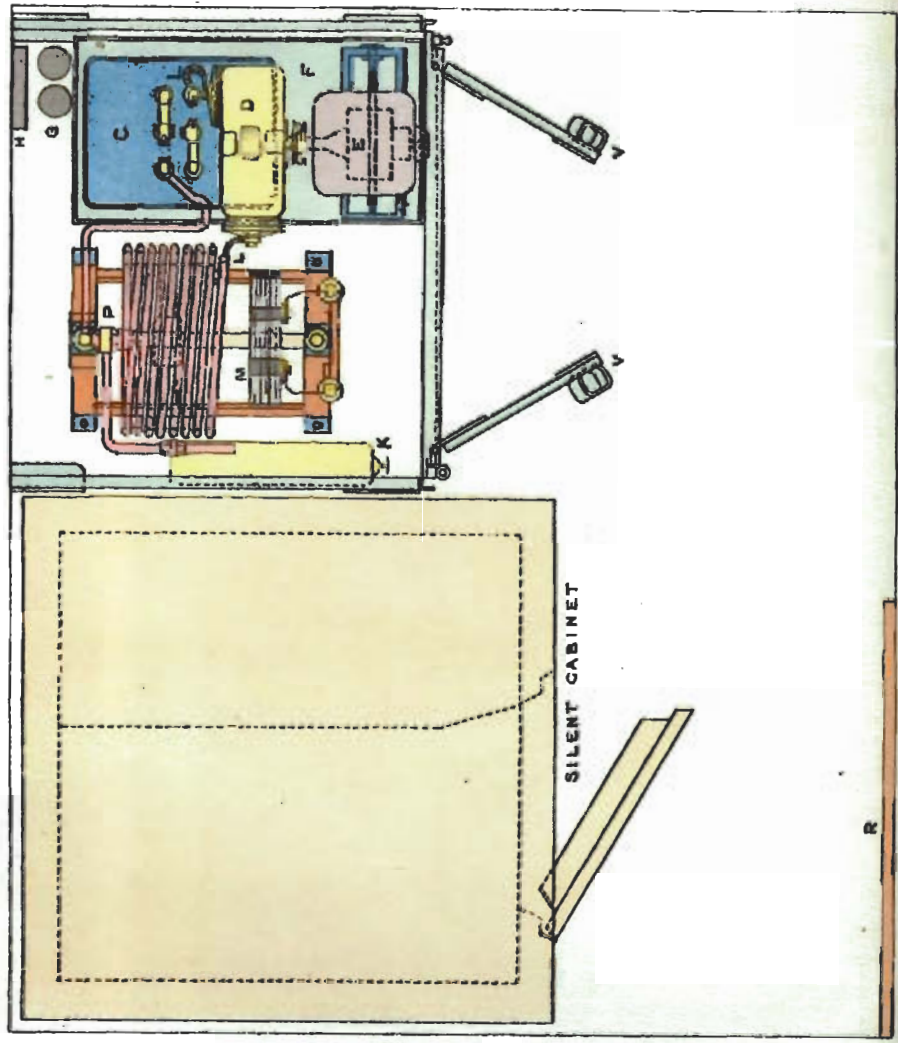
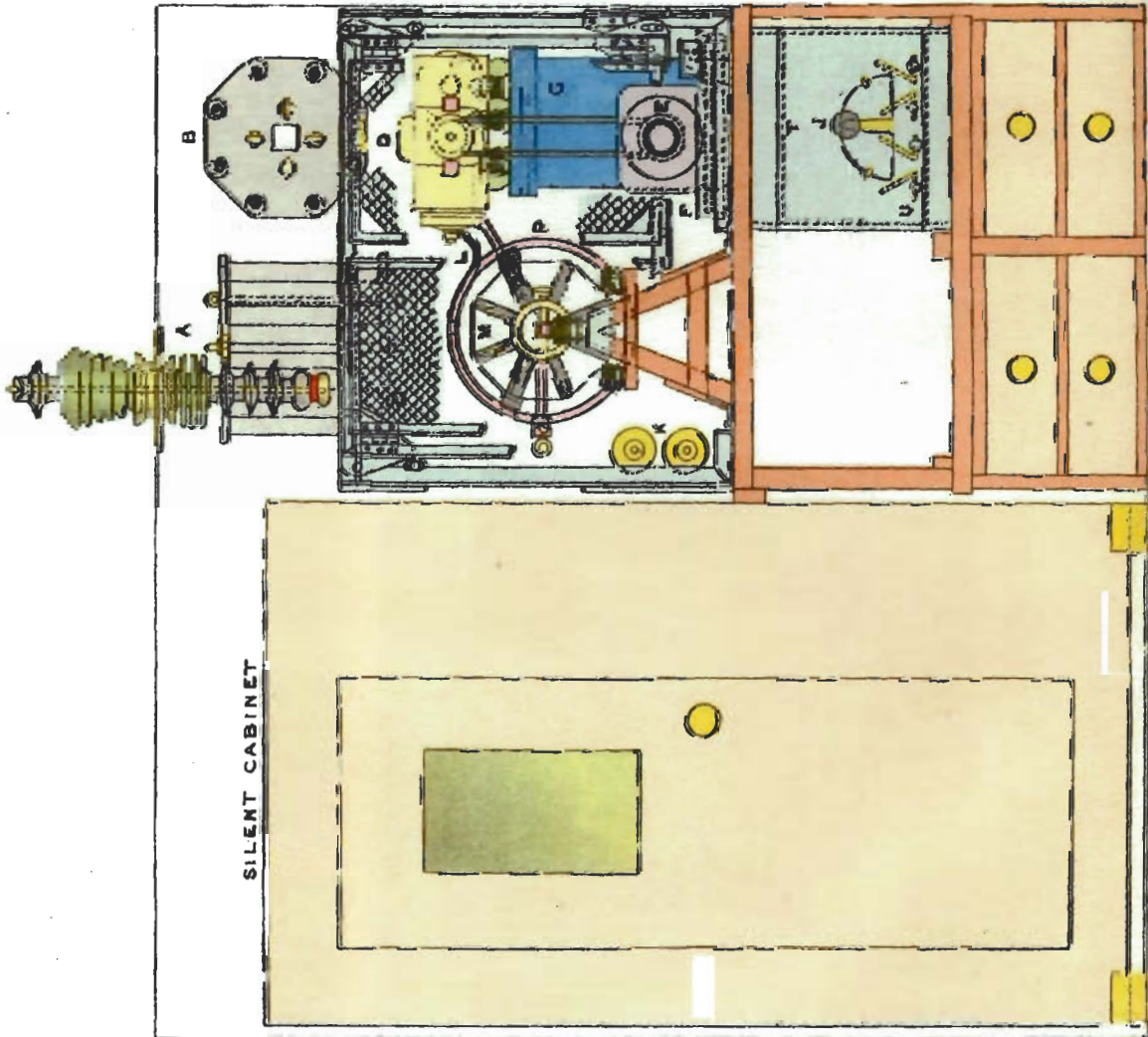
Wiring of
Service I*.
(Outside office).

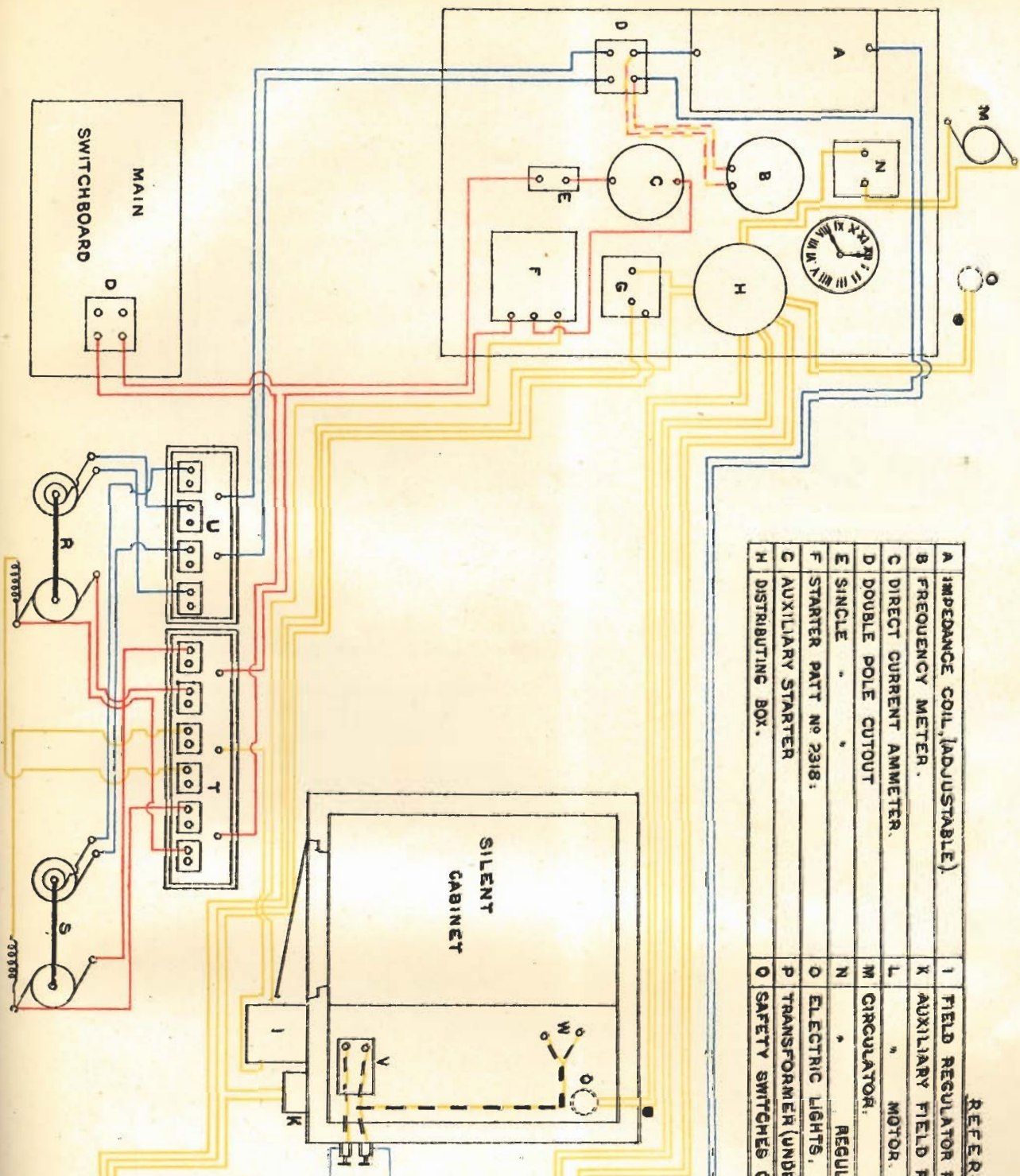
(Inside office).

GENERAL ARRANGEMENT OF INSTRUMENTS AND OFFICE SERVICE MARK I *

REFERENCE

A	AERIAL COIL No 1	K	AUXILIARY CONDENSERS
B	SPARK GAP	L	FLEXIBLE LEADS
C	CONDENSER TANK	M	MUTUAL COIL
D	AUXILIARY MOTOR	P	PRIMARY COIL
E	TRAY FOR CONDENSER TANK & MOTOR	R	INSTRUMENT BOARD
F	BENCH INSULATORS	T	TRANSFORMER
G	PROTECTING COILS (BASE PLATE)	U	SAFETY HORNS
H	HANDLE OF SERIES PARALLEL HIGH TENSION SWITCH	V	DOORS OF SAFETY SCREEN
J			





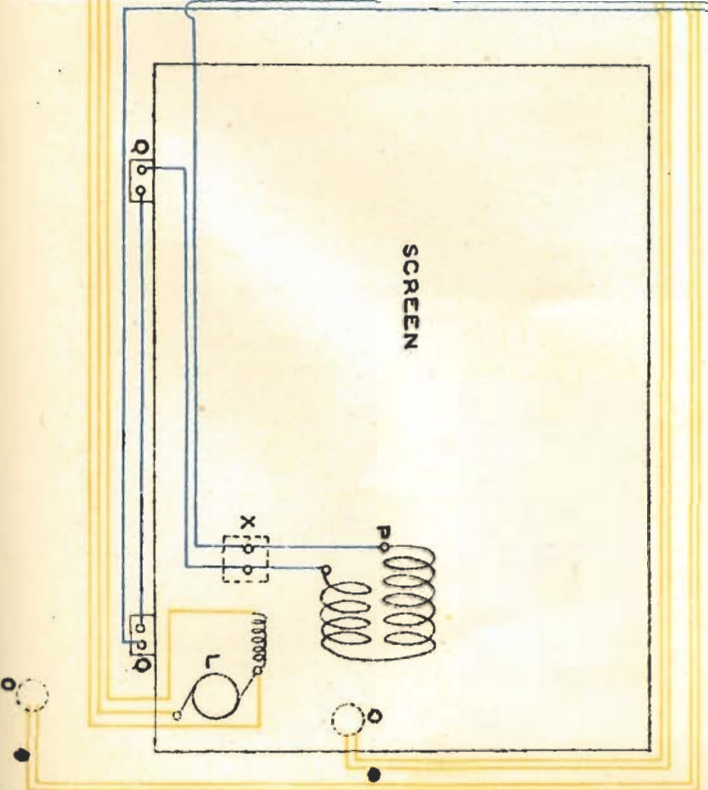
A	IMPEDANCE COIL, (ADJUSTABLE)	I	FIELD REGULATOR
B	FREQUENCY METER.	K	AUXILIARY FIELD MOTOR.
C	DIRECT CURRENT AMMETER.	L	" " "
D	DOUBLE POLE CUTOUT	M	CIRCULATOR.
E	SINGLE " "	N	" " REGUL.
F	STARTER PATT. NO 2318:	O	ELECTRIC LIGHTS.
G	AUXILIARY STARTER	P	TRANSFORMER (UNDER)
H	DISTRIBUTING BOX.	Q	SAFETY SWITCHES

SERVICE INSTALLATION M. I.*
 DIAGRAMMATIC SKETCH OF COMPLETE WIRING.

REFERR

NCE

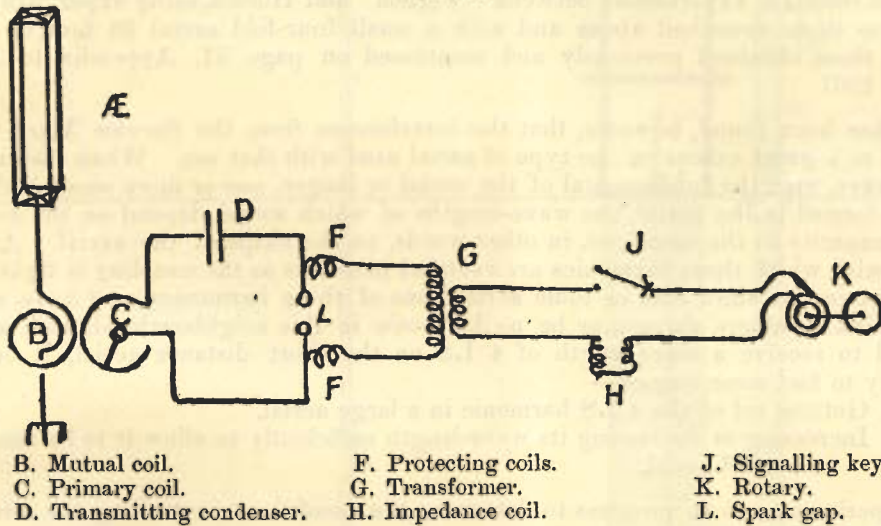
REGULATOR	R	No 1 ROTARY
REGULATOR	S	No 2 "
REGULATOR	T	CHANGE OVER SWITCHBOARD D.C.
REGULATOR	U	" " " A.C.
REGULATOR	V	SIGNALLING KEY
REGULATOR	W	SAFETY SWITCH ON LEVER
REGULATOR	X	SWITCH
REGULATOR		CABLE PATT 821A D.C. LEADS
REGULATOR		" " " A.C. "
REGULATOR		" " " 798A D.C. "
REGULATOR		" " " A.C. "
REGULATOR		" " " 546
REGULATOR	X	TRANSFORMER TERMINAL BLOCK.



SHORT-DISTANCE W.T.

Since the publication of A.R., 1907, experiments have been carried out with the Progress short-distance sets, with a view to a limited number of them being sent to sea.

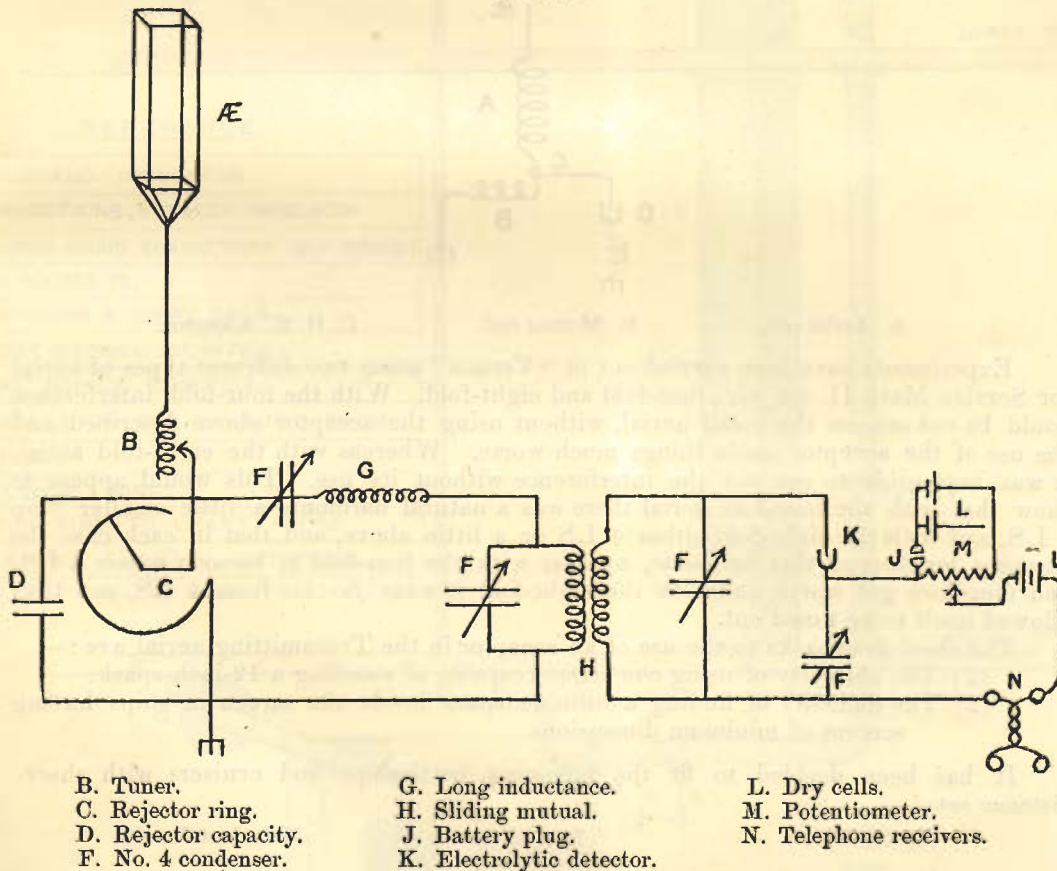
FIG. a.



- | | | |
|----------------------------|----------------------|--------------------|
| B. Mutual coil. | F. Protecting coils. | J. Signalling key. |
| C. Primary coil. | G. Transformer. | K. Rotary. |
| D. Transmitting condenser. | H. Impedance coil. | L. Spark gap. |

The transmitting set consists essentially of a destroyer set (see Fig. a) the condenser of which has been reduced from 18 to 5.9 jars, the impedance coil being accordingly re-wound to give resonance between 95 and 105 cycles. Transmitting instruments.

FIG. b.



- | | | |
|-----------------------|---------------------------|-------------------------|
| B. Tuner. | G. Long inductance. | L. Dry cells. |
| C. Rejector ring. | H. Sliding mutual. | M. Potentiometer. |
| D. Rejector capacity. | J. Battery plug. | N. Telephone receivers. |
| F. No. 4 condenser. | K. Electrolytic detector. | |

The receiving circuit (Fig. b) is electrically identical with the ordinary Service receiving circuit, except:— Receiving instruments.

- (1) Since with the short aerial, and receiving circuits tuned to a 400-foot wave, there is little chance of an electrolytic being damaged by atmospherics and heavy signalling close by, it has been thought desirable to fit an electrolytic detector in lieu of a magnetic detector, the former being more compact.
- (2) The tuner is replaced by a small tuner and the No. 2 condenser has been removed from the rejector since small ranges of adjustment only are required, whilst the No. 5 condenser has had two adapters fitted to enable it to be connected direct to the adjustable inductance, Mark II.

(3) It has been found necessary in some cases to introduce—

(a) An extra acceptor circuit, marked F and G, of which the inductance G is of fine wire, wound on a long former of $\frac{1}{2}$ inch diameter.

(b) A No. 4 condenser across the primary of sliding inductance so as to make it into a rejector circuit of which the mutual is the inductance.

The circuit shown in Fig. b will therefore be the standard one.

Results of experiments.

The results of experiments between "Vernon" and Horsea, using experimental sets similar to those described above and with a small four-fold aerial 26 feet in length, confirm those obtained previously and mentioned on page 51, Appendix to Annual Report, 1907.

Harmonics.

It has been found, however, that the interference from the Service Mark II. set depends to a great extent on the type of aerial used with that set. When transmitting a long wave, viz., the fundamental of the aerial or longer, one or more small harmonics are also formed in the aerial, the wave-lengths of which would depend on the distribution of capacity in the aerial, or, in other words, on the shape of the aerial. And the energy with which these harmonics are radiated increases as the coupling is tightened.

Experiments show that in some aerials one of these harmonics may have an LS of 4, whilst in others there may be no harmonic in this neighbourhood, and, as it is intended to receive a wave-length of 4 LS on the short distance aerial, it becomes necessary to find some way of—

(1) Getting rid of the 4 LS harmonic in a large aerial.

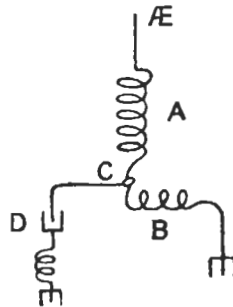
(2) Increasing or decreasing its wave-length sufficiently to allow it to be tuned out in a small aerial.

Method of overcoming harmonics

Experiments are in progress to determine the conditions controlling the formation of these small harmonics.

One method, tried in "Vernon," consists of placing an acceptor circuit, of approximately the LS of the interfering harmonic, between the top of the aerial coil and earth. (See Fig. c.)

FIG. c.



A. Aerial coil.

B. Mutual coil.

C, D, E. Acceptor.

Experiments have been carried out in "Vernon" using two different types of aerial for Service Mark II. set, viz., four-fold and eight-fold. With the four-fold, interference could be cut out on the small aerial, without using the acceptor above described, and the use of the acceptor made things much worse. Whereas with the eight-fold aerial, it was impossible to cut out the interference without its use. This would appear to show that with the four-fold aerial there was a natural harmonic a little smaller than 4 LS, and with the eight-fold either 4 LS or a little above, and that in each case the acceptor lengthened this harmonic, so that with the four-fold it became *nearer* 4 LS, and therefore got worse, and with the eight-fold it went *further* from 4 LS, and thus allowed itself to be tuned out.

The chief drawbacks to the use of an acceptor in the Transmitting aerial are:—

(1) The necessity of using condensers capable of standing a 12-inch spark.

(2) The difficulty of finding a suitable space inside the screen in ships having screens of minimum dimensions.

Future policy.

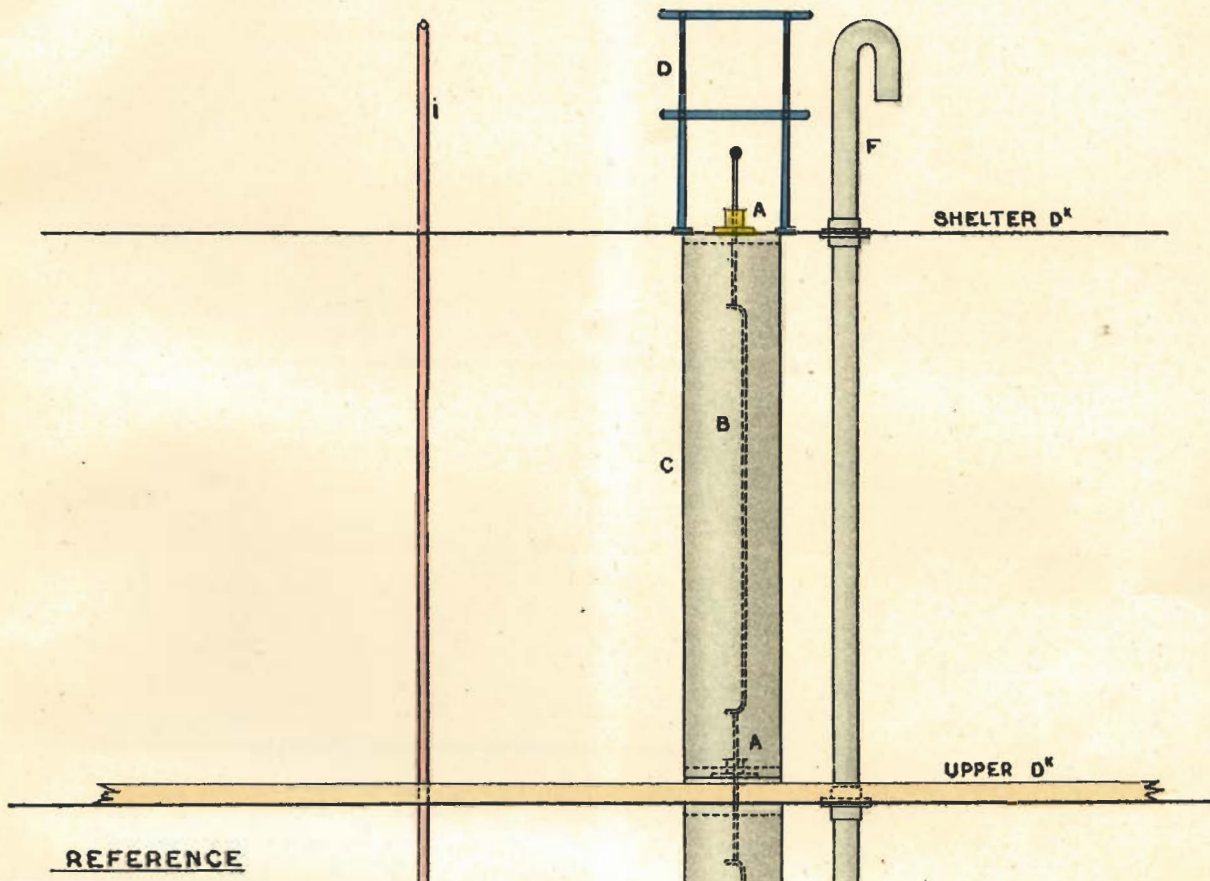
It has been decided to fit the following battleships and cruisers with short-distance sets:—

Battleships.	Battleships.	Main Installation.
"Aboukir."	"Dreadnought."	} Service Mark II.
"Agamemnon."	"Hibernia."	
"Bacchante."	"Hindustan."	
"Bellerophon."	"King Edward VII."	
"Dominion."	"Lord Nelson."	
Cruisers.		
Third Cruiser Squadron - - -	- - -	- - - Service Mark II.

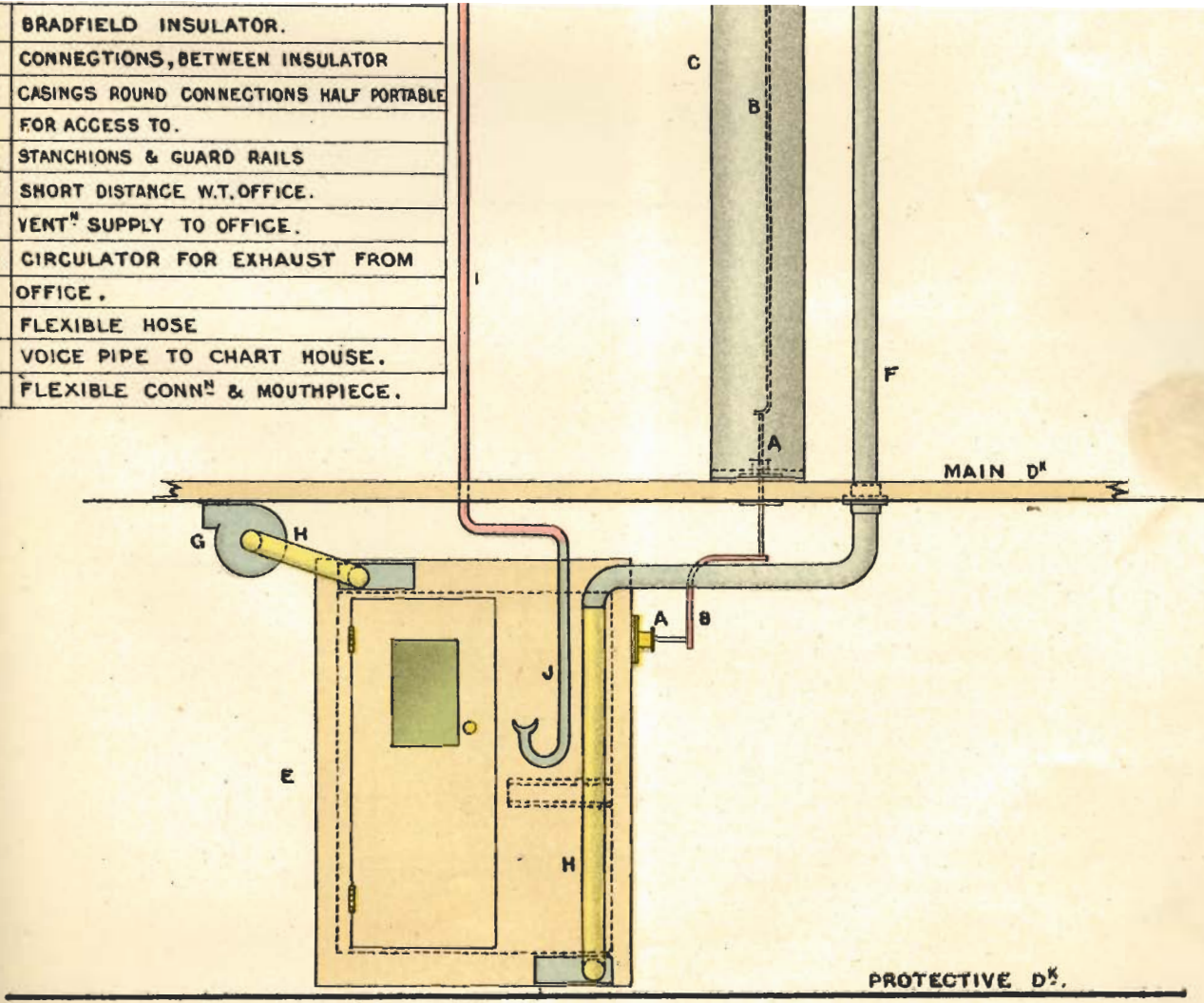
Office.

The short-distance office will consist of a large size left-hand silent cabinet placed behind armour on the protective deck (see Plate I X.).

METHOD OF FITTING AERIAL & EARTH CONNECT^{NS}.
TO SHORT DISTANCE $\frac{1}{4}$ OFFICE.



A	BRADFIELD INSULATOR.
B	CONNECTIONS, BETWEEN INSULATOR
C	CASINGS ROUND CONNECTIONS HALF PORTABLE FOR ACCESS TO.
D	STANCHIONS & GUARD RAILS
E	SHORT DISTANCE W.T.OFFICE.
F	VENT ^N SUPPLY TO OFFICE.
G	CIRCULATOR FOR EXHAUST FROM OFFICE.
H	FLEXIBLE HOSE
I	VOICE PIPE TO CHART HOUSE.
J	FLEXIBLE CONN ^N & MOUTHPIECE.



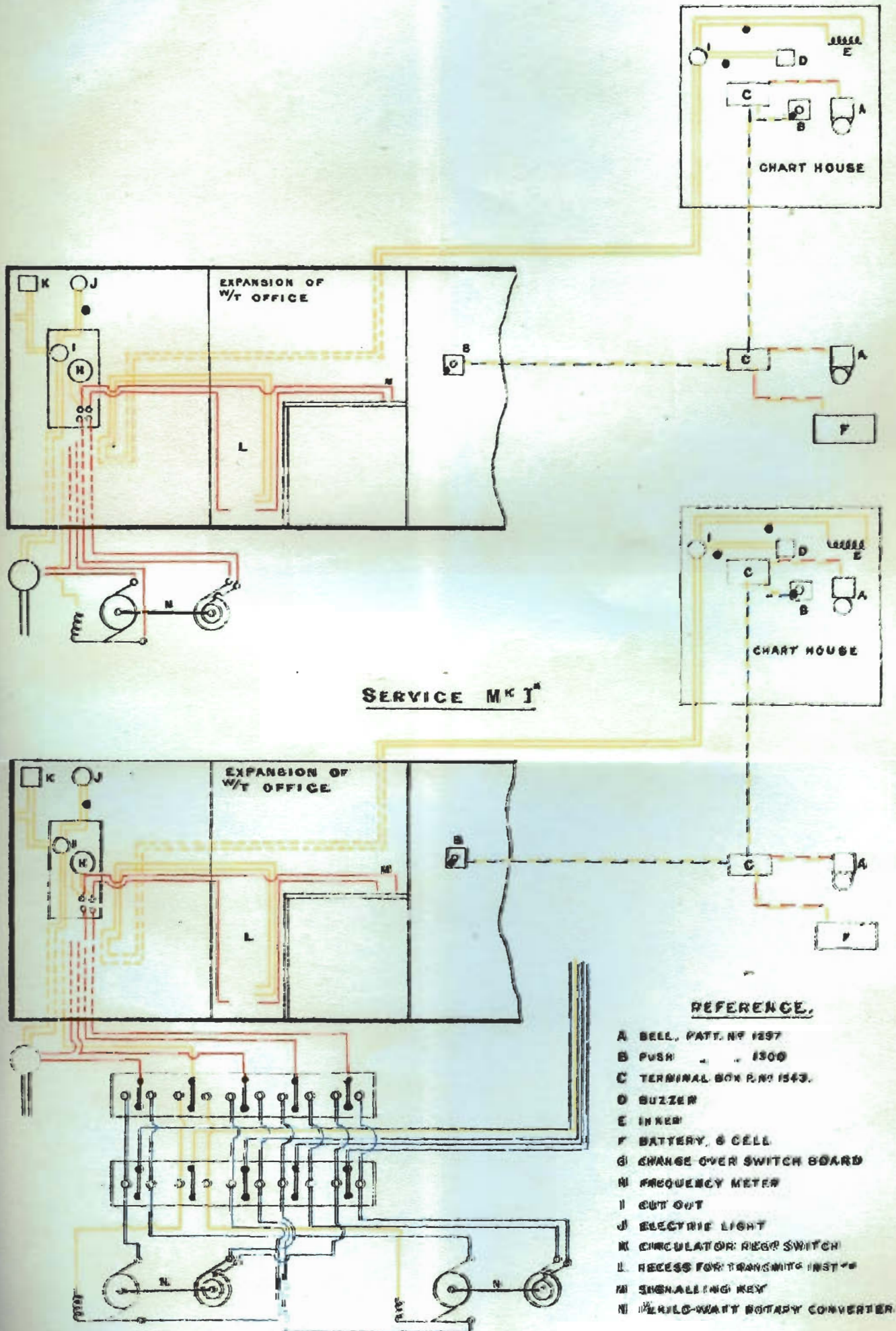
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WIRING OF SHORT DISTANCE ^{W/T} SETS.

FOR SHIPS FITTED WITH "C" TUNE & SERVICE M^K II.

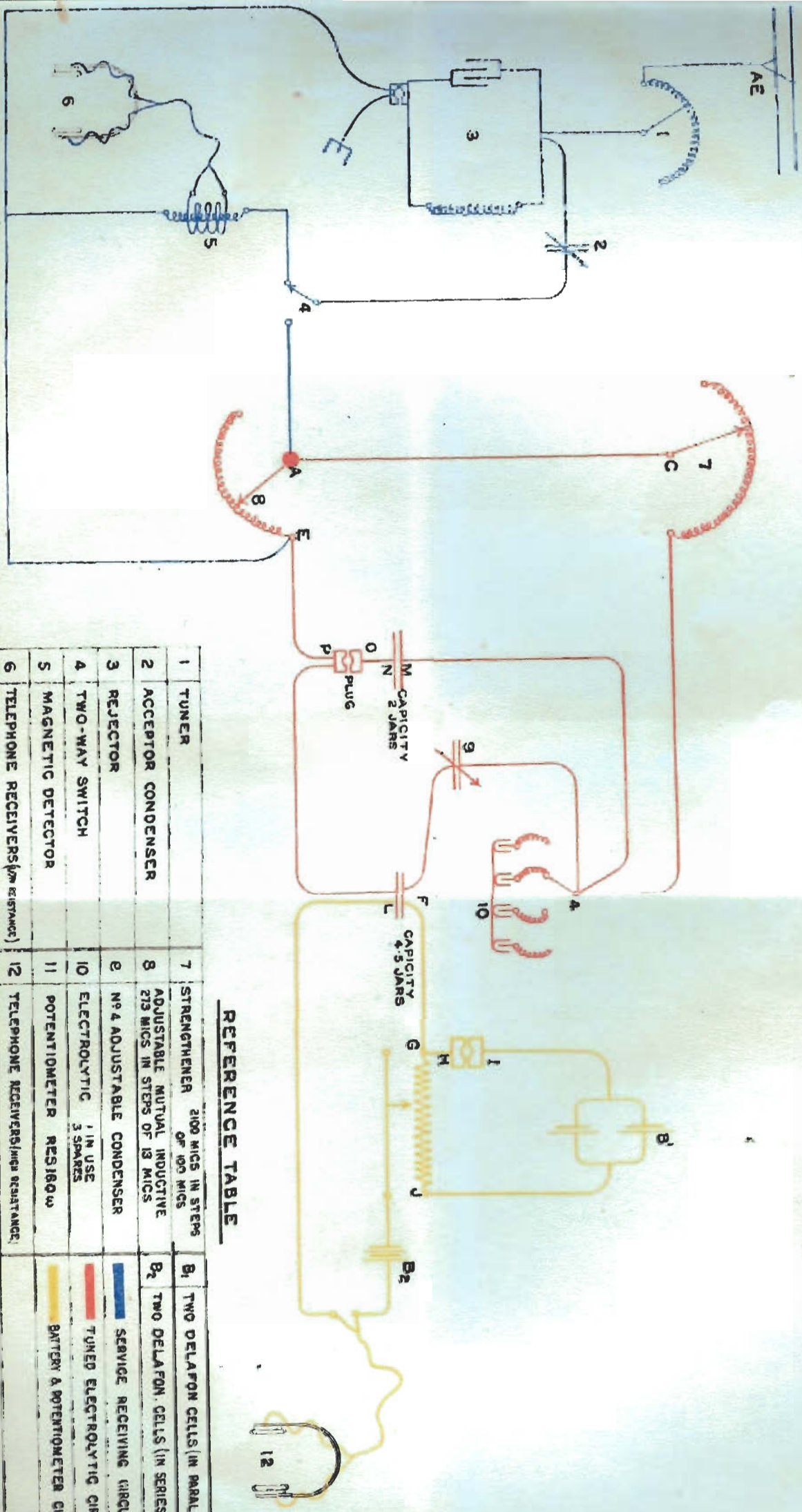


REFERENCE.

- A BELL, PAT. NO 1297
- B PUSH, 1300
- C TERMINAL BOX P. NO 1543.
- D BUZZER
- E INKER
- F BATTERY, 6 CELL
- G CHANGE OVER SWITCH BOARD
- H FREQUENCY METER
- I CUT OUT
- J ELECTRIC LIGHT
- K CIRCULATOR; REG. SWITCH
- L RECESS FOR TRANSMITTING INST.
- M SIGNALLING KEY
- N MILLE-WATT BATTERY CONVERTER

EXPERIMENTAL ELECTROLYTIC RECEIVING SET

DIAGRAMMATIC SKETCH OF CONNECTIONS.



REFERENCE TABLE

1	TUNER	7	STRENGTHENER 2100 MICS IN STEPS OF 100 MICS	B ₁	TWO DELAFON CELLS (IN PARALLEL)
2	ACCEPTOR CONDENSER	8	ADJUSTABLE MUTUAL INDUCTIVE 213 MICS IN STEPS OF 13 MICS	B ₂	TWO DELAFON CELLS (IN SERIES)
3	REJECTOR	9	N ^o 4 ADJUSTABLE CONDENSER		SEWIGE RECEIVING CIRCUIT
4	TWO-WAY SWITCH	10	ELECTROLYTIC 1 IN USE 3 SPARES		TUNED ELECTROLYTIC CIRCUIT
5	MAGNETIC DETECTOR	11	POTENTIOMETER RES 160 Ω		BATTERY & POTENTIOMETER CIRCUIT
6	TELEPHONE RECEIVERS (low resistance)	12	TELEPHONE RECEIVERS (high resistance)		

A 25-foot four-fold vertical aerial is required above the upper deck or superstructure, and, where it passes between decks to the office, it will be protected by a light steel circular casing 16 inches in diameter.

Aerial.

The arrangement of the office will follow very closely that of the destroyer's office.

Arrangement of office.

In ships fitted with Service Mark I*, an additional change-over switchboard will be installed, enabling either of the two $1\frac{1}{2}$ -K.W. rotaries to be used for main installation on short distance.

Rotary converter.

In ships having Mark II. or "C" tune, a $1\frac{1}{2}$ -K.W. rotary will be supplied solely for short distance. The wiring of these rotaries is shown on Plate X.

It is intended to fit the above mentioned ships with this installation, for trial as to its reliability as a substitute for visual and sound signalling in a fleet, and to test its suitability for manœuvring purposes.

Uses for short distance.