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O. U. 5041.

HANDBOOK

OF

SIGNALLING,

1918.

NAVAL STAFF,
SIGNAL DIVISION (No. 1457)
21st November, 1918.

PLATE I.

FLAGS AND PENDANTS USED IN NAVAL SIGNALLING

ALPHABETICAL FLAGS AND SPECIAL FLAGS.

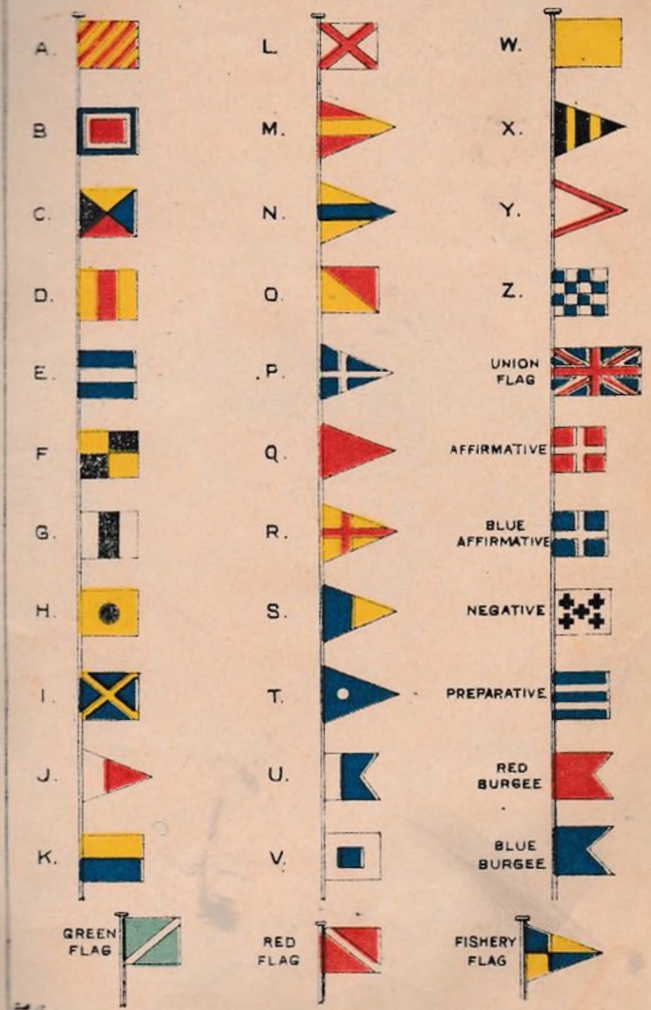
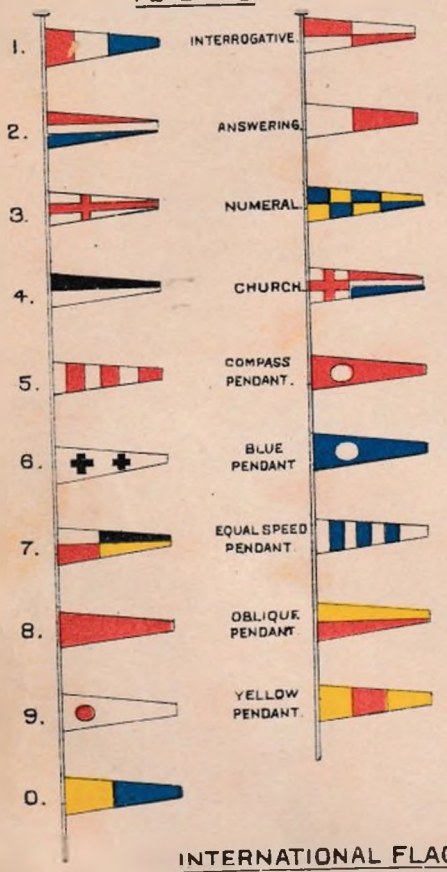


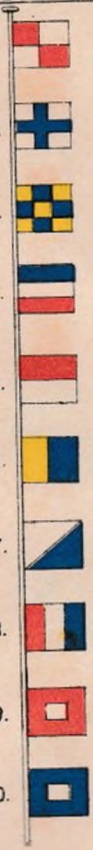
PLATE I. (Continued)

FLAGS AND PENDANTS USED IN NAVAL SIGNALLING.

PENDANTS.



NUMERAL FLAGS.



INTERNATIONAL FLAGS.

A. CORAM LTD. LITH.

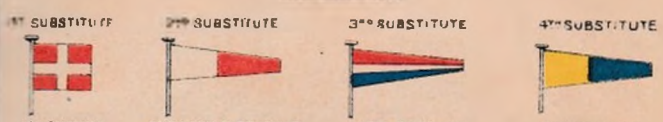
PLATE II.

SUBSTITUTES.

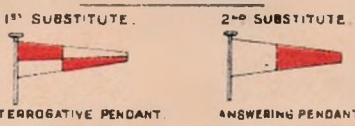
THE 1ST SUBSTITUTE ALWAYS REPEATS THE UPPER FLAG OR PENDANT OF A SERIES, THE 2ND SUBSTITUTE REPEATS THE SECOND FLAG OR PENDANT, THE 3RD SUBSTITUTE REPEATS THE THIRD FLAG, AND THE 4TH SUBSTITUTE REPEATS THE FOURTH FLAG.

NOTE. THE NUMERAL PENDANT WHEN HOISTED BETWEEN NUMERAL FLAGS IS NOT TO BE CONSIDERED AS BREAKING THE SERIES

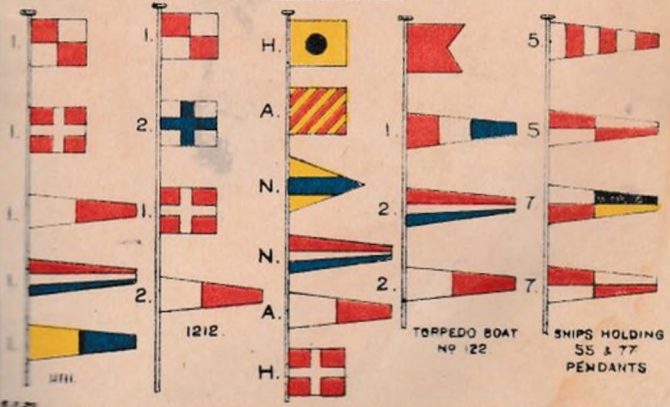
FOR FLAGS.



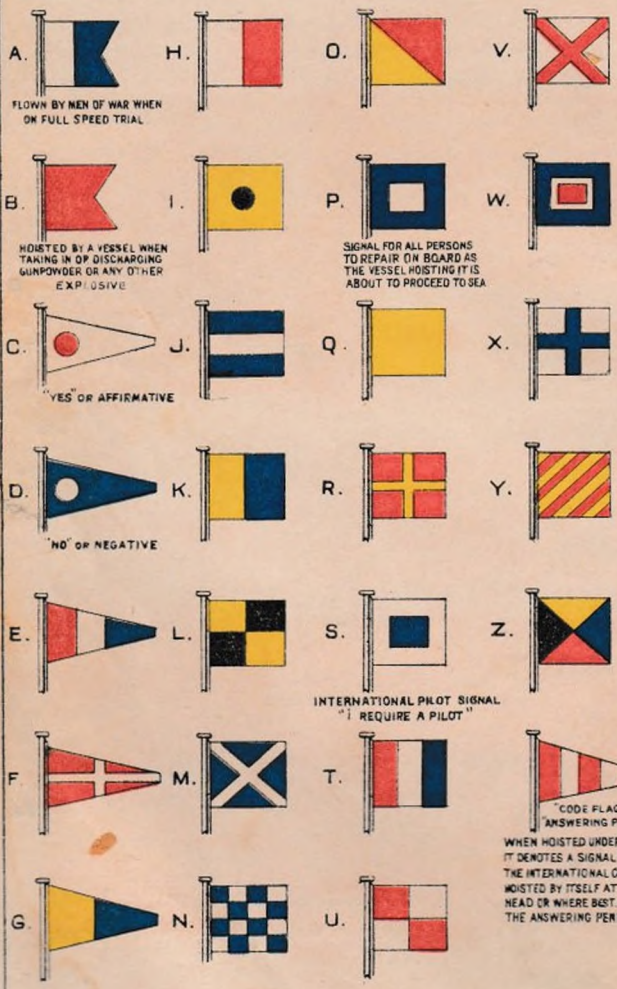
FOR PENDANTS.



EXAMPLES.

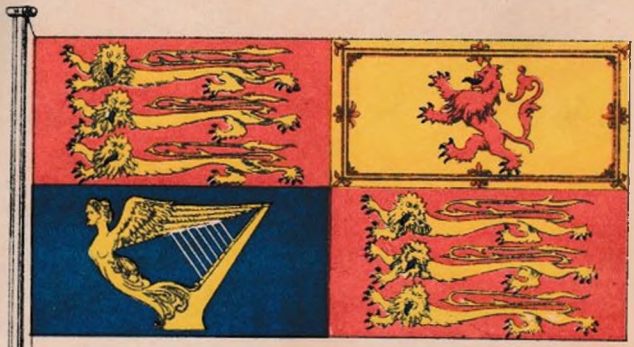


FLAGS AND PENDANTS USED IN THE INTERNATIONAL CODE.



H & C GRAHAM Ltd LITH.

ROYAL STANDARD

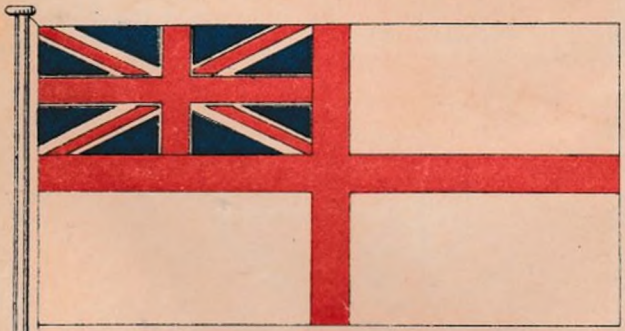


LORD HIGH ADMIRAL
OR
ADMIRALTY FLAG.

W. & C. GRAHAM, Lith.

UNION FLAG.

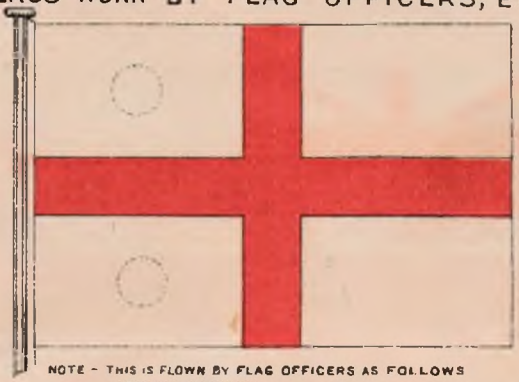
THE WHITE ENSIGN



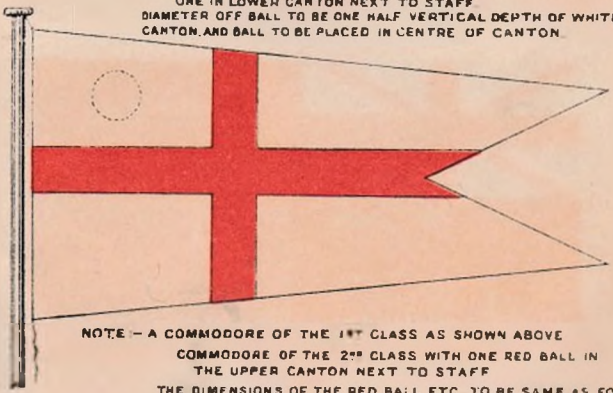
ALL HIS MAJESTY'S SHIPS OF WAR IN COMMISSION SHALL WEAR A WHITE ENSIGN, WITH THE RED ST GEORGES CROSS AND THE UNION IN THE UPPER CANTON.

H & C GRAHAM LTD LITHS

FLAGS WORN BY FLAG OFFICERS, ETC.



NOTE – THIS IS FLOWN BY FLAG OFFICERS AS FOLLOWS
ADMIRAL AS SHOWN
VICE ADMIRAL, WITH ONE RED BALL IN THE UPPER CANTON NEXT TO STAFF
REAR ADMIRAL, WITH ONE RED BALL IN THE UPPER CANTON AND ONE IN LOWER CANTON NEXT TO STAFF
DIAMETER OFF BALL TO BE ONE HALF VERTICAL DEPTH OF WHITE CANTON, AND BALL TO BE PLACED IN CENTRE OF CANTON.

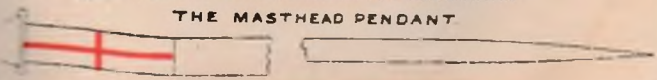


NOTE – A COMMODORE OF THE 1ST CLASS AS SHOWN ABOVE
COMMODORE OF THE 2ND CLASS WITH ONE RED BALL IN THE UPPER CANTON NEXT TO STAFF
THE DIMENSIONS OF THE RED BALL ETC TO BE SAME AS FOR ADMIRAL'S FLAG.

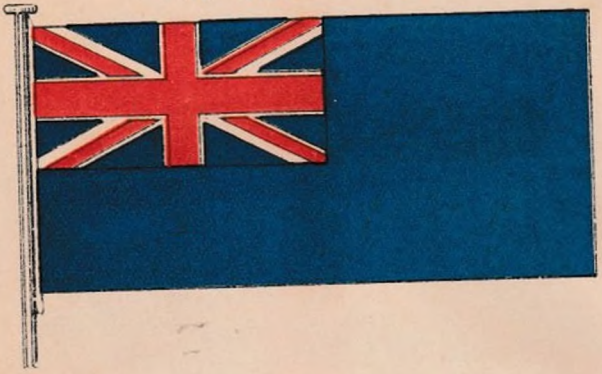
SENIOR OFFICERS PENDANT

NOTE – THIS PENDANT IS MADE IN TWO SIZES VIZ 5 AND 3 BREADTHS

THE MASTHEAD PENDANT

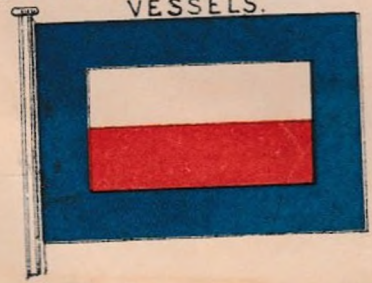


THE BLUE ENSIGN.



THE RED ENSIGN.

FLAG FLOWN BY EXAMINATION VESSELS.



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CHAPTER I.

MISCELLANEOUS NOTES ON WEARING CERTAIN FLAGS, ETC.

Ensign and Union Flag.

1. The Ensign and Union Flag should be laced on when flags of the size of six breadths and above are used.

Boat Ensigns and Pendants.

2. Boats when away from their ships are to fly Ensigns when :—

(*a*) Ships are dressed;

(*b*) In a foreign port;

(*c*) Visiting foreign Men-of-War in British ports;

(*d*) Flying the flag of any Governor, Military, Diplomatic or Consular Authority during the time the colours are hoisted in ships.

NOTE.—When under sail, Ensigns are to be flown by launches and pinnaces only.

3. The boat carrying the Officer of the Guard, when boarding a foreign Man-of-War or foreign yacht, is to fly an Ensign on all occasions, day and night; in addition, the Officer of the Guard is also to fly a small Masthead Pendant in the bows of the boat.

4. When colours are half-masted in ships, boats' Ensigns (if worn) are also to be half-masted.

4. Whenever a corpse is being conveyed in a boat, either at home or abroad, the boat conveying such is to carry an Ensign half-masted.

5. When Ensigns or Pendants are flown in boats, they should always be clean, in good repair, and stopped neatly to the staffs.

Union Flag.—Procedure for Flying at Jack Staff Under Way.

3. Whenever H.M. Ships are under way flying the Royal Standard, or escorting one of H.M. Ships which is flying the Royal Standard, or when dressed with Mast-head Flags, they are to fly the Union Flag at the Jack Staff.

Half-masting Colours.

4. When colours are half-masted for a funeral on shore, they should be lowered at the time the cortege is due to leave the hospital, mortuary or place where the body has been lying, and re-hoisted when sufficient time has elapsed for the interment. This depends on the distance to be covered, &c., but usually one hour is the time allowed.

2. When the body leaves a ship, the colours should be lowered when the body is removed from where it has been lying on board that ship, and re-hoisted when sufficient time has elapsed for the interment.

3. For a funeral at sea the colours should be lowered when the body is removed from where it has been lying, and re-hoisted when the funeral service has been completed.

4. When a body is being conveyed from a ship to another ship or place to await interment the colours are not to be half-masted, but the boat conveying it is to fly a boat's Ensign at half-mast.

5. When colours are ordered to be half-masted throughout the day, they should be hoisted close up when

colours are hoisted in the morning and immediately lowered to half-mast. At sunset, they should first be hoisted close up and then lowered in the usual manner. This also applies to any foreign National Flag that is ordered to be worn at half-mast at the Main.

Flying Ensign at Half-Mast when Under Way.

5. Ships approaching or leaving an anchorage where others of H.M. Ships are wearing a Foreign National Flag at half-mast at the main, or have their colours at half-mast, are to hoist or keep the foreign National Flag at half-mast, or half-mast their own colours, while within sight of the ships in port.

Death of a Flag Officer, Half-Masting and Striking his Flag.

6. On the death (otherwise than in battle) of a Flag Officer whose flag is flying in one of H.M. ships or naval establishments, his flag is to be half-masted, and is to be kept at half-mast until sunset on the day of the funeral, when it is to be hoisted close up and then finally struck.

2. Should, however, the funeral take place outside the vicinity of the ship or port in which the flag is flying, the flag is to be kept at half-mast until sunset on the day upon which the body is removed from the ship or port for the purpose of burial.

NOTE.—Exceptional cases (such as a Flag Officer dying in hospital whilst his flagship is absent, or dying whilst on leave ashore, etc.), should be dealt with in accordance with the foregoing principles.

CHAPTER II.

SIGNALLING BY SEMAPHORE.

The Semaphore Flag.

7. Flag "E," hoisted either singly or inferior to fleet numbers or other distinguishing signals, denotes that a communication is about to be made by semaphore. The arms of the semaphore are, at the same time, to be set to the Alphabetical sign.

Special Signs.

8. A Semaphore signal is commenced with the *Alphabetical sign.*

2. The *Alphabetical sign* is also to precede each distinct message.

3. The *Numeral sign* is always to precede signs on the semaphore when they represent numbers, *e.g.* the time of origin.

4. The *Annul sign* denotes that the word or group immediately preceding it is erased; the Alphabetical sign will then be made, followed by the last word, words or group sent correctly, and the message continued.

How Signals are to be Made.

9. The semaphore arms must be placed at the exact position indicating the letters or signs. To enable this

done, the position of the arms must exactly agree with the position of the handles, and backlash in the arms must be reduced to a minimum. The arms are to be moved from sign to sign by the shortest route; a distinct pause being made at each sign, according to the rate of sending.

2. When using hand flags the signs are formed in the same plane as the shoulders of the sender, arms and staves at their full extent, forefingers along the staves. When at the closed position the arms should hang straight from the shoulder.

3. At the end of each word or group the arms are to be dropped to the closed position. When double letters occur, the arms are to be dropped to the closed position after the first letter is made, and then moved out to the second letter without pausing.

How Signals are to be Read.

10. The Alphabetical sign shows from which side the signs are to be read.

2. The signs, as a general rule, are made by a signalman facing the ships addressed; they are read from the right-hand side of the sender.

3. As it is often necessary to signal in opposite directions by the same semaphore, signalmen must be careful to observe in which direction the sender is facing, more especially when he is using hand flags, so that they can tell from which side the signs must be read from their point of view. It should be noted that when the Alphabetical sign is shown it is the *left* arm which is extended horizontally.

How Signals are to be Answered.

11. The Answering Pendant is to be hoisted at the dip at the yard-arm or similar position immediately the ship's

addressed see the signal, and hoisted close up when they are ready to read and write down.

2. It is to be dipped *immediately* a word is missed, and the transmitting ship is then to repeat preceding words until the Answering Pendant is again hoisted close up.

Rate of Signalling.

12. As a general rule, with ships in close order, semaphore messages should be transmitted at the rate of 15 words per minute on the semaphore, or 20 words per minute with hand flags.

2. General semaphore messages should always be made at a moderate and steady rate by the Flagship and ships repeating. There is nothing to be gained, but usually considerable delay is caused, by rushing a message through.

Procedure.

13. When the ship-s addressed have answered, the following procedure will be carried out :—

Preamble :—Marlborough to Benbow (fullstop sign)
Message—
Time of origin.

2. If there is no doubt as to the ship of origin or the ship addressed, the preamble to a signal is unnecessary and should be omitted; but it is always to be included in signals passed through a ship, or made to more than one ship, or if either the transmitting or receiving ship is in such a position as to render her identity uncertain.

3. If after a message has been concluded, it is required to alter any particular word-s or group-s, the Alphabetical sign should be shown, and the corrected message made as follows :—*In message (time of origin) for —— read ——* and conclude with a time of origin.

4. Should it be required to cancel the whole message, the Alphabetical sign should be shown and the message made as follows :—

Cancel message (*time of origin*), and conclude with a new time of origin.

5. In order to render the text of a message to be semaphored perfectly clear, the following signs are to be made use of :—

Fullstop	AAA

or if desired, the word "fullstop" may be spelt out.

Tack-line or Break sign	II
*Words to be in parenthesis	KK
*Words to be underlined	UK
*Words to be in inverted commas	RR
Nothing more coming	N
Wait	Q

* To be made before and after the words.

6. All signals made by semaphore are to conclude with a time of origin, which is to be considered as part of the message and made by numerals.

7. Coded messages are not to be made by semaphore; they are to be made by morse. Cypher messages should as a rule be made by morse; if made by semaphore each group of figures is to be spelt out, and the groups separated from each other by the Break sign.

8. Unless there are special reasons to the contrary, figures and times which occur in the text of a message are to be spelt out by the sender, but the time of origin is always to be signalled in numerals.

TABLE I.

MORSE SIGNS.

Alphabet.				Numerals.	
A	• —	N	— •	1	• — — — —
B	— • • •	O	— — —	2	• • — — —
C	— • — •	P	• — — •	3	• • • — —
D	— • •	Q	— — • —	4	• • • • —
E	•	R	• — •	5	• • • • •
F	• • — •	S	• • •	6	— • • • •
G	— — •	T	—	7	— — • • •
H	• • • •	U	• • —	8	— — — • •
I	• •	V	• • • —	9	— — — — •
J	• — — —	W	• — —	0	— — — — —
K	— • —	X	— • • —		
L	• — • •	Y	— • — —		
M	— —	Z	— — • •		

Punctuation, &c.

Apostrophe (')	• — — — — •	WG	As one sign.
Hyphen (-)	— • • • • —	DU	
Exclamation (!).....	— — • • — —	MIM	
Bar Sign (—)	— • • — •	NR	
Fraction Sign	— — — —	MM	
*Parenthesis ( )	— • — — • —	KK	As separate letters.
*Underline (—)	• • — — • —	UK	
*Inverted commas (" ")	• — • • — •	RR	
Full Stop (.).....	• — • — • —	AAA	

*To be made before and after the word-s.

TABLE I.—*(continued).*

MORSE SIGNS.

Pendants.		
Pendant Sign	• — • — •	PT
Interrogative	• • — • —	INT
Guard	— — • — • •	GD
Numeral	• • — • • •	FI
Church	• • — —	UT
Compass	— • — • —	CT
Line	— • • • —	BT
Nine	— — — — • —	9T
Equal Speed	— — • • — —	MIM
Oblique	• — — — — •	WG
Yellow	— — — • • •	OS
International Code	— — — —	MM
Position	— • • — • •	DD
Horary	• • • • — — —	HO
Nought	• — • • — — —	LO
Special.		
Union	• • — — •	UN
Affirmative	• — • • — •	AF
Negative	— • — — —	NO
Preparative	— — — •	OE
Red Burgee	• — • — • • •	RB
Blue Burgee (Stationing)	— • • • — • • •	BB
Fishery Flag	• • — • — • — —	FY
Flag	• • — • • — • •	FL
Repeat	• • — — • •	IMI
Commencing	• • • — •	VE
Finale	• — • — •	AR
Spelling	• • — • • • — •	FF
Pilot Jack	• — — • • — — —	PJ
General Call	• • • • • • • • • •	E's
Answering	— • — • — • — •	N's
General Stop	— — — — — —	T's
Receipt	• — • • — • • — • • — • • — •	R's
Error	• — • — • — • —	A's
Silence	• • • • — — • • • • — —	HM's
Negative Silence	• • — — — — • • — — — —	UO's
Figure	— — —	O
Priority	• — — •	P
Dash-line	• • • •	II Two I's
Red Flag	• • — • • — • • • — • • — • •	Flag | RED
Green Flag	• • — • • — • • — — • • — • • • — •	Sign | GREEN

As one sign.

A succession of

CHAPTER III.

THE USE OF THE MORSE CODE.

14. When using the morse code, symbols are expressed by two elements called a "dot" (or a "short"), and a "dash" (or a "long"), which are signalled either singly or in combination.

2. These two elements can be made in various ways. In visual signalling, by the motion of any single object which is made to appear and disappear for short and long periods of time, representing dots and dashes respectively. This method is illustrated in the flash of light from a lantern, heliograph or a signalling projector.

3. Flag-waving is an instance where the two elements are signalled by moving an object through small and large arcs.

4. They can also be signalled by short and long blasts on the whistle, foghorn or syren.

5. In telegraphy these elements are recognised by short and long periods of silence between the clicks of a sounder; or by short and long sounds emitted by a buzzer.

6. The dots and dashes, and spaces between them, should be made to bear the following ratio one to another as regards their duration :—

A dot is taken as the unit, and a dash is equivalent to three units.

The space of time between any two elements of a symbol is equal to one unit, between two complete symbols is equal to a dash (or three units), and between two words or groups, two dashes (or six units).

Up to ordinary limits, whatever may be the rate of sending, accuracy in signalling depends upon these rules being strictly adhered to.

7. In visual signalling, where the rate of signalling depends on the apparatus employed, no definite rate can be laid down; but while generally obeying these rules, it is best to err on the side of making the dots rather shorter in their proportion to the dashes, as it then makes the distinction between those elements plainer; otherwise, in very slow signalling, it is hard to appreciate their relative lengths, because they do not follow one another sufficiently quickly to show their distinction by comparison.

8. The following methods may be used for transmitting messages by the morse code :—

By Day :—

1. Flag-waving.
2. Signalling lantern.
3. Heliograph.
4. Signalling projector.
5. Buzzer and W/T.

By Night :—

1. Signalling lantern.
2. Signalling projector.
3. Buzzer and W/T.

In a Fog :—

1. Sound signals.
2. Buzzer and W/T.
3. Signalling projector.

9. Signals may be made either by using the groups of letters and signs in the Signal Books, or the communication may be made in plain language.

Use of Signalling Projectors.

15. The projector may be used for signalling in three different ways :—

(*a*) By flashing the light directly on the object by means of the Scott's shutter.

(*b*) By training the beam on one side of the object and then waving it through a vertical arc, the dots and dashes being recognised by the short and long periods of time while the beam is kept elevated.

(*c*) By flashing the light, either by wavings or by the shutter, on a conveniently shaped and situated cloud between two points of communication.

2. The principal use of the projector for signalling purposes is its use by day, the success of which depends upon the true focussing and alignment of the beam of the light on the object.

3. The projector may also be used at night, but a cruiser arc lantern or Aldis signalling lantern will often fulfil the requirements.

4. It may also be used for communication between ships not in sight of one another by using it in the manner laid down in pars. (*b*) and (*c*) above.

5. A projector or an Aldis signalling lantern will often prove more efficient than semaphore when communicating with boats by day.

Use of Signalling Lanterns at Night.

16. The rules governing the use at night of the various signalling lanterns depend upon the orders of the Senior Officer as to what lanterns are allowed to be used.

CHAPTER IV.

SIGNALLING BY FLAG WAVING.

When to be used.

17. Flag-waving is principally used by landing parties, for communicating with the Army and for inter-top communication between ships, should signalling lanterns fail.

Procedure.

18. The normal procedure for signalling by flashing is to be used except :—

(*a*) When communicating with the Army. (*See Chapter VII.*)

(*b*) For inter-top communication when fire control procedure (visual) will be used.

Explanation of System.

19. "Dots" are made by waving a flag through small arcs, "dashes" by waving it through large arcs.

2. The flags are of two sizes—

3 ft. square with a staff 5 ft. 6 in. long,
2 ft. square with a staff 3 ft. 6 in. long,

and of two colours—

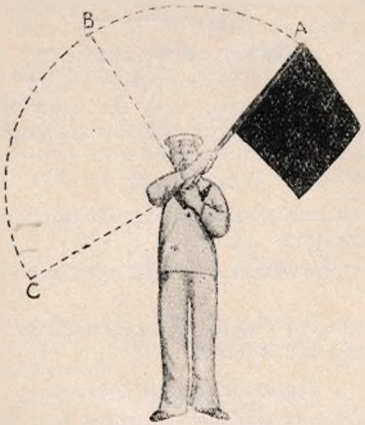
White with a blue horizontal stripe, for use with a dark background,
Dark blue, for use with a light background.

Position of the Signalman.

20. The signalman should stand square (either facing or with his back turned) to the station to which he is signalling, according to convenience and the direction of the wind.

2. The staff should be kept as upright as possible while in motion, the point never being allowed to droop to the front or rear.

3. The flag is to be held high enough for the signalman to see below it when it is in motion.



In the above figure, (*a*) is the normal position of the flag.

How to Signal.

21. In order to keep the flag always exposed while in motion, the point of the staff should be made to describe an elongated figure of 8.

2. To make a "dot," the flag is waved from (*a*) to (*b*), and without any pause back again to the normal position.

3. To make a "dash," the flag is waved from (*a*) to (*c*), and after a slight pause at (*c*), brought back to the normal position.

4. To signal a letter, the elements representing it should be made in one continuous wave of the flag, taking care that no pause is made when at the normal position.

Example.—To make R (• ▬ •) *wave the flag from* (*a*) *to* (*b*), *back to* (*a*), *and without any pause down to* (*c*), *making there a slight pause, back to* (*a*), *then without any pause to* (*b*), *and back to the normal position* (*a*).

5. A pause, equal to the time taken to make a "dash," should be made at the normal position (*a*) between each letter of a word, or symbol in a group.

6. When a word or group is completed, the staff should be brought down diagonally in front of the body, and the flag gathered in with the left hand.

7. A slight pause (equal to the time occupied in making two dashes) should be made at the normal position before commencing another word or group.

8. In receiving a message, the flag should be kept down diagonally in front of the body, and gathered in until required for answering.

CHAPTER V.

TELEPHONE.

Precautions when using.

22. Particular attention is called to the danger of leakage of information passed by telephone. No telephone is entirely safe from possible leakage. A private direct line is safe from overhearing by operators, but apart from this the possibilities of conversations on all telephones being overheard are considerable. The greatest danger of leakage on all telephone lines is the possibility of mechanical faults which result in a third party accidentally overhearing a conversation. All lines pass through Post Office centres, where they are led over test frames, and overhearing may result from contact with adjacent wires, either on or near the test frames, or on any portion of the routes where the wires run close together, or through faulty insulation of the wires. Other sources of leakage on telephone lines are the possibility of an evilly-disposed person or enemy agent tapping the lines where they run overhead, as they do for a greater part of their length in many cases. Also there are numerous points on all lines where they can be officially tested, which form a possible source of leakage.

2. Matters of a secret nature are not, therefore, to be discussed over the telephone unless the conversation is so worded that no information would be disclosed to a third party who might overhear the conversation.

3. Care is also to be taken that no information is divulged over the telephone to unauthorised persons. No information is to be given by telephone in answer to enquiries, unless the authority and identity of the enquirer are established beyond doubt.

4. During war, weather forecasts must not be passed over the public telephone line, except in code, under any circumstances whatever.

5. Reports of prevailing weather conditions may be passed over the public line in P/L, but only when absolutely necessary.

6. Senior Naval Officers are to take steps to prevent unauthorised use of the telephones and to warn all concerned of the danger of leakage of information.

Hints on Telephoning Messages, Single Letters, Numbers, &c.

Messages.

23. In passing messages by telephone, the following points should be noted :—

(*a*) If an unusually long message is to be passed, the sender should notify the fact by saying "long message" before commencing.

(*b*) If the message is in P/L, the sender should pass it on straight through to the end.

(*c*) If the message is in code or cypher, the sender, after repeating the heading, should give the warning "First Group." As each group is passed, the receiver should say "yes" if satisfied, or query the group by repeating it back.

2. When the sender has sent the whole message, the receiver should repeat it back, the sender remaining silent until a mistake is discovered.

3. If the message is being telephoned to two or more recipients simultaneously, the sender should, before starting the message, designate *one* of them only to answer. After this recipient has repeated back the message correctly, the sender should ask the others in turn if they

are "all right." It will usually be unnecessary for them to repeat back, since they will have overheard the first recipient doing so.

4. Operators must exchange names and record them on the pad.

Single Letters.

5. When single letters are passed, or words spelt, on the telephone, it is essential to use the phonetic alphabet. (*See Article* 96.)

Numbers.

6. Single numbers (other than cypher groups or times of origin) are often difficult to telephone. This difficulty can be overcome by saying the number first, then counting up to it from 3 or 4 figures below it. Thus, to pass the number "sixteen," the procedure would be to say "six teen : twelve thirteen fourteen fifteen *sixteen*," emphasizing the number when spoken for the second time.

7. The figure "nought" is always to be telephoned as "Oh," thus :—

The cypher group 06610 should be telephoned as "Oh double six one oh."

The time of origin 1140 should be telephoned as "Double one four oh," *not* "eleven forty."

If the figure "nought" occurs singly, it should be telephoned as "Oh for zero."

General.

24. The principal points to be observed are accuracy, courtesy and speed.

2. When making a call do not speak until you hear "Number please" (if working through an exchange) or hear the number (or the name of the place) required, repeated back.

3. When making a call, give the name of the exchange before the number, *e.g.*, "Central 3171" *not* "3171 Central."

4. Speak close to the mouthpiece; speak distinctly without shouting, remembering it is the consonants which are difficult to hear.

5. When receiving a call—state at once what station you are: say "Signal School speaking" not "Hullo—who's there?"

6. If asked to "hold the line"—do not replace the receiver but keep it in hand.

7. In the case of a "cut-off" the transmitting station should hold on and re-establish connection: the receiving station should hang up the receiver.

CHAPTER VI

SIGNALLING BY HELIOGRAPH.

Theoretical Considerations.

25. With the heliograph, signalling is effected by reflecting the light of the sun from a mirror or mirrors on to the distant station in accordance with the morse system.

Reflection of Light and Definitions.

26. Light travels in straight lines called rays. If a plane mirror is placed in the path of these rays, the light will be reflected in accordance with the following laws :—

1st law.—The angle of reflection is equal to the angle of incidence.

2nd law.—The incident ray, the normal and reflected ray are always in the same plane.

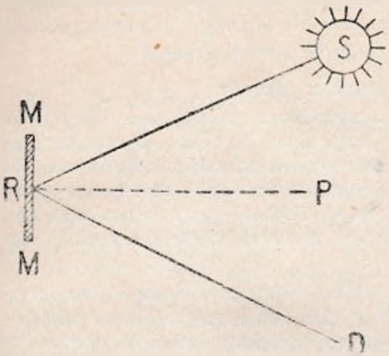
i. *Incident ray* :—The incident ray is the line along which the light travels before striking the reflecting surface.

ii. *Reflected ray* :—The reflected ray is the line along which the light travels after striking the reflecting surface.

iii. *Normal* :—The normal is a line at right angles to the reflecting surface at the point where the ray strikes it.

iv. *Angle of incidence* :—The angle of incidence is formed by the incident ray and the normal.

v. *Angle of reflection*:—The angle of reflection is formed by the reflected ray and the normal.



Now suppose light to come from the sun and to strike the mirror at the point R and to be reflected in the direction RD, then we see from the first law that the angle DRP (angle of reflection) is equal to the angle SRP (angle of incidence), RP, the normal, being at right angles to the mirror MM.

Or in other words, in order to reflect the light on a distant point, the mirror must be placed at right angles to an imaginary line half-way between the direction of the sun and of the distant point.

Apparent Motion of the Sun.

27. As the sun appears to move gradually from east to west, and moreover its altitude, or apparent height above the horizon, also varies, gradually increasing until noon (when the sun is crossing the meridian or north and south line) and then gradually decreasing, therefore, to keep the reflected light in one direction, it is necessary to counteract the apparent motion of the sun by continuously altering the position of the signalling mirror. The vertical and horizontal motions to be given to the mirror must always be made to follow the sun both horizontally and vertically according to the time of day.

2. Owing to refraction of the sun's rays when striking and passing through the atmosphere surrounding the

earth, the rate at which the sun appears to be moving varies, being greatest immediately after sunrise and before sunset, and least before and after midday. It is therefore necessary to alter the rate of moving the mirror accordingly.

Duplex Mirror.

28. When the sun and distant station are in opposite directions, it becomes impossible to reflect the light from one mirror alone, in the required direction. Moreover, the greater the angles of incidence and reflection become, the more is the intensity of the reflected light diminished, and consequently the distance at which it can be seen is also diminished.

2. It has been found that owing to the above considerations, when the sum of the angles of incidence and reflection would be equal to or greater than 90 degrees, a second mirror, called the "Duplex," must be placed so that the light from the sun is reflected from the signalling mirror on to it, and thence to the distant station. As the light striking the duplex always comes from the signalling mirror, it is unnecessary to move the duplex in order to keep the light on the distant station; but the signalling mirror must be moved to keep the light on the duplex.

Aligning the Heliograph.

29. As it is impossible to see whether the reflected light is on the distant station, a sighting mark on a vane is brought into alignment with the centre of the mirror and the distant station. A small circle (⅛" diameter) is left unsilvered in the centre of the mirror, and this causes a small shadow to be thrown on the vane.

2. When using the duplex mirror a paper vane is attached to the mirror itself, so that the sighting mark coincides with its centre. In aligning, the duplex is placed so that the reflection at its centre of the distant station will be visible from the centre of the signalling mirror.

3. The signalling mirror is so mounted that all motion imparted to it takes place about its centre. Hence this motion will not disturb the alignment.

Range of the Heliograph.

30. The approximate distance in miles at which the heliograph can be used is obtained by multiplying the diameter of the mirror in inches by 10. This range is governed by the angles at which the rays strike and leave the mirror and the state of the atmosphere.

2. The lateral range of the heliograph is due to the fact that the rays of light from the sun falling on any point in the mirror form a cone, and therefore the rays, after the reflection, also form a cone. The angles of these cones are equal, and consequently the lateral range bears the same proportion to the distance between the stations as the diameter of the sun bears to its distance from the earth; this is approximately 1 :107.

3. The total lateral range between two stations can be obtained by dividing their distance apart in yards by 107

Thus :—Two stations 8 miles apart the flash will be visible about 66 yards on either side of the station.

Advantages and Disadvantages of the Heliograph.

31. The advantages are :—

i. Portability.

ii. Range.

iii. Secrecy.

iv. Rapidity. With a well-balanced instrument the labour of sending is no more than that of using a morse key, and therefore a high rate can be kept up for a long time. Moreover, the flash from a heliograph is readily seen and communication is therefore more readily opened with it than with any other instrument.

2. On the other hand the use of the heliograph with the best results requires practice, and attention must be paid to its being carefully handled, otherwise it will rapidly become unserviceable.

3. The heliograph can be used with the light from the moon or from any artificial source, such as an electric light, but the range is limited to short distances varying with the power of the light employed.

General Description.

32. The service pattern instruments are made in different sizes; these vary slightly in the details of their construction, but the principles are the same in each case. The medium size is that generally used, *i.e.*, one having an exposed mirror of 5 inches diameter.

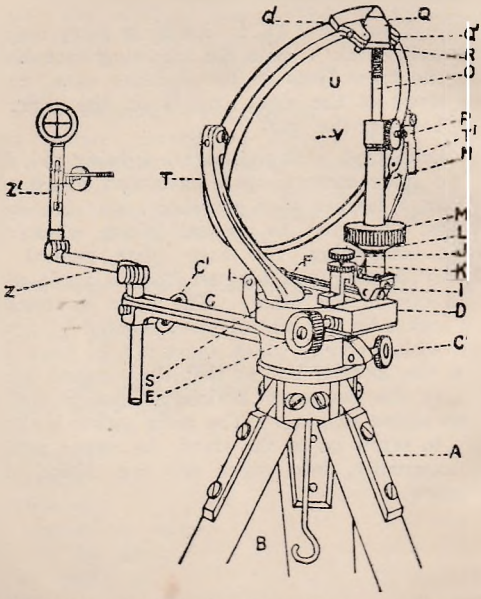
Heliograph. Mark V. (*See pages 26-28*).

A. Stand.
B. Anchoring hook.
C. Sight arm with clamping screws C'.
D. Tangent box with lid below.
E. Tangent screw head.
F. Key.
G. Key spring.
H. Key bridge.
I. Key bearings.
J. Beat regulating screw.
K. Lock nut for ditto.
L. Swivel joint.
M. Collar.
N. Vertical socket.
O. Vertical steel rod.
P. Clamping screw for ditto.
Q. German silver ball attached to claw Q'.
R. Adjustable screw for ditto.
S. Base plate.
T. U arms, with detachable portion T' and screws adjusting.

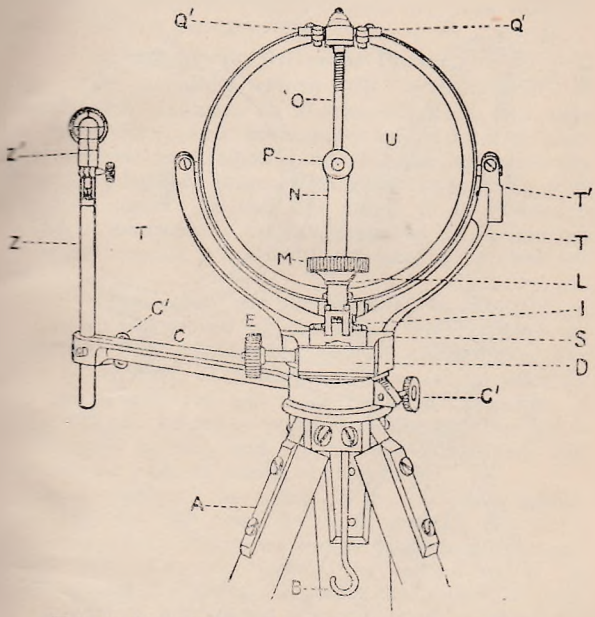
U. Signalling mirror in frame.
V. Unsilvered spot at centre of signalling mirror.
W. Duplex mirror with frame in U arms (T).
X. Sighting vane on ditto.
Y. Butterfly and pivoting screw.
Z. Sighting rods with movable vanes Z'.

The heliograph, Mark IV, is similar in every respect to the heliograph, Mark V, with the following exceptions:—There are no cross lines on the sighting vane, and the clamping screw of the sight arm is on the right front instead of being at the rear.

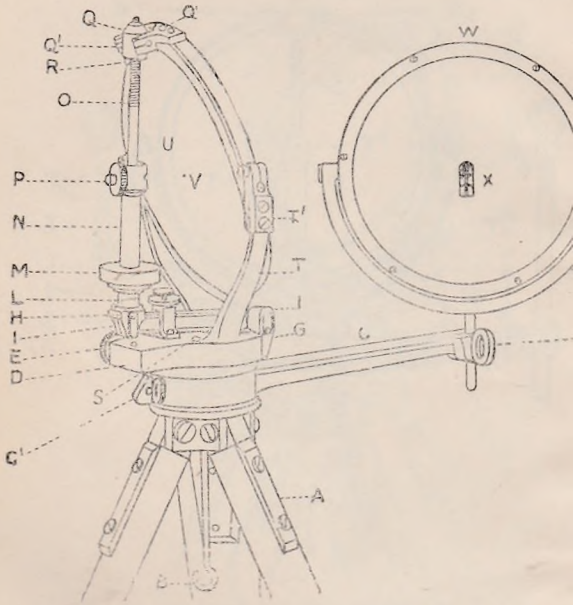
2. The heliograph with sight arm, sighting rod, duplex mirror, two spare mirrors, spare parts and adjusting tool is carried in a leather case provided with shoulder and waist straps, the latter to prevent jolting when riding. The body, comprising the base plate, central pivot, U-arms, key bearing and tangent box, is made of gun metal and cast in one piece. The body is attached to the main socket by the central pivot secured by a washer and main socket screw, which must not be fastened too tightly or too loosely, but so that the tangent screw is able to give the necessary horizontal motion, and that there is no undue shaking. The main socket is threaded internally to screw on to the stand; its upper portion is toothed externally, into which fits the thread of the tangent screw.



HELIOGRAPH WITH JOINTED SIGHTING ROD.



HELIOGRAPH WITH STRAIGHT SIGHTING ROD.



HELIOGRAPH WITH DUPLEX MIRROR

Stand.

33. The stand consists of three mahogany legs united at the top by a brass head provided with a screw for receiving the main socket of the heliograph. An anchoring hook and a strap, or loop to fasten the legs together when closed, are also provided.

Use of the Different Parts.

34. The signalling mirror (U) (5″ diameter) is mounted with trunnions on U-arms (T) fixed to a base plate (S) which moves horizontally on an interior plate made to screw on a tripod stand (A); the tangent screw (E) working between these plates gives the mirror a slow horizontal motion. To turn the mirror to any considerable degree horizontally the tangent screw (E) is put out of gear by pressing it back with the forefinger of the left hand.

35. A vertical screw rod (O) attached to the back of the mirror, and moved by the collar (M) regulates its inclination; if a considerable vertical alteration of the mirror is required, the clamping screw (P) is released, when the vertical rod will move freely in its socket; it can be clamped when the position of the sighting rod is approximately correct, and an accurate adjustment can afterwards be made by means of the collar.

36. By a continual movement of the two slow motion screws (E) and (M) every 15 to 20 seconds, the sun's reflected rays from the mirror can be kept steadily on any selected spot. To make signals, the vertical rod is depressed against the spring (G) under the bridge (H) and, after a short or long pause released, thus throwing the light on, and off, a distant station for the space of a dot or dash.

Beat.

37. The distance through which the key is moved when signalling is called the "beat." This can be regulated between $\frac{1}{8}$ and $\frac{1}{4}$ inch, to suit the skill of the signaller and the distance between the stations. (*See* page 42.)

Sighting Rods.

36. The "sighting rods" are of two patterns, one being straight with a circle of metal and cross wires at the top and the other similar in construction with the exception that it has two joints which render it capable of being rapidly elevated or depressed without unclamping the screw which retains it in the "sight arm."

2. In aligning this instrument, it must be remembered that the point of bisection of the cross wires is the "sighting mark," and so it is necessary to move the rod laterally and vertically until the distant station is cut by the intersection of them. There is an enamelled vane on the upper part of the sighting rod which must be turned down sufficiently far to admit of alignment, and when turned up, enables the signalman to see that his light is properly adjusted. The vane has a thin black line down its centre from the "spot," and three horizontal lines. This enables the signalman to judge the correct position for the "shadow spot."

USING THE HELIOGRAPH.

To set up the Heliograph and Stand.

37. Unstrap and separate the legs of the stand, keeping the brass head as level as possible. Unscrew the cap. Suspend the heliograph case over the legs of the stand, with the plain side of the case outwards.

2. Withdraw the sight arm from the case and place it over the main socket, rib uppermost, and tighten the clamping screw with the right hand.

3. Then take the heliograph with the left hand, and the sight-arm with the right; turn the heliograph over and place the heliograph on the head of the stand. Without relaxing the grip of either hand, turn it so that the screw of the main socket engages with the screw on the head of the stand, care being taken that the threads do not cross.

4. Screw the heliograph home on the stand by passing the sight-arm from hand to hand; the heliograph must not be forced beyond the end of the screw, as, in that case, the difficulty of removing it from the stand may result in the instrument being damaged. See that the mirror is clean and free from dust.

5. Seize two legs of the stand and the case strap, and move the stand round till the signalling mirror roughly faces the sun.

6. The stand must be firm and rigid, the legs, where possible, being securely fixed in the ground. Holding the stand just below the head, press each leg in turn firmly into the ground, keeping the head of the stand as level as possible, and taking care that the pressure is applied along the direction of each leg, and not vertically so as to cause it to break.

7. On hard or rocky ground where the legs cannot be driven in, stability may be obtained by suspending a weight from the anchoring hook under the head of the stand. The weight should just touch the ground so that it cannot swing.

To Align the Heliograph.

38. First decide whether it will be necessary to use the sighting rod or duplex mirror. The signalman should be able to estimate roughly an angle of 90 degrees, by placing one arm in the direction of the distant station and the other in the direction of the sun, he should see whether the angle thus formed is less or greater than 90 degrees, and use the sighting rod or duplex accordingly.

2. When there is any doubt the signalman should consider whether the angle is being increased or decreased by the apparent motion of the sun; in the former case use the duplex, and in the latter the sighting rod, and thus obviate changing from one to the other after work has been commenced.

Using the Sighting Rod.

3. 1st method—

(*a*) Move the stand round till the signalling mirror roughly faces the sun. Unclamp and place the sight arm in the direction of the distant station, then clamp it. Elevate the mirror so that the reflection of the distant station may be readily seen. Withdraw the jointed sighting rod from the case and place it in the sight arm (as far down as possible), clamping it so that it moves stiffly. Turn the vane half-way down.

(*b*) Stand with your back to the sun, look into the mirror and move the head until the reflection of the distant station is hidden by the unsilvered spot in the centre of the mirror.

(*c*) Keeping the head still, move the jointed rod until the bisection of the cross wires exactly coincides with the reflection of the distant station, *i.e.*, so that the centre of the unsilvered spot, the bisection of the cross wires and the reflection of the distant station are in one line.

(*d*) Turn up the vane gently, being careful not to displace the alignment in doing so : then direct the light. (*See Article* 41.)

4. 2nd method—

If from the position of the instrument it should be inconvenient for the signalman to place himself in front of the mirror in order to align the vane on the distant station he may accomplish this from the rear by looking through the hole in the centre of the mirror.

Note.—When using the straight sighting rod the horizontal motion is obtained by unclamping the sight arm and moving it in the required direction, clamping it when the three marks are in the same vertical line. The vertical motion is obtained by moving the sighting rod up

and down, clamping it when the three marks are in the same horizontal line. It should be placed about half-way down in the sight arm.

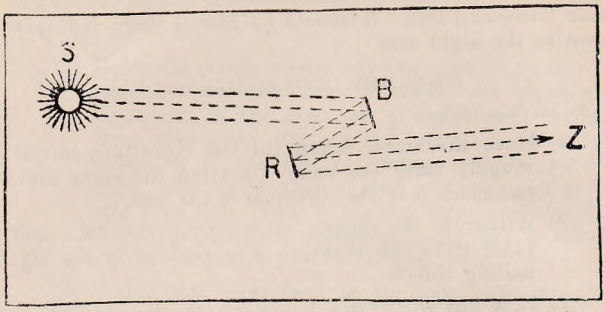
USING THE DUPLEX MIRROR.

5. 1st method—

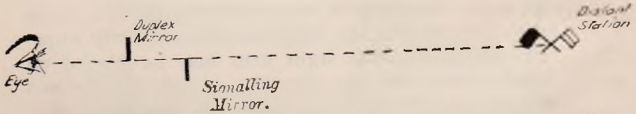
(*a*) Move the stand round till the signalling mirror roughly faces the sun. Unclamp the sight arm, and place it in the direction of the sun.

(*b*) Withdraw the duplex mirror from the case and place it in the sighting arm parallel to the signalling mirror.

(*c*) It is now necessary to determine the position of the sight arm, so that the angles of incidence and reflection at both mirrors will be as small as possible; for example, suppose (in England or similar latitudes) the direction of the distant station to be due north, then, although the angle formed by the direction of the sun and that of the distant station will be the same at 1000 and at 1400, yet in the forenoon the sight arm and duplex mirror should be to the east of the signalling mirror, whereas in the afternoon they should be to the west. Exactly at noon (solar time), *i.e.*, when the sun and distant station are in exactly opposite directions, the sight arm may be placed on either side, but the direction in which the sun appears to be travelling should be considered, and the sight arm placed so as to obviate any necessity for re-aligning later in the day. The sight arm should be kept as near as possible to an imaginary line joining the sun and the signalling mirror, but it must be placed sufficiently far to the side to prevent the duplex mirror R (*see diagram, page* 34) intercepting the sun's rays from the signalling mirror B, and to prevent the latter intercepting the light reflected from the duplex mirror to the distant station Z.



As a guide the following rule may be adopted :— Stand in front of the heliograph with the back to the sun, and ascertain whether the distant station lies on the right or left of the prolongation of an imaginary line passing through the sun and the heliograph (*i.e.*, right or left of your own shadow) and move the sight arm to the right or left accordingly, keeping the mirrors parallel until the distant station can just be seen between the trunnions of the two mirrors, thus—



Should the distant station appear just on the imaginary line mentioned above, or very near it, the sight arm should be moved in the direction in which the sun is apparently travelling. Then clamp the sight arm and elevate the signalling mirror slightly.

(*d*) Turning the duplex mirror in the sight arm roughly to face the distant station, and keeping it parallel with the signalling mirror, adjust the clamping and butterfly screws so that the mirror moves stiffly.

(*e*) Stand with your back to the sun, and looking into the signalling mirror, move the head until the reflection of the sighting mark on the duplex mirror is hidden by the unsilvered spot in the centre of the signalling mirror.

(*f*) Keeping the head still, hold the duplex mirror near the bottom with both hands, thumbs to the rear, first, second, and third fingers to the front, the two former resting on the rim of the duplex, the latter on its U arms. Turn the mirror horizontally and vertically, until the reflection of the distant station, as seen in the signalling mirror, is exactly covered by the reflection of the sighting mark; so that the unsilvered spot on the signalling mirror, the reflection of the distant station and the sighting mark on the duplex mirror are in one straight line.

(*g*) Tighten the clamping and butterfly screws, taking care not to disturb the position of the duplex mirror: then direct the light. (*See Article* 41.)

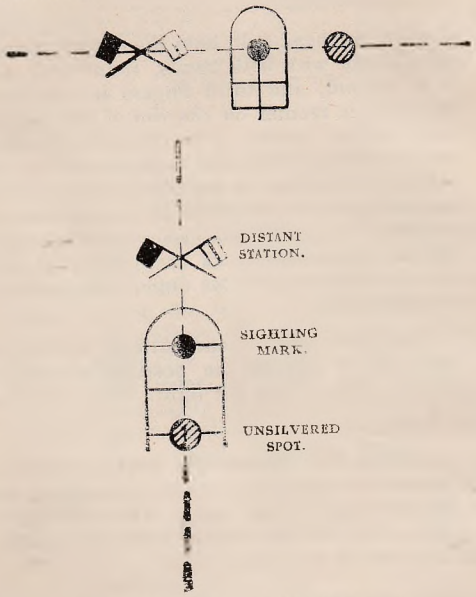
6. 2nd method—

The signalman may adjust the duplex mirror while standing behind the signalling mirror and looking through the hole in the centre of the latter. The reflection of the distant station must in this case be made to coincide with the sighting spot on the paper vane.

Verifying the Alignment.

39. The alignment should always be verified. This may be done by standing back from the heliograph and by looking into the signalling mirror and getting the three points (the centre, the reflections of the sighting mark, and the distant station) covered as before; then if on moving the head and eye slightly to one side, the three points appear to be in the same horizontal line, the elevation is correct; similarly, if on moving the head slightly

upwards, the three points appear to be in the same vertical line, the direction is correct. When using the sighting rod the alignment should be verified *after* the vane has been turned up.



Use of a Second Heliograph.

40. When using the duplex in a high wind, it will be found difficult to read the signals owing to the vibration; to overcome this difficulty the duplex may be removed and the signalling mirror of the second heliograph substituted for it, the latter being on its own stand, which should be placed close to the stand of the signalling heliograph. It will be necessary to affix a paper vane over the unsilvered spot of the second heliograph.

Directing the Light.

41. When the heliograph has been aligned, the light is thrown on the distant station by training the signalling mirror so that the reflected light covers the sighting vane, and the shadow spot just covers the sighting mark, the necessary adjustment of the signalling mirror being made by the slow motion screws, viz., the tangent screw and the collar. The light is properly directed when the shadow spot covers the sighting mark *with the key depressed.* The shadow spot will therefore be below the sighting mark when the key is released.

Note.—An easy method when using the sighting rod is to extend the hand behind the vane and feel for the reflection of the sun and convey it to the vane as above.

To Regulate the Beat.

42. Adjust the beat regulating screw so that the shadow spot falls below the sighting mark to a point, such that when the key is released, the light may not be visible to the distant station; the beat must be as short as possible, so that there is no difficulty in depressing the key to the full length of the beat, and also to prevent the instrument from being shaken unnecessarily. When the beat is satisfactory, screw down the milled lock nut. As a rule the spot should fall $\frac{1}{4}$ to $\frac{3}{8}$ inch below the mark on the vane. At short distances the beat must be still further increased, otherwise a constant light will be directed on the distant station.

To Signal.

43. Hold the collar on the vertical socket with the first and second fingers, one on either side of the vertical column, the thumb on the side of the collar; the head of the tangent screw is to be held by the thumb and first finger of the other hand. The key can then be used in the same manner as a morse key; at the same time constant attention must be paid to the sighting vane to see that every time the key is depressed the shadow spot just comes to its proper place, *i.e.*, covering the sighting

mark. With this object the tangent screw and the collar must be turned very slowly and continuously, without interrupting the sending.

Calls for Light.

44. Directly the distant station calls for light, the signalman will depress the key and look to the sighting vane, and if necessary rectify the position of the shadow spot.

2. When answering a call for light, care should be taken that the key is depressed to just the same extent as when signalling, as there is a tendency to apply a heavier pressure. The adjustment of the heliograph must be performed with the greatest accuracy; if the alignment is too high, every time the collar is depressed the light will pass through the distant station to a point above it, and on the pressure being relaxed, the light, during its return, will again pass through the station, consequently each dash will appear as two dots, and the dots will be broken up into a quivering light, and be very difficult to read; on the other hand, if the light is set slightly too low, the distant station will not see the full light.

Searching for an Unknown Station.

45. If the direction of the unknown station is roughly the same as that of the sun, align the heliograph as nearly as possible in the direction required, then slowly traverse the body of the heliograph, at the same time turning the collar and making a succession of dots. The country may be freely swept, and the flash will be readily seen and answered; an accurate alignment may then be made. The duplex mirror held in the hands by itself may also be used for this purpose.

2. If the direction of the unknown station is roughly opposite to that of the sun, the heliograph should be roughly aligned on the supposed position (with duplex mirror), the spot should be brought on the vane and the

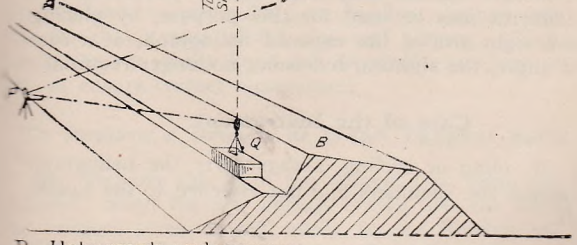
duplex mirror then traversed slowly with the hands, both horizontally and vertically.

Working Under Cover.

46. By directing the light from one heliograph on to a second conveniently placed and with its mirror in the proper position, signals may be conveyed to the distant station without exposing the signalman, the flashes being either thrown through an embrasure or over the top of a parapet or other cover.

1. Every time light is reflected its intensity is diminished, and therefore the position for the heliographs should be chosen so that the light will not be reflected oftener than necessary. To prevent loss of light, the heliographs should be set up as close together as possible, consistent with cover being obtained for the signalman.

3. The method of setting up and aligning the heliograph will be made clear by the following example :— Suppose AB to be the crest line of a parapet, and suppose S and D to represent the position of the sun and distant station respectively :—



P. Heliograph under cover.

Q. Heliograph raised so that it may be aligned on the distant station.

(*a*) First consider the positions of S and D and decide on the approximate positions for the heliograph as at P and Q, P being the signalling heliograph under cover and Q the secondary heliograph, exposed.

(*b*) Align the heliograph at Q on the distant station, using the sighting rod.

(*c*) Align the heliograph at P on the centre of that at Q; this must be done very accurately.

(*d*) Reflect the sun's rays from P on to Q, and keep the light exposed.

(*e*) Move to Q and find these rays after reflection from the secondary heliograph; turn the mirror of the latter so that the shadow spot strikes the sighting mark. Under certain conditions the light from the sun will strike this heliograph directly; in these cases care must be taken that it is the light as reflected from P and not that from the sun which is made to cover the sighting vane.

Return to P, regulate the beat and proceed as usual.

4. By placing the eye level with the mirror at P and looking into that at Q, answers and other signals made by the distant station may be seen, or preferably the duplex mirror may be used for this purpose, by placing it in the sight arm of the exposed heliograph, at a convenient angle, the sighting rod being no longer required.

Care of the Instrument.

17. If riding or cycling, always carry the heliograph slung across the shoulders and not attached to the saddle or cycle.

2. Never leave the heliograph on its stand when work with it is finished. Replace the cap on the stand when not in use.

3. Avoid holding the instrument by the U-arms or mirror frame, and never touch the surface of the mirror with the hands.

4. If the heliograph gets wet, wipe the mirror dry, and rub the metal portions over with an oily rag before putting it away, or at the first opportunity.

5. Always keep the heliograph clean and free from rust and dust. Grit and dust in the tangent box, or on the vertical rod and German-silver ball, will soon destroy the best instrument.

6. Occasionally oil the working parts (main socket and body, tangent screw, bearings, etc.), but never leave superfluous oil on any part, as it collects dust. Never allow oil to drop on the mirror.

7. Only make adjustments of the bearings, etc., when necessary. Be careful not to damage or burr the heads of screws, and see that the threads are not crossed.

To Replace a Broken Mirror.

48. It is unnecessary to remove the mirror frame from the body of the heliograph. Remove the detachable part of the rim by taking out the screws, take out the broken pieces of mirror, and lay the new mirror on the paper washer covering the German-silver springs; replace the detachable part of the rim and screws. V-shaped marks are cut on the fixed and detachable portions of the rim to ensure correct replacement.

To Replace a Broken or Weak Tangent Spring.

49. Remove the lid of the tangent box, clean out the recesses; insert the new spring, seeing that the shank of the tangent screw works freely in the bearing on the spring. Replace the lid. As a temporary measure, pressing the head of the tangent screw away from the signalman will assist it to engage the teeth on the main socket.

To Adjust the Vertical Rod Screw or to Replace the Rod.

50. Very slightly tighten the screw in the bottom of the German-silver ball, thus closing in the threads.

2. Loosen the clamping screw on the vertical socket, unscrew the threaded portion of the rod from the German-silver ball, and withdraw it from the socket, then replace in inverse order.

To Remove the Key Spring.

51. Turn the mirror flush with the U-arms, remove the pin fastening the key to the front key bearings, and draw back the key. The screw fastening the spring to the base plate is then easily accessible.

Notes.

52. The heliograph is not to be taken to pieces, unless absolutely necessary; the body should very rarely require to be detached from the main socket; but if it is found that it fits badly, this may sometimes be remedied by adding a paper washer of the required thickness to the brass washer under the main socket-screw.

2. Great attention must be paid to ensure that the symbols are made sharply and distinctly. The importance of always depressing the key evenly and to its full extent must be impressed on learners, by causing them to align the heliograph and send on to a spot marked on a wall a short distance off. Constant attention must be paid to the sighting vane, so that the sight may not be allowed to wander, and the habit should be acquired of looking constantly at the vane and not at the distant station.

CHAPTER VII.

VISUAL SIGNALLING BETWEEN THE NAVY AND ARMY.

Definitions.

53. Throughout these instructions, the transmitting station is the station by which the message is actually being made, and the receiving station is the station by which a message is actually being read. The term station includes H.M. Ships, Military Stations and those established by landing parties from H.M. Ships.

Systems Used.

54. All visual signalling (abbreviation V/T) between the Navy and Army is to be carried out by morse (flag-waving, heliograph, signalling projector or lantern) and semaphore when it can be used, but the latter is only taught to the Royal Artillery.

Rate of Signalling.

55. The normal rate of signalling between the two services may be taken as 8 words per minute for morse and 10 words per minute for semaphore.

Component Parts of a Message.

56. The **Heading** of the message will consist of :—

(*a*) The *Preamble* which conveys signal instructions as to the route of, or method of dealing with, a message, *e.g.* whether the message is for the receiving station or for re-transmission.

(*b*) The *Address* which consists of the call signs of the station of delivery and station of origin separated by V. The call sign of the

latter will always be given, but that of the former may be omitted unless the message is for re-transmission.

(*c*) The *Prefix* which shows the category of the message and gives all instructions or information not included in the preamble. This may consist of procedure signals or plain language.

2. The **Text** of the message will always commence with the address to, then address from, separated by V.

(*a*) The *Break Sign* will immediately follow the address from.

(*b*) The *Reference Line*. This will consist of three mixed groups of figures and letters, the first is the originator's number of message, the second is the date, the third is the reply to No. ——. This is the originator's number of the message to which a reply is being sent. If a message is being sent which is not a reply to anything, the third group will not necessarily be made.

(*c*) The *Text* which contains the information.

(*d*) The *Time of Origin* which is the time at which the originator directs the message to be made (*see Art.* 64).

(*e*) The *Time of Handing in* at the station for transmission.

Method of Demanding Repetition

57.

Repetition required.	Signal sent.
(1) The whole message	IMI
(2) All before a certain word or group	IMI break sign, followed by that word or group
(3) All after a certain word or group	That word or group followed by break sign IMI
(4) All between two words or groups	The first word or group break sign IMI break sign and the second word or group
(5) One word	WA (word after) followed by word correctly received. Where one word after or before is not sufficiently distinctive, WA and two words may be sent to ask for a repetition

Method of Correcting Errors in Transmission.

58. Should the transmitting station perceive that she has made a word or group incorrectly, she will make the erase sign which is to be repeated back, and will then repeat the last word or group made correctly and continue with the message.

NOTE.—The erase sign is the annul sign when using semaphore.

Method of Cancelling a Message.

59. To cancel a message actually in process of transmission the transmitting station will send (break sign) Q (break sign) cancel (spelt out).

2. Where the message has actually been received and R made by the receiving station, it can only be cancelled by another message from the originator to the addressee.

Signal Service Message.

60. A signal service message is a message originated by the signal department, referring to the working of the lines of communication. It is always addressed direct to the signal personnel. If it is desired to give the message precedence over ordinary messages of the same category it may be prefixed by D.

Repeating Back Figures.

61. All figures in the text of the message (except map references) will be repeated back by the alphabetical check table as shown below.

2. To ensure the correct receipt of mixed numbers, *i.e.* groups of figures which contain both whole numbers and fractions, the numerator of the fractional part will be repeated back in words by the receiving station.

Example :—

$1\frac{5}{16}$ would be signalled as :—

1 — — — — 5 — • • — • 16

This would be repeated back as :—

A five AF, to distinguish it from $\frac{15}{16}$, which would be repeated back as fifteen AF.

ALPHABETICAL CHECK TABLE.

1	• —	A		6	• • — •	F	
2	— • • •	B		7	— — •	G	
3	— • — •	C		8	• • • •	H	
4	— • •	D		9	• •	I	
5	•	E		0	— • —	K	

Map References.

62. Where map references are referred to in the text of a message, they will be repeated back spelt out.

Example :—

Map reference sheet signalled in the text of a message as :—

51B K12 a 3.4

would be repeated back as :—

Five one B K one two a three dot four

Method of Signalling without Answering.

63. When a station desires to receive without making any answer NA will be sent, meaning "send the message by the F method." This signal will be answered by R. The message will then be transmitted followed by MI and then repeated and finished with AR. After a pause the message will again be repeated and finished with ARAR.

2. When sending by the F method the standard rate is to be six words per minute.

Time of Origin.

64. The time of origin is the time at which the originator of a message directs it to be made : it should be written by him on the message form. The time of origin is indicated by four figures which are not to be coded, the first two denoting the hour (from 00=midnight to 23=11 p.m.) and the second two denoting the minutes (00 to 59).

Examples :—

Time.		Time of Origin.
1.0 a.m.	*would be signalled as*	0100
11.10 a.m.	,, ,, ,, ,,	1110
5.2 p.m.	,, ,, ,, ,,	1702

The time of origin is always signalled by numerals.

The Time of Handing in.

65. The time of handing in is the time at which the message is handed in at the station for transmission.

2. It will consist of four figures similar to the time of origin and is signalled by numerals.

Call Signs.

66. The usual call signs to be used (unless other arrangements have been made) will be the W/T call signs of the stations concerned. Where however it is expected that communication will have to be maintained for some time it will probably be more convenient to allot special 2-letter call signs, both to ships and shore stations.

2. If W/T call signs are not being used, the call sign will consist of the first and last letters of the station's name except in the case of the S.N.O. who will always use the call sign XA.

How to Open up Communication.

67. When a station requires to get into communication the following procedure is to be carried out.

(*a*) *When call signs are known* :—

Example :—

Station with call sign CD wishes to get into communication with a station whose call sign is AB.

CD makes	AB AB until answered
AB answers by making ...	AB
CD makes	AB V CD
AB makes	CD V AB

(*b*) *When call signs are not known* :—

If CD does not know AB's call sign, CD will make RU until answered by AB making her own call sign.

An Offer of a Message.

68. When either station has a message for transmission it offers the message by sending VE Z or VE T according to whether the message is for delivery at the receiving station or for re-transmission respectively.

2. This preliminary warning is answered by making K, if the receiving station is ready; if not ready, Q is sent instead.

How to Transmit and Receive a Message.

69. After having opened up communication as laid down in Art. 67, the following procedure will be carried out :—

	Transmitting Station. How sent :—	Receiving Station. How answered :—
Makes the offer	VE Z or VE T	By K if ready to receive By Q if not ready to receive
Preamble	Procedure signals F, M, T or Z; should more than one be sent it will be made as one group separated by the II	By T
	II	By T
Address	Call sign of the station of delivery V the call sign of the station of origin. The former may be omitted unless the message is for retransmission	By T
	II	By T

	Transmitting Station. How sent :—	Receiving Station. How answered :—
Prefix	Procedure signals O, P, D or G; should more than one be sent it will be made as one group separated by the II. If plain language is inserted, the II will separate the procedure signal from the plain language II	Each group by T By T
Address to	Plain language or code V	Each word or group by T By T
Address from	Plain language or code II	Each word or group by T By T
Reference line	Sent as three separate groups	Each group by T
Full stop sign	$\overline{AAA}$ if message is in plain language. $\overline{BT}$ if it is in code or cypher	By T
Text	If in plain language If in code or cypher	Each word by T Each group repeated back (except in the case of numerals when each group is repeated back by alphabetical check)

	Transmitting Station. How sent :—	Receiving Station. How answered :—
	T (if repetition correct)	
	Note, where numerals are made in plain language	They are repeated back in alphabetical check
	T (if repetition correct)	
End of Text	$\overline{BT}$	By T
Time of Origin	Numerals T (if repetition correct)	Repeated back by alphabetical check
	II	By T
Time handed in	Numerals T (if repetition correct)	Repeated back by alphabetical check
	II	By T
End of Message	$\overline{AR}$	By R

Note.—If the transmitting station has another message awaiting transmission, B II T or B II Z will be made before the $\overline{AR}$.

Procedure Signals Used in Visual Signalling between the Navy and Army.

70. Where the signals are marked with a bar (—) over the letters, they are sent in morse as one sign.

By morse.	By semaphore.	Use.
$\overline{\text{AAA}}$	AAA	In plain language messages separates the reference line from the text (in cypher $\overline{\text{BT}}$ is substituted). In the text represents Fullstop
$\overline{\text{AR}}$	AR	Denotes the conclusion of a message
B	B	Has message been received ? Made before the $\overline{\text{AR}}$ sign :—There is more to follow
$\overline{\text{BT}}$	BT	In code or cypher messages separates the reference line from the text, and the text from the time of origin in all messages
C	C	Correct
D	D	Prefix to a signal service message (*see Art. 60*)
F	F	Message following not to be answered
G	G	Repeat back
$\overline{\text{HM}}$		Silence sign
H	H	Break sign
$\overline{\text{IMI}}$	IMI	Repeat sign (*see Art. 57*)
$\overline{\text{INT}}$	INT	Interrogative sign

By morse.	By semaphore.	Use.
J	—	Check and repeat
K	K	Go on
LL	LL	Your light is too powerful, diminish your light
M	M	In heading :—Pass following *via*
MH	MH	Move higher up or further off
ML	ML	Move to the left
MO	MO	Move lower down or nearer in
MR	MR	Move to the right
N	N	Not (nothing) received
NA	NA	I cannot answer. Use F method
O	O	Urgent (prefix)
OL	OL	Open light. Used by a station which requires a mark on which to align their helio or lantern (sent as separate letters)
O H P	O H P	Urgent priority (prefix)
P	P	Priority (prefix)
Q	Q	Wait. Also used before the word "cancel" when cancelling a message actually in process of transmission
QRU	QRU	Nothing to communicate
R	R	Message received

By morse.	By semaphore.	Use.
RU	RU	Who are you ?
T	T	In the heading: Transmit to ——— Also used to answer the receipt of a word or correct repetition of a group
U	U	Your Enemy report
$\overline{UO}$		Negative silence sign
V	V	From
$\overline{VA}$	VA	Nothing more for transmission
$\overline{VE}$	VE	Commencing sign
W	W	I cannot read your signals, calls for light
WA	WA	Word after
Z	Z	Addressed to

71. Miscellaneous Signs used in Visual Signalling between the Navy and Army.

	By morse	By semaphore	Use
Hyphen	– • • • • –	NV	Used in the text of a message
Separates whole numbers from fractions	– – – –	MM	Used between whole numbers and fractions
Oblique stroke	• – • • –	I/T	As written by originator
Horizontal bar	– • • – •	NR	Separates numerator from denominator of a fraction
Brackets	– • – – • –	KK	Made before and after words in brackets
Inverted commas	• – • • – •	RR	Made before and after words in inverted commas
Block letters	• • – – • –	UK	Made before and after words that have to be written in block letters
Decimal point	• • • • • •	III	Sent as three I's
Fullstop	• – • – • –	AAA	Sent as one sign
Erase	• • • • • • • • E's (8 in No.)	Annul Sign	

CHAPTER VIII.

FLAG OF TRUCE.

72. A Flag of Truce is used when a belligerent wishes to enter into negotiations with his Enemy.

2. A Flag of Truce displayed from a conspicuous position will indicate that it is proposed to send a communication.

3. That it will be received is indicated by the display of a Flag of Truce in response; then, with confidence, a boat or Officer may be sent in advance with bearers of a Flag of Truce.

4. It must be understood that a condition of truce does not exist till the Flag of Truce hoisted by one party has been replied to.

5. A belligerent has a right to decline to enter into negotiations and to refuse to receive a Flag of Truce. The bearers cannot insist on being received.

6. Blank guns fired while a Flag of Truce is displayed will indicate that the bearers must halt or stop and not approach nearer.

7. A Flag of Truce must not be turned back by firing on it. Anyone who kills or wounds the bearers is guilty of a serious infraction of the law of nations.

8. Persons bearing a Flag of Truce are inviolable, provided they do not act improperly.

9. They must not, without permission, approach sufficiently near to acquire useful information.

10. They should not, without permission, pass the outer line of sentries, or approach within range of the guns of the ships or forts of the Enemy.

11. They should stop and wait when desired to stop, and are bound to obey the directions and signals or signs of those who have offered to receive the Flag of Truce. If they are contrary to their orders, or to what is considered proper, they must retire. (For instance, it is quite usual to blindfold bearers who have to deliver despatches, and they must submit or retire.)

12. When a vessel bears a Flag of Truce she should stop at a proper distance, or, when signalled to, by blank guns or otherwise, send a boat also bearing a Flag of Truce, and the boat will act in a similar manner, and will stop or go when and where the receiver directs, and probably will be met by another boat; but no absolute rule can be laid down in this latter respect. (*See par.* 3.)

13. The precise method to be adopted for the receipt of communications sent under a Flag of Truce rests with the receiver and not the sender.

14. If a Flag of Truce is displayed during an engagement it is not necessary to cease firing entirely though it may be decided to receive it. Fire should cease to the extent necessary to secure the safety of the bearers.

15. When belligerents have been face to face for some time it is quite usual to arrange when, where and how to receive communications under a Flag of Truce.

16. It is held that a Flag of Truce can only be used legitimately for the purpose of entering into some arrangement with the Enemy. If adopted to obtain surreptitious information as to an Enemy's forces or position, or to obtain other such advantage, the Flag loses its character of a Flag of Truce and exposes its bearers to punishment as spies. The most conclusive evidence, however, is necessary, and great caution must be exercised before the bearers of a Flag of Truce can be convicted as spies.

17. While the proper use of Flags of Truce is generally in the interests of humanity, efforts to gain time or to obtain any other advantage under the excuse of exchanging communications have to be guarded against.

CHAPTER IX.

ORGANIZATION OF SIGNAL DEPARTMENT.

General.

73. It is not practicable to produce an organisation which will be suitable to every ship under all conditions of service, but the following general principles may be taken as a guide.

2. The Signal staff is divided into two sections, Watchkeepers and Daymen.

The Watchkeepers, as far as practicable, keep four standing watches. Circumstances may sometimes require them to keep three watches, but in peace routine this should only be for short periods. Experience has shown that the best results are obtained by keeping four watches and calling up the watch below when required.

3. The remainder of the staff (with the exception of certain ratings told off for special duties) comprise the Daymen and are divided into two watches. They should be available for work from "Hands fall in" (in harbour), or daylight (at sea), until 2200, or as requisite, one watch only being on deck during meal hours and dog watches: both watches for the remainder of the time, when pressure of work requires it.

4. It must be borne in mind that dawn is a most likely time for flag signals to be hoisted. This especially applies to vessels spread. Great care should therefore be taken, when in war organization, to ensure a sufficient number of hands being available at this time.

Typical Organization.

74. The following are the main points in the organization of first class ships: other ships should follow roughly the same lines.

FLAGSHIPS.

Battleships.

Watch-keepers.	Chief Yeoman	For Flag Captain.
	4 Yeomen	Yeomen of watches.
	4 Leading Signalmen	Leading Hands of watches.
	4 Signalmen	2nd Hands of watches.
	4 Ordinary Signalmen	3rd Hands of watches.

Special Duties :—

Distributing Office (when this system is used).	1 Yeoman or Leading Signalman	In charge of Distributing Office.
	1 Leading Signalman	2nd Hand of Distributing Office.
	2 Signalmen	Loggers.

NOTE.—The Distributing Office staff for other ships can be modified as necessary according to circumstances.

1 Leading Signalman - To attend on Signal Officer.

Remainder of the staff form the Daymen, with a Leading Signalman in charge.

Battle Cruiser or Cruiser.

1 Chief Yeoman	For Flag Captain.
3 Yeomen	For three watches at sea. In harbour, two work watch and watch in charge of deck from 0600 to 2200, or as requisite. The 3rd (Day Yeoman) in general charge of Daymen.
4 Leading Signalmen	Leading Hands of watches.
4 Signalmen	2nd Hands of watches.
4 Ordinary Signalmen	3rd Hands of watches.

Special Duties :—

Distributing Office - As for Battleship (Flagship).
To attend on signal Officer - - Ditto.

Remainder of the staff form the Daymen, the senior acting taking charge at sea in place of the Day Yeoman.

PRIVATE SHIPS.

Battleship.

1 Chief Yeoman -	In charge.
3 Yeomen - -	As for Cruiser Flagship.
4 Leading Signalmen - - -	Leading Hands of watches.
4 Signalmen - -	2nd Hands o watches.

Remainder of the staff form the Daymen.

Battle Cruiser or Cruiser.

2 Yeomen - -	Watch and watch from 0600 till 2 00, or as requisite, unless circumstances require them on deck at night.
4 Leading Signalmen - -	Leading Hands of watches.
4 Signalmen - -	2nd Hands of watches.

Remainder of the staff form the Daymen, with a Leading Signalman in charge.

The above is only a guide, and the organization must be decided by the number of signalmen borne on the ships on which the ship is employed. As a rule more signalmen on deck than other ships, and it may be necessary to put the watchkeepers in four watches, or to augment the watches by detailing the Daymen in turns to keep first, middle, or morning watch as the case may be. In all cases the signalmen must be so organized that sufficient signalmen are on deck to ensure that there is no delay in signalling.

SPECIAL DUTIES.

Chief Yeoman.

(Flagship.)

75. To be entirely responsible for keeping the Captain generally informed, and for all instructional work as far as possible.

Note.—When immediate action is required, and the Chief Yeoman is not on the bridge, the Yeoman of the Watch is responsible that the Captain is informed.

Chief Yeoman.

(Other Ships.)

2. In charge of the staff.

Yeoman of Watch.

3. The Senior rating on watch, whatever his rating, is termed the Yeoman of the Watch. He is responsible for the general conduct of signalling on the bridge, method of and route for transmitting messages, the disposal of all messages transmitted and received, dress and behaviour of men on watch, reporting immediate messages or occurrences, and (in ships with no Distributing Office) for reporting all messages and for the safe custody of signal books during his watch.

4. All messages for transmission when brought on the bridge, and all messages received, are to be given to him, and he will decide as to their disposal. If messages have to be reported direct from the bridge (there being a Distributing Office in the ship) the following routine should be carried out. The Yeoman of the Watch should write on the chit the names of the Officers to whom the message is to be reported, and detail a hand from the watch to report it, after which the chit is to be brought back to the Yeoman, who will satisfy himself that it has been shown to the officers concerned, and that their names have been ticked off, the hand who reported it is to initial the chit, after which the chit is to be sent to the

D.O. for reporting it to any other Officer, or departments, etc., that it may concern. Reports of occurrences should be treated in the same manner as messages (and if time admits) written on a pad and sent round for reporting.

5. To save time in the D.O. when messages and occurrences are reported direct from the bridge, a good method is to use the duplicate copy for reporting from the bridge, the original copy being sent to the D.O. so that the latter can get the message finally reported much quicker.

6. The Yeoman of the Watch should, as far as possible, avoid making or reading messages himself, but should supervise and see that the signalmen under him carry out their duties efficiently.

7. Private messages are never to be allowed to interfere with service work.

Leading Hand of Watch.

8. In Harbour :—Generally to assist the Yeoman and in his absence to perform his duties.

9. At Sea :—

(a) To keep watch on the Compass Platform from the time the signal is made to unmoor or shorten in until the ship moors or anchors again.

(b) Never to leave the Bridge until properly relieved, unless ordered by the Officer of the Watch to do so.

(c) To report to the Officer of the Watch all signals and other matters which concern him.

(d) At night, to look out for the executive signal and to report it instantly to the Officer of the Watch.

(e) Above all, the Leading Hand should exercise his faculties as a look-out. He should be the first to sight and report land, lightships, buoys, lighthouses, prominent navigational marks, ships and boats of all descriptions, floating

objects, &c.; his telescope or glasses should be constantly in use to look out for the above, and he should regard it as a reflection on his ability if anyone sights anything before he does. There is no objection to his asking the Officer of the Watch from time to time if there is anything special for him to look out for.

(*f*) To make himself acquainted (by referring to the Mercantile Navy List, Book of House Flags and Funnels, Lloyd's Shipping News, &c.) with the identity of passing steamers, but this is not to be done at the expense of keeping a constant good look-out.

(*g*) To look out for Coastguard Stations hoisting the "Demand," to watch for steamers dipping, and to see the ensign is dipped in return.

(*h*) To be thoroughly acquainted with the lights displayed by the different descriptions of Fishing Vessels, and to know what nets to look out for and their probable direction.

(*i*) Generally speaking he should try to make himself a thoroughly reliable assistant to the Officer of the Watch.

(*j*) In the event of the Navigating Officer or Captain being on the Compass Platform, he should, in the absence of the Chief Yeoman, report all signals to them as well as to the Officer of the Watch.

Second Hand of Watch.

10. Generally assist the Yeoman in looking out, and with semaphore work.

Leading Hand of Daymen.

11. In charge of stores, repair and cleaning work, and placing and returning of cones, lanterns, &c.

Distributing Office.

76. The object of the Distributing Office is to relieve the ratings on watch on the Bridge from the responsibility of reporting routine and other non-immediate messages. It has been found convenient in peace routine to work the Distributing Office from 0600 till 2200, during which time all logging, filing, reporting, &c., is done there.

2. Messages requiring immediate action, movements of ships, unusual events outside the ship, &c., are reported direct from the bridge, but all other messages are sent to the Distributing Office for the necessary action to be taken.

3. The duties of the Distributing Office staff should be as follows :—

The Yeoman and Leading Signalman (or the two Leading Signalmen) work watch and watch while the Distributing Office is open, the senior rating being responsible for the organization, conduct, &c.

The Loggers are responsible for the logging and filing of messages.

At least four messengers should be detailed for distributing messages. These should be provided from other departments.

4. In war routine, the Distributing Offices in most ships have to be kept open all night, and the organization must be so arranged that this is provided for, and it may be found necessary in some ships to put the watchkeepers in three watches.

Reporting Messages.

77. No definite orders can be laid down as regards reporting messages, but the following instructions should be followed where possible, being varied as necessary to suit different classes of ships.

2. Messages should be reported to Officers and departments concerned as quickly as possible, due regard being paid to the fact that certain Officers or departments will have to act at once on receipt of the message, and that others are only interested from the information it conveys.

For instance, the signal "Let go another anchor" has to be acted on by the First Lieutenant or Cable Officer, and a message concerning dental treatment by the Senior Medical Officer.

3. The following Officers should see all messages referring to the subjects mentioned against them :—

Commander or Executive Officer.—Steam, routine, internal organisation, Officers or Ratings, leave and any message affecting the ship.

Officer of the Watch.—All service messages made during his watch.

Navigating Officer.—Steam, anchors or cables, position course or speed, time ball.

Gunnery Officer.—Gunnery armament, ammunition, funerals.

Torpedo Officer.—Torpedo armament, electrical apparatus, searchlights, projectors.

Engineer Officer.—Steam, machinery, fuel, steamboats, stores.

Marine Officer.—Marines, escorts, guards, pickets.

Medical Officer.—Hospital and dental cases, bills of health, medical guards.

Accountant Officer.—Victualling stores, pay and pay documents, Officers or Ratings joining or leaving.

Warrant Officers.—Stores for which they are responsible, work with which they deal.

Captain's Office.—Orders, returns, stores, books, Officers or Ratings joining or leaving.

Ship's Office.—Pay documents, Officers or Ratings joining or leaving.

Master-at-Arms.—Leave, Ratings joining or leaving.

Sergeant-Major.—As for Master-at-Arms where it affects the Detachment.

4. In flagships, Staff Officers should be shown all messages which concern them, details being arranged by the Signal Officer.

5. To assist the staff of the D.O. in the reporting of messages, a tabulated list should be drawn up showing to whom various types of messages are to be reported.

NOTE.—For fuller instructions as regards filing, reporting, custody and distribution of messages, see C.B. 511 Instructions for Handling Messages.

Method of Dealing with Out-Messages.

78. All messages received on the bridge for transmission are to be given to the Yeoman of the Watch. If made by flags, or coded groups, the hoists or coded groups as made are to be written down on another chit, and the name of the man who supervised the making of the signal is to be noted on the chit, and the method by which it was made; when the message is finished the original and the coded group chits are to be placed together, initialled by the Yeoman of the Watch, and sent to the D.O.

2. When passed through another ship, the name of the ship through which it was passed is to be noted as via —— (*name of ship*) in the "From" or "To" spaces. Should any messages for transmission be given verbally on the bridge, they are to be treated as in the above cases.

Method of Dealing with In-Messages.

79. All messages received are to be treated as follows:—

(a) If received by flags or in code, the message is to be written down as received, and when decoded the two chits are to be placed together.

(*b*) The message as received is to be carefully read over by the man who read it and the name of the man who read the message and the method by which it was received is to be noted on the chit.

2. If received through another ship, the name of the ship it was read from is to be noted as via —— (name of ship) in the "From" or "To" spaces, after which the message is to be given to the Yeoman of the Watch for disposal.

Signal Pads (Form S1320 b or c).

80. Signal pads should be kept in boxes (one each for large and small pads), two on each side of the bridge; they should be within easy reach of the signalman and to save time they should be charged with carbon paper so as to get duplicate or triplicate copies of messages received.

2. Dates and times should always be carefully noted on all Signal Forms, and when messages have to be re-transmitted the Time of Despatch should be noted in addition to the Time of Receipt.

3. In order to check mistakes and avoid messages being mislaid, the following system is advocated :—

All forms are to be filled in with the abbreviations as laid down in the instructions for keeping the signal log to show the method employed in making the message, and messages received or transmitted through other ships should be noted via (name of ship) in the "From" or "To" spaces.

4. Forms should be initialled by :—

The maker or reader.	In the case of an "in" message the reader should check the original copy before initialling it.
Yeoman of Watch.	
Rating reporting message.	
Distributing Office P.O.	Who should see these initials complete.
Logger.	

NOTE.—Forms are to be filled in accordingly in the space provided in the upper corner. Representatives of Offices, and such ratings as M.A.A., Sergeant-major, Victualling Chief Petty Officer, etc., should initial all messages shown to them, even if copies of messages are given to them.

5. Pads should be placed in all Officers' messes and offices in order that messages may be sent up to the bridge by messenger.

It is desirable that signal ratings should not be sent for, for this purpose, also that Officers should initial any messages they originate.

Procedure with W/T Signals.

81. Messages sent to the W/T Office for transmission are to be dealt with as laid down in C.B. 511.

2. The time the message actually arrived on bridge (or in D.O.) from W/T Office is to be noted on top of the chit.

Logs.

82. To keep in touch with their work, signalmen will find it advantageous, before relieving a watch, to read the signal log for the watches which have intervened since they were last on watch.

2. This does not take long, and a few minutes spent before the bell strikes are of immense value later on when questions arise in reference to past signals.

3. The log should be initialled by the Yeoman of the Watch at the end of his watch, and he should log "Signal books and addenda correct," having first satisfied himself that they are so.

4. Full instructions for keeping signal logs are to be found at the beginning of the Log (S. 323).

Station Board.

83. A station board should be made out for "Stations for going in or out of harbour," "General Evolutions," "Dressing and Undressing Ship," "Cleaning Quarters," "Signal Exercise," "Action Stations," &c., and should also show the organization of watches and Daymen, the latter being numbered.

Stations should be assigned as far as possible to standing numbers, and should not be detailed in a haphazard manner.

CHAPTER X.

HINTS TO SIGNAL RATINGS.

Confidential Nature of Signalmen's Work.

84. Signalmen must remember that the whole of their work (not only the contents of the various Signal Books but also *all* the information contained in the messages which pass through their hands) should be regarded as CONFIDENTIAL, and must on no account be disclosed to persons not belonging to H.M. Services, or be discussed in the presence of civilians or amongst themselves.

Discipline on the Bridge.

85. Laxity of discipline on the bridge means slackness in signalling. Skylarking or yarning must be prevented. No two ratings should be permitted to walk the bridge or signal deck together, nor should any congregation of ratings in any one part of the bridge be allowed.

It is one of the Yeoman's principal duties to see these points attended to.

2. The various regulations governing the conduct of signalling are framed to ensure accuracy and rapidity. There are good reasons for every detail contained in them, although in some cases the reasons may not immediately be apparent.

3. Carelessness in regard to details inevitably brings confusion and trouble, sooner or later.

Necessity of Silence on the Bridge.

86. Silence is the characteristic of a properly organised signal bridge, noise is a sign of inefficiency, and as far as possible the only voice to be heard should be that of the person in charge, on whom the attention of the Signal Staff should be fixed.

Semaphore and Morse Signalling.

87. Accuracy is the essence of signalling.

2. Smartness is also necessary, but unless it is subordinated to accuracy it is almost worse than slackness. Signalmen should be impressed with the fact that semaphore making is good physical exercise, and if made correctly, and not in a slovenly manner, great benefit to the man making it will be derived.

3. The best signalman is the man who is able to receive messages *correctly* and pass messages, *so that they can be read correctly*, in the shortest time, and who is in addition an efficient look-out. It is of no use to make a message at a great speed if the receiving ship has to demand a repetition.

4. When possible, a man should check the repeating of semaphore messages from one of the repeating ships to see if it has been repeated correctly.

5. When reading a general semaphore message, it is always advisable for the reader to have in mind another conveniently placed repeating ship, so that in the event of the semaphore which he is reading becoming obscured through smoke, sail, etc., he should at once shift his glass on to the other repeating ship. This action, if done smartly, invariably prevents words being missed.

6. When repetitions have to be asked for, it is more often the fault of the man making the message than of the man reading it. Usually the message has been made in a slovenly manner, or at too great a speed, or a bad background has been selected.

7. The tendency is to err in over-smartness, one instance being to make guesses, in the *hope* that they will prove correct. This fault, simple as it is, is very hard to cure, but it is quite incompatible with efficiency.

8. It is far better to make absolutely certain by looking again, by waiting a moment longer, or even by asking for a repetition, than to report a message incorrectly.

9. A typical instance is where a signalman misses a word, either through his own incompetence, or by fault of the sender. Owing to false pride he will not immediately dip; he goes on in the hope that he will be successful in guessing the missing word afterwards by the context, but more often than not his guess is hopelessly wide of the mark. The subsequent controversy as to whether the word he guessed was or was not made, is apt to undermine the confidence of the Service in the reliability of the signal branch.

10. It not infrequently occurs that a message, the wording of which is obviously incorrect, is reported in its incorrect form to Officers and Departments. On investigation it is found that the message was made like that. The receiving ship is as much to blame as the ship of origin in accepting such a message obviously incorrectly worded and it should be the duty of the Yeoman of the Watch to obtain a check and repeat if he is not satisfied with the correctness of any message received.

Backgrounds, &c., when Signalling.

88. Carelessness on the part of the transmitting ship in choosing a suitable background is liable to result in delay, through the receiving ship having to ask for a repetition.

2. The trouble entailed in having to stand on a derrick or davit head, or climb on to a boat, or even to go aloft, is generally repaid by the receiving ship being able to read the message straight off, by virtue of the good background obtained.

3. Objects become more conspicuous when they show a marked contrast to their environment. For instance,

when the background is dark, the object used for signalling should be of a light colour; *vice versâ*, when a light background prevails, a dark object is necessary.

4. As a general principle, the further off the background-producing medium is, the better it proves.

5. In daylight, the best natural background is the sky or sea; such a background can usually be obtained in a ship, and is particularly necessary whenever the ship signalled to is at any considerable distance.

6. To judge whether the background is clear, the sender should first stand with his back to the receiving ship, and see if he has an uninterrupted view, bearing in mind that the background against his arms when extended should also be clear.

7. In seeking to obtain a good background in a ship, endeavour to anticipate changes in the relative positions of your ship and the ship to which you are signalling. The two ships may be on different and divergent courses, so that a position which gives a sky background at one moment, may be shut out by the funnel or mast the next.

8. Whenever the receiving ship is turning, it must be borne in mind that the view of the receiving signalman is liable to be obstructed. This can generally be anticipated by observing when his side of the signal bridge is likely to be shut off. The sender should therefore then discontinue signalling until his signal can be picked up again on the other side.

9. In such a case, when it is observed on board the receiving ship that the receiver's view of the semaphore he is reading is likely to be cut off through his ship turning, another signalman should be sent to the other side in order to pick up the message again with the least possible delay.

10. When making a semaphore message the sender must remember that it is impossible to see through a passing sail or dense smoke. Consequently he should

stop just before such obstruction interferes with the line of sight, and keep the semaphore arms fixed at the last visible sign until the view is clear again, when he can proceed.

11. Mechanical semaphores are generally mounted at the ends of the bridges. Therefore, to obtain a sky background the following procedure will usually be found to be the best :—

To address Ships—	*Semaphore to be used.—*
On the starboard bow	Port side of bridge.
On the starboard quarter	Starboard side of bridge.
On the port bow	Starboard side of bridge.
On the port quarter	Port side of bridge.
Ahead or astern	Whichever is most convenient
On the beam	Handflags, if a clear background cannot be obtained for the mechanical semaphore.

12. When using morse flags, the choice of the colours to be employed must be determined both by the nature of the background and the position of the sun.

13. With a light background a blue flag should be used, with a dark background a white flag.

14. When the background allows of either flag being used, a white flag if the sun is in front of the sender (as he faces the receiver), and a blue flag when the sun is behind him, will usually be found the best.

Writing down Messages.

89. Messages should be written legibly and clearly, otherwise mistakes are bound to occur. *Plain writing* is of more practical value than so-called good writing.

2. Care must be taken to spell correctly; punctuation should also be carefully attended to, and messages checked through to prevent mistakes.

3. The man writing down the message should (so as to prevent errors) write it down as it is made. Numbers are to be written out in full as spelt out.

4. The original message (*i.e.*, as taken down first hand from the reader) should be sufficiently well written to obviate any necessity for making a "fair" copy.

Reading out Messages for Transmission.

90. The man reading out messages that are being made either by semaphore or morse is to stand in such a position that the maker can hear distinctly, also that the man reading out can check that the message is being made correctly. If single letters or difficult words are in the message, he should make use of the phonetic alphabet as laid down on page 81.

Miscellaneous.

91. Small Affirmatives or Answering Pendants should not be left at the dip. If the transmitting ship does not stop in a reasonable time, the Affirmative or Answer should be hauled down, and a repetition called for.

2. "Dip and hoist," made both before commencing and after concluding a semaphore message, is also a useful check, though not infallible, as cases have occurred of two ships making it at the same time.

3. In large fleets it will be found convenient to arrange special flags for answering certain ships.

4. Whenever possible, each sender should have a copy of the message, and another person to dictate. Where semaphores are widely separated and one person attempts to dictate to two or more at the same time, mistakes are bound to occur.

5. In the case of a ship repeating, it is very important that the man reading the message from another ship should be close alongside the man repeating the message.

6. An acknowledgment or a repetition should be requested for all important signals when there is any possibility of an error.

7. *Points to be remembered* :—

(*a*) When about to signal, think of the background (*see Art.* 88).

(*b*) Keep the arms of the semaphore clear, and avoid having two different backgrounds for the two arms.

(*c*) When using hand flags get in a position where the body can be kept upright, use the whole length of the flag staves with the forefingers along the staves, and form the letters properly with straight arms in line with the body, not projecting to the front.

(*d*) Note the movements of the transmitting and receiving ships.

(*e*) Stop sending when on the swing or vision is about to be obscured.

(*f*) Watch carefully the Answering Pendant in the receiving ship, and should it be dipped, stop sending *immediately*.

Flag Signalling.

92. It should always be borne in mind that flag signals convey orders which have to be quickly attended to. Consequently every endeavour should be made to ensure such signals being read and understood as rapidly as possible.

2. Care should therefore be taken that, when more than one hoist is being made at the same time, *the masthead hoist is always shown first*, and that all flags are clear when they leave the deck.

3. When making flag signals, it is essential that Signalmen should attend to their own part of the halyards, and avoid fouling other men on the hoist, or on other halyards. Men not actually engaged in hoisting or hauling down should stand clear of those so engaged. When hauling down a signal care should be taken to keep clear of men who are bending on or hoisting another signal, as it is most important that no delay should occur in the hoisting of signals.

4. When there is little or no wind, flags should be kept continually on the move; but great care must be exercised in this respect, for if the hoist is dipped too low, it is liable to be reported as "signal down," thereby causing confusion, especially, if it should be a signal directing a movement.

5. Small Answering Pendants—or Affirmatives—should be run up smartly with both hands. A smart ship is usually known by the manner in which signals are answered, and it looks very slovenly to see an Answering Pendant being hoisted with one hand. Care should be taken to see that the halyards are sufficiently taut to prevent Answering Pendants or Affirmatives slipping down.

6. It is very important to impress upon all concerned the necessity for prefacing the order to "bend on," "hoist," or "haul down" signals by stating the halyards required. In many cases men do not do this, and the result is fatal if there is more than one signal flying. In order to avoid clapping of hands, shouting, etc., it is advisable for the Yeoman to carry a whistle to attract the attention of any men concerned who are not on the bridge.

7. It is quite unnecessary to *shout* "Close up" or "Down," or any other order which can be better given by a motion of the hand, and the naming of the hoist or signal.

8. Should it be necessary to get a repetition of an order, the man on the head of the halyards should say "Repeat" sharply and clearly, naming his hoist if necessary.

9. No flag signals should be flying during the firing of a salute.

10. No unimportant signal, by flags or semaphore, should be made or kept flying, at the same time as a manœuvring signal.

11. The practice of bending on flag signals in anticipation of their being required should be discouraged. Not only does this practice militate against quick repeating of unexpected signals but also causes delay if the signal to be repeated should differ from the signal that was expected and bent on.

12. Flags will get foul at times, but with reasonable care a good deal of this can be prevented.

13. When hoisting signals endeavour to hold only the roping of the flags, and give the bunting a chance to fly clear.

14. When a hoist is foul, do not shake it aimlessly up and down, but keep the halyards taut, and bump the head sharply against the block; this will give the flags a "lift" off the halyards, and the wind will do the rest.

Signalling Lanterns.

93. At the commencement of every watch during the hours of darkness, it is advisable to try all signalling lanterns to see that they are in good working order; and when lights are taken down at daybreak, the Yeoman of the Watch should be informed as to whether all lanterns are correct or otherwise.

2. At daybreak or dusk, use a signalling lantern, and, if distance is considerable, a Cruiser Arc or Aldis lantern in preference to a masthead lantern.

3. At night, have as few lights as possible on the signal bridge; at sea, keep the lantern in use well away from any navigation lights.

Care when Signalling to Small Ships, Merchant Vessels and Boats.

94. In addition to choosing a background, the size of the ship addressed must also be considered. The smaller the ship the more lively she is and the more vibration she experiences, especially when proceeding at high speed.

2. Signalmen in a large ship with a steady platform and favourable conditions for reading messages should not get impatient with a small ship if she fails to read at once the messages that are being made to her, but should realise the unfavourable conditions under which those in the small ship are labouring, and should endeavour to assist them in every way possible by making the signals clearly and distinctly.

3. Great care should be taken in making messages to merchant vessels or boats, and by experience it has been found that when making semaphore on the mechanical semaphore, if the latter cannot be trained so as to make it face the merchant vessel or boat, the letters on the semaphore should be made backwards so as to make it appear correct to the man reading the message.

4. It must be borne in mind that a telescope is very difficult to use in a boat and the best condition should be given her to receive the message.

W/T Office to be kept informed by Signal Bridge.

95. To avoid failure in W/T communication it is most essential that the Wireless Office should be kept fully informed in such matters as :—

(*a*) Fog coming on, and fog lifting.

(*b*) Movement of ships in any way, such as leaving and returning to fleet anchorage, all arrivals and sailings, and when out of visual touch or again when in visual touch

(*c*) Changes of organization, ships exchanging stations or a ship being given a fleet number in an organization.

(*d*) All messages made visually about steam, organizations, leaving or returning to harbour and any messages that are of importance to W/T department.

A practical method of ensuring this is to have all such information sent to W/T Office in duplicate, one copy being initialled by P.O.T. of watch and returned to Yeoman of the Watch (or Distributing Office).

Phonetic Alphabet to be used when making Single Letters in a Message.

96. When single letters, having important meanings, such as berths, areas, etc., occur in the text of a plain language message, the letter should be followed by "for" and the word shown in the following table :—

A	...	Apples	J	...	Johnnie	S	...	Sugar
B	...	Butter	K	...	King	T	...	Tommy
C	...	Charlie	L	...	London	U	...	Uncle
D	...	Duff	M	...	Monkey	V	...	Vinegar
E	...	Edward	N	...	Nuts	W	...	William
F	...	Freddy	O	...	Orange	X	...	Xerxes
G	...	George	P	...	Pudding	Y	...	Yellow
H	...	Harry	Q	...	Queenie	Z	...	Zebra
I	...	Ink	R	...	Robert			

Example :—

Marlborough take "A six berth" would be signalled

Marlborough take "A for apples six berth."

2. The above table should also be used when passing coded groups over the telephone, or when difficult letters appear in plain language messages and when single letters are sent.

Keeping a Look-out.

97. It should be remembered that Signalmen are the trained look-outs of the Service, and that a man who sees a signal first, although he may not be able to read it, is frequently more valuable than a man who is more skilled at reading signals but is a less efficient look-out.

2. All signal ratings, whether watchkeepers or daymen, are equally responsible for sighting or reporting, etc., and must not think that, because they are stationed on a pair of halyards, they are relieved from the responsibility of keeping a good look-out.

3. No man can be regarded as an efficient Signalman unless he is able to keep a good look-out in every direction; everything in sight should be observed by Signalmen, and any occurrence of importance or interest brought to the notice of those concerned.

4. Sighting, and immediately reporting, such objects as land, lights, buoys, etc., is as important as the rapid and correct transmission or receipt of signals.

5. If looking into the sun always use a neutral tinted handshade. It is very difficult to read a signalling projector without one.

6. Always report immediately you have observed a flashing signal, even before you have had time to read anything, so that a light may be switched on and trained on the correct bearing ready to answer at once.

How to Look-out.

98. When placed as a look-out, or at all times on the bridge when not otherwise employed, every Signalman should be responsible for a certain arc or a particular ship. When detailed to look-out over an arc he should note in his mind the directions relative to his position of the principal bearings such as Green 30, 60 and 90 degrees, etc. Whether supplied with a telescope, glasses or not, he should then start systematically to sweep his

arc going over its whole extent each time, taking from half a minute to a minute for 90° according to weather conditions, and then resting for about a minute. When an object is sighted he should immediately report as accurately as he can and judge its bearing in degrees and its appearance. To sum up, do not "dab" at the horizon here and there, but sweep it and never wait until you are sure about the outline of a supposed object before directing the attention of others to it and getting the benefit of their judgment also.

2. When sweeping, keep the horizon level, just below the centre of the field, and do not look *at* the horizon but *above* it. Similarly, when in doubt as to whether a suspected object is real or not it is a great help to look above and all round it. In the case of a faint light on the horizon at night it generally shows up best when one looks about two finger breadths (held at arms length) above the horizon. Looking directly at it causes it to disappear.

3. When you think you see something in sweeping your arc, swing back at once to the bearing at which you suspected it, and, keeping your glasses on the spot, let your eyes travel slowly all round the field of view. If still not quite sure, sweep very slowly backwards and forwards over the neighbourhood, repeating the process. You will then quickly see if it is something unusual or not.

4. With a difficult horizon it will generally be found better to look a little higher than usual. When sweeping round over a portion of the arc where sea and sky or cloud merge together, and the horizon is lost, it can often be picked up again by raising or lowering the glasses till the level where dark sea changes to lighter sky becomes noticeable, or by swinging rapidly to a part of the arc where it is easily discernable and tracing it along afresh. The necessity for keeping the right level lies in the fact that the tendency is to go high, and time may be wasted in scrutinising clouds.

5. Objects roughly in the direction of the moon, or other source of light, will show up more clearly than objects roughly in the opposite direction. It is advisable, therefore, to sweep in the latter direction more slowly than in the former.

6. Always note at starting the direction of the wind, and from that the direction in which you may expect smoke to be blowing in different circumstances. Thus, with a fresh wind on the starboard beam, what might appear to be a trail of smoke right ahead, rising upwards and to the *right*, would in reality be only a cloud, and similarly, if you have the wind right astern and you see a column of smoke rising straight upwards, you will know that the ship making it is going in the same direction as you are.

7. When you have pointed out a suspicious object find out whether you yourself are to keep your attention on it or whether you should search the remainder of your arc for further objects, as it is essential that someone should do this.

8. If you see the track of a torpedo coming there may be a possibility of avoiding it if you report it well. Do not shout "Hard a Starboard," or "Look out! there's a torpedo coming," but report as rapidly as you can the rough bearing of the track, and whether at the moment it points at you, before you, or abaft you, thus :—

"Torpedo, Green 45, ahead!" or "Torpedo, Red 90, amidships!" etc.

9. Remember, that by the time you have made the bridge understand this the torpedo will have advanced a considerable distance, so, if possible, give a bearing that you judge the head will reach in a few seconds.

10. Submarines should be reported in the same way, except that *the bearing only* should be reported thus :—

"Submarine, Red 10," or "Submarine, Green 75," etc.

11. Never shout unless absolutely necessary. If you are posted at a bridge end without a bearing plate, remem-

ber that the forecastle head does not represent zero, or right ahead of you, but is well on the opposite bow.

Night Work.

99. Everyone knows that a person coming from bright daylight to a dim flat or other place, cannot see anything at first, though people who have been there for some time find no difficulty at all. Their eyes have become suited to the partial darkness, the pupils having dilated and other changes taken place within the eye. Eyes in this state are said to be in the "dark adapted" condition, and can make the best use of whatever light there is to see by.

2. It goes without saying that a look-out man's eyes should be in this dark adapted condition, and that when he first arrives on the bridge after having been near electric lights he is of no use at all for some little time.

3. Having once reached the dark adapted state, the look-out man must be very careful not to lose it by looking at a light such as that thrown on the compass card, or striking a match, or looking towards the glow from some opening on deck. Experiments have shown that, after being disturbed in this way, the eye will not recover its *full* sensitiveness and power of seeing faint objects for twenty minutes or more.

For this reason it is most important to use the least powerful lamp possible to signal with at night, a blue shaded lamp being used whenever practicable.

4. If you think you see something like a dull glow of light anywhere *below the horizon* be particularly vigilant; it may be either reflected light on upperworks, due to badly screened openings, or the glow from a funnel that is not quite flaming, in both of which cases it will be comparatively close to your ship.

5. On a dark night, with breaking seas, it is particularly difficult to see approaching torpedo craft, but warning sometimes may be got from an irregularity in the

general line of waves, coupled with specially bright patches where they are breaking on a destroyer's bows, etc.

6. If searchlights are burning, blot out any direct light (*i.e.* the searchlight itself) by holding out your hand at arms length. It is the only way in which you will be able to see anything in that direction.

7. If looking out to the eastward, at night, you may expect to see rising stars appearing from time to time and resembling lights.

CHAPTER XI.

CARE AND MAINTENANCE OF MATERIEL.

Signal Books.

100. Orders are generally issued in all ships as to the procedure for reporting Signal Books, but it should be generally understood that Signalmen are responsible for all Signal Books entrusted to them, and great care should be taken to prevent damage or loss. They should be kept in the special box supplied when not in use.

2. Books should always be SEEN by the Yeoman of the Watch at least TWICE in each watch, *i.e.*, when going on, and when going off watch.

3. The key of the Signal Book Box should always be in the possession of the Yeoman of the Watch.

4. Under no circumstances are any of the *Confidential* Signal Books to be covered with baize or with any other material.

(*For further instructions see C.B.* 511.)

Flags.

101. Flags used for signalling should always be kept clean and in good repair, never being left lying about, especially in wet weather, or used in such a manner that they will become unnecessarily dirty. Dirty or torn flags make the reading of flag signals more difficult, and reflect discredit on the ship using them.

Halyards.

102. Halyards should always be kept taut by day, but eased off and coiled up when it is too dark for flag signalling, being hauled taut and coiled down at daybreak.

2. In fog or wet weather they should be frequently eased to prevent undue strain on the blocks. This is especially necessary with endless halyards, such as those used for small Answers, etc.

3. Halyards of the Ensign, Admiral's Flag and Union Flag should always be kept taut. At night the Ensign halyards should be turned up clear of the staff to prevent them rattling against it.

Blocks.

103. The care of blocks is an important item, and they should be kept clean and well lubricated, which will increase the life of the blocks and minimise the work of hoisting flags.

Mechanical Semaphores.

104. To ensure efficient working, it is necessary to keep semaphores well lubricated and adjusted. The chains require greasing, and the working parts oiling, once a week. If the arms are properly adjusted when the semaphore is shipped, they will require no further attention unless the semaphore is stripped for any repairs, &c.

Signalling Projectors and Lanterns.

105. Great care must be taken to keep all glass shades, reflectors and lenses clean, as it will be frequently found that they become dim from smoke, &c.; this particularly applies to lanterns aloft and these should constantly be examined.

2. Electric lights (which are not fixtures) such as speed lights, position lights, &c., should be carefully handled when being got up or down, care being taken to avoid knocking the glasses or the contact points and, when joining up or disconnecting, see that the switches are "off." The lead should be stopped to the lantern and to the switch boxes, so that the weight does not come on the terminal connections when moving the lantern.

3. Where wandering leads are fitted, they should be carefully coiled up and stowed away when not in use.

4 Accurate alignment of all day signalling lanterns and correct focussing of all signalling projectors and lanterns is essential.

5. Sights should be correctly calibrated and precautions taken to ensure that the carbon holders of projectors always ship in their correct positions.

6. Mirrors must be replaced as soon as they begin to deteriorate.

7. All shutters are to be fitted to work from the rear of the projector.

Types of Signalling Projectors and Lanterns.

106. Signalling projectors and lanterns are of two different classes—those which are flashed by mechanical means, and those which are controlled electrically.

2. The former are worked by opening or closing an aperture in front of the light by means of a hand-worked shutter or disc.

3. The latter are manipulated by a morse key, which makes and breaks the circuit.

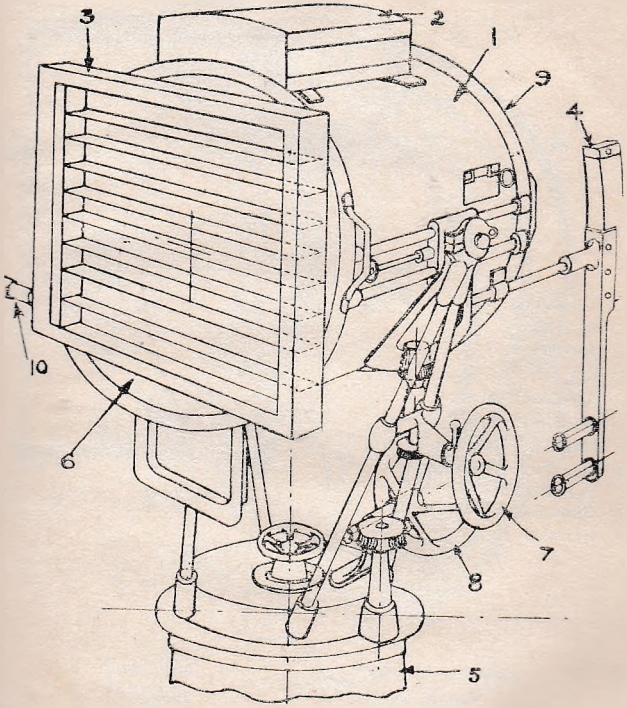
The following is a list of the various projectors and lanterns supplied to H.M. Ships for making flashing signals :—

Name of Projector or Lantern.	How light is produced.	Method of Flashing.	To whom supplied.
Signalling Projector (*Patt. 543*) 24" (*Patt. 5300*) 10" Cruiser Arc Signalling Lantern (*Patt. 1875*).	Passing an electric current through two pieces of carbon.	Detachable shutter fitted at front of the projector. Fixed venetian shutter fitted inside lantern.	All ships. All ships and torpedo craft. All ships and torpedo craft.
Aldis Signalling Lantern (*Patt. 5110*).	Portable battery, or joined up to ship 20-volt circuit.	Hinged mirror fitted with a pistol grip.	All ships and vessels.
Portable Electric Signalling Lantern (*Patt. 4298*).	Accumulator fitted at the back of the lantern.	Morse key.	All ships and torpedo craft.
Masthead Signalling Lantern for ships (*Patt. 414*).	Sixteen 6-c.p. finger lamps.	Morse key.	All ships.
Masthead Signalling Lantern for torpedo craft & Yard-arm Signalling Lantern for ships (*Patt. 2102*).	Eight 6-c.p. finger lamps.	Morse key.	All ships and torpedo craft.
Oil Signalling Lantern (*Patt. 2*).	Burner and wick for using oil.	Perpendicular venetian shutter fitted inside lantern.	Signal and Coast-Guard Stations.
Boats Signalling Lantern (*Patt. 4*).	Candle.	Disc fitted inside lantern.	All ships and vessels.
Acetylene Signalling Projector, 24"	Oxygen and acetylene gas.	Fitted with disc, or detachable shutter.	War Signal Stations.

20in. and 24in. PROJECTOR

Fitted with

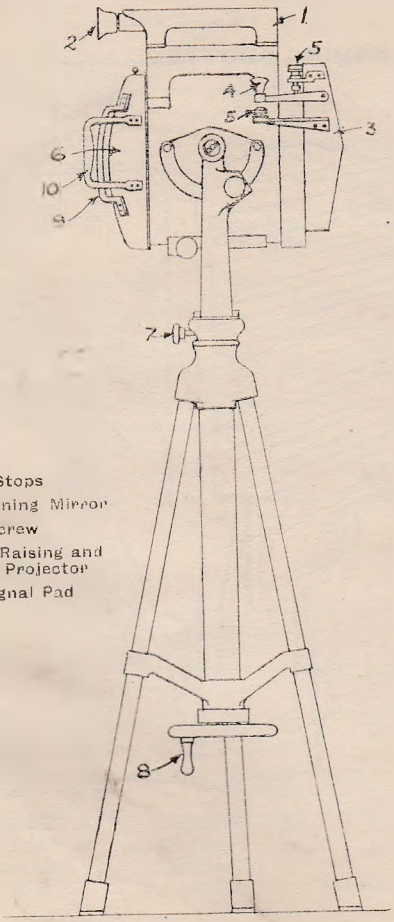
FLASHING SHUTTER. Patt. No. 1905A.



1. Barrel.
2. Ventilator.
3. Shutter.
4. Shoulder Piece.
5. Pedestal.
6. Front Glass.
7. Elevating Wheel.
8. Training Wheel.
9. Back.
10. Handle for Working Shutter.

10in. SIGNALLING PROJECTOR.

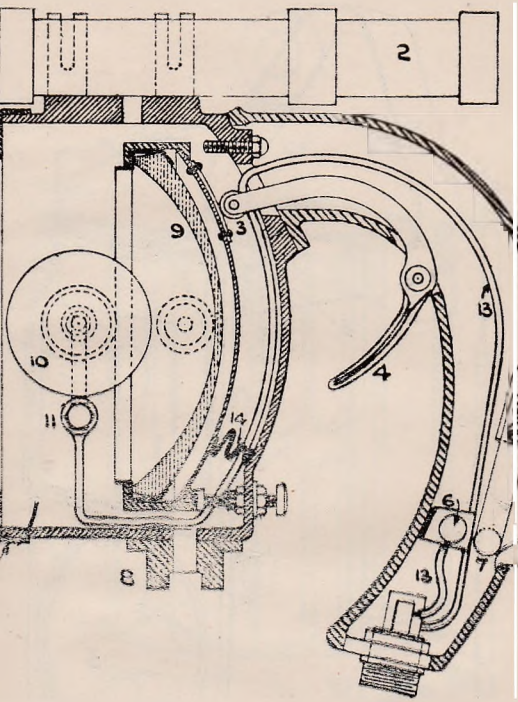
Patt. No. 5300.



1. Telescope
2. Eyepiece
3. Shutter
4. Key
5. Adjustable Stops
6. Back containing Mirror
7. Clamping Screw
8. Handle for Raising and Lowering Projector
9. Clips for Signal Pad
10. Handles

ALDIS SIGNALLING LANTERN.

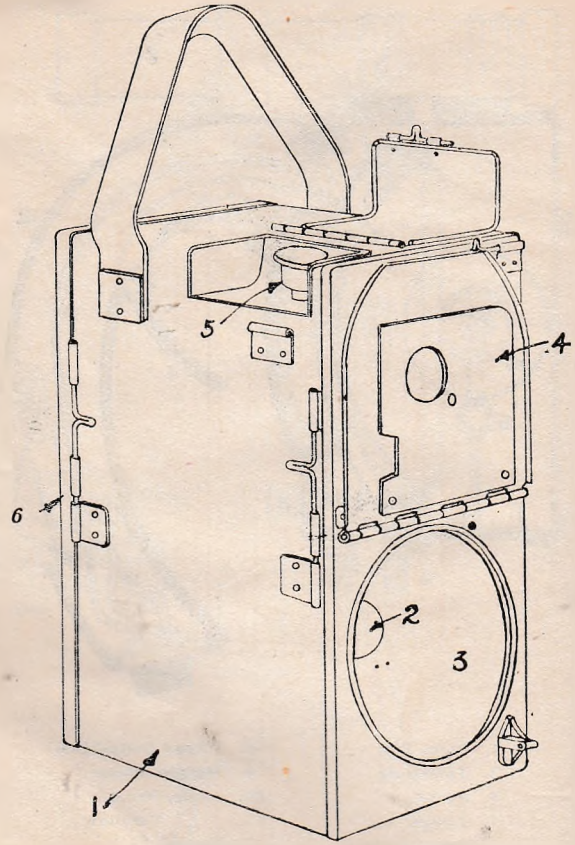
Patt. No. 5110.



1. Front Rim
2. Telescope
3. Roller
4. Trigger
5. Switch Grip
6. Contact, fixed
7. ,, on trigger
8. Tripod Connection
9. Mangin Mirror
10. Lamp, 50 c.p.
11. ,, Terminal
12. Handle
13. Flexible Wires
14. Spring

LANTERN, SIGNALLING, PORTABLE ELECTRIC.

Patt. No. 4298.

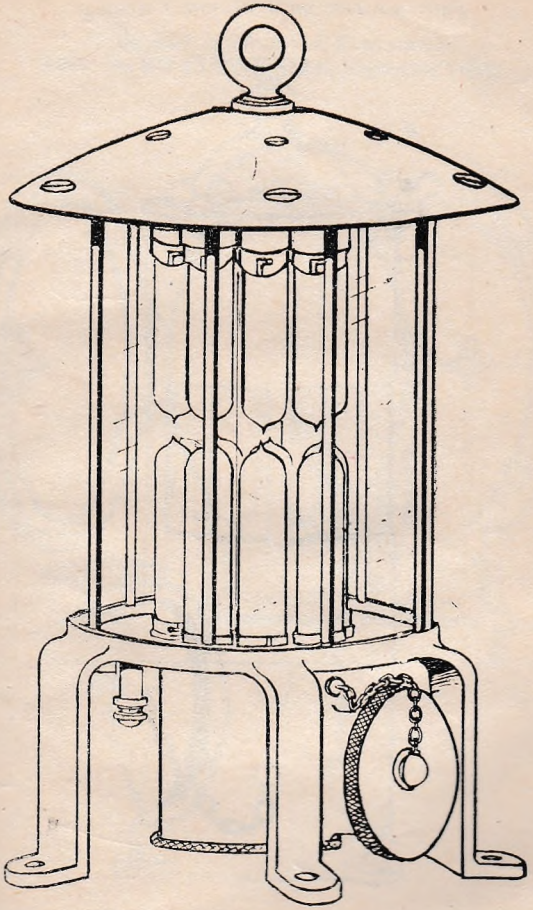


1. Sheet Brass Case.
2. Lamp.
3. Parabolic Reflector.
4. Diaphragm Plate.
5. Morse Key Handle.
6. Door to Cell Compartment.

MASTHEAD SIGNALLING LANTERN.

Patt. No. 414.

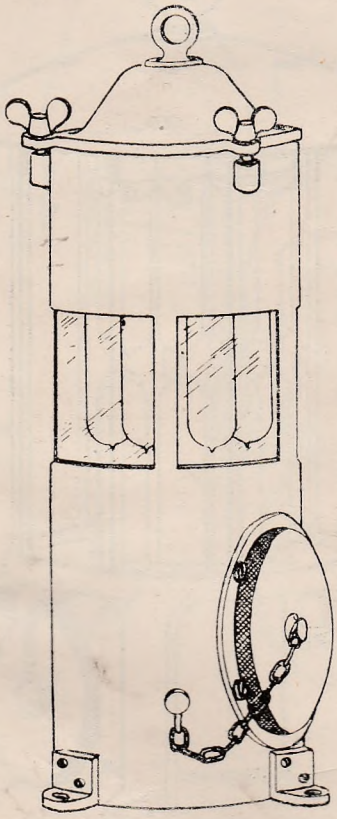
Contains 16 in No. 6 c.p. Lamps, 8 above and 8 below.



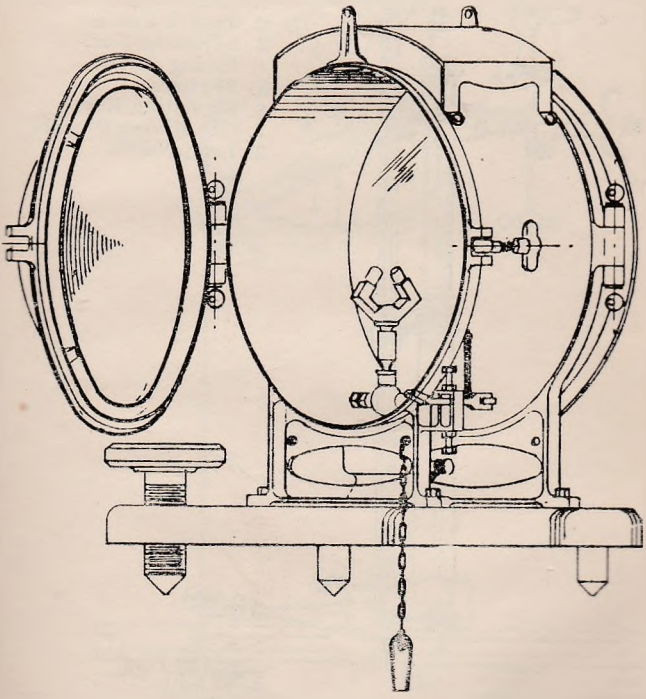
MASTHEAD AND YARDARM SIGNALLING LANTERN.

Patt. No. 2102 for T.Bs. and T.B.Ds.

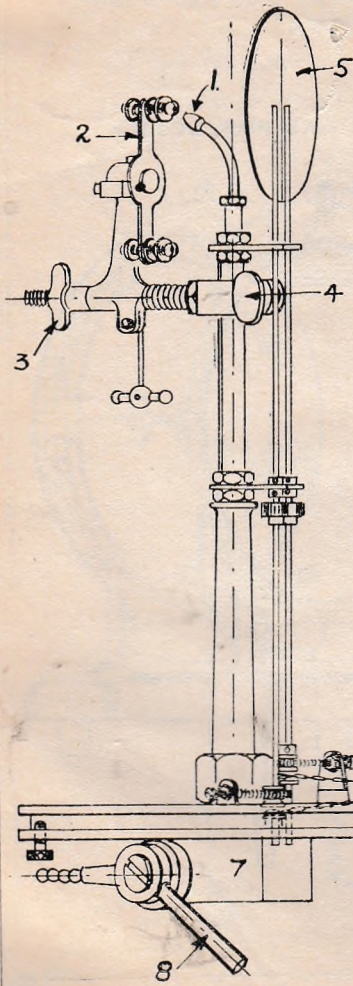
Contains 8 in No. 6 c.p. Lamps.



10in. ACETYLENE GAS PROJECTOR.

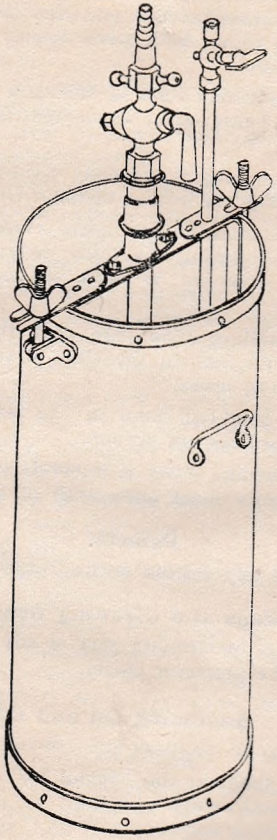


ACETYLENE GAS LAMP for 24-in. PROJECTOR.



1. Large Nipple.
2. Pastille Carrier
3. Adjusting Nut.
4. Fixing Screw.
5. Shutters.
6. Signalling Key.
7. Gas Mixing Chamber.
8. Lamp Valve.

ACETYLENE GAS GENERATOR.



How to Burn a Signalling Projector.

107. Before switching on see that both carbons are secured firmly in their holders, and that they are exactly in line with each other, both when facing the front and the side of the lamp.

2. See that the carbons are of sufficient length to prevent the holders being burnt or melted due to excessive heat.

3. See that the lamp is correctly focussed in the projector (*i.e.*, that it is the correct distance from the mirror).

4. Keep the door and front glass closed as much as practicable while burning the light, to prevent wind or draught causing the arc to burn unsteadily, or being blown out.

5. While signalling take care that the projector is kept accurately aligned on the ship or station to which the signal is being made.

6. With the hand-fed lamp in the ten-inch projector take care the arc does not go out.

7. Turn the feeding screw at intervals so as to keep the lips of the carbons about one-eighth of an inch apart.

Defects.

108. Report any defects to the Torpedo Department.

Rags and Cleaning Gear.

109. No rags or cleaning gear of any sort are ever to be left *inside* the projector barrel.

Switching On and Off.

110. To switch on in 80 and 100-volt ships :—

(*a*) See the lamp in the "Stand by" position, *i.e.*—
Pedestal switch to "OFF," or broken.
All other switches to "ON," or made.
Carbons just touching, but not pressed together.

(*b*) With automatic lamps, before opening or closing the carbons by hand, see the hand-automatic switch to "HAND."

In some ships this switch is marked—"ON" and "OFF," in such cases see it to "OFF."

(*c*) Ensure that the correct circuit is made at the switchboard.

(*d*) When ready to commence signalling, switch on the pedestal switch.

2. To switch off in 80 or 100-volt ships :—

(*a*) Separate the carbons until the light goes out.

(*b*) Switch off the pedestal switch.

(*c*) Place the lamp in the "Stand by" position.

3. To switch on in 220-volt ships :—

(*a*) See that the lamp is in the "Stand by" position.

(*b*) Switch on the pedestal switch.

(*c*) Start the motor generator.

N.B.—In these ships each projector has its own motor generator, and arrangements generally exist in each ship for starting and stopping the motor generators from the bridge.

4. To switch off in 220-volt ships :—

(*a*) Stop the motor generator, then break the pedestal switch, or

(*b*) Separate the carbons until the light goes out, then stop the generator.

N.B.—The time taken to switch on is so small that there is no good purpose served by keeping the generator running when the lamp is not in use.

5. NEVER SWITCH OFF A PROJECTOR BY MEANS OF THE PEDESTAL SWITCH.

Focussing.

111. To get a good beam of light as nearly parallel as possible, it is very important that the lamp should be accurately focussed in the projector (*i.e.*, that the source of light is the correct distance from the mirror).

2. This is accomplished in daylight by turning the focussing screw until the lamp is in its correct position, according to marks which have been made beforehand.

3. Care must be taken not to move the feeding screw by mistake instead of the focussing screw and *vice versa*.

4. *The Feeding Screw* is for moving the carbons nearer to or farther from one another.

5. *The Focussing Screw* is for moving the lamp nearer to or farther from the mirror.

Signalling Projector—Alignment of Sights.

112. The success of daylight signalling by projector depends on the true alignment of the beam on the object. Experience has shown that the present methods of laying a projector, *e.g.*, a tube fixed to the side of the barrel, a wooden telescope holder, or the service bracket, are far from satisfactory as the side of the barrel is generally not parallel with the axis of the beam.

2. In order to align the sights parallel to the beam the projector should be laid on to a distant object, *e.g.*, a light at 2 miles or more, and the sights adjusted until they are also on the distant light.

3. For this purpose the beam should be a parallel one and should be kept accurately on the object by two observers (one just above the barrel and one to the side) whilst the sight is being adjusted.

4. The practice of diverging the beam for daylight signalling is the outcome of incorrectly adjusted sights; for the best results, a parallel beam and accurate sighting are necessary. It is pointed out that what is known as a parallel beam is a beam which looks parallel when observed from behind the light; such a beam has really a slight divergence which illuminates a large enough area to make its use quite practicable for daylight signalling at sea.

5. Attention is called to the fact that both the barrel and the automatic lamp should be marked when the latter is in the correct position for a parallel beam, so that, should the lamp be removed (for replacing carbons, &c.), it can be immediately replaced in its correct position.

6. Arrangements are to be made forthwith in all ships, where the work has not been carried out, that—

(*a*) All projectors used for signalling are fitted with sights.

(*b*) The sights are adjustable.

(*c*) The sights are adjusted and checked as frequently as practicable.

(*d*) The lamp is marked clearly with a white arrow to coincide with a similar mark on the slide.

(*e*) The shutter is fitted to enable it to be worked from the rear.

7. A convenient time for adjusting the sights in harbour is before dark* (or in the early morning) as soon as the beam can be seen sufficiently to enable it to be laid.

10-inch Signalling Projector—Instructions for Carbon Adjustment, Focussing and Operating.

113. As the range of a projector depends upon careful and accurate focussing of the beam of light, it is important that, in order to increase the range to its maximum, the divergence of the beam should be kept as narrow as possible, consistent with being wide enough for signals to be readily seen and taken in.

2. When using the projector with a narrow beam of this description it is essential that the sights are kept on the receiving ship and that the line of sight and beam of light are parallel. To ensure the attainment of these objects the following instructions must be carefully followed :—

(*a*) *Alignment of Carbons.*—The axes of the two carbons must be exactly in line with one another, and the carbons firmly secured in the holders.

(*b*) *To Focus the Lamp.*—When the carbons are cold hold the shutter open so that the lips of the carbons can be easily seen through the small sighting hole in the upper half of the projector barrel. Turn the feeding screw until the lips of the carbons are one-eighth of an inch apart. This is the normal distance the carbons should be apart when the arc is burning. Then turn the focussing screw until the edge and centre line of the positive carbon, the eye, and the centre of the opposite (lower) sighting hole are all in line. The view obtained is as in Fig. 1, the actual line of vision being that shown in Fig. 2.

FIG. 1.

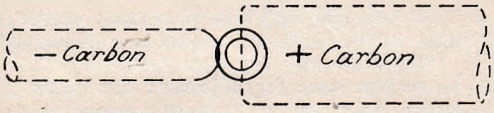
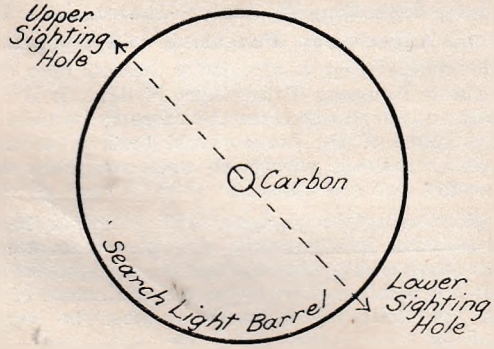


FIG. 2.



The lamp can be focussed in exactly the same way when the carbons are red hot, in which case it is unnecessary to open the shutter.

(*c*) When the arc is burning, it can be ascertained if the lamp is in focus by the following method :—On the inside of the coloured glass window scratch a vertical line or fix a vertical stretched wire. On the inside of the barrel on the opposite side of the coloured glass window paint a white line or attach a strip of light coloured metal in such a position that, when the lamp is in focus the vertical line across the coloured glass window, the edge and centre line of the positive carbon, and the white line on the opposite side of the barrel are all in line. Care must be taken that the focussing marks for focussing the lamp when the arc is burning are in the same vertical plane as the sighting holes for focussing the lamp when the arc is not burning.

(*d*) *Adjustment of Means for Focussing.*—Each signalling projector is adjusted for focus before leaving the maker's works, but, when a new mirror is inserted or when checking the correctness of the adjustments, it may be found necessary to readjust the means of focussing. This can be done in the dark or dusk by directing the beam on to some object (such as a turret or funnel) and turning the focussing screw until the circle of light is of such a diameter that, when the distance is taken into consideration the beam is of the dispersion desired. For example, if a dispersion of 5° is required and the beam is projected on an object 100 feet away, the diameter of the circle of light on the object should be $2\ [(100 \times 12 \times \tan 2.5^\circ) + 5]$ inches = 115 inches. Having obtained the desired dispersion by this method, the upper sighting hole can be moved (by easing up the two screws gripping the plate in which the hole is drilled) until it is in line with the edge and centre line of the positive carbon and the centre of the opposite sight hole.

Then screw up taut the two screws gripping the plate. This ensures that, when the projector is focussed in daylight in accordance with the instructions in (*b*), the pre-determined degree of dispersion is obtained. Care must be taken that the rays of the beam do not cross when these adjustments are made.

(*e*) *Adjustment of Sights.*—This is carried out in the same manner as the adjustment for focussing except that the beam is reduced to a very small circle. This can be done by moving the focussing screw. The sights are then adjusted until the centre of the cross wires coincides with the centre of the circle of light. The sight adjusting screws are then firmly clamped.

(*f*) *Current and Carbons.*—With the carbons supplied the lamp is intended to burn with 20 to 25 amperes of current. If smaller carbons are used such as cruiser arc lantern carbons (Pattern Nos. 1930 and 1931) the candle power and range of the projector are considerably reduced. It is therefore inadvisable to use any other carbons than the carbons supplied for use in this projector.

(*g*) *Hints for Operation.*—All screws for fixing adjustments, clamping wires or carbons must be kept tightened up.

(*h*) *Feeding the Carbons.*—The operator should accustom himself to turning the feeding screw at regular intervals while the arc is burning. The degrees and intervals at which it requires turning in order to maintain a good steady arc will be ascertained by practice. If the arc hisses or sings it is a sign that it requires feeding. If the arc is allowed to get too long it is more likely to be blown out by any wind or draught.

(*i*) *Cleaning Mirrors and Glasses.*—This should be done at least once every 24 hours when the projector is in regular use.

(*j*) *When the Lamp is Focussed* and provided the focussing screw is not touched, it should remain in focus a considerable time. It is, however, advisable periodically to see that the lamp is in focus by the methods indicated in (*b*) and (*c*).

Cruiser Arc Signalling Lantern.

114. The lamp is 2,000 c.p. and is designed to give a light capable of being read at horizon distance with the naked eye on a dark night when the atmosphere is clear. This lantern should only be used when the distance is outside the range of the ordinary signalling lantern, and it should not be used for signals at short distances unless the visibility is very low.

How to Burn a Cruiser Arc Signalling Lantern.

115. See the carbons firmly fixed in the carbon holders, in line with, but separated from each other—the positive (the larger one) at the top; the negative (the smaller one) at the bottom.

2. See the switch is "Off" and join up the circuit; switch on, and close the carbons until they touch each other, then gradually separate them until you get a steady light; the carbons should then be from $\frac{3}{8}$ inch to $\frac{1}{2}$ inch apart. This distance should be maintained by gradually closing the carbons as they burn away.

3. To extinguish the light, separate the carbons until the arc disappears, then switch off.

NOTE.—The wandering lead supplied with the cruiser arc lantern is a length of twin wire fitted at one end with a slot and bolt connection which is joined up to the "switch," and at the other end with two plugs, one larger than the other, to prevent mistakes when joining up to the lantern; these plugs join direct to the two terminals at the rear of the lantern.

Aldis Signalling Lantern.

116. The Aldis Signalling Lantern is supplied to vessels primarily to replace the Cruiser Arc Lantern. It is particularly suitable for signalling to aircraft and is always to be used for this purpose when range and circumstances permit.

2. The lamp is supplied with a short length of twin cable and plug piece. One terminal of the bulb is in metallic connection with the lamp case. The lamp is, therefore, only suitable for use on an earth circuit.

Arrangements are being made to provide a combined plug and resistance, so that power may be taken from any of the 3 or 5 way gun circuit boxes in ships fitted with low-power gun circuits. Vessels not fitted for dynamo firing can use the secondary batteries already supplied.

Pattern 3361 cells have been found suitable. The cells must be arranged to give a terminal voltage of 11 to 11.3 volts at the lamp bulb. The lamp should take about 3 amperes. Six cells of pattern, 3361 will normally provide the correct power supply, depending on the state of the contacts and condition of the cells.

3. The lantern consists of—

(*a*) Barrel fitted with a pistol grip.
(*b*) Hinged mirror.
(*c*) Detachable glass front.
(*d*) Cowl.
(*e*) Sighting arrangement fitted on top of the barrel.
(*f*) Lamp bulb.

The pistol grip is fitted with two keys—the lower key is the contact key and must always be kept pressed while the lantern is being used. The upper key is the signalling key and actuates the movement of the mirror.

4. When signalling, the lamp is always burning, but no rays are visible to the observer until the signalling key is pressed, which alters the angle of the mirror and deflects the rays down to the observer.

5. For day signalling the glass front may be kept on, but in these circumstances the lamp has a wide divergence. If it is desired to limit this divergence by day, and in all cases by night, the glass front should be detached, and the cowl shipped in its place.

6. The sight fitted on top of the barrel is a combination of 3 sights, any one of which may be used according to circumstances :—

(1) A "telescopic" sight. This must always be used for testing the sighting adjustment. (*See para.* 8.)

(2) An "open" sight, fitted to the left of the telescope.

(3) A "V" sight fitted above the telescope.

7. The lantern as supplied to vessels is fitted with an 11-volt bulb which is at present difficult to produce in sufficient quantities; it is, therefore, important not to overburn the lamp—(*see para.* 2), nor is there any need to do so. The bulb is shipped horizontally, the stem of the cup which holds the bulb being fitted with a key which fits into a featherway in the socket. A screw collar keeps the whole in place. The socket in the stem piece of the bulb must *never be tampered with.*

8. These lanterns should be periodically tested for "sighting adjustment." At a distance of between 30 to 50 feet a fixed object should be viewed through the centre of the telescopic sight; this centre is marked by a square formed by hair lines drawn across the front of the lens. At the same time the trigger which operates the mirror should be pulled. If it is found that the beam of light is projected directly on to the object viewed through the telescopic sight, then the sighting adjustment is correct. If the beam should fall short of or beyond the object in view, then the lantern is out of adjustment.

9. The re-adjustment is made by means of the set-screw at the back of the lamp which varies the movement of the mirror controlling the travel of the beam. This set screw must *never be used for altering the length of the beat* of the signalling key, as this would at once throw out the sighting adjustment.

10. Adjustments should not be attempted by altering the position of the sight which is pinned to the body of the lantern.

11. All Aldis signalling lanterns are carefully adjusted before issue, and the mirror set screw held in position by a locking nut. Under normal usage these lanterns should not require re-adjustment.

Portable Electric Signalling Lantern.

117. This lantern is principally supplied for use when ships are darkened. It is fitted to show lights of various power by means of a revolving disc fitted in front of the lantern. Great care should be taken in handling this lantern and in keeping it perfectly upright so that the liquid in the cells is not upset. It is worked by means of a morse key, fitted on top of the lantern, which is protected by a cover when not in use.

Oil Signalling Lantern.

118. This lantern is supplied principally for use at Signal and Coastguard Stations.

2. The lantern is fitted to burn mineral oil in the lamp with a wick, and is fitted inside with a Scott's shutter which is worked by means of a spring and lever key on the outside.

3. If the lamp is fitted with wick adjusting gear it should be burned low and only turned up to full power when required for signalling.

Boats Signalling Lantern.

119. This lantern is principally supplied for boat work; it can also be used as a screened lantern if fitted with a funnel in front of the glass.

2. The lantern is fitted to burn a candle, and is fitted with a disc inside which is worked by means of a lever key on the outside.

Glasses.

120. It is important that telescopes and binoculars should always be kept in good condition, and it is recommended that, where possible, only Petty Officers or Leading Signalmen should open glasses for cleaning, and that proper materials are used for this purpose.

2. Telescopes and binoculars are numbered and should be detailed for various ratings, a list being kept so as to check loss or damage.

3. In wet weather, glasses should (as far as possible) be kept under cover, except when actually in use. When a glass has got wet, it is very important that the sliding tube should be wiped dry, otherwise moisture will be conveyed to the cloth packing, and this moisture will set up condensation inside the glass for a considerable time afterwards.

4. Binoculars and telescopes are supplied to enable you to see the Enemy before he sees you. To get the best results from them four things are necessary, viz. :—

(*a*) The glasses should be undamaged.

(*b*) They should be properly focussed.

(*c*) They should be properly handled.

(*d*) The observer should give his whole attention to his work.

Care of Glasses.

121. The binoculars are made "water and dust proof" and of substantial strength, and all that is required is ordinary care to prevent them from receiving blows or rough usage, particularly at the eyepieces. They should be kept in their leather cases except when actually in use, though in the event of the leather case being soaked through by rain or damp inside, the glasses are better out of it till it has been dried. If the case gets saturated

with salt water it should be well washed with fresh or it will not dry properly. No attempt must ever be made to strip the glasses. To prevent fogging of telescopes and binoculars the lenses should be rubbed over with Everclear; this preparation is supplied in the Gunner's stores.

Focussing.

122. The best objects to focus on are fine ones such as :—

By day—The W/T aerials of a ship a mile or so away.

By night—A star. When in focus a star appears as a fine point of light; a planet can be seen to be a round object of appreciable size.

2. Focus one eyepiece at a time as follows :—Screw the eyepiece right out (generally left handed) until the object is right out of focus, and then screw inwards slowly, keeping both eyes open until it appears again. Fix your attention on one small delicate part of it in the centre of the field and then get it sharp. Be sure you do not screw the eyepiece further in than necessary. The disengaged eye should see the object sharply but not magnified at the same time as the eye looking through its eyepiece.

3. Repeat this for the other eye and eyepiece. When both are done bend the hinged body wide open so that on looking through it two overlapping circles are seen. Then bend the hinged body inwards until the two circles coincide and the eyes feel comfortable. Read off the adjustments by the marks provided and *remember them for future guidance*, especially at night when it is not always easy to find an object on which to focus.

4. The divisions round the revolving eyepieces are graduated both ways, + in one direction and − in the other, up to 8. A white line on the non-revolving part indicates the reading. The glasses will be nearly in correct focus for most people when the eyepieces are revolved till the reading is zero.

5. A beginner may practice focussing his glasses without looking at the scale until he has got them right, and then throw out and repeat. Each trial should result in the same reading within one division. The divisions on the hinge correspond to the distance apart of the eyes which varies with different people.

Proper Handling of the Glasses.

123. The instrument itself being efficient and suitably made, the next thing to do is to eliminate, as far as possible, all interferences with its proper use. In ordinary clear weather the worst of these is vibration. Always use both hands. Even when there is little vibration, no man can keep the horizon as steady in his field of view with one hand as he can with two. To use one hand only is pure laziness. Strain on the shoulders from prolonged use can be lessened by easing the sleeves upwards.

2. Do not rest the elbows on anything fixed to the ship. It will generally be vibrating and will cause the glasses to vibrate at a different rate to your head and eyes. The one way to get a steady field is to make the glasses vibrate at the same "period" as the head and eyes by connecting them together as rigidly as possible. This can be done with ease and comfort in the following way :—

(*a*) With a peaked cap, tilt the cap well back and settle firmly on the head. With an unpeaked cap, tilt it well forward and settle firmly on the head.

(*b*) Hold the glasses with the palms of the hands and last two fingers only (the thumb may be used if desired).

(*c*) Place the first two fingers over the top or peak of the cap, and then try to bowse the cap firmly down towards the glasses.

(*d*) The thumbs may then be conveniently used to screen off the light coming in at the side of the eyepieces. The additional steadiness and clearness of the horizon attained in this way will be found very marked.

3. Where vibration is very great, as in T.B.D.'s, its effects can be lessened by slightly bending the knees and letting them "give" to it.

4. Wind shakes the glasses very badly. Always get a lee if possible; kneel down if necessary.

5. Keep your line of sight clear of the funnels or any big surfaces heated by the sun. The hot air from either of these will produce a kind of mirage and prevent you from seeing clearly.

6. In wet weather do your best to keep the lenses dry, particularly the eye lenses. Keep the latter covered with your hand when not at your eyes, and wipe the object glasses frequently with a handkerchief. A useful fitting for the protection of the glasses of the eye lenses from rain consists of a shallow cupped lid of hard leather or metal, which loosely covers the eye pieces when in place. The slings of the glasses reeve through two slits in the lid, which is free to slide up and down on the slings.

CHAPTER XII.

SIGNAL STORES.

124. The following is a summary of books and stores supplied for signal purposes; they are in charge of the officers specified and should be obtained from them on commissioning a ship.

Signal Books (Confidential) ...	The Captain.
International Code of Signals, Allied Signal Manual, Boats' Signal Books, Handbooks of Signalling, Books of Reference,* Signal Cards, Logs, Pads and all Signal Forms.	Accountant Officer.
Flags, Halyards, Bunting, Thread, Blocks, Cones, Balls, Glasses, Dressing Lines, Wallets, Staves, Instructional Box, Sewing Machine and all stores for fitting and repairing Flags.	Boatswain.
Very's Lights and Pistols ...	Gunner.
All Electric Signalling Lanterns and Fittings, Flashing Shutters, Heliographs, and Telegraph Instruments.	Gunner (T) (or Gunner where no Gunner (T) is borne).
Colomb's Lamps, Oil and Boats' Signalling Lanterns, Semaphores, Signal Box and Foghorns.	Shipwright Officer.

*For Books of Reference allowed, *see* S123.

Stores for Various Classes of Ships.

125. Stores are supplied to ships according to classes, of which there are 13.

2. Classes 1 to 8, inclusive, comprise Battleships to Gunboats; Classes 9 to 13, inclusive, comprise Yachts.

3. Torpedo Craft are dealt with in the same manner as above except that classes are lettered from A to H.

4. Full details of flags and stores allowed will be found in "Boatswains' Establishment of Stores" and "Establishment of Stores for Torpedo Craft."

Signal Halyards.

126. Signal halyards are made of white hemp soft laid, with one-sixth of the yarns reverse spun so as to get flexibility. They are supplied in lengths made up in coils of 122 fathoms.

2. There are three sizes made, viz., $\frac{3}{4}$, $1\frac{1}{8}$, and $1\frac{1}{4}$ inches: the size is measured by its circumference.

Measurements of British Ensigns, Standards, &c.

127. The size of British Ensigns, Standards, and Union Flags is commonly expressed in terms of "breadths." This measurement, which is 9 inches, was originally that of the width of a cloth of bunting, and it is still used for describing the size of any of the above flags, although bunting is now supplied in widths of 18 inches.

2. In the Union Flags, Standards and the White, Blue, and Red Ensigns the length is twice the breadth. In the Admirals' Flags the length is $1\frac{1}{2}$ times the breadth.

3. When the size of one of the above flags is spoken of as, say, "16 breadths," it denotes that it is 16 × 9 inches, *i.e.*, 12 feet broad and, as it is twice as long as it is broad, 24 feet long.

4. Each cloth of bunting (18 inches in width) has a few thicker threads worked not only into its edges, but also at every 6 inches of its warp,* and this mark shows the bunting to be of Government make.

5. The flags and pendants used in the Naval Code are made in six different sizes (*see Table III.*), and are supplied according to the class of the ship.

* NOTE. The *warp* threads are those which are longitudinal to the cloth of bunting, the *weft* are those which are woven by the shuttle at right-angles between them.

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TABLE II.

PATTERN NUMBERS OF SIGNAL FLAGS AND PENDANTS.

No. 1 Size.

Flag or Pendant.	Patt. No.
Burgees Blue ...	101
„ Red... ...	102
„ Letter U...	103
Rect. Affirmative	104
„ Med. Guard	105
„ Negative ...	106
„ Preparative	107
„ Letter A ...	108
„ „ B ...	109
„ „ C ...	110
„ „ D ...	111
„ „ E ...	112
„ „ F ...	113
„ „ G ...	114
„ „ H ...	115
„ „ I ...	116
„ „ K ...	117
„ „ L ...	118
„ „ O ...	119
„ „ V ...	120
„ „ W ...	121
„ „ Z ...	122
„ No. 1	123
„ „ 2	124
„ „ 3	125
„ „ 4	126
„ „ 5	127
„ „ 6	128
„ „ 7	129
„ „ 8	130
„ „ 9	131
„ „ 0	132

Flag or Pendant.	Patt. No.
Triang. Letter J	133
„ „ M	134
„ „ N	135
„ „ P	136
„ „ Q	137
„ „ R	138
„ „ S	139
„ „ T	140
„ „ X	141
„ „ Y	142
Pendant Answer	143
„ Blue ...	144
„ Church	145
„ Compass	146
„ Inter. ...	147
„ Numeral	148
„ No. 1 ...	149
„ „ 2 ...	150
„ „ 3 ...	151
„ „ 4 ...	152
„ „ 5 ...	153
„ „ 6 ...	154
„ „ 7 ...	155
„ „ 8 ...	156
„ „ 9 ...	157
„ „ 0 ...	158

Flag or Pendant.	Patt. No.
Rect. H. International ...	159
„ R. International ...	160
Pdt. Intl. Code Flag	161
„ F. Intl. ...	162
Rect. Green	163
„ Red	164
Pdt. Equal Speed...	165
„ Oblique ...	166
„ Yellow ...	167
Rect. Blue Aff. ...	168
Triang. Fishery Flag ...	169
Special Flags for Allied Fleet Signal Book :—	
Compass	170
No. 1	171
„ 3	172
„ 4	173
„ 5	174
„ 7	175
„ 8	176
„ 9	177
„ 2	178
Black Flags :—	
Triangular ...	10
Pendant	11
Burgee	12
Square	13
Hand Semaphore Flags ...	019

2. The pattern numbers of remaining sizes are identical with the above, except that the initial digit of the pattern number always corresponds with the number of the size.

Thus :—No. 3 Size A Flag has a Patt. No. 308.

3. A set of flags comprises one flag of each pattern with an additional one of each pattern 102 and 112 (or corresponding patterns of other sizes) and one Union Flag.

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TABLE III.

SIZES OF SIGNAL FLAGS.

Shape of Flag.	Size :	1.	2.	3.	4.	5.	6.
		′ ″	′ ″	′ ″	′ ″	′ ″	′ ″
Rectangular flags.	Length	11 0	9 0	7 6	5 0	4 0	2 6
	Breadth	9 0	7 6	6 0	3 9	3 4	2 0
Triangular flags.	Length	15 0	11 0	9 6	6 8	5 0	2 9
	Breadth	11 0	9 6	7 6	4 7	3 11	2 6
Pendants	Length	22 0	20 0	15 6	9 2	8 0	5 0
	Breadth at head.	6 9	5 9	4 9	3 2	2 3	1 4
	Breadth at fly.	2 0	1 6	1 3	0 10	0 6	0 4

2. Burgees are the same size as rectangular flags, the depth of the swallow tail being cut into the flag in the following sizes :—

	Feet	Inches
No. 1 size	3	8
No. 2 ,, ...	3	0
No. 3 ,, ...	2	6
No. 4 ,, ...	1	8
No. 5 ,, ...	1	4
No. 6 ,, ...	0	10

For the sizes of the various sections of flags *see* "Flags of All Nations."

TABLE IV.

LOGS, RETURNS, FORMS, Etc.
Supplied to Signal Department.

Distinguishing Number	Description of Form.	Nature.
S. 174	Quarterly return of signalling between H.M. Ships and Merchant Ships.	½ sheet.
S. 279	Notice as to the entry of unauthorised persons in W/T office.	¼ sheet.
S. 323	Signal Log.	Book.
S. 323A	Cypher Log.	Book.
S. 325A	W/T Cabinet Log.	Book.
S. 575	Message Book (Army Form C.2121).	Pad of 100 forms.
S. 575 C & D	Naval telegrams and signals { C. For retention in delivery office. D. For carbon copy for addresses.	Pads of 200 forms large and small.
S. 575F	Memorandum Book (Note size).	Book.
S. 1308	Record of Exercises in Flashing.	Book.
S. 1309	Record of Exercises in Flashing (*Flag and Senior Officer's ship only*).	Book.
S. 1318	Weekly Squadron Report.	½ sheet.
S. 1319	Daily Expenditure of Coal, Oil, Fuel and Water.	½ sheet.
S. 1320b	Naval Signal Form (*small*).	Pad of 200 forms.
S. 1320c	Naval Signal Form (*large*).	Pad of 200 forms.
S. 1321	Return of Signal Exercises.	¼ sheet.
S. 1322	Signal Forms W/T.	Pad of 200 forms.
S. 1324	Report of Sighting of Enemy (for ship's use).	Pad of 200 forms.
S. 1324c	Report of Sighting of Enemy's Battlefleet.	Pad of 200 forms
S. 1557	Signal Pad for Aircraft Code.	Pad of 200 forms.

Note.—For number of each form allowed to ships *see* S1.

Dressing Lines

128. The Dressing lines in a 2-masted ship consist of three separate jackstays which lead from the foremost awning stanchion to the upper topmast stop, from the upper topmast stop on the foremast to upper topmast stop on the mainmast, and from the upper topmast stop on the mainmast to the after awning stanchion. In a 1-masted ship, two jackstays only are used.

2. They are made of 1 inch flexible steel wire rope and are fitted with a swivel at either end.

3. The fore jackstay has a swivel at each end, the foremost swivel being about 2 feet abaft the block on the foremast awning stanchion, the other being at the upper end just before a block on the topmast stop. At the foremast end a short steel wire rope with a rope tailing is connected to the other side of the swivel, reeves through the block, and is set up by a jigger on the deck. At the upper end a whip is secured to the other side of the swivel on the end of the jackstay, and reeves through the block on the mast down to the deck and thence through a leading block and has a rope tailing.

4. The remaining two jackstays are fitted and rove in a similar manner, except the one between the two masts which is fitted with a single whip on both ends.

5. Downhauls are fitted and secured to the centre of each jackstay and are made of hemp rope.

Dressing lines should be marked with bunting as follows :—

Ships with Two Masts :—

Fore down ...	White at masthead, Yellow at the foremost stanchion.
Main to fore	Red at main. White at fore.
Main down ...	Red at main. Black at the after stanchion.

Ships with One Mast :—

Fore down ...	White at masthead. Yellow at the foremost stanchion.
Main down ...	Red at masthead. Black at the after stanchion.

CHAPTER XIII.

MISCELLANEOUS INFORMATION.

Very's Lights.

129. The colours of Very's Lights may be distinguished by feeling the rims which are marked as follows :—

Milled for Red;
Half Milled for White;
Plain for Green;

but it is much safer to keep them separate and to know where to find each colour.

2. Always have a responsible hand to fire a light, and allow no one to play with the pistol.

Shackle of Cable.

130. A length of a shackle of cable is 12½ fathoms. The first shackle of cable is marked with a piece of iron wire round the stud of the first studded link, on each side of the shackle, the second shackle is marked at the second studded link, and so on.

Ensign at Mast Head.

131. When an Ensign is required at the masthead for saluting purposes, a signalman should be sent aloft to keep the tack close in, and to clear it, in case of it being foul on breaking or on hauling down.

Checking number of Guns when Salutes are Fired.

132. A hand should always be detailed for checking the number of guns when salutes are fired, using the board that is provided for the purpose.

Cable's Length.

133. A cable's length as spoken of in the signal book is estimated roughly at 600 feet, or 1-tenth of a mile.

Thus 1 cable=600 feet=100 fathoms.
10 cables=1 nautical mile.

Knot.

134. In navigation the unit of speed is the speed of one nautical mile per hour, and is called the knot. A ship steaming 10 nautical miles per hour is said to be steaming 10 knots, and this should never be expressed as "10 knots per hour."

TABLE V.

ABBREVIATED TITLES.

NAVAL.

Abbreviated Titles which may appear in messages.

Abbreviated Title.	*Full Title.*
A.C.	Admiral Commanding.
A.C.A.	Admiral Commanding Aircraft.
A.C.L.	Additional Civil Lord.
A.C.R.	Admiral Commanding Coast Guards and Reserves.
Admty.	Admiralty.
A.G.	Accountant General.
A.G.R.M. ...	Adjutant General Royal Marines.
A.H.	Admiralty House.
A.O.	Accountant Officer.
A.P.O.	Auxiliary Patrol Officer.
A.P.V.	Auxiliary Patrol Vessel.
A.S.	Admiral Superintendent.
A.S.O.	Admiral Superintendent's Office.
B.C.F.	Battle Cruiser Force.
B.I.O.	Base Intelligence Officer.
B.S.	Battle Squadron.
Capt.	Captain.
C.C.	Chief Constructor.
C.-in-C.	Commander-in-Chief.
C.M.	Constructive Manager.
C.O.	Commanding Officer.
C.O.F.	Captain of Fleet.
Comdr.	Commander.
C.O.O.	Chief Ordnance Officer.
C.O.S.	Chief of Staff.
C.S.	Cruiser Squadron.
C.S.O.	Chief Staff Officer.
D.A.C.	District Air Commander.
D.D.W.	Director of Dockyards and Dockyard Work.
D.E.	Director of Naval Education.
D.M.D.	Director of Mobilisation Department.
D.N.C.	Director of Naval Construction.

TABLE V.—(*continued*).

D.N.E. ...	... Director of Naval Equipment
D.N.I. ...	... Director of Naval Intelligence.
D.N.O. ...	... Director of Naval Ordnance.
D.N.T.O. ...	... Divisional Naval Transport Officer.
D.O. ...	... Distributing Office.
D.O.D. ...	... Director of Operations Division.
D.S.B. ...	... Duty Steam Boat.
D.S.D. ...	... Director of Signal Division.
D.T.M. ...	... Director of Torpedo and Mining.
D.T.O. ...	... Divisional Transport Officer.
E.	... Engineer.
E.D.O. ...	... Extended Defence Officer.
E.E. ...	... Electrical Engineer.
F.C. ...	... Flag Captain.
F.Comdr.	... Flag Commander.
F.L. ...	... Flag Lieutenant.
F.L.C. ...	... Flag Lieutenant-Commander.
F.W.O. ...	... Fleet Wireless Officer.
G.	... Gunnery.
G.L. ...	... Gunnery Lieutenant.
G.L.C. ...	... Gunnery Lieutenant-Commander.
G.S.O.(N.)	... General Staff Officer (Naval).
Helio. ...	... Heliograph.
I.C.M.S. ...	... Inspecting Captain of Minesweeping Vessels.
I.D. ...	... Intelligence Division.
K.H.M. ...	... King's Harbour Master.
K.R.A.I. ...	... King's Regulations and Admiralty Instructions.
Lieut. ...	... Lieutenant.
Lt.Col. ...	... Lieutenant Colonel.
M.A.A. ...	... Master-at-Arms.
M.C.D. ...	... Manager Constructive Department.
M.D. ...	... Mobilisation Division.
M.D.G. ...	... Medical Director General.
M.E.D. ...	... Manager Engineering Department

TABLE V.—(*continued*).

M.O.	Medical Officer.
N.	Navigation.
N.A.	Naval Attaché.
N.O.	Navigating Officer.
N.O.O	Naval Ordnance Officer.
N.O.S.O. ...	Naval Ordnance Store Officer.
N.S.O.	Naval Store Officer.
N.T.O.	Naval Transport Officer.
O.O.D.	Officer of Day.
O.O.G	Officer of Guard.
O.O.P.	Officer of Picket.
O.O.W.	Officer of Watch.
P.M.O	Principal Medical Officer.
P.M.S.O.	Port Mine Sweeping Officer.
P.N.T.O.	Principal Naval Transport Officer.
P.T.I.	Physical Training Instructor.
R.A.	Rear Admiral.
R.A.C.	Rear Admiral Commanding.
R.D.S.B	Reserve Duty Steam Boat.
R.M.B	Royal Marine Barracks.
R.N.B.	Royal Naval Barracks.
R.N.D.	Royal Naval Division.
S.	Signals.
S.C.E	Superintending Civil Engineer
S.C.O.	Shipping Control Officer.
S.D.T O	Sub-Divisional Transport Officer
Sec.	Secretary.
S.I.O.	Shipping Intelligence Officer.
S.M.O.	Senior Medical Officer.
S.N.O.	Senior Naval Officer.
S.O.	Signal Officer.
S.O.M.S.	Senior Officer of Minesweepers.
S.O R.M.	Senior Officer Royal Marines.
S.S.S.	Superintendent of Signal Schools.
S.W.O.	Squadron Wireless Officer.
T.	Torpedo.

TABLE V.—(*continued*).

T.B.	Torpedo Boat.
T.B.D.	Torpedo Boat Destroyer.
T.L.	Torpedo Lieutenant.
T.L.C	Torpedo Lieutenant-Commander
T.O.	Transport Officer.
V.A.	Vice Admiral.
V.S.O.	Victualling Store Officer.
W.T.O.	Wireless Telegraphy Officer.

MILITARY.

Abbreviated Titles which may appear in messages.

Abbreviated Title.	*Full Title.*
A.A.G.	Assistant Adjutant General.
A.D.C.	Aide-de-Camp.
A.G.	Adjutant General.
A.O.D.	Army Ordnance Department.
A.P.D.	Army Pay Department.
A.Q.M.G. ...	Assistant Quartermaster General.
B.G.G.S.	Brigadier General, General Staff.
Capt.	Captain.
Col	Colonel.
C.I.G.S.	Chief of the Imperial General Staff.
C.-in-C.	Commander in Chief.
C.O.S.	Chief of Staff.
C.R.A.	Commanding Royal Artillery.
C.R.E.	Commanding Royal Engineers.
D.A.G.	Deputy Adjutant General.
D.A.A.G.	Deputy Assistant Adjutant General.
D.A.A.Q.M.G. ...	Deputy Assistant Adjutant and Quartermaster General.
G.H.Q.	General Headquarters.
G.O.C.	General Officer Commanding.
H.Q.	Headquarters.
Helio.	Heliograph.
Lieut.	Lieutenant.
Lt.Col.	Lieutenant Colonel.

TABLE V.—(*continued*).

Maj.	Major.
M.G.G.S. ...	Major General, General Staff.
M.L.O.	Military Landing Officer.
M.T.O.	Military Transport Officer.
N.C.O.	Non-Commissioned Officer
O.C.	Officer Commanding.
Q.M.	Quartermaster.
Q.M.G.	Quartermaster General.
R.A	Royal Artillery.
R.A.F.	Royal Air Force.
R.A.M.C. ...	Royal Army Medical Corps
R.A.S.C.	Royal Army Service Corps.
R.E.	Royal Engineers.
R.F.A.	Royal Field Artillery.
R.G.A.	Royal Garrison Artillery.
R.H.A.	Royal Horse Artillery.

TABLE VI.

STANDARDS OF KNOWLEDGE.

Subject	Rating being examined for											
	Signalman			Leading Signalman			Yeoman			Chief Yeoman.		
	A	B	C	A	B	C	A	B	C	A	B	C
Semaphore Reading 50 words of prose	100	20	94	100	20	96	100	20	98	100	20	98
Flag Waving Reading 25 words of prose	100	12	92	100	12	96	100	12	96	100	12	96
Flashing	100	10	94.7	100	10	94.7	100	10	97.3	100	10	97.3
Buzzer Reading 50 words of prose	50	18	85	50	18	85	50	20	90	50	20	90
Reading 50 coded groups	50	17	85	50	17	85	50	20	90	50	20	90
Part I	200		85	200		85	200		85	200		90
Part II	200		85	200		85	200		85	200		90
Part III	100		85	100		85	100		85	100		90
Extra Paper ...							100		85	100		90
Coding and Decoding	100		85	100		85	100		85	100		90
Wireless Telegraphy	100		85	100		85	100		85	100		90
Oral	200		85	200		85	200		85	200		90

A—Number of marks allowed.
B—Rate of sending per minute.
C—Percentage of marks required to pass.