



SUPPLEMENT

TO THE

NEW ZEALAND GAZETTE

OF

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Rules for Examinations of Masters and Mates.

Marine Department,
Wellington, 29th July, 1910.

IN pursuance and exercise of the powers vested in me by section 23 of "The Shipping and Seamen Act, 1908," I do hereby make the following rules for the conduct of examinations of masters and mates, and as to the qualifications of applicants; and I do direct that the fees specified therein shall be paid to the Superintendents of Mercantile Marine or Collectors of Customs at the ports where the applications to be examined are made. These rules (except where provision to the contrary is specifically made) shall come into force on the 1st day of October, 1910, and shall then supersede any rules or regulations heretofore existing and affecting such examinations, qualifications, and fees.

J. A. MILLAR,
Minister of Marine.

PRELIMINARY AND GENERAL.

1. In accordance with the provisions of section 21 of "The Shipping and Seamen Act, 1908," every British ship when going to sea or plying from any place in New Zealand, and every foreign ship when plying as a home-trade ship,* shall be provided with

* By a "home-trade ship" is meant one which is employed in trading or going between any ports or places in New Zealand, but not to or from the Cook Islands, Kermadec Islands, the Chatham Islands, the Auckland Islands, Campbell Island, Antipodes Island, or Bounty Island. By a "foreign-going ship" is meant every ship not included in the term "home-trade ship."

deck officers duly certificated under this Act according to the following scale:—

- (a.) In any case with a duly certificated master.
- (b.) If the ship is a home-trade sailing-ship of 100 tons register or upwards, or a home-trade steamship of 60 tons register or upwards, then with at least one officer besides the master, such officer holding a certificate not lower than that of mate: Provided that any such ship of 100 tons register or upwards running more than 300 miles between terminal ports shall carry a second mate holding a certificate not lower than that of master of a fishing-boat or cargo-vessel under 25 tons register.
- (c.) If the ship is a foreign-going ship, then with at least a first and second mate duly certificated.
- (d.) If the ship is a steamship authorised to ply within river limits or extended river limits only, then with a master holding a certificate as master of a river-steamer.
- (e.) If the ship is a home-trade cargo-ship only of over 5 tons or up to 25 tons (inclusive) net register, then with a duly certificated master whose certificate shall not be of a lower grade than that prescribed for that class of ship by the next succeeding section.
- (f.) If the ship is a home-trade ship over 25 and up to 100 tons net register, and not included in the foregoing provisions, then with a duly certificated master whose certificate shall not be of a lower grade than that of a master of a home-trade ship.

(g.) If the ship is a sailing-ship of over 5 tons and up to 25 tons register, carrying passengers within such restricted limits as may be approved by the Minister, then with a duly certificated master whose certificate shall be of a grade prescribed by the Minister.

(h.) If the ship is a fishing-boat exclusively employed in fishing on the coast of the colony, whether sea-going or running within river or extended river limits, then with a duly certificated master whose certificate shall be of a grade prescribed by the Minister.

An officer is not duly certificated unless he is the holder for the time being of a valid certificate of competency (or service) under the Shipping and Seamen Act of a grade appropriate to his station in the ship or of a higher grade.

If any person, having been engaged as one of the above-mentioned officers goes to sea as such officer without being duly certificated, or employs a person as an officer in contravention of this section without ascertaining that the person so serving is duly certificated, that person shall be liable for each offence to a fine not exceeding £50.

2. Certificates of competency will be granted to those persons being British subjects who pass the requisite examination and otherwise comply with the requisite conditions. For this purpose Examiners have been appointed, and arrangements have been made for holding examinations. The time and places at which these examinations are held are shown in Appendix B.

3. Candidates for examination must fill up a form of application (Form Exn. 2) at a Mercantile Marine Office. The form, properly filled in, together with the candidate's testimonials and discharges, must be lodged with the local Examiner not later than the day before the day of examination, and the candidate must conform to any regulations in this respect which may be laid down by the Marine Department. As discharges and testimonials may require verification, it is desirable that they should be handed in, together with the form of application, as many days as possible before the date of the examination which the candidate desires to attend. In the absence of the necessary verification the candidate cannot be examined.

The Examiner should be particularly careful to ascertain that there are no gaps in the candidate's service which are not properly accounted for before he is allowed up for examination.

4. In cases where the services of a candidate require verification, or where he is in doubt whether his service complies with the regulations, and wishes to submit his case for special consideration, all certificates, discharges, and testimonials, together with the form of application (Form Exn. 2, which can be obtained at any Mercantile Marine Office), properly filled in, should be submitted to the Examiner of Masters and Mates or to the Superintendent of the Mercantile Marine. If necessary, the officer will, after seeing that all the required information is clearly set forth in the papers, forward them, with his observations, to the Marine Department, who will deal with the case.

5. All other inquiries regarding examinations should be made and dealt with in the same way. The point on which information is sought should be clearly stated, and certificates, discharges, testimonials, &c., should be forwarded when they are material to the inquiry.

6. Sea service cannot be regarded as qualifying for examination for certificates of competency unless it can be verified by reference to the articles of the ship on which it was performed—*e.g.*, service claimed by testimonial or otherwise to have been as mate when the actual rating as shown by the articles was only that of boat-swain or other petty officer will not be accepted where officer's service is required. Where service as first (or

second) mate is required to qualify for examination the candidate must actually have held the executive position next (or next but one) to the master.

Candidates who represent themselves as having served in a higher capacity than that actually held in the ship render themselves liable to prosecution under section 32 of "The Shipping and Seamen Act, 1908." (See par. 8.)

In this connection Examiners should remember that it is a common practice for officers to be rated on ships' articles as "second mate" although in reality they were only third or fourth mates, and acted in one of those positions on board ship.

In every case where a candidate for a master's certificate of competency claims service as second mate, he should be requested to make a declaration in Divn. G of the Form Exn. 2, to the effect that during his service as second mate he had only one officer over him, or, if more than one, that a third and a fourth mate were also carried.

If the service claimed is as "auxiliary second mate," the candidate should be required to state the number of officers serving in a junior capacity.

A candidate with first mate's service should make a declaration that he was the senior officer under the master, or, if not, he must comply with the requirements of par. 128, as it has been found that in some cases the second mate has been signed on the articles as first mate, the proper first mate being called "chief officer" simply for examination purposes.

It must be clearly understood that the amount of service laid down in the regulations for each grade of certificate of competency is the absolute minimum that can be accepted, and unless a candidate can show the full amount he must in no case be allowed up for examination.

7. Should any doubt exist as to the age of a candidate, he will be required to produce a certificate of birth.

8. It is provided by section 32 of "The Shipping and Seamen Act, 1908," that any person who makes, assists in making, or procures to be made any false representation for the purpose of procuring, either for himself or for any other person, a certificate of competency or service, or the grant of any such certificate, shall in respect of each offence be guilty of a crime the punishment for which is imprisonment for a term not exceeding two years, or a fine not exceeding £100.

9. Testimonials to character, including sobriety, and to experience and ability, on board ship for at least the twelve months of service immediately preceding the date of application to be examined will be required of all candidates, and without producing them no person will be examined.

10. Candidates who have neglected to join their vessels after having signed articles, or who have deserted their vessels after having joined, or who have been found guilty of gross misconduct on board, will be required to produce satisfactory proofs of two years' subsequent service and good conduct at sea, unless the Marine Department, after having investigated the matter, should see fit to reduce the time.

11. Every candidate for a certificate of competency of any grade must pass the three sight-tests before he can proceed to the examination in navigation and seamanship.

(i.) The sight-tests are open to all persons serving or intending to serve in the mercantile marine, and all such persons are recommended to take the earliest opportunity of ascertaining by means of these tests whether their vision is such as to qualify them for service in that profession.

(ii.) The three tests are,—

- (a.) Form-vision test (see Appendix A);
- (b.) Colour-vision test (see Appendix A);

(c.) Colour-ignorance test (see Appendix A).

No candidate will be examined in the colour-vision test until he has passed the form-vision test, or in the colour-ignorance test until he has passed the colour-vision test.

This rule must be observed whether the candidate has or has not on any previous occasion passed the sight-tests.

(iii.) Any person serving or intending to serve in the mercantile marine, if desirous of undergoing the form-vision, colour-vision, and colour-ignorance tests *only*, must make application to the Superintendent of a Mercantile Marine Office on the Form Exn. 2*b*, and must pay a fee of 2s. 6d.

This fee will be payable on each occasion upon which a candidate is examined in form-vision and colour tests.

(iv.) Candidates who fail to pass the form-vision test or colour-ignorance test can be re-examined at intervals of three months; but candidates who fail to pass the colour-vision test cannot be re-examined. It is open, however, to any candidate who has failed to pass the colour-vision test to appeal to the Marine Department, who may, if they think fit, remit the case to a special Examiner, or body of Examiners, for final decision.

(v.) The expenses of candidates who are examined by the special Examiner or body of Examiners, and are reported by them to have passed, will, under certain circumstances, be paid by the Marine Department, at a rate which will be notified to the candidate; but no payment whatever will be made towards the expenses of candidates who upon their own application are examined by the special Examiners, and are reported by them to have failed, unless the Marine Department consider that the particular circumstances of the case justify such payment. The special examinations will be held in Auckland, Wellington, Lyttelton (or Christchurch), and Dunedin.

(vi.) When a candidate fails to pass the colour-vision test the Examiner will point out to him the conditions under which he can appeal. Appeals are to be made through the Examiner, and forwarded to the Marine Department, with the Examiner's remarks.

(vii.) The fee paid for examination for a certificate of competency includes the fee of 2s. 6d., for examination in form-vision, colour-vision, and colour-ignorance; and if the candidate fails to pass those tests this fee will, with the exception of 2s. 6d., be returned to him.

(viii.) Only Examiners who have themselves passed the colour-vision test are to undertake these examinations.

(ix.) Whenever the holder of a certificate of competency fails to pass any of the three tests, there is reason to believe that he is from incompetency unfit to discharge his duties, and in the public interest the Marine Department may cause an inquiry to be held by a Court having jurisdiction to cancel or suspend such certificate; but, in the alternative, the Marine Department may accept the voluntary surrender of the certificate until such time as the applicant succeeds in passing the test in which he failed.

12. The standard in form-vision to be required of all candidates prior to the 1st January, 1914, except when they elect to take the higher standard, and there-

after in the case of candidates who already hold certificates of competency is as follows:—

If the candidate can read correctly *five of the eight letters in the fifth line* from the top of the sheet of letters he may be considered to have passed the test. If he cannot do so, his case should be submitted to the Principal Examiner of Masters and Mates.

Candidates may use both eyes or either eye when being tested for this standard, but the candidate should be tested with at least two sheets of letters, and the test should be conducted in other respects in accordance with the general instructions in Appendix A.

The colour-vision and colour-ignorance tests are the same for both standards.

13. On and after the 1st January, 1914, the standard of form-vision in the sight-tests shall be raised to that specified in Appendix A, subject to the condition that candidates who before the above date shall have obtained any certificate of competency as master or mate (foreign-going or home trade) shall have the option of undergoing the present tests, and shall not, in order to obtain certificates of higher grades, be required to pass the more severe test.

From the 1st March, 1910, it will be possible for any person serving or intending to serve in the mercantile marine to be examined with reference to the higher standard, and if he passes he may receive a certificate to that effect, or, if he holds a certificate of competency, the fact of his having passed the higher standard may be indorsed upon it.

The Examiners should in all cases point out to boys and others coming up for the sight-tests that unless they are in possession of a certificate of competency by the 1st January, 1914, they will after that date be required to pass the new standard of form-vision as laid down in Appendix A, whether they are coming up for a certificate of competency or for examination in the sight-tests only.

14. If during the progress of the examination the Examiner finds that a candidate is afflicted with deafness, with an impediment in his speech, or with some other physical or mental infirmity, and he is satisfied upon further investigation that the degree of deafness or of the impediment or other infirmity is such as to render the candidate incompetent to discharge the ordinary duties of a mate or master at sea, he should not allow the candidate to complete his examination, and should return his examination fee; but every case in which this action is taken must be reported to the Marine Department.

If the candidate subsequently produces a medical certificate to the effect that his hearing, speech, or physical or mental condition has improved or is normal, the Board will take into consideration the question of allowing the candidate to sit again for examination.

15. Foreigners being British subjects must prove to the satisfaction of the Examiners that they can speak and write the English language sufficiently well to perform the duties required of them on board a British vessel. (See par. 23.)

16. If the candidate passes he will receive a form (Form Exn. 16) authorising the Superintendent of the Mercantile Marine Office to whom it is addressed to issue the certificate. The candidate's testimonials and other papers will be returned to him with the certificate. It is therefore important that the port at which the certificate is to be issued should be the same on both the Form Exn. 16 and the Form Exn. 2. If circumstances should make any alteration necessary, the Examiner should see that it is made in both forms, otherwise delay in the issue of the certificate may be caused.

17. If after a candidate has passed the examination it is discovered on further investigation that his services are insufficient to entitle him to receive a certificate of the grade for which he has passed, the certificate will not

be granted to him; but if the Marine Department is satisfied that the error in the calculation of the candidate's services did not occur through any fault or wilful misrepresentation on his part, he may either have the fee returned to him or have it placed to his credit. Should his services entitle him to a certificate of a lower grade it may be granted to him, and the difference, if any, between the fee paid by him for the superior certificate and the fee payable for the inferior certificate will be returned to him or placed to his credit. The superior certificate will not be granted until the candidate has performed the amount of service in which he was deficient, and has been re-examined in all the subjects, unless the Marine Department see fit to dispense with the re-examination.

18. In all cases of failure the candidate must be examined anew. If a candidate fails in seamanship he will not be re-examined until after a lapse of six months. Whether the whole or part of this period must be served at sea must depend upon the subjects in seamanship in which the candidate failed, but the amount of further sea-service to be required will be left to the discretion of the Examiner.

19. The Examiner, in making his report on the Form Exn. 14, should state what amount, if any, of further sea service the candidate must perform, and he should also insert this information in the Form Exn. 2.

20. If a candidate fails three times in navigation within three months, he will not be re-examined until after a lapse of three months from the date of the last failure.

21. Candidates for extra certificates will not be allowed to present themselves for examination more than three times within a period of twelve months.

22. If a candidate fails in his examination for an ordinary certificate, and the subjects in which he has failed are not included in the syllabus prescribed for a certificate of a lower grade, he may, if he so desires, be examined for the lower-grade certificate without further formal application or payment of fee, but he will be required to complete the whole of the work prescribed for such lower grade, that portion (if any) already done standing good.

If a candidate fails for the extra certificate, he may also, without further formal application, on payment of fee, proceed with the examination for the ordinary certificate, but in this case the whole of the examination prescribed for the lower grade will have to be completed irrespective of any work which may have been done under examination for the extra certificate. The subsequent examination for the lower grade may, if time permits, be taken during the current week, but in this case a fresh set of papers must be given; should the time be insufficient, the candidate will be allowed to sit at the next following examination.

23. If a candidate fails for bad spelling or writing, he will not be re-examined until after a lapse of at least three months. If he fails for ignorance of the English language, he will not be re-examined until after a lapse of six months.

24. If a candidate fails in seamanship so far as regards the management of square-rigged sailing-vessels in his examination for an ordinary certificate, he may, if qualified as to service, without further formal application or further payment of fee, proceed with the examination for a certificate of competency for foreign-going steamships or for fore-and-aft-rigged vessels. And, if a candidate fails in the same manner in his examination for an extra master's certificate, he may, under the same conditions as above, proceed with the examination for an extra certificate for steamships.

25. Candidates for examination, in making their application on Form Exn. 2, will be required to pay the examination-fee before any step is taken in the way of inquiring into their services or testing their qualifica-

tions. If the candidate is found not to be qualified, the fee will either be returned to him or placed to his credit until he is qualified.

26. The fee for examination must be paid to the Superintendent of the Mercantile Marine Office. If a candidate offers a gratuity to any officer of the Department he will be regarded as having committed an act of misconduct, and will be rejected, and not allowed to be again examined for twelve months either at the port where the offence was committed or at any other port.

27. If a candidate fails to pass the examination no part of the fee will be returned to him.

28. The fees are as follows:—

For Foreign-going Ships.

	£	s.	d.
Second mate	1	0	0
First or only mate—			
If previously possessing an inferior certificate, either granted by the Board of Trade, or by the Government of a British possession under Order in Council ...	0	10	0
If not	1	0	0
Master	2	0	0
Where a candidate is in possession of a certificate for fore-and-aft-rigged vessels, and requires an ordinary or a steamship certificate of the same grade; or where a candidate is in possession of a steamship certificate, and requires an ordinary certificate of the same grade			Half the usual fees
Master extra, if possessing an ordinary master's certificate; or master extra for steamships, if possessing a master's certificate for steamships	*1	0	0
Where a candidate is in possession of a colonial certificate for foreign-going ships not granted under the Imperial Order in Council recognising colonial certificates, or of a provisional certificate of qualification, obtained after examination on board one of His Majesty's ships, for an Imperial certificate of same grade, for first attempt ...			No fee.
Every subsequent attempt			Usual fee.

For Home-trade Ships.

Second mate	0	10	0
Mate	0	10	0
Master	1	0	0
Master of fishing-boat or cargo-vessel under 25 tons register	0	10	0
Master of fishing-boat up to 5 tons register ...	0	10	0

For Restricted Limit Ships.

Master of steamship in restricted limits ...	1	0	0
Master of restricted-limit sailing-ship ...	0	10	0

Voluntary Examination in Steam.

Any master or mate holding a certificate of any grade, whether for the foreign or home trade, or as master of his own pleasure-yacht	1	0	0
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Voluntary Examination in Compass-deviation.

Any master or mate holding a certificate of any grade, whether for the foreign or home trade, or as master of his own pleasure-yacht	1	0	0
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* If the examination for the extra master's certificate takes place at the same time as the examination for the ordinary master's certificate, the usual fee for the ordinary master's certificate, in addition to the fee for the extra certificate, must be paid. This rule also applies to the extra examinations for steamships and yachts, and for extra certificates of efficiency.

	<i>For Yachts.</i>	£	s.	d.
Master	2	0	0

NOTE.—No abatement will be made in the fee charged to a candidate for a certificate for foreign-going ships in consequence of his possessing a master's, mate's, or second mate's certificate for home-trade ships.

FIRST AID TO THE INJURED.

29. (1.) Every candidate for a certificate of competency of any grade will be required to produce a certificate from the St. John Ambulance Association, the St. Andrew's Ambulance Association, or the London County Council, to the effect that he has passed an examination in first aid to the injured.

(2.) The certificate must be an adult certificate—i.e., obtained by the candidate when sixteen years of age or more—and the examination for it must have been passed not more than three years before the date of the examination for the certificate of competency.

(3.) If a candidate does not possess such a certificate of proficiency in first aid, he should apply, some time before he wishes to sit for examination for a certificate as master or mate, to the local secretary of the St. John or St. Andrew's Ambulance Association, who will inform him of the available facilities for the instruction and examination of candidates in first aid.

(4.) Besides the courses of instruction which are provided on shore at the ports at which examinations for certificates as master and mate are held in the United Kingdom, New Zealand, &c., courses of instruction given by qualified surgeons on board merchant vessels will be accepted by the St. John Ambulance Association as qualifying the candidate for examination for their certificate of proficiency in first aid, provided the surgeon certifies that he has followed the syllabus of instruction laid down by the association.

(5.) The St. Andrew's Ambulance Association will also accept instruction by a ship's surgeon on board ship as qualifying a candidate for examination for their certificate of proficiency in first aid, provided their syllabus is followed. In this case the candidate must previously have enrolled, and obtained an attendance card, by applying to the local secretary of the association, or to the head office at 176 West Regent Street, Glasgow.

(6.) It will not be necessary for the candidate for a certificate as master or mate in all cases to produce the formal certificate of proficiency in first aid issued by the associations. In order to prevent delay in proceeding with the examination for the certificate as master or mate, and in the issue of the certificate to successful candidates, the special mercantile marine linen certificate issued by the St. John Ambulance Association and duly signed by the lecturer, the surgeon examiner, and the association's local representative, or, in Scotland, a certificate signed by the local examiner of the St. Andrew's Ambulance Association, to the effect that the candidate has passed the examination for a certificate of proficiency, may be accepted as showing that the candidate possesses the required knowledge of first aid.

QUALIFICATIONS REQUIRED FOR THE VARIOUS GRADES.

[NOTE.—These are shown in a tabular form in Appendix O.]

Certificates for Foreign-going Ships, or Ordinary Certificates.

30. A candidate for an ordinary certificate of any grade who has not previously held an ordinary certificate of a lower grade must prove that he has served twelve months in the foreign trade, or eighteen months in the home or coasting trade, in a square-rigged sailing-vessel.

31. Ordinary certificates will entitle the holders to go to sea as mates or masters of any vessel, sailing or steam.

32. SECOND MATE.—A candidate must be not less than seventeen years of age, and must have served four years at sea.

33. *Examination in Navigation.*—A candidate for a second mate's certificate will be required,—

- (a.) To write a legible hand and spell correctly. This will be tested by not less than a quarter of an hour's dictation.
- (b.) To write a short definition of various astronomical and other terms, and to draw a rough sketch or diagram to illustrate their meaning. (See Appendix C and par. 166.)
- (c.) To show a competent knowledge of the first five rules of arithmetic and the use of logarithms.
- (d.) To work a day's work complete, correcting the courses for leeway, deviation, and variation.
- (e.) To find the latitude by the meridian altitude of the sun.
- (f.) To work any practical problem in parallel sailing.
- (g.) To find the true course and distance from one given position to another by Mercator's method; also the compass course, the variation and deviation being given.
- (h.) To find the time of high water at a given port.
- (i.) To find the true amplitude of the sun, and the error of the compass therefrom; also the deviation, the variation being given.
- (j.) To find the longitude by chronometer from altitude of the sun by the usual methods, computing the daily rate of chronometer from errors observed when required; also to find the true azimuth of the sun, and the error of the compass; and the deviation, the variation being given.
- (k.) To find the true azimuth of the sun by the "true azimuth" tables; the error of the compass; also the deviation, the variation being given.
- (l.) To find on either a "true" or "magnetic" chart* or plan the course to steer and the distance from one given position to another; to find the ship's position on the chart or plan from cross-bearings of two objects; to find the ship's position from two bearings of the same or different objects, the course and distance run between taking the bearings being given; also, the distance of the ship from the object at the time of taking the second bearing; and to state what the small numbers and Roman numerals found on the chart indicate, and give a method of finding approximately the time of high water at any given place without the aid of the Admiralty or other tide-tables. (See Appendix G.)

He will be examined orally in the following subjects:—

- (m.) The Morse and British movable semaphore alphabets, the International Code of Signals, and the British Signal Manual.
- (n.) The use and adjustments of the sextant, read off and on the arc, and the mode of finding the index error by both horizon and sun.
- (o.) The construction, use and principle of the barometer, thermometer, and hydrometer. Also the use and care of a chronometer.
- (p.) Weights and measures.

34. *Examination in Seamanship.*—He must understand and give satisfactory answers on the following subjects:—

- (a.) The standing and running rigging of ships.
- (b.) Bending, unbending, setting, reefing, taking in, and furling sail.
- (c.) Sending masts and yards up and down, &c.
- (d.) Management of a ship when under canvas.

* The short terms "true" and "magnetic" are used for brevity and convenience throughout the regulations to indicate charts which have compasses engraved upon them showing the true or magnetic points of the compass respectively.

- (e.) Management of ship's boats in heavy weather.
- (f.) Dunnaging and stowing cargo, &c.
- (g.) The rule of the road as regards both steamers and sailing-vessels, their regulation lights, and fog and sound signals.
- (h.) The signals of distress, and the signals to be made by ships wanting a pilot, and the liabilities and penalties incurred by the misuse of these signals.
- (i.) The marking and the use of the lead and log lines.
- (j.) The use and management of the rocket apparatus in the event of a vessel being stranded.
- (k.) Any questions of a like nature appertaining to the duties of a second mate that the Examiner may think necessary to ask.
- (l.) Also questions on the additional subjects which are specified in the rules of examination for second mates' certificates of competency for foreign-going steamships. (See par. 45.)

35. ONLY MATE.—A candidate must be not less than nineteen years of age, and have served five years at sea.

36. FIRST MATE.—A candidate must be not less than nineteen years of age, and have served five years at sea, of which—

- (a.) One year must have been in a capacity not lower than fourth mate of a foreign-going vessel whilst holding a second mate's certificate for foreign-going vessels;
If his service was as third or fourth mate, proof will be required that he had during the whole year *charge of a watch*. (See par. 128.)
- (b.) Or, one year and a half must have been in a capacity not lower than only mate in a home-trade or coasting vessel whilst holding a second mate's certificate for foreign-going vessels, or a mate's certificate for home-trade ships;
- (c.) Or, one year must have been as pilot, with a first-class pilot's certificate. (See par. 124.)

37. *Examination in Navigation*.—A candidate for an only or first mate's certificate will be required:—

- (a.) To work out any *three* of the nautical problems prescribed for the second mate's examination which may be given him by the Examiner, in addition to the chart paper (l) and the oral subjects (m, n, o, p) prescribed for that grade.
- (b.) To compute the time at which a given star will be on the observer's meridian. [Occasionally by inspection.]
- (c.) To describe where tables giving the names of the principal stars passing the meridian may be found.
- (d.) To describe where the meridian passage of the principal planets may be found.
- (e.) To determine what bright stars will be within an hour, or more, of the observer's meridian, above the pole and above the horizon, at any given time; also the hour, angle, east or west, of each of the stars, and whether to the north or south of the observer's zenith when passing the meridian.
- (f.) To describe any maps or diagrams which the candidate knows and prefers for further facilitating the recognition of the stars and planets.
- (g.) To compute the approximate meridian altitude of one of the stars just found for setting the sextant.
- (h.) To find the latitude from the meridian altitude of the same star.
- (i.) To find the longitude by chronometer by altitude of a star.
- (j.) To find the true azimuth of a star by the "time azimuth" tables, and get the deviation therefrom.
- (k.) To find the latitude by ex-meridian altitude of the sun or a star.

- (l.) To find the line of position and the true bearing of the sun, and the ship's position, by Sumner's method by projection.
- (m.) To answer certain questions relative to cyclones, or revolving storms. (See Appendix H.)
- (n.) To find on a chart or plan the course to steer by compass in order to counteract the effect of a given current, and find the distance the ship will make good towards a given point in a given time; to fix a ship's position on a chart or plan by horizontal sextant angles, using a station pointer; and to work out practically the correction to apply to soundings taken at a given time and place to compare with the depth marked on the chart. (See Appendix G.)

He will be examined orally in the following subjects:—

- (o.) How to keep a ship's log-book.
- (p.) How to calculate the capacity of a given bunker or hold.
- (q.) How to calculate a freight and its commissions.
- (r.) The measurement and equipment of ship's life-boats, and number of persons allowed to be carried in each class of boat.
- (s.) Testing of life-buoys and life-belts.
- (t.) The screening of ship's side lights.

38. *Examination in Seamanship*.—In addition to the qualifications required for a second mate's certificate, an only or first mate will be required to show a knowledge of the following subjects:—

- (a.) Shifting large spars, rigging shears, taking lower masts in and out.
- (b.) How to moor and unmoor ship; to keep a clear anchor; and to carry out an anchor.
- (c.) How to manage a ship in stormy weather, and to cast a ship on a lee shore.
- (d.) How to secure the masts in the event of accident to the bowsprit.
- (e.) How to rig purchases for getting heavy weights, anchors, machinery, &c., in or out.
- (f.) How to dispose various kinds of cargo and weights in a stiff and in a tender vessel.
- (g.) The ventilation of holds, and the stowage of explosives.
- (h.) The stowage of grain cargoes.
- (i.) How to rig a sea-anchor, and what means to employ to keep a vessel, disabled or unmanageable, out of the trough of the sea, and lessen her lee drift.
- (j.) How to get a cast of the deep-sea lead in heavy weather.
- (k.) Accidents, and how to deal with them.
- (l.) Any other questions appertaining to the duties of an only or first mate which the Examiner may think necessary to ask.
- (m.) Also questions on the additional subjects which are specified in the rules of examination for only and first mate's certificates of competency for foreign-going steamships. (See par. 54.)

39. MASTER.—A candidate must be not less than twenty-one years of age, and—

- (a.) He must have served six years at sea, of which one year must have been in a capacity not lower than only mate* of a foreign-going

* In every case where a candidate for a master's certificate of competency claims service as second mate he should be requested to make a declaration in Division G of Exn. 2 to the effect that during his service as second mate he had only one officer over him, or, if more than one, that a third and fourth mate were also carried. If the service claimed is as auxiliary second mate the candidate should be required to state the number of officers serving in a junior capacity. Also, a candidate with first mate's service should make a declaration that he was the senior officer under the master, or, if not, he must comply with par. 128, as it has been found that in some cases the second mate has been signed on the articles as first mate, the proper first mate being called "chief officer" simply for examination purposes.

vessel, whilst holding a certificate not lower than an only mate's certificate for foreign-going vessels, provided that if this service as officer was not performed whilst holding a first mate's certificate for foreign-going vessels the candidate will also be required to prove the officer's service prescribed for that grade (par. 36);

(b.) Or, he must have served six years at sea, of which one year and a half must have been in a capacity not lower than only mate of a home-trade or coasting vessel whilst holding a certificate not lower than an only mate's certificate for foreign-going vessels; provided that, if this service as officer was not performed whilst holding a first mate's certificate for foreign-going vessels, the candidate will also be required to prove the officer's service prescribed for that grade (par 36);

(c.) Or, he must have served six and a half years at sea, one year of which must have been in a capacity not lower than second mate* of a foreign-going vessel whilst holding a first mate's certificate for foreign-going vessels; provided that, if this service as second mate was performed under an additional or auxiliary first mate, it will only be accepted if a third and fourth mate were also carried, and one year and a half not lower than third or fourth mate of a foreign-going vessel in charge of a watch whilst holding a second mate's certificate for foreign-going vessels;

(d.) Or, he must have served nine years at sea in the home or coasting trade, of which three years must have been as master, or one year as master and three years in a capacity not lower than that of mate; provided that in either case he has served in such capacity for not less than one year with a second mate's certificate for foreign-going vessels or a master's certificate for home-trade ships.

40. *Examination in Navigation.*—A candidate for an ordinary master's certificate will be required to work out any twelve of the nautical problems prescribed for the grades of second and first mate that may be given him by the Examiner, in addition to the chart paper, the cyclone paper, and the oral subjects prescribed for the grades of second and first mate. He will also be required,—

- (a.) To find the latitude by the altitude of the Polar Star at any time.
- (b.) To find the latitude by the meridian altitude of the moon.
- (c.) To find the magnetic bearing of any fixed object when at sea or at anchor from bearings of the object taken with the ship's head on equidistant compass points, and to compute the deviation therefrom; to construct a deviation curve upon a Napier's diagram which will be furnished by the Examiner, and show that he understands its practical application; to give satisfactory written and oral answers to certain practical questions as to the effect of the ship's iron upon the compasses, and the method of determining the deviation, and to show how to compensate the deviation by magnets and soft iron by the aid of Beall's compass deviascope. (See Appendix I.)
- (d.) To find on a chart the course to steer by compass in order to counteract the effect of a given current, and to find the distance the ship will

make good towards a given point in a given time; and to work out practically the correction to apply to soundings taken at a given time and place to compare with the depth marked on the chart. (See Appendix G.)

He will be required to answer *viva voce* questions on the following subjects:—

- (e.) The law as to the engagement, and discharge, and management of the crew, and the entries to be made in the official log.
- (f.) How to prevent and check an outbreak of scurvy on board ship.
- (g.) The law as to load-line marks, and the entries and reports to be made respecting them.
- (h.) Invoices, charter party, bills of lading, Lloyd's agent, nature of bottomry, bills of exchange, surveys, averages, &c.
- (i.) The prevailing winds and currents of the globe.
- (j.) The trade routes.
- (k.) Tides.

41. *Examination in Seamanship.*—In addition to the qualifications required for the grades of second and first mate, an ordinary master will be required to show a knowledge of the following subjects:—

- (a.) Construction of jury-rudders for both wooden and iron vessels, also rafts.
- (b.) Resources for the preservation of the ship's crew in the event of wreck.
- (c.) Management of ship in heavy weather.
- (d.) Rescuing the crew of a disabled vessel.
- (e.) Steps to be taken when a ship is on her beam-ends, or in any danger or difficulty, or disabled or unmanageable and on a lee shore.
- (f.) Heaving a keel out.
- (g.) How to proceed when placing a ship in dry dock and directing repairs, and when putting into port in distress with damage to cargo and ship.
- (h.) Any other question of a like nature appertaining to the management of a ship which the Examiner may think it necessary to ask.
- (i.) Also questions on the additional subjects which are specified in the rules of examination for masters' certificates of competency for foreign-going steamships. (See par. 57.)

Special Regulations relating to the Examination of Masters and Mates, to apply only where the Candidate has served an Apprenticeship in an Approved Sea-going Training-ship, with a View to Promotion in the Service of the Company to which the Training-ship is attached.

42. (1.) The training-ship must be a sea-going, cargo-carrying, square-rigged sailing-vessel, and the course of study and practical training which the cadets receive must be approved by the Board of Trade.

At the end of four years' service in the training-ship the cadet will be qualified for examination for a certificate as second mate, provided (1) he can produce a testimonial to the effect that both his conduct and his ability have given satisfaction during the whole period, and (2) that he has served *at sea* for not less than four-fifths of the time—that is to say, has not spent more than one-fifth of the time in home ports. Cf. par. 143.)

If the cadet has served previously for two years in either the "Conway" or the "Worcester" training-ship, this time will be allowed to count as one year's qualifying service (cf. par. 141), and he will be required to serve for three years only in the company's training-ship before he can be allowed up for examination for a certificate as second mate (ordinary).

(2.) A candidate who has served for four (or three) years on the training-ship may be allowed up for examination for a certificate as first mate (ordinary) when he has served, whilst holding a certificate as second mate,

* See note on page 3068.

for two years as junior bridge-keeping officer of the watch upon vessels of the company satisfying certain requirements. (See sub-par. (4).)

(3.) A candidate who has obtained a certificate as first mate in the above way may be allowed up for examination for a certificate as master (ordinary) when he has served for eighteen months whilst holding the certificate as first mate, as a senior watch-keeping officer upon vessels of the company satisfying the same requirements. (See sub-par. (4).)

If the candidate has served for eighteen months as senior of the junior officers—*i.e.*, the officers next below the junior of the officers in full charge of the watch—whilst holding the certificate as first mate, he may be allowed up for examination for a certificate as master (ordinary) on the understanding that the certificate as master would not be issued to him until he had completed twelve months' service as a senior watch-keeping officer, the service in both cases to be performed on vessels satisfying the same requirements. (See sub-par. (4).)

(4.) The special regulations (pars. 2 and 3) in regard to the acceptance of service as qualifying for the examinations for certificates as first mate and master shall apply only when the service is performed in the specified capacities upon ocean-going steamers of not less than 8,000 tons gross, making an average speed of 16 knots or upwards, and carrying a crew of not less than 130 men, including at least six deck officers beside the master.

Certificates for Foreign-going Fore-and-aft-rigged Vessels.

43. Certificates for the grades of master, first mate, only mate, and second mate of fore-and-aft-rigged vessels will be issued to candidates who have not complied with the regulations which require them to have served at least one year in square-rigged sailing-vessels, or who prove in course of examination that they are ignorant of the management of square-rigged ships. In other respects the qualifications for examination for such certificates are the same as for ordinary certificates.

44. The examinations for the grades of second mate, only mate, first mate, and master of fore-and-aft-rigged vessels will be precisely the same as for the ordinary certificates, excepting that in seamanship a knowledge of the management of square-rigged vessels is not required.

45. A certificate for fore-and-aft-rigged vessels will not entitle the possessor to act in any case in which a certificate for square-rigged vessels is required. Amongst square-rigged vessels are classed full-rigged ships, barques, brigs, barquentines, brigantines, and steamships carrying square sails.

46. A candidate possessing a certificate for fore-and-aft-rigged vessels, and desiring to be examined for an ordinary certificate, must prove that he has served at sea at least one year in a square-rigged sailing-vessel, unless he has previously held an ordinary certificate of a lower grade.

Certificates for Foreign-going Steamships.

47. Certificates applying only to steamships are issued to candidates who are either unable to comply with the regulation which requires them to have passed one year in square-rigged sailing-vessels, or who prove in course of examination that they are ignorant of the management of square-rigged sailing-vessels. All the qualifying officers' service prescribed for these certificates must have been performed in steamships.

These certificates will entitle the holders to go to sea as masters or mates of foreign-going steamships, but will not entitle them to go to sea as masters or mates of foreign-going sailing-ships.

There will be no distinction in these certificates between fore-and-aft-rigged steamships and square-rigged steamships.

48. **SECOND MATE.**—The qualifications as to age and service are the same as for an ordinary second mate's certificate (see par. 32), excepting that no service in square-rigged sailing-vessels is required.

49. *Examination in Navigation.*—The examination in navigation for a second mate's certificate for foreign-going steamships will be precisely the same as that prescribed for an ordinary second mate's certificate.

Examination in Seamanship.

50. The candidate must understand and be able to give satisfactory answers on the following subjects:—

- (a.) The standing and running rigging of steamships.
- (b.) Bending, unbending, setting, taking in, and furling sail.
- (c.) Sending masts and yards up and down, &c.
- (d.) Seeing everything in readiness and clear for getting under way, and the precautions to be then observed with regard to steering-gear and connections, engines, propeller, &c.
- (e.) Care and usage of patent logs and leads.
- (f.) Management of ships' boats in heavy weather.
- (g.) Dunnaging and stowing cargo, &c.
- (h.) The rule of the road as regards both steamers and sailing-vessels, their regulation lights, and fog and sound signals.
- (i.) Signals of distress, and signals to be made by ships wanting a pilot, and the liabilities and penalties incurred by the misuse of these signals.
- (j.) The marking and use of the ordinary lead and log lines.
- (k.) The construction, use, and action of the sluices, and of the water-ballast tanks.
- (l.) Engine-room and other telegraphs used on board ship, and deck appliances generally.
- (m.) Use and management of the rocket apparatus in the event of a vessel being stranded.
- (n.) Any other questions of a like nature appertaining to the duties of the second mate of a steamship which the Examiner may think necessary to ask.

51. **ONLY MATE.**—The qualifications as to age and service are the same as for an only mate's ordinary certificate (see par. 35), excepting that no service in square-rigged vessels is required.

52. **FIRST MATE.**—The qualifications as to age and service are the same as for a first mate's ordinary certificate (see par. 36), excepting that the service required as officer must have been in steamships, and that no service in square-rigged vessels is required.

53. *Examination in Navigation.*—The examination in navigation for an only or first mate's certificate for foreign-going steamships will be precisely the same as that prescribed for an ordinary first mate's certificate. (See par. 38.)

54. *Examination in Seamanship.*—In addition to the qualifications required for a second mate's certificate, an only or first mate will be required to show a knowledge of the following subjects:—

- (a.) Shifting large spars; rigging shears; and taking lower masts in and out.
- (b.) How to moor and unmoor ship, keep a clear anchor, and to carry out an anchor.
- (c.) Management of a steamship in stormy weather.
- (d.) How to rig purchases for getting heavy weights, anchors, machinery, &c., in and out.
- (e.) How to dispose various kinds of cargo and weights in a stiff and in a tender vessel.
- (f.) Ventilation of holds, and the stowage of explosives.

- (g.) Stowage of grain cargoes.
- (h.) The effects of the screw-race upon the rudder; and the effect produced on the direction of the head of the ship by going [ahead] [astern] with a [right] [left] handed screw when the rudder is [ported] [starboarded]; also, the effect of twin screws under the same conditions, and when going ahead with one and reversing the other, &c., &c.
- (i.) How to rig a sea-anchor, and what means to employ to keep a steamer, with her machinery disabled, out of the trough of the sea, and to lessen her lee drift.
- (j.) How to turn a steamship short round.
- (k.) How to get a cast of the deep-sea lead in heavy weather.
- (l.) Any other questions of a like nature appertaining to the duties of a first mate of a steamship which the Examiner may think necessary to put to him.

55. MASTER.—The qualifications as to age and service are the same as for a master's ordinary certificate for a foreign-going ship (see par. 39), excepting that the service required as officer must have been performed in steamships, and that no service in square-rigged vessels is required.

56. *Examination in Navigation.*—The examination in navigation for a master's certificate for foreign-going steamships will be precisely the same as that prescribed for an ordinary master's certificate. (See par. 40.)

57. *Examination in Seamanship.*—In addition to the qualifications required for the grades of second and first mate, a master will be required to show a knowledge of the following subjects:—

- (a.) Construction of rafts and jury-rudders suitable for screw-steamships.
- (b.) The preservation of the ship's crew in the event of wreck.
- (c.) Management of steamships in heavy weather.
- (d.) Rescuing the crew of a disabled ship.
- (e.) Steps to be taken when a vessel is on her beam-ends or disabled and on a lee shore.
- (f.) How to use steam-appliances in the event of fire.
- (g.) Economy in coal-consumption.
- (h.) The best arrangement for towing vessels under different circumstances.
- (i.) Placing ship in dry-dock; directing repairs, and the mode of procedure when putting into port in distress with damage to cargo and ship.
- (j.) Any other questions of a like nature appertaining to the management of a steamship which the Examiner may think it necessary to put to him.

58. A candidate possessing a certificate for foreign-going steamships, and desiring to be examined for an ordinary certificate, must prove that he has served at sea at least one year in a square-rigged sailing-vessel, unless he has previously held an ordinary certificate of a lower grade.

Certificates for Home-trade Ships.

59. SECOND MATE.—A candidate for a home-trade second mate's certificate must be not less than seventeen years of age, and must have served four years at sea, or in extended river limits.

60. *Examination in Navigation.*—A candidate for a second mate's certificate will be required—

- (a.) To be able to read, to write a legible hand, and to spell with moderate correctness.
- (b.) To understand the first five rules of arithmetic, both simple and compound.
- (c.) To be able to take a bearing by compass, and be able to find the distance from a point or light by the methods shown in the "New Zealand Nautical Almanac" of 1910, on pages 83 and

84; or on pages 79 and 80 of the A, B, and C Azimuth Tables, published by the Marine Department.

(d.) He must show a competent knowledge of the International Code of Signals.

61. *Examination in Seamanship.*—He must understand and give satisfactory answers on the following subjects:—

- (a.) The standing and running rigging of steamships.
- (b.) Bending, unbending, setting, reefing, taking in and furling sail.
- (c.) Management of ship's boats in heavy weather.
- (d.) Dunnaging and stowing cargo, &c.
- (e.) The rule of the road as regards both steamers and sailing-vessels, their regulation lights, and fog and sound signals.
- (f.) The signals of distress, and the signals to be made by ships wanting a pilot, and the liabilities and penalties incurred by the misuse of these signals.
- (g.) The marking and use of the lead and log lines.
- (h.) The use and management of the rocket apparatus in the event of a vessel being stranded, and a knowledge as to the ports in New Zealand where such rocket apparatus for saving life has been placed.
- (i.) The construction, use and action of the sluices, and of the water-ballast tanks.
- (j.) Engine-room telegraph, &c.
- (k.) Any other questions of a like nature appertaining to the duties of the second mate of a home-trade vessel which the Examiner may think necessary to ask.

62. MATE.—A candidate must be not less than nineteen years of age, and have served four years at sea, or in extended river limits.

63. *Examination in Navigation.*—In addition to the subjects of examination required to qualify for a second mate of a home-trade vessel, a mate will also be required—

- (a.) To find on either a "true" or "magnetic" chart the course to steer, and the distance from one given position to another; to find the ship's positions on the chart from cross-bearings of two objects, and from two bearings of the same or different objects, the course and distance run between taking the bearings being given, and also the distance of the ship from the object at the time of taking the second bearing; and to state what the small numbers and roman numerals found on a chart indicate, and give a method of finding approximately the time of high water at any given place without the aid of the Admiralty or other tide-tables. (See Appendix G.)
- (b.) He must know the general tide, bar, harbour, and storm signals to be used at all New Zealand ports, as given in the "New Zealand Nautical Almanac."
- (c.) He must also know both the Morse and British movable- semaphore alphabets, and have a good working-knowledge of the International Code of Signals and British Signal Manual.

64. *Examination in Seamanship.*—In addition to the qualifications required for the grade of second mate, a mate will be required to show a knowledge of the following subjects:—

- (a.) How to moor and unmoor ship, to keep a clear anchor, and to carry out an anchor.
- (b.) The ventilation of holds and the stowage of explosives.
- (c.) How to rig a sea-anchor, and what means to employ to keep a vessel disabled or unmanageable out of the trough of the sea, and lessen her lee drift.

- (d.) How to rig purchases for getting heavy weights, anchors, machinery, &c., in or out.
- (e.) Any other questions appertaining to the duties of a mate of a home-trade vessel which the Examiner may think necessary to ask.

65. MASTER.*—A candidate must not be less than twenty years of age, and have served five years at sea, or extended river limits, of which—

- (a.) One year must have been in a capacity not lower than that of only mate of a home-going or coasting vessel whilst holding a mate's certificate for home-trade ships or a second mate's certificate for foreign-going vessels;
- (b.) Or, two years and a half must have been in a capacity not lower than second mate of a home-trade or coasting vessel *in charge of a watch* whilst holding a mate's certificate for home-trade ships, or a second mate's certificate for foreign-going vessels (see par. 128);
- (c.) Or, one year must have been as pilot with a first-class pilot's certificate (see par. 124);
- (d.) Or, one year and a half must, whilst holding the requisite certificate, have been in a capacity not lower than that of second mate of a home-trade or coasting vessel which is required by law to carry a certificated second mate;
- (e.) Or, one year must have been as master of a cargo-vessel plying in the home trade or extended river limits whilst holding a certificate of competency as master of a fishing-boat or cargo-vessel under 25 tons register;
- (f.) Or, one year must have been as master of a vessel of 50 tons register or upwards plying in the home trade or extended river limits whilst holding a certificate of service as master of a vessel of 50 tons register or upwards;
- (g.) Or, one year and a half must have been as master of a vessel plying in the home trade or extended river limits whilst holding a certificate of service as master of a vessel under 50 tons register.

66. *Examination in Navigation.*—In addition to the qualifications required of a mate of a home-trade ship, a master will also be required to work the following problems:—

- (a.) To find on a chart the course to steer by compass in order to counteract the effect of a given current, and to find the distance the ship will make good towards a given point in a certain time.
- (b.) To work out practically the correction to apply to soundings taken at a given time and place to compare with the depth marked on the chart, &c.
- (c.) To find by means of Table H, on page 85 of the "New Zealand Nautical Almanac" of 1910, or by same table on page 81 of the A, B, and C Azimuth Tables, the distance from an object when abeam by the distance run between the beam-bearing and any other bearing before or abaft the beam.
- (d.) To set the course when at a known distance from an object to pass any required distance from it by aid of the traverse table. (See example on page 86 of "New Zealand Nautical Almanac," 1910, or on page 81 of the A, B, and C Azimuth Tables.)
- (e.) To find the true bearing of the sun and deviation of the compass by time-azimuth tables.†
- (f.) To find the latitude by a meridian altitude of the sun.

* For convenience of calculation the service required is stated in a tabulated form in Appendix O.

† The candidate will be allowed to use any tables that will solve the problem within half of a degree, the altitude of the heavenly body not being given,

(g.) To give written answers to certain practical questions on the subject of the deviation of the compass.

(h.) He will also be required to understand the use of the sextant, to be able to observe with it, to read off and on the arc, and to find the index error by the horizon. (See also supplementary *viva voce* test, paragraph 176.)

67. *Examination in Seamanship.*—In addition to the qualifications required for the grade of mate, a master will be required to show a knowledge of the following subjects:—

- (a.) How to act in the event of a fire breaking out in the ship.
- (b.) Rescuing the crew of a disabled ship.
- (c.) Management of steamships in heavy weather.
- (d.) Construction of rafts and jury-rudders suitable for screw-steamships.
- (e.) The preservation of the ship's crew and passengers in the event of wreck.
- (f.) The best arrangement for towing vessels under different circumstances.
- (g.) The law as to the engagement, discharge, and management of the crew, and the entries to be made in the official log-book.
- (h.) Any other questions of a like nature appertaining to the duties of a master of a home-trade vessel which the Examiner may think necessary to ask.

Rules for the Examination of Masters, River-steamers.

68. *General.*—Candidates for examination must make a proper application, on a form which will be supplied on application at any mercantile marine office. This application, accompanied with the necessary testimonials, must be lodged at the mercantile marine office for delivery to the Examiners. Certificates procured on false information will be cancelled.

69. All candidates for certificates must pass the three sight tests previously mentioned.

70. *Master.*—A master of a river-steamer must be twenty-one years of age, and must have served at least one year at sea, or on board of a vessel plying within river or extended river limits. He must produce satisfactory testimonials of good conduct and sobriety. He must be able to read and write, and understand the five rules of arithmetic. He must understand the rules of the road as regards both steamers and sailing-vessels, their regulation lights, and fog and sound signals, International Code of Signals, Harbour Regulations, and the colonial bar and tidal signals.

NOTE.—Time served in steamers plying within river and extended river limits does not count as service at sea for the purpose of obtaining a certificate for a sea-going ship, with the exception that service in the extended river limits will count as qualifying for home-trade and other New Zealand local certificates.

Rules for Examination for Certificate as Master of Restricted-limits Sailing-ships over 5 Tons and up to 25 Tons Register, carrying Passengers.

71. The general rules as to the conduct of examinations and for the examination of sight-tests contained in the foregoing regulations shall apply to these examinations.

72. A candidate must be not less than twenty-one years of age, and have served four years at sea or in extended river limits, one year of which must have been served in a somewhat similar class of sailing-vessel.

73. *Examination in Navigation.*—He must be able to read and to write a legible hand, and understand the first five rules of arithmetic. He must be able to take a bearing by compass, be conversant with the use of Mercator's chart, and be able to find, on a *magnetic*

chart, the course to steer, and the distance from one given position to another; to find the ship's position on the chart from cross-bearings of two objects, and from two bearings of the same or different objects, the course and distance run between taking the bearings being given, also the distance of the ship from the object at the time of taking the second bearing. He must be able to find the deviation of the compass by bearings of two objects in a line. He must be able to find the times of high and low water at the different places given in the "New Zealand Nautical Almanac." He must also pass an examination in the International Code of Signals, the New Zealand General Harbour Regulations, and the colonial bar and tidal signals.

74. *Examination in Seamanship.*—He must possess a thorough knowledge of the rule of the road as regards both steamers and sailing-vessels, their regulation lights, and fog and sound signals. He must be able to describe the signals of distress and the use and management of the rocket apparatus in the event of his vessel being stranded, and a knowledge as to the ports in New Zealand where such rocket apparatus for saving life has been placed. He must be able to mark and use the lead and log lines, to manage a ship's boat in a surf or in heavy weather, to bend, unbend, set, reef, take in, and furl sail, to know how to act for the safety of the vessel if caught in a sudden squall, and what action to take if a man falls overboard, or if spars carry away; also any other questions of a like nature appertaining to the duties of the master of this class of vessel.

Rules for Examination for Certificates as Master of Fishing-boats and Cargo-ships over 5 Tons and up to 25 Tons Register.

75. The general rules as to the conduct of examinations, and for the examination in sight-tests contained in the foregoing regulations shall apply to these examinations.

76. A candidate must be not less than twenty-one years of age, and have served four years at sea or in extended river limits, one year of which service must have been in the same class of vessel as that for which the certificate is desired.

77. *Examination in Navigation.*—He must be able to read, and to write a legible hand, and understand the first five rules of arithmetic. He must be able to take a bearing by compass, be conversant with the use of Mercator's chart, and be able to find, on a *magnetic* chart, the course to steer and the distance from one given position to another, to find the ship's position on the chart from cross-bearings of two objects, and from two bearings of the same or different objects, the course and distance run between taking the bearings being given, also the distance of the ship from the object at the time of taking the second bearing. He must be able to find the deviation of the compass by bearings of two objects in a line. He must be able to find the times of high and low water at the different places given in the "New Zealand Nautical Almanac." He must also pass an examination in the International Code of Signals, the New Zealand General Harbour Regulations, and the colonial bar and tidal signals.

78. *Examination in Seamanship.*—He must possess a thorough knowledge of the rule of the road as regards both steamers and sailing-vessels, their regulation lights, and fog and sound signals. He must be able to describe the signals of distress and the use and management of the rocket apparatus in the event of his vessel being stranded, and a knowledge as to the ports in New Zealand where such rocket apparatus for saving life has been placed. He must be able to mark and use the lead and log lines, to manage a ship's boat in a surf or in heavy weather, to bend, unbend, set, reef, take in, and furl sail, to know how to act for the safety of the

vessel if caught in a sudden squall, and what action to take if a man falls overboard, or if spars carry away; also any other questions of a like nature appertaining to the duties of the master of this class of vessel.

Rules for Examination of Masters of Fishing-boats up to 5 Tons Register.

79. (1.) Candidates for examination must make proper application on Form Exn. 2, which will be supplied on application at any Mercantile Marine Office or Customhouse. The application, accompanied by the necessary testimonials, must be lodged at the Mercantile Marine Office or Customhouse for delivery to the Examiners. Certificates procured on false information will be cancelled.

(2.) All candidates must pass the examination in the sight-tests prescribed by the Rules for the Examination of Masters and Mates before they commence the other part of the examination.

(3.) A master of a fishing-boat up to 5 tons register must be not less than nineteen years of age, and must have performed at least one year's deck service at sea in extended river, or river or harbour, limits. He must produce satisfactory testimonials of good conduct and sobriety for at least a year immediately preceding the date of his application to be examined. He must be able to read and write.

(4.) He must understand the rules of the road as regards both steamers and sailing-vessels, their regulation lights, and fog and sound signals, harbour regulations, and the colonial bar and tidal signals; also any other questions appertaining to this class of vessel and the duties of the masters of such vessels which the Examiner may put to him.

Extra Certificates.

80. *Certificates as Extra Master.*—An extra master's certificate will entitle the holder to go to sea as master of any vessel, sailing or steam.

The examination is voluntary, and intended for such persons as wish to prove their superior qualifications, and are desirous of having certificates of the highest grade granted by the Marine Department.

The extra examination may take place when the applicant is qualified to go up for examination for an ordinary master's certificate, or at any time subsequent to his having passed the examination for that certificate.

81. *Examination in Navigation.*—The candidate will be required to work out and show the construction of any four of the problems* prescribed for the ordinary certificates, and to satisfy the Examiner in the oral subjects prescribed for those certificates. He must also be prepared to be examined in any of the following subjects, showing the construction of all the problems: †—

- (a.) To find the latitude from double altitudes of the sun or of a star.
- (b.) To determine, from simultaneous observations of two different stars, the position of the ship, and the true bearing of the stars, by Sumner's method. The candidate may either determine the four longitudes from the two assumed latitudes which will be given, or solve the question in any other way he may choose.
- (c.) To find the error of a chronometer from the altitude of the sun or of a star, observed with an artificial or with the natural horizon.
- (d.) To explain clearly in writing the principles of
 - (1) great-circle sailing; (2) windward great-

* Either of the chart papers, Exn. 9c or Exn. 9d, may be given as one of these four problems.

† Two or three of these problems may usually be omitted, but all those set in the examination-papers given to the candidate must be worked.

circle sailing; (3) composite great-circle sailing; and their advantages and disadvantages.

- (e.) To show approximately on a terrestrial globe the great-circle track and the distance from one given position to another; also the latitude and longitude of vertex; and the longitude from vertex; and to explain how the track can then be transferred to a Mercator's chart. Occasionally the candidate will be required to lay the track down on a chart.
- (f.) To determine the initial great-circle course, and the distance, from one given position to another, the latitude and longitude of vertex, the longitude from vertex and the latitudes and longitudes through which the great circle will pass; laying the track, composite or otherwise, down on a Mercator's chart, and explaining briefly how the course and distance from one point to another on this track is then found. This problem may, subject to the decision of the Examiner, be solved either by calculation, or by any tables, graphic method, or great-circle chart, known to and preferred by the candidate, and it will usually be set so as to leave the choice of method to the candidate.
- (g.) To draw a figure, and write down the trigonometrical ratios.
- (h.) Right-angled plane trigonometry; deducing and writing down the formula for each computation in the problem given.
- (i.) Oblique-angled plane trigonometry; deducing and writing down the formula, or the rule, for each computation in the problem given.
- (j.) To give Napier's rules for circular parts for the solution of right-angled spherical triangles, explaining clearly how the different angles and sides are considered in deducing the formulæ.
- (k.) Right-angled spherical trigonometry.
- (l.) The laws of the deviation of the compass in iron ships. (See Appendix K.)
- (m.) To construct a plan or chart on Mercator's principle and solve a given problem thereon.
- (n.) To write an essay on the "Law of Storms." He need not confine himself solely to laws and indications laid down in the various text-books, but should supplement his text-book knowledge by personal experience.
- (o.) To give written answers to from six to ten questions on naval architecture, and sketches where required.

He will be examined orally on the following subjects:—

- (p.) The leading principles of the construction of the sextant and vernier; patent logs and leads.
- (q.) The civil duties of a shipmaster, in which he will be expected to show a more extensive knowledge than a candidate for an ordinary master's certificate.

He will be required,—

- (r.) To show practical proficiency in both the Morse and movable- semaphore methods of signalling. (See Appendix D.)

The construction of the problems mentioned above, and those in the compass syllabus, must be shown as follows:—

- (a.) A circle should be drawn projected on the plane of the horizon—unless the problem can be shown better otherwise—and a correct figure drawn in it, the magnitude of the sides and angles being estimated approximately by the eye.
- (b.) The sides and angles used in solving the problem should be marked by distinguishing letters in the figure, and the candidate should over each fresh computation write down clearly what is

given and what he is required to find, together with the formula which he proposes to use.

- (c.) Opposite each quantity in the computation he should put the letters denoting the part of the triangle which it represents, writing "comp." before the letters when the quantity is the complement of that part of the triangle.

Candidates will not be required to enter into the mathematical investigation of the rules and formulæ used in the solution of the problems involving oblique-angled spherical triangles, but credit will be given to any candidate showing such knowledge. When, however, a problem or part of a problem is solved by right-angled spherical trigonometry, the simple process of deducing the formula from the figure by Napier's rules for circular parts or other method must be shown.

Where a problem is solved by right-angled plane trigonometry, the simple process of deducing the formula from the figure for each of the computations in it must be shown.

The rule for finding the latitude by meridian altitude must be proved by the figure.

Protractors must not be used in the chart-construction problem, either for setting off variation or laying off positions. All sketches and drawings required in the paper on naval architecture should be neatly done on cartridge-paper supplied by the Examiner.

82. *Examination in Seamanship.*—In addition to the qualifications required of an ordinary master, an extra master will be expected to give satisfactory answers to any questions in practical seamanship that the Examiner may put to him.

83. Extra certificates for steamships will also be issued, subject to the examination described below, to officers who can show the necessary service in steamships. The certificates will be marked "For steamships only," and will only entitle the holders to go to sea as masters of steamships.

The examination is open to all who are qualified to go up for a certificate as master of a foreign-going steamship, or who have already obtained this certificate. It is open also to candidates who have failed in the examination for an extra master's certificate to show the requisite knowledge of the management or square-rigged sailing-vessels, provided they can prove the necessary amount of officer's service in steamships. (See par. 24.)

84. *Examination in Navigation.*—The examination in navigation for an extra master's certificate for steamships will be precisely the same as that prescribed for an extra master's certificate.

85. *Examination in Seamanship.*—In addition to the qualifications required of a master of a foreign-going steamship, the extra master will be expected to give satisfactory answers to any questions appertaining to the management of a steamship that the Examiner may put to him.

Provisional Certificates.

86. Provisional certificates for foreign-going ships or for foreign-going steamships, according to the candidate's qualifications, are granted on the conditions stated below to any officer of the mercantile marine who may require such a certificate to qualify him for appointment to or promotion in the Royal Naval Reserve. These certificates are only issued for Royal Naval Reserve purposes, and do not authorise the holders to go to sea as first mate or master.

87. Candidates for these certificates must apply at a Mercantile Marine Office, fill up the form of application (Exn. 2), and pay the usual fee. They must produce their first or second mate's certificates of competency, and an authority from the Marine Department before they can be examined.

88. *Provisional Certificates as First Mate.*—Provisional certificates as first mate are granted to candidates who can prove that they have served five years at sea, and that during one year of this period they have served in a capacity not lower than fourth mate while holding a second mate's certificate. They must pass the usual examination for first mate, and pay the usual fee. The provisional certificate is exchangeable for the full certificate as first mate, without further payment or examination, on production to the Marine Department of satisfactory proofs that the holder has served at sea not less than twelve months in a foreign-going vessel in a capacity not lower than fourth mate, and that during the whole of that period he has been in regular charge of a watch, and in possession of a full certificate of competency as second mate.

89. *Provisional Certificates as Master.*—Provisional certificates as master are granted to candidates who can prove not less than six and a half year's service at sea, and who pass the usual examination for master, and pay the usual fee. Of this service two and a half years must have been served in a capacity not lower than fourth mate of an ocean-going steamship, during the last twelve months of which the candidate must have been in possession of a full certificate as first mate. These certificates will be exchanged for the full certificate as master, without further payment or examination, on production to the Marine Department of satisfactory proofs that the holder has served at sea not less than two and a half years in a foreign-going vessel in charge of a watch in a capacity not lower than fourth mate, and that during twelve months of this period he has served as second mate while in possession of a full certificate of competency as first mate.

Certificates for Pleasure-yachts.

90. The examination for these certificates is purely voluntary, and is confined to persons who command their own sea-going pleasure-yachts. A master of a yacht who is not also the sole owner, or who is under twenty-one years of age, is not eligible for examination.

91. Only one description of certificate will be issued, whether the yacht is foreign-going or cruises within the home-trade limits.

The certificate will not entitle the holder to command any vessel except the pleasure yacht or yachts of which he is at the time the sole registered owner.

92. Candidates are not required to have served any specified time afloat, as it is believed that their sea-knowledge will be sufficiently tested by the examination they will have to pass in seamanship.

93. Testimonials of service need not be shown, but a candidate for examination will be required to produce a statutory declaration to the effect (1) that he is sole owner of the yacht; (2) that the yacht is sea-going; (3) that it is not to be used for trading purposes. He will also be required to fill up the form of application (Form Exn. 2), and pay the fee of £2 at a Mercantile Marine Office, as prescribed in par. 3.

94. In all other respects the regulations relating to examinations of masters of foreign-going ships will apply in these cases.

95. *Examination in Navigation.*—The examination in navigation for yacht-master's certificate will be precisely the same as that prescribed for an ordinary master's certificate, except that in the civil duties of a shipmaster the master of a yacht will only be expected to possess a knowledge of what he is required to do by the Shipping and Seamen Act.

96. *Examination in Seamanship.*—He must give satisfactory answers as to his knowledge of making and taking in sail, and as to the management of a yacht under canvas in moderate and in stormy weather. He must have a thorough knowledge of the rule of the road

at sea as regards both steamers and sailing-vessels, their regulation lights, and fog and sound signals; and be able to describe the signals of distress, and the signals to be made by ships wanting a pilot, and the liabilities and penalties incurred by the misuse of these signals. He must also understand the use and management of the rocket apparatus in the event of his vessel being stranded. He must be able to mark and use the lead and log lines; to cast a vessel on a lee shore; to moor and unmoor a ship; to keep a clear anchor, and to carry out an anchor. He must know how to keep his vessel out of the trough of the sea in the event of accident; how to rig rafts and jury-rudders, &c.; and what steps to take if his vessel is disabled or unmanageable and drifting towards a lee shore. He will also be examined as to the resources for the preservation of the crew in the event of wreck. He must also possess a knowledge of the measures he should adopt for preventing and checking an outbreak of scurvy on board; and be prepared to answer any other questions relating to the management of a yacht, either steam or sailing, which the Examiner may ask.

97. *Extra Master of Yacht.*—An extra certificate will be issued to the owner of a yacht who either holds, or is qualified to be examined for, a yachtmaster's certificate, subject to the following examination.

98. *Examination in Navigation.*—The examination in navigation will be precisely the same as that prescribed for an extra master's certificate. (See par. 81.)

99. *Examination in Seamanship.*—The subjects of examination in seamanship will be the same as those prescribed for a yacht-master's certificate, but the candidate for an extra certificate will be expected to show a more extensive practical knowledge than is required of a candidate for the yacht-master's certificate.

Voluntary Examination in Compass-deviation.

100. Any person holding a certificate of any grade in the foreign or home trade, or as master of his own pleasure-yacht, who wishes to pass a voluntary examination in compass-deviation, can at any time be examined upon filling up the usual form of application, and paying to the Superintendent of the Mercantile Marine Office the fee of £1. If the candidate passes the examination a note to that effect will be made upon his certificate.

Voluntary Examination in Signalling.

101. The examination in signalling as prescribed for candidates for the extra master's certificate is open as a voluntary examination to all officers holding, or who have passed for, a certificate of competency of any grade.

If the candidate passes, the fact, with the date and place of passing, will be recorded upon his certificate of competency.

Candidates may be examined at any port where ordinary examinations are held, upon filling up the form of application (Exn. 2) and paying the fee of £1. (See Appendix D.)

Voluntary Examination in Steam.

102. These examinations are provided for the purpose of giving masters and mates who are possessed of certificates of competency an opportunity of undergoing a voluntary examination as to their practical knowledge of the use and working of the steam-engine.

103. The examination is open to any person who holds a certificate of any grade in the foreign or home trade, or as master of his own pleasure-yacht. Candidates should fill up the form of application (Form Exn. 2) at a Mercantile Marine Office, pay the fee of £1, and deposit their certificates with the Superintendent. The Superintendent will inform the applicant when and

where to attend to be examined. If the candidate fails to pass, his certificate will be at once returned to him.

104. If he passes, the report (Exn. 14) will be sent to the Marine Department with the certificate of competency, together with the Form Exn. 2; and the words "Certified to have passed in steam," with the date and place of examination, will then be entered on the certificate and its counterpart, and the certificate will be sent to the Superintendent of the Mercantile Marine Office of the port named in the Form Exn. 2, and be delivered to the candidate in the usual manner.

105. If a candidate fails he may not present himself for re-examination until the expiration of three months from the date of failure.

106. The examination is for the most part *viva voce*, and extends to a general knowledge of the practical use and working of the steam-engine, and of the various valves, fittings, and pieces of machinery connected with it; and of the way in which electric lighting is carried out on board ship. Intricate theoretical questions on calculations of horse-power or areas of cylinders and valves, or any of the more difficult questions relating to steam-engines and boilers, will not be asked. The examination will, in fact, be confined to the duties which a master of a steam-vessel may be called upon to perform in the case of the death, incapacity, or delinquency of the engineer.

107. Examiners are to satisfy themselves that the candidates know the names and understand the uses of the various parts of engines and boilers, and their connecting-pipes, valves, cocks, &c. Practical knowledge, as distinguished from theories and abstruse calculations, is to be the test of the candidate's fitness to have his certificate indorsed.

108. The Examiner should arrange to conduct part of the examination in the engine-room of a steamship, unless from circumstances he finds it impossible to do so; but, in the event of the candidate passing, the Examiner should state in writing what circumstances prevented a visit to an engine-room. If an opportunity offer, the candidate should be permitted, under the guidance of the Examiner, to start and stop the engine of some vessel which may have her steam up.

109. The Examiner, in sending in his report of the examination, should state where the examination has been held.

110. Candidates will be required to give written answers to sixteen out of twenty questions taken from a book of elementary questions published for the Marine Department.* These questions will be altered from time to time without notice. The twenty questions are not to be difficult, theoretical, or book questions, but are to be such as any man of ordinary capacity who has any practical knowledge of the use and working of the steam-engine ought to answer.

111. These questions, with the candidate's answers, should be sent to the Marine Department, with the reports, after each examination.

112. If a candidate refers to any book, or paper, or memorandum, or obtains information from another candidate during the examination, he will be treated as having failed, will forfeit his fee, and will not be allowed to be re-examined for a period of three months.

113. The examiners will report, in the case of failure, the nature of the question or questions that decided the failure, or the point in the management of the engine in which the candidate was deficient.

114. There is nothing in the regulations requiring that applicants for the voluntary examination shall have served on board steamships; all that is required is that they shall have practical knowledge of the use and working of the steam-engine. Examiners will not fail

* Printed at the end of the regulations relating to the examination of engineers.

to appreciate the fact that practical knowledge is best gained in the engine-room; and the examination of an officer who does not produce official evidence of service in steamships and of experience of engines must necessarily be more searching than in the case of one who produces evidence of such service and experience.

Certificates of Service.

115. A person who has attained the rank of lieutenant, sub-lieutenant, navigating lieutenant, or navigating sub-lieutenant in His Majesty's Navy, or of lieutenant in His Majesty's Indian Marine Service, is entitled to a certificate of service as master of a foreign-going ship without examination.

116. Applications for certificates of service must be made on the proper printed form, to be obtained free of charge from the Superintendent of any Mercantile Marine Office.

117. Applications for certificates of service by officers of the Royal Navy on the active list must be made through their commanding officers, and applications from officers who have retired from the Royal Navy or who are on half-pay must be made to the Secretary of the Admiralty, who in either case will forward the application to the Marine Department.

Ambulance Certificates and Government Awards.

118. An officer in the mercantile marine who holds a certificate of proficiency in first aid to the injured from the St. John or St. Andrew's Ambulance Association, or some equivalent certificate, can have the fact indorsed on his certificate of competency, provided the latter was issued before the 1st January, 1909, if the two certificates are forwarded to the Secretary, Marine Department, either directly or through the Superintendent of a Mercantile Marine Office.

Recipients of Government awards can also have the fact stamped on their certificates of competency, if they submit evidence of the award, together with their certificate in a similar manner.

RULES FOR ESTIMATING SEA-SERVICE.

119. In these regulations sea-service is reckoned from the commencement to the termination of the voyage. The certificate of discharge will generally be accepted as proof of sea-service. Superintendents and Examiners will be careful to see that these discharges have not been in any way tampered with, and will report any suspicious cases to the Marine Department.

120. For foreign-going certificates the term "sea-service" means, unless otherwise stated, service performed in foreign-going vessels.

121. For home-trade certificates service in the home or coasting trade or in extended river limits is regarded as equivalent to service in the foreign trade; but for foreign-going certificates it is regarded as only equivalent to two-thirds of the time served in the foreign trade.

122. By the word "certificate" is meant a certificate of competency granted by the Board of Trade under the Merchant Shipping Act or by the Government of a British possession under an Order in Council issued in pursuance of "The Merchant Shipping Act, 1894," and under "The Shipping and Seamen Act, 1908."

A list of the colonial certificates referred to will be found in Appendix S. They are of the same force as the corresponding certificates granted by the Board of Trade.

123. Where a foreign-going certificate is required in order to qualify a candidate for examination, the certificate may be either an ordinary certificate, or a certificate for fore-and-aft-rigged vessels, or a certificate for foreign-going steamships.

124. The term "pilot" in these regulations (see pars. 36 and 65) means a pilot who is employed in general pilotage, and holds a first-class pilot's certificate from some competent authority authorising him to pilot vessels outside harbour and partially smooth-water limits.

125. Officers' services, to be recognised as qualifying for purposes of examination, must be performed with the requisite certificate, as specified in Appendix O. The officers' service performed by men who have been duly promoted during the course of a voyage (see par. 129), or who, in consequence of serving in vessels plying between ports abroad, have been unable to obtain the necessary certificates, may, however, be recognised, provided that it is in other respects satisfactory.

126. Foreign officers who wish to apply for a British certificate of competency must in all cases have performed their qualifying officer's service with the requisite British certificate. The service may have been performed in foreign vessels if the candidate can produce satisfactory testimonials to conduct and character, and is able to prove that the service has been in the required capacities, and that during the period of service he has held a British certificate of competency of the rank required by the regulations.

127. When service in charge of a watch in either the foreign or home trade is specified in the regulations, the candidate will have to prove that during the whole of the time claimed he has had the *regular* charge of a watch or watches, which, if in the foreign trade, must amount to not less than eight hours of each twenty-four hours of service. It must be distinctly understood that this service will only be accepted when the candidate has kept his full regular watch *during the whole voyage*—i.e., *from port to port*—and that occasional service in charge of a watch will not be accepted as mate's service under the regulations. Great care must be exercised by the Examiners and others in regard to such service, and unless the candidate produces a clear and satisfactory certificate, specially setting forth the above facts, from the master or owner of the vessel in which the service was performed, it must not be accepted.

128. Service as additional or auxiliary first or second mate in large foreign-going vessels, when in both cases third and fourth mates are also carried, will count as first mate's or second mate's service, as the case may be, provided that the candidate was entered on the articles in one of these capacities, and that he produces the necessary certificate (see par. 127) showing that he was in charge of a watch or watches during the whole time claimed.

129. Whenever a man has, from any cause, been regularly promoted on the occurrence of a vacancy in the course of the voyage from the rank in which he first shipped, and such promotion, with the ground on which it has been made, is properly entered in the articles and in the official log-book, he will receive credit for his service in the higher grade for the period subsequent to his promotion.

130. Service in a lower grade than first or only mate in the home or coasting trade will not be recognised as officers' service towards qualifying a candidate for a foreign-trade certificate.

131. The testimonials of service of foreigners and of British officers and seamen serving in foreign vessels, which cannot be verified by the Marine Department, must be confirmed either by the Consul of the country to which the ship in which the candidate served belonged, or by some other recognised official authority of that country, or by the testimony of some credible person on the spot having personal knowledge of the facts required to be established. The production, however, of such proofs will not of necessity be deemed sufficient. Each case will be decided on its own merits, and if the

sufficiency of the proofs given appears to be at all doubtful it must be referred to the Marine Department.

132. Service in auxiliary screw whaling-ships, and in vessels with auxiliary power, which use their screws only in calms or during light winds, is considered as service performed in sailing-vessels.

133. In the case of excursion-steamers, only such service as can be proved to have been performed at sea will be accepted for foreign-going certificates, and only such as has been performed at sea or in extended river limits for home-trade certificates.

134. Candidates whose service has been performed in capacities other than apprentice, midshipman, cadet, ordinary seaman, or able seaman—*e.g.*, men who have served as carpenter, or sailmaker, or as cook in small vessels where cooking is only part of a man's duty—will be required to satisfy the Examiner or the Marine Department that they have during the whole time claimed performed deck-duties in addition to their own particular work, and that they have a good knowledge of seamanship. These facts may possibly be proved by the production of satisfactory certificates from the masters with whom the applicant has served; but such service will only be accepted as equivalent to two-thirds of the time served as ordinary deck-hand. Failing satisfactory evidence, the applicant will be required to perform additional service in the capacity of seaman. Service as cook (under other conditions than the above), or as steward, or as purser will not be accepted.

135. Service performed exclusively in trawlers and other deep-sea fishing-vessels or in pilot-vessels will not qualify a candidate for examination. He must, in addition, prove the following service:—

- (1.) For a foreign-going certificate, service for at least eighteen months in an ordinary trading-vessel in the foreign trade, or the equivalent period, twenty-seven months, in the home or coasting trade.
- (2.) For a home-trade certificate, service for at least twelve months in an ordinary trading-vessel in the foreign, home, or coasting trade.

136. Service in pleasure-yachts will be accepted as qualifying service under the following conditions:—

(a.) It must in all cases be verified by satisfactory proofs, which must set forth clearly and in detail the nature and duration of the service claimed; and it must be distinctly understood that only actual sea-service will be accepted, and that service in harbour or port is inadmissible.

(b.) Service in foreign-going yachts will be accepted in full; and service performed within home-trade limits in sailing-yachts of not less than 50 tons net register, or in steam-yachts of not less than 80 tons gross register, will be accepted in the proportion stated in paragraph 95; but candidates must also show—(1) For a foreign-going certificate, service for at least eighteen months in an ordinary trading-vessel in the foreign trade, or for the equivalent period, twenty-seven months in an ordinary trading-vessel in the home or coasting trade; (2) for a home-trade certificate, service for at least twelve months in an ordinary trading-vessel in the foreign, home, or coasting trade.

(c.) Service within home-trade limits in sailing-yachts of 20 tons net register, or in steam-yachts of 40 tons gross register, will be accepted towards qualifying a candidate for a foreign-going certificate as equivalent to half the time served in the foreign trade; but no amount of such service shall count as more than two years' service in the foreign trade, and no such service shall count as officers' service to qualify candidates for foreign-going certificates.

(d.) Service within home-trade limits in sailing-yachts of not less than 20 tons net register, or in steam-yachts of not less than 40 tons gross register, will be accepted at the ordinary rate as qualifying service for home-trade certificates; but candidates must prove that they have in addition served for at least twelve months in an ordinary trading-vessel in the foreign, home, or coasting trade.

(e.) Service within home-trade limits in sailing-yachts of less than 20 tons net register, or in steam-yachts of less than 40 tons gross register, will not be accepted as qualifying-service for any class of certificate.

137. Service performed in tugs employed outside partially smooth-water limits may be accepted as sea service for the purpose of qualifying a candidate for a second mate's, mate's, or master's certificate for home-trade ships.

138. Service in steam hopper-barges may, subject to the provisions of par. 139, be allowed to count towards qualifying a candidate for a second mate's or mate's certificate of competency for home-trade ships, provided the candidate can prove at least two years' service in an ordinary trading-vessel in either the home, coasting, or foreign trade. Service in these steam-hoppers will not be accepted as officer's service towards qualifying a candidate for a master's certificate.

139. Service in lightships or in an engine-room will not be accepted as sea service.

140. Service performed on rivers, no matter of what size, and service performed within restricted limits, will not be accepted, with the exception mentioned in note of par. 70.

Where any doubt whatever exists on this point, the candidate will be required to produce a certificate from the master or owner of the vessel in which the service was performed before the service can be accepted.

141. Half the time served on board a training-ship will be allowed to count as service at sea up to a limit of one year (*i.e.*, no length of service will be allowed to count as more than one year at sea), provided that the candidate can produce a certificate from the committee that he has conducted himself creditably, and passed a good examination in seamanship, so far as it is practised in the training-ship, as well as in other matters down to the time of his leaving the ship; but this service will not be regarded as equivalent to service in square-rigged vessels.

142. The *whole* of the time claimed under indentures of apprenticeship will be accepted as actual sea service to qualify under par. for second mate's certificate, provided—(a) that the indentures have not been cancelled through some fault of the candidate, but are indorsed by the owner or master to whom he was bound to the effect that he has performed his service faithfully during the time he remained as apprentice; and (b) that the candidate had served at sea four-fifths of the time claimed—that is to say, has not spent more than one-fifth of the time in home ports.

In cases where an apprentice is qualified for examination before the expiration of his indentures—*e.g.*, where he has had training-ship or other sea service prior to being bound which, together with his actual time as apprentice, makes up the required four years, or where his indentures are for a period of more than four years—a letter from the owner or master will be accepted in place of the indorsement referred to above.

In the event of the candidate being short of the required four-fifths of the time claimed as apprentice, he will be required to show sufficient additional sea service, either as seaman or junior officer, to make up the four-fifths of the time claimed.

143. The *whole* of the time served as midshipman or cadet under indentures will also be accepted, subject to

the same conditions as those laid down for apprentices; and the same will be the case even when not bound by indentures, provided that the service as midshipman or cadet has been continuous, and that on the date of the termination of the period of service claimed in this capacity the candidate was on articles of agreement, and that he is able to comply with the requirements laid down in the matter of serving or making up the four-fifths period at sea during the time claimed.

144. Officers of the Royal Navy are at liberty to apply for certificates of service and to be examined for certificates of competency in the mercantile marine, but the Lords Commissioners of the Admiralty have directed that the applications of officers on the active list should be made through their commanding officers, and that the applications of officers on half-pay should be made to the Secretary of the Admiralty.

The conditions on which certificates of service are issued are stated at p. 115, 116, and 117.

145. Officers of the Royal Navy or of the Royal Indian Marine who wish to be examined for certificates of competency in the mercantile marine will be required to prove the following service; and if an officer wishes to obtain the ordinary certificate for foreign-going ships he must prove that at least twelve months of this required period was served under sail alone.

(1.) For second mate: The officer must prove four years' service at sea, or that he has attained the rank of acting sub-lieutenant.

(2.) For only mate: Five years' service at sea.

(3.) For first mate or master: The officer must prove that he has attained the rank of sub-lieutenant in the Royal Navy, or of lieutenant in the Royal Indian Marine.

146. Lieutenants, sub-lieutenants, and acting sub-lieutenants of the Royal Naval Reserve who perform sea service on board His Majesty's ships will, if accompanied by a good report, be allowed to count such service as if it had been performed in foreign-going merchant ships, and the service will rank according to the certificate of competency held by the candidate at the time.

Midshipmen of the Royal Naval Reserve possessing a first mate's certificate, and temporarily granted the rank of acting sub-lieutenant whilst undergoing twelve months' training afloat in the Royal Navy will, if accompanied by a good report, be allowed to count such service as if it had been performed in the capacity of second mate of a foreign-going merchant ship with a first mate's certificate.

147. The time spent in drill in the Royal Naval Reserve on board sea-going vessels of the Royal Navy, if accompanied by a good report, will be accepted in full; but if the drill has been performed in harbour ships of the Royal or colonial navies, only half such time will be accepted as sea-service, and no such service must amount to more than one-fourth of the time required for the particular grade of certificate applied for.

CONDUCT OF THE EXAMINATIONS.

148. The examinations will commence early in the forenoon, and will be continued from day to day until all the candidates whose names appear upon the list are examined.

149. Candidates are required to appear at the examination-room punctually at the time appointed.

150. Before commencing the examination, the tables or desks must be cleared of all scraps of paper or books that are not used in the examination, and care should be taken that the candidates do not bring into the examination-room any book or paper.

151. No person will be allowed in the room during the examination other than those whose duties require them to be present.

No instructors will be allowed on the premises.

152. Candidates are prohibited from bringing into the examination-room books or papers of any kind whatever. The slightest infringement of this regulation will subject the offender to all the penalties of a failure, and he will not be allowed to present himself for re-examination for a period of three months.

153. No candidate will be allowed to work out his problems on a slate or on waste-paper, or to write on the blotting-paper supplied for his use in the examination. Violation of this rule will subject the candidate to all the penalties of a failure.

A sheet of blotting-paper should be issued to each candidate with the first examination-paper, and it must be returned to the Examiner when the last paper is completed each day. The Examiner will be careful to see that the blotting-paper has not been used by the candidate in solving his problems, or for conveying information to other candidates.

154. All instruments necessary for use in the examinations are supplied by the Marine Department.

155. No candidate may leave the examination-room without permission, and without giving up the paper on which he is engaged. Under no circumstances will a candidate be allowed to leave the building while the examination is proceeding. Violation of this rule will subject the candidate to all the penalties of a failure.

156. Candidates should be so placed as to prevent one copying from the other, and no communication whatever between the candidates should be allowed.

157. In the event of any candidate being discovered referring to any book or paper, or copying from another, or affording any assistance, or giving any information to another, or communicating in any way with another during the time of examination, or copying any part of the problems for the purpose of taking them out of the examination-rooms, he will subject himself to all the penalties of a failure, and will not be allowed to be examined for a period of six months.

158. If a candidate defaces, blots, writes in, or otherwise injures any book or form belonging to the Marine Department, his papers will be retained until he has replaced the damaged book or document. He will not be allowed to remove the damaged book or document, and will be subjected to all the penalties of a failure.

159. Perfect silence is to be preserved in the examination-room.

160. Any candidate violating any of the regulations, or being guilty of insolence to the Examiner, or of disorderly or improper conduct in or about the room, will render himself liable to the postponement of his examination, or, if he has passed, to the detention of his certificate for such period as the Marine Department may direct.

161. The envelopes containing the examination-papers when received from Wellington must on no account be opened by any other officer than the Examiner, and by him only at the commencement of the examination. Should the envelope containing the examination-papers appear to have been opened or in any way tampered with on its arrival from Wellington, the Examiner should, if he thinks it necessary, defer the examination until the following day, and telegraph immediately to the Principal Examiner in Wellington for a fresh set of papers. In the event of any case of this kind occurring, a full report of the circumstances, and of the steps taken in the matter, should be immediately forwarded to the Principal Examiner. After the envelopes have been opened, and until the examination-papers are again sealed up and despatched to Wellington, the Examiner is expected to take special precautions to preclude the possibility of any person having access to them. The responsibility of insuring that this is effectually done will rest with the Examiner. The

examination-papers of candidates must in all cases be sent to the Principal Examiner in Wellington for his approval, together with the report of the examination on the Form Exn. 14. The envelopes in which the examination-papers are returned to the Principal Examiner must be carefully sealed with the official seal at both the top and bottom, and this must be done under the eye of the Examiner.

162. The examination-papers should be issued to the candidates in half-sheets only, and one at a time. This will prevent a candidate from spreading out the sheets on the table so as to enable his neighbour to look over the problems. It will also enable the Examiner to look over and report upon the work on one half-sheet while the candidate is at work upon another. When the errors are not too numerous the incorrect problems may be returned to the candidate for correction, but in no case should the errors be pointed out by the Examiner, neither should any marks be made which would indicate how far or to what extent the work is incorrect. The incorrect problems are not to be returned to the candidate for correction a second time, and should more than one of the problems—or two, if the errors are only slight—be still incorrect, this would involve a failure. It must be understood, however, that the day's work, latitude by meridian and ex-meridian altitude of sun and star, chronometer problem by sun and star, and the Summer problem, must always be correct.

163. At those ports where, from the large number of candidates, it may sometimes be found impossible to look over the work on the day of examination during the office-hours, an hour in the morning of the following day may be allotted for the purpose of correcting the problems, but in no case should a candidate have his problem returned to him for correction after he has made the second attempt.

164. In the examination for extra certificates for foreign-going ships and for steamships the candidate will be required to complete the whole of his problems and other papers, which must not be returned to the candidate for correction, but will then be dealt with by the Examiner on the mark system. If the candidate does not obtain 85 per cent. of the total number of marks allotted for the papers he will be declared to have failed.

165. The examination will commence with not less than a quarter of an hour's dictation to test handwriting and spelling. This, however, is only to be given to those candidates who present themselves for examination for the first time for a foreign-going certificate. The spelling must be reasonably and fairly good, and the writing clear and legible. The spelling and writing of all candidates must be satisfactory, and, in cases where there is any doubt about the ability of a candidate to spell correctly, he will be specially tested by dictation.

166. The paper of definitions is only for those candidates who present themselves for examination for the first time for a foreign-going certificate. In using this paper the Examiner will place a mark against the questions which he wishes to be answered, not less than ten questions being so selected. The candidate will then write against the questions so marked his definition of the terms in a clear and legible hand, so as to prevent the possibility of any letter being mistaken, and also draw a rough sketch or diagram opposite to each of the questions to which he has given written answers, in further illustration of its meaning. *Viva voce* questions will be asked on the answers given. (See par. 176.)

167. In the questions on the deviations of the compass, the Examiner will mark at least twelve of the questions, including the problems. The selected questions will be varied frequently, and no two candidates will have precisely the same questions. The candidate will be furnished with sheets of the blank ruled paper which is supplied for the purpose, with instructions that he is to

write only on one side of the paper, and to answer in a clear and legible hand each of the questions against which a mark is placed, and to commence each answer by writing down the number of the question to which it relates in the margin. In answering question 39, on the tentative method of compass-adjustment, the candidate will be tested by Beall's compass-deviascope, and it will not therefore be necessary for him to give the written answer and sketches. A candidate for an extra master's certificate will not be required to answer the questions on compass-deviation on Form Exn. 7, but will be examined in the syllabus and with the compass-deviascope.

168. The examination on the barometer, thermometer, and hydrometer, prevailing winds and currents of the globe, trade routes, and tides, will for the present be conducted orally, and the questions asked by the Examiner, which will be constantly varied, will be confined to and based on the information given in the text-books mentioned in Appendix Q. Candidates will be required to have a fair and intelligent knowledge of the contents of those books.

169. Particular attention should be paid to the adjustments of the sextant, the examination in which subject will be conducted orally and practically. Every candidate will be examined practically as to his knowledge of the adjustments and the use of the various screws; he must be able to read correctly off the arc, a supposed index error being given by the Examiner as additive, as well as reading on the arc in the usual way; he must also be able to find the index error both by the horizon and by the sun.

170. Candidates will find it more convenient, both during the examination and at sea, to correct the declination and other elements from the "Nautical Almanac" by the hourly differences given in that work; they will thereby render themselves independent of any proportional or logarithmic table for that purpose.

171. The corrections by inspection of tables given in some of the works on navigation—e.g., Tables IX, XI, and XXI, in Norie's Epitome—will not be allowed; every correction must appear on the papers of the candidates.

172. All outstanding or minor corrections should appear in the margin of each problem paper and on the chart papers, and the papers of the candidates will not be considered complete without these corrections.

173. Examiners should bear in mind that the problems to be solved are required as tests, and for the purposes of an examination, and not for sea-going or practical purposes alone.

174. Candidates will be allowed to work out the various problems according to the method and the tables they have been accustomed to use.

175. All the problems given in the examinations, both for the ordinary and for the extra certificates, will be constantly varied; and the mode of stating the times in the astronomical problems, and the mode of wording and setting these and all other problems, will be varied in every possible way, so as to insure that the candidate has a proper knowledge of the subject.

176. Candidates are expected not only to give correct written answers to the questions set in the papers, but also to possess an intelligent knowledge of the various subjects prescribed in the regulations. The Examiner will therefore put a few *viva voce* questions to the candidate as the papers are brought up for inspection or during the course of the examination. The questions, which will be based on the papers set, will be such that the Examiner may satisfy himself that the candidate possesses a real knowledge of what he has written.

177. When an Examiner finds it necessary to fail a candidate in this supplementary *viva voce* test, a statement to that effect will be made on the candidate's

examination-papers before they are forwarded to the Principal Examiner in Wellington.

Time allowed.

178. Candidates for second mates' ordinary certificates must complete the whole of the examination in navigation in nine hours, including the time allowed for writing the definitions on Form Exn. 4a, the paper on the chart, and the correction of all errors and oversights; but the quarter of an hour's dictation, and all the nautical problems, excepting the chart paper, must be completed within six hours, and without the candidates leaving the premises during that period.

179. Candidates for only and first mate's ordinary certificates must complete the whole of the examination in navigation in twelve hours,* including the time allowed for the papers on the chart, cyclones or revolving storms, and for the correction of all errors and oversights; but the nautical problems up to and including (k) of the syllabus prescribed for only and first mate must be completed within six hours, and without the candidates leaving the premises during that period.

180. Candidates for ordinary certificates as master must complete the whole of the examination in navigation in fifteen hours, including the time allowed for the papers on the chart, compass-deviation, cyclones or revolving storms, and for the correction of all errors and oversights; but the problems up to and including (k) of the syllabus prescribed for only and first mate must be completed within six hours, and without the candidates leaving the premises during that period.

181. Candidates for certificates for foreign-going steamships will be allowed the same amount of time to complete their navigation-work as is allowed in the case of ordinary certificates.

182. Candidates for certificates as masters of pleasure-yachts will be allowed the same amount of time for completing the examination as the candidates for ordinary masters' certificates.

183. Candidates for home-trade mates' certificates must complete the whole of their arithmetical, chart, and other papers within eight hours, and candidates for home-trade masters' certificates within ten hours.

184. The time allowed for candidates for extra certificates to complete the whole of the problems and writings, including the compass syllabus, must not exceed twenty-six hours.

185. Candidates for certificates as masters of river-steamers must complete the arithmetical paper as well as the paper to test writing within three hours.

186. Candidates for certificates as masters of sailing-vessels of over 5 tons and up to 25 tons register, within restricted limits, carrying passengers, also as masters of fishing-boats or cargo-vessels under 25 tons register, must complete the whole of their arithmetical chart and other papers within six hours.

187. A period not exceeding eleven hours will be allowed to candidates for the completion of the whole of the examination in the compass syllabus, including the correction of all errors and oversights in both the problems and writings.

188. Punctually at the expiration of the prescribed time all papers will be collected, whether completed or not. If the papers are not completed, the candidate will be declared to have failed, unless the Examiner sees fit to lengthen the period in any special case. Where such an extension of time is granted, the case must be fully reported to the Principal Examiner on the Form Exn. 14.

189. The periods prescribed in the foregoing para-

* A candidate who is not applying for a second mate's certificate, and who has not previously passed an examination may be allowed the time allotted to dictation and writing the definitions on Form Exn. 4a in addition to the above.

graphs are not intended to include the time occupied by the *viva voce* part of the examination.

190. In the *viva voce* examination a reasonable time should be allowed for the candidate to give his answers. No assistance should be given or leading questions put.

191. It is anticipated that few candidates will require the whole of the time allowed for completing the examination in navigation, but ample time has been given, so that candidates may perform their work in a careful, clear, and legible manner, and to the entire satisfaction of the Examiners.

192. Candidates, after finishing the problems required in the various grades on the first day of examination, should proceed, until the end of that day, with such subjects as the definitions, chart, questions relating to cyclones, and compass-deviation.

193. The Sumner problem (EXH. 6c) must on no account be given out to any of the candidates on the first day of the examination, but should form the commencement of the candidates' work on the second day. On the completion of this problem, if included in the lower-grade problems, the candidates for masters' certificates should proceed with the problems (a), (b), (c) of the syllabus for that grade.

194. Degree of precision required in the solution of the problems:—

- (a.) Candidates are expected to work out their answers to all problems where the answer required is a latitude, longitude, or distance within $1\frac{1}{2}'$ of position from a correct result; in finding the ship's position by Sumner's method a margin of $2\frac{1}{2}'$ will be allowed.
- (b.) In such problems as the "amplitude" and "altazimuth," where the bearing, deviations, &c., only are required, a margin of 3' or 4' from a correct result will be sufficiently accurate.
- (c.) Candidates for ordinary certificates are not required to correct for *second differences* in taking out the quantities from the "Nautical Almanac"; and even candidates for extra certificates are only required to show that they are acquainted with the method of *second differences* by correcting the elements for same in the chronometer problem.
- (d.) In solving the time-azimuth problems, an answer not exceeding half a degree from the exact result will be sufficiently near. But in all cases the actual latitude, declination, and time used, together with the exact bearing from the north or south as given in the tables, must be clearly shown by the candidate on his papers.
- (e.) In computing the time at which a given star will be on the observer's meridian, and the name of the stars near the meridian (sections *b* and *e* of par. 37), an approximation only is required, and it will be sufficiently precise if the candidate works throughout with the nearest minute of time. In computing the approximate meridian altitude of a star (section *g*), working throughout with the nearest minute of arc will also be sufficiently close.
- (f.) In interpolating for the correct deviation to be applied in solving the chart questions, it will usually be sufficient if the candidate works throughout with the nearest degree of deviation taken from the deviation-card; and even in cases where the deviations may vary but little, the nearest half-degree used throughout will be sufficiently precise. It is not necessary that the candidate should waste his time in solving the course to odd minutes, as is sometimes done.
- (g.) In calculating the correction to apply to soundings, the candidate is not required to work to

the exact inch, as is sometimes done. It will be sufficient if he brings his answer within half a foot or so of a precise result.

It must be clearly understood, in reading the foregoing instructions as to the precision required, that they only apply when the work of the candidate is correct in principle.

195. A candidate will not be allowed to undergo examination twice in the same week, unless, under very special and urgent circumstances, the Marine Department sees fit to relax this rule. In that case a different set of problems should be given to the candidate.

APPENDICES.

APPENDIX A.

THE SIGHT-TESTS.

THESE tests must be conducted under the strict personal supervision of the Examiner. A careful record must be kept of all mistakes made by the candidate in the form-vision test, and on *no account whatever* must a candidate be allowed to make his selections in the colour-vision test during any temporary absence of the Examiner.

Each Examiner must keep a record of all candidates passed by him for reference when required.

1. FORM-VISION TEST.

(1.) The test for form-vision is the first test which the candidate is required to undergo, and until he has passed this test he cannot be allowed to proceed further with the examination. (See par. 11.)

(2.) The test to be used is the letter test on Snellen's principle for all candidates.

The sets of tests which have been supplied to the Examiners consist of eight sheets of letters.

(3.) The chief object of the tests for form-vision is to show whether the candidate possesses eyesight of sufficient strength and acuity, or, in other words, they are means of discovering whether the candidate has good or bad sight.

They also afford a means of detecting whether a candidate is suffering from that form of colour-blindness which is caused by the excessive use of tobacco, and by illness or similar affections. All candidates who are suffering from colour-blindness arising from causes of that nature will be found to be incapable of passing the tests for form-vision.

(4.) Candidates will be tested with each eye separately, and they must not be allowed to use spectacles or glasses of any kind.

The set of tests is to be hung on the wall, *in a good light*, at a height of about 5 ft. or 6 ft. from the ground.

(5.) The candidate should be placed at a distance of exactly 16 ft. from the letter-test sheets, and exactly opposite them. The distance should be carefully measured, and never varied under any circumstances whatever.

One of the eight sheets of letters should then be exposed, and the candidate should be asked to read the letters, beginning at the top and going downwards. If he can read correctly nine of the twelve letters in the sixth line from the top and eight of the fifteen letters in the seventh line with one eye, and the whole of the eight letters in the fifth line with the other eye, he may be considered to have passed the test. If he cannot do so his case should be submitted to the Principal Examiner of Masters and Mates.

(6.) All candidates must be tested with at least two sheets of letters—viz., one to each eye—and the order of the test-sheets must be varied with different candidates.

In cases of candidates failing to reach the required standard, they should be tested with at least eight sheets—viz., four to each eye—and the result noted on the Form Exn. 17*b*.

(7.) The Examiner must take care, by varying the test-sheets in form-vision, and by every other means, to guard against the possibility of any deception on the part of the candidates.

(8.) Every candidate who fails to pass the form-vision test is to be examined with the pellet-test as follows: The pellets should be placed on a white plate, and the first test-pellet (which is of the same colour as the first wool-test skein) should then be placed a little distance from the box on another white plate. The candidate should be required to pick out and lay by the side of the test-pellet all pellets of the same colour. The same should be done with the other test-pellets, and the examination should proceed in the same way as the wool test.

(9.) Should the candidate pass the pellet test, the Form Exn. 17*b*, properly filled up, together with the remarks of the Examiner, is to be forwarded to the Principal Examiner for his instructions as to whether the candidate is or is not to be regarded as having failed in form-vision.

(10.) Should, however, the candidate fail in the pellet test, thus indicating that the defective form-sense is due to disease, &c., it will not be necessary to submit the case to Wellington, but the Examiner should report the candidate as having failed in form-vision, and in forwarding the usual papers a description of the colours of the pellets incorrectly selected as matches in the respective tests, with any remarks, should be given on the Form Exn. 17*c*, in the space allotted for the incorrect wools.

(11.) The result of every test in form-vision is to be reported to the Marine Department, on the Form Exn. 2, and to the Principal Examiner of Masters and Mates on the Form Exn. 14, when the candidate is up for examination for a certificate; and to the Marine Department on the Form Exn. 2*b* when the candidate is up for examination in colours only.

All cases of failure to pass the test are also to be reported to the Principal Examiner of Masters and Mates on Form Exn. 17*b*.

2. COLOUR-VISION TEST.

(1.) The colour-vision of candidates is to be tested by means of Holmgren's wools.

The wools are always to be kept in the tins provided for the purpose, except when in use at an examination, in order that they may not become faded or dirty. Each set contains about 135 skeins of wool.

(2.) Before the examination commences the skeins should be separated from one another, but each separate skein should be kept tied up as when first received.

The five test-skeins which must *always* be used at each examination, and in the order named, are labelled respectively I (light green), II (pink), III (red), IV (purple), and V (yellow).

Care must be taken that the labels do not get detached.

The colour-vision test should be held only by daylight. If a good natural light is not obtainable the test must be postponed. When the weather is dark or foggy, and a candidate cannot be examined in colours before his examination in navigation commences, he may be allowed to proceed with the examination in navigation, provided he is examined in colours on the first available opportunity.*

Full instructions as to the conduct of the examination will be found in this appendix.

* When the examination in navigation precedes the colour-tests the candidates should be informed that the examination in navigation will be cancelled if they should fail to pass the colour-tests.

(3.) The Examiner, as the examination proceeds, should carefully place on one side the skeins, the selection of which by the candidate seems to indicate a defect in colour-vision, taking care to discriminate between those selected as matching each of the five test-skeins.

The skeins, which have been correctly selected should be returned to the general heap on the completion of each of the five tests.

(4.) In every case in which the Examiner rejects a candidate, or is in doubt as to whether he should reject him or not, he is, when the examination is finished, to cut a small piece (say, an inch) off *every one of the actual skeins incorrectly selected by the candidate*, and to stitch the pieces cut off on to Form Exn. 17*c*, keeping the pieces cut off the skeins selected as matches to the first test-skein in one line, the pieces cut off the skeins selected as matches to the second test-skein in a second line, and the pieces cut off the skeins selected as matches to the third test-skein in a third line, and similarly for the fourth and fifth tests. The Form (Exn. 17*c*) with the pieces of wool attached to it is then to be forwarded to the Principal Examiner of Masters and Mates, with the Examiner's report, on Form Exn. 17*b*.

The greatest care must be taken that the pieces forwarded are cut off the actual skeins selected by the candidate, in order that there may be a reliable record of the actual selections made by the candidate if any question should subsequently arise.

Pieces need not be cut off the test-skeins, but only off the skeins incorrectly selected by the candidate.

(5.) The Examiner should also note any incorrect skeins selected and withdrawn or seriously handled or compared with the test-skein by the candidate, and should when this occurs submit the case with similar portions of the incorrect skeins and his remarks on Form Exn. 17*c*, together with the Form Exn. 17*b*, to the Principal Examiner for his decision as to whether the candidate should be passed or failed.

(6.) In cases in which the candidate passes the test, pieces need not be cut off the skeins he has selected.

(7.) During the colour-vision test the Examiner should avoid naming the colours of any of the wools, and should explain to the candidate that he does not require them to be named to him.

In the test for colour-ignorance the candidate has to name three colours.

(8.) As soon as the skeins become discoloured, or unduly reduced in size (say, by one-third), owing to pieces having been cut off, application should be made to the Marine Department by the Examiner for a new set.

(9.) In the remarks which follow reference is made to different kinds of colour-blindness (red blindness and green blindness), but the Examiner is not required to form any conclusion as to the kind of colour-blindness from which the candidate suffers, and should not offer the candidate any opinion on this point.

All that is required is that the Examiner shall conduct the examination according to the rules laid down, the nature of the candidate's colour-blindness being immaterial.

(10.) The result of every test should be reported to the Marine Department on the Form Exn. 2, and to the Principal Examiner of Masters and Mates on the Form Exn. 14, when the candidate is up for examination for a certificate of competency; and to the Marine Department on the Form Exn. 2*b* when the candidate is up for examination in colours only.

All cases of failure should also be reported to the Principal Examiner of Masters and Mates on Form Exn. 17*b*, to which should be attached Form Exn. 17*c*, containing the pieces of the wools incorrectly selected by the candidate. (See par. 4.)

Method of Testing for Colour.

The method of testing consists in asking the candidate to select from variously coloured objects those which

appear of the same colour as one which the Examiner selects. The most suitable objects and at the same time the most readily obtainable are skeins of wool, which can be procured of almost every desired hue and tone. An advantage of skeins of wool, besides their portability, is that, owing to their want of gloss, they appear of approximately the same tone from whichever side they are viewed. The colours of the skeins to be selected include reds, oranges, yellows, yellowish-greens, pure greens, blue-greens, blues, violets, purples, pinks, browns, and greys. Several shades of each colour, with at least five gradations of each tint, are provided, from the deepest to the lightest greens and greys. Varieties of pinks, blues, and violets, and of light grey, together with shades of brown, yellow, red, and pink, are well represented. The test-skeins with which the examinees are to compare the other skeins are five in number—(1) a light green, (2) a pink, (3) a bright red, (4) a purple, and (5) a yellow. These five colours will suffice to indicate approximately the amount and kind of colour-blindness which may exist. The light-green skein, which is a tolerably pure green mixed with a large proportion of white, is chosen as the colour which closely matches the spectrum colour which the red and green blind distinguish as white or grey. It is chosen of a pale tint, as it then becomes puzzling to the colour-blind to distinguish its colour by luminosity. A light-grey or drab skein will represent the same brightness to him that this pale colour does, and, although he may be trained to distinguish bright colours by their relative luminosities, in the case of these pale varieties he will be unable to do so. The pink is chosen for similar reasons, and, in fact, it is nearly a complementary colour to the green. The pink is, according to the Young-Helmholtz theory, a mixture of two fundamental colours, the blue and the red, and as in the green blind it excites both the blue and red sensations it may be confused with grey, or with a green. In the red colour-blind it excites in excess the blue sensations mixed with what they call white. A blue or violet may therefore be matched with it.

The method of examination is as follows:—

Method of Examination and Diagnosis.

The wools are placed in a heap on a large table covered by a white cloth or white paper, and in broad daylight. The first test-skein is taken from the pile, and laid far enough away from the others not to be confounded with them during the examination. The person examined is requested to look carefully at the test-skein and then to select other skeins from the pile most nearly resembling it in colour, and to place them by the side of the sample. At the outset it is necessary that he should thoroughly understand that he is required to search the heap for the skeins which make an impression on his chromatic sense or sense of colour, similar to that made by the test-skein, and quite independently of any name he may give the colour. The Examiner should explain that resemblance in every respect is not necessary; that there are no two specimens exactly alike; that the only question is the resemblance of the colour; and that, consequently, the candidate must endeavour to find something similar in shade and something lighter and something darker of the same colour.

If the person examined cannot succeed in understanding this by a verbal explanation, *resort must be had to action.* The Examiner should himself pick out the skeins, thereby showing in a practical manner what is meant by a shade, and then restore the whole to the pile, except the sample skein. *This should always be done before a candidate is reported as failed.*

As it would require too much time to examine every individual in this way, it is advisable, when examining large numbers, to instruct them all at once, and to ask

them to attentively observe the examination of those preceding them so as to become more familiar themselves with the process. This saves time, and there is no loss of security, for no one with a defective chromatic sense will be able to find the correct skeins in the heap the more easily from having a moment before seen others looking for and arranging them. He will make the same characteristic mistakes; but the normal observer, on the other hand, will generally accomplish his task much better and more quickly after having seen how it has to be done.

The coloured plate shows the test-colours—that is, those which the Examiner presents to the persons examined.

As to the similarity between the confusion-colours and the wools which the colour-blind take from the heap, reliance must be placed simply on the hue, and not their brightness or degree of colour-saturation.

We can now pass directly to the test itself. The following are the directions for conducting it, and for making a diagnosis of the results:—

TEST I.—The *green* test-skein, which is labelled Test No. I in the bundle, is placed before the candidate. This sample is the palest shade (the lightest) of very pure green, which is neither a yellow-green nor a blue-green to the normal eye, but fairly intermediate between the two, or at least not verging upon yellowish-green.

Rule.—The examination must continue until the examinee has placed near the test-skein all or nearly all the skeins of the same colour, or else, with these or separately, one or more incorrect skeins, or until he has sufficiently proved that he can easily and unerringly distinguish the correct colours, or else has given unmistakable proof of a difficulty in accomplishing it.

Diagnosis.—An examinee who places with the test-skein “incorrect colours”—that is to say, who thinks that they resemble the “test-colour”—is *colour-blind*, whilst if he evinces a manifest disposition to do so, though he does not absolutely do so, he has a *feeble chromatic sense* or sense of colour.

TEST II.—The *pink* skein, which is labelled No. II, is placed before the candidate. The colour is midway between the lightest and darkest. It only approaches that given as II of the plate, as the colour of the wool is much more brilliant and saturated, and bluer.

Rule.—The trial must be continued until the examinee has placed all or the greater part of the skeins of the same colour near the test-skein, or else, together or separately, several incorrect skeins. If he is colour-blind he will probably select either the light or deep shades of blue and violet, especially the deep, or the light or deep shades of one kind of green or grey inclining to blue.

TEST III.—The *red* skein labelled No. III is placed before the candidate. It is necessary to have a vivid red colour, like the red flag used as signals on railways. The colour should be that of III of the plate, rather towards yellowish-red.

Rule.—This test should be continued until the person examined has placed beside the test-skein the greater part of the skeins belonging to this hue, or else several “incorrect skeins.”

TEST IV.—The *purple* skein labelled No. IV is placed before the candidate.

Rule.—This test should be continued until the person examined has placed beside the test-skein all or nearly all of the skeins belonging to that colour, or else several incorrect skeins. If he is colour-blind he will most probably select any shade of blue or green, also pinks and greys.

TEST V.—The *yellow* skein labelled No. V is placed before the candidate.

Rule.—This test should be continued until the person examined has placed beside the test-skein all or nearly

all of the skeins belonging to that colour, or else several incorrect skeins. If he is colour-blind he will most probably select greenish - yellows, light yellow - greens, fawns, and pinks.

Remark.—Every case of comparatively complete colour-blindness does not always give precisely the same mistakes. Instances occur of persons who are not completely colour-blind, or of completely colour-blind persons who have been practised in the colours of signals, and who endeavour not to be discovered. They usually confound at least green and brown, but even this does not always happen.

Monochromatic Vision.—The absence of every colour sensation except one will be recognised by the confusion of all the hues, which will appear to be of the same intensity of light or brightness.

Special Instructions to Examiners.

In the conduct of the colour-test the sole question under consideration is whether or not the candidate has normal colour-vision, and, in order to answer this question satisfactorily, no pains must be spared by the Examiner to make the candidate fully understand what he is expected to do. As the result of the local examination often hinges upon the adequacy or otherwise of the instruction given to the candidate, together with the intelligent interpretation of the rules laid down for the guidance of the Examiner, it is very important that Examiners should be able to modify their mode of procedure with different candidates in order to gain the best results from the varied types which come up for examination in these tests.

Before going into the question of how to treat different cases, Examiners should always bear in mind that no amount of verbal explanation is equivalent to practical instruction, and as the test is in no wise vitiated by being seen beforehand, opportunity should be given, when possible, to prospective candidates to see others tested. Candidates undergoing the colour-test may be broadly divided into two classes, irrespective of whether they are colour normal or not—viz., (a) those who make a rapid selection of a large number of skeins to the required test, and (b) those who are slow and hesitating.

In the majority of cases the simple request by the Examiner for the candidate to “pick out from the heap of wools all those skeins which are of the same colour—both lighter and darker—as the test-skein” will be found sufficient, but where a candidate shows a tendency to pick out a large number of skeins which even remotely resemble the test-skein in colour as in (a) he should at once be stopped, and be given to understand that it is not desired that the original test-colour should be graded off into another—i.e., by his introduction of, say, yellow-green skeins into the first test he can easily be shown that a simple graduation of shade will speedily land him in yellow, or a very near approach to it. This can best be demonstrated by the Examiner taking one of the shades of yellow-green verging on yellow and placing it beside the test-skein, at the same time asking the candidate if it is the same colour, when, if the candidate is colour normal he will very likely at once remark that it is too yellow. The candidate should then be told to return the whole of his selections to the heap, and, after reshuffling them, be made to commence afresh, when in all probability he will understand what is required and the test will be rapidly completed. The same remarks apply to cases where the blue-green range of skeins is introduced.

It will be seen that the introduction of these mixed green skeins need not be taken as a positive indication of defective colour-vision, as the chances are that these selections are made through ignorance of what is required. Should, however, the candidate introduce

amongst the selections any obviously incorrect skeins—i.e., skeins in which there is no green—the Examiner must proceed carefully, noting at the same time any tendency to handle incorrect skeins and to compare them with the test-skein. In cases of this kind, when there are other candidates up for examination, it is best to postpone the trial until the candidate has had an opportunity of seeing what is done by others, or, failing this, the Examiner himself should pick out all the correct skeins to the test, showing the candidate what he is expected to do. If the candidate has defective colour-vision the same characteristic mistakes will be made. The second case (b)—where a candidate is slow and hesitating—may be due to several causes—nervousness, anxiety as to result, real or fancied defective colour-vision, &c. All candidates, the latter especially, must be tactfully dealt with, in order to get the best results from the examination. Candidates of this latter type often evince a tendency to obstruct their work by gathering up handfuls of the skeins with one or both hands and turning them over without any result, at the same time bending over the wools in a more or less strained position. The Examiner should then quietly tell the candidate to stand back a moment, and, having spread out the skeins again, tell him to put his hands by his side, look at the heap of wools, and when he thinks he sees a skein of the required colour to pick it up and place it beside the test-skein, at the same time showing him practically what he means him to do. This will tend to reassure him, and at the same time give him a chance of seeing the skeins required, and the test should be continued until all or nearly all the correct skeins have been picked out. Again, candidates will be found who show a tendency to compare skeins with the test-skein, and if not exactly the same shade (though perhaps quite correct in colour) to reject them. This is very likely due to failure to understand the instructions given by the Examiner, and the candidate should then be reminded that he will find no exact match, but that several shades of the same colour, both lighter and darker, are to be found in the heap. Should he, however, evince a tendency to compare obviously incorrect skeins with the test-skein, careful note should be taken of the colours. Candidates of this type, whose colour-vision is defective, and who may be aware of the defect, will probably select few wools on the chance that what they pick out may be correct. It is accordingly essential that in all cases a fair number of skeins to each test should be required, as the colour-blind candidate may, of course, pick out correct skeins as well as incorrect ones, since all look more or less alike to him. The experienced Examiner can usually recognise such cases by the tentative manner in which the various skeins are handled; and, although the candidate may not actually compare incorrect skeins with the test-skein, the fact that he has seriously handled them with a view to selection should be carefully noted.

When the candidate has successfully passed the first test, as a rule, the other tests will be passed easily; but the same care must be taken to see that the test-colour, and that only, is selected, or if incorrect colours are seriously handled or compared with the test-skein, a careful note must be taken as before.

In no case should an Examiner pick up incorrectly selected skeins and ask the candidate, “Do they match the test?” If the Examiner is not satisfied that the candidate knows what he is expected to do, the whole of the wools should be returned to the heap, and the test commenced anew, when, if the candidate is really defective in colour-sense, the same characteristic mistakes will be made.

Examiners should bear in mind that these tests should always be conducted in a good light. The skeins of wool should be placed on a table covered with a white cloth or paper of sufficient size, so that ample room is

given for the candidate to search the heap and place his selections well clear of both the heap of wools and the test-skein. It is also advisable that the table should be placed so that a strong sunlight should not fall directly on the wools and white table-cover, as this has rather a dazzling effect upon the eyes.

In view of the extreme importance of the proper and efficient conduct of these colour-tests, Examiners should strictly adhere to the rules laid down, and on no account should candidates be passed who make incorrect selections, though they may be subsequently withdrawn, or who seriously handle or compare incorrect skeins. All such cases should be submitted to the Principal Examiner for his decision.

3. COLOUR-IGNORANCE TEST.

(1.) The object of this test is simply to ascertain whether the candidate knows the names of the three colours—red, green, and white—which it is important for every seaman to be acquainted with, and the test is to be confined to naming those colours.

(2.) One or two of the purest red and green skeins should be selected from the set of wools, and the candidate should be required to name their colours. He should also be required to name the colour of any white object, such as a piece of white paper.

(3.) If he answers correctly he should be considered to have passed the test. If he makes any mistake he should be failed.

(4.) The result of every test should be reported to the Marine Department on the Form Exn. 2, and to the Principal Examiner of Masters and Mates on the Form Exn. 14, when the candidate is up for examination for a certificate of competency; and to the Marine Department on the Form Exn. 2b, when the candidate is up for examination in colours only.

All cases of failure should be reported to the Principal Examiner of Master and Mates on Form Exn. 17b.

APPENDIX B.

EXAMINATION-DAYS.

SIGHT-TESTS.

Auckland: Saturday morning, from 10 to 12, by the Examiners of Masters and Mates.

Wellington: Saturday morning, from 10 to 12, by the Examiners of Masters and Mates.

Lyttelton: Saturday mornings, from 10 to 12, by the Examiner of Masters and Mates.

Port Chalmers: Saturday morning, from 10 to 12, by the Examiner of Masters and Mates.

MASTERS' AND MATES' CERTIFICATES.

Auckland: Monday in each week.

Wellington: Monday in each week.

Lyttelton: Monday in each week.

Dunedin: Monday in each week.

APPENDIX C.

DEFINITION PAPER.

The candidate is required to write a short definition or answer, accompanied by a rough sketch or diagram, where applicable, in the case of so many of the following questions as may be marked with a cross by the Examiner. The Examiner will mark not less than ten. Candidates must write clearly and pay attention to the spelling.

1. Great circles.
2. Vertex of a great circle.
3. Small circles.
4. Vertical circles.
5. Right angle.
6. Oblique angle.
7. Obtuse angle.
8. Spherical angle.
9. Arc.
10. Complement of an arc or angle.
11. Supplement of ditto.
12. The Equator.
13. The poles.
14. A meridian.
15. The ecliptic.
16. The tropics.
17. Equinoctial.
18. The visible horizon.
19. The sensible horizon.
20. The rational horizon.
21. Artificial horizon and its use.
22. Parallels of latitude.
23. Difference of latitude.
24. Meridional parts.
25. Longitude.
26. Difference of longitude.
27. Departure.
28. Nautical mile.
29. Rhumb line.
30. Prime meridian.
31. First point of Aries.
32. Prime vertical.
33. Civil time.
34. Astronomical time.
35. Sidereal time.
36. Mean time.
37. Apparent time.
38. Equation of time; why it is used, when it is at a maximum, and when at a minimum.
39. Hour angle of a celestial object.
40. Observed altitude.
41. Apparent altitude.
42. True altitude.
43. Zenith distance.
44. Azimuth.
45. Amplitude.
46. Declination.
47. Polar distance.
48. Right ascension.
49. Dip or depression of the horizon.
50. Refraction.
51. Parallax.
52. Semi-diameter.
53. Augmentation of moon's semi-diameter.
54. Magnetic meridian.
55. True course of a ship.
56. Magnetic course.
57. Compass course.
58. Variation of the compass.
59. Deviation of the compass, and how it is caused.
60. The error of the compass.
61. Lee-way.
62. Does the variation change with time?
63. Is the variation the same all over the world?
64. Where do you find variation?
65. Does the deviation change; if so, when?
66. Where is the North Magnetic Pole situated?
67. Where is the South Magnetic Pole situated?
68. Should the compass-needle point to the Magnetic or the true Pole of the earth?
69. When is the altitude of an object most seriously affected by refraction?
70. Where is the Pole Star situated?
71. Which is the most favourable time for determining the hour angle of a celestial body, and thence the longitude, and state the reason why?
72. Describe the construction of a mariner's compass.
73. Describe an azimuth compass.
74. Describe a pelorus, and its use.
75. Describe a chronometer, and its use.

APPENDIX D.

EXAMINATION IN SIGNALLING.

The examination in signalling should in all cases and for all grades commence with an examination in the International Code and be followed by an examination in the British Signal Manual, including Morse flashing, flag-waving, and semaphore.

International Code.—Examiners are recommended to frame the examination in the International Code of

Signals upon the instructions and illustrations given at the commencement of Parts I and II of the Signal-book. The information there given will be found sufficient to indicate all the characteristics of the code.

By the form of the hoist, an observer can at sight understand the nature of any signal he sees flying; the examination should, therefore, tend to elicit a clear knowledge of all the distinctive features of the code.

With this object in view, the Examiners should question the candidates as to the distinguishing forms of the respective hoists, which will be indicated according as a burgee, a pennant, or a square flag is uppermost, and also with regard to the number of flags, and the position of the code flag when used in the hoist; making the 1, 2, 3, and 4 flag signals with the flags supplied for the purpose, and varying the signals made, showing 2 and 3 flag signals, with and without the code flag included, or a geographical or a vocabulary signal, the name of a merchant ship or of a ship of war.

As the two latter signals would not be found in the Signal-book, the candidate should know where to find them and how to look them out.

The candidate should—(a) Be able to read a signal at sight, so far as to name the flags composing the hoist; (b) know the use of the code pennant and of the pennants C and D, "Yes" and "No," also of the two burgees A and B, and the square flags S and P, and the flags used to indicate cholera, plague, &c., on board, and the quarantine flag; (c) be required to signal some word or words not included in the vocabulary of the code, either by letters or by the spelling table (page 516) or both; (d) have a knowledge of the distant signals, and of their object, and the different modes of signalling therewith; (e) know the special Morse signals indicated by certain letters as given on page 550; (f) have a good knowledge of the distress signals and understand the penalty which may be incurred by their improper use.

The International Code is used on board His Majesty's ships, and it has been adopted by all the principal maritime Powers for their public as well as merchant ships.

British Signal Manual.—Candidates will be expected to know the meaning of any or all of the single flag signals given therein, and the signification of the Pilot Jack when incorporated in a hoist. They should also be required to make or read from the Pilot Jack table a hoist given by the Examiner. Candidates need not be expected to commit the Pilot Jack table to memory, but there should be no hesitation whatever in making or reading a signal. They should also know how to recognise any of the special signals given at the end of the British Signal Manual.

For the ordinary examination candidates should be required to read Morse letters made slowly and with a reasonable interval, say, 3 to 5 seconds, between each letter by both flashing lamp and flag-waving, and also be able to read letters made either by hand flags or mechanical semaphore with the same interval allowed between the letters. They must also be able to make any given letters by any of these methods. A short sentence may be used for both making and reading.

For the extra master's certificate and the voluntary examination in signalling the standard of efficiency required is as follows:—

Candidates must be capable of sending and reading signals made by (1) semaphore, at a rate of ten words per minute; (2) Morse, flashing and flag-waving, at a rate of six words per minute (the average length of a word to be calculated at five letters).

The semaphore test will be a spelling message of fifty words.

The Morse, flashing and flag-waving, test will be a test message (see British Signal Manual), followed by a spelling message of twenty-five or thirty words.

The candidate must attain a degree of accuracy of at least 90 per cent. both in making and reading in each method—*i.e.*, flashing, flag-waving, and semaphore.

In the examination in Morse flashing and flag-waving the candidate should be first required to make a test message, followed by a spelling message of twenty-five or thirty words. The Examiner should then make a test message followed by a spelling message of twenty-five or thirty words to be read by the candidate.

The same procedure must be observed in the semaphore examination, except that, as a test message is not given, the candidate will be required to make a spelling message of fifty words and then to read a message of fifty words made by the Examiner. The semaphore messages may be made either by hand flags or mechanical semaphore, or both, at the discretion of the Examiner.

In the Morse flashing and flag-waving examination, marks will be allotted for the test message in the proportion of 50/78 of a mark for each correct letter (see table at back of test-cards), and for the spelling message 2 marks for each correct word or group of figures. The candidate must for a pass gain an aggregate of at least 90 per cent. of the maximum marks in both spelling and test messages.

In the semaphore examination 2 marks will be allotted for each correct word and 90 per cent. of the maximum must be obtained for a pass.

The spelling message is left to the discretion of the Examiner, and may be a passage from any book or newspaper in English. When the passage contains figures, and the candidate does not choose to spell them out, the Examiner should see that the proper signs are made before and after the figures.

The message as read by the candidate should be taken down by another candidate, clerk, or other person according as the Examiner may deem expedient.

Candidates should be thoroughly tested in the various signs and the procedure of calling up, sending and answering a signal, as laid down in the British Signal Manual, and this course should always be strictly adhered to.

Particular attention should be paid by Examiners to the accurate spacing of the Morse signs, and to the intervals between letters and words, both in flashing and flag-waving, and also to the correct making of the semaphore signs. Any attempted increase of speed at the expense of accuracy should be discouraged.

The block-letter test and spelling message as read by the candidate should be forwarded on the Form Exn. 19a, together with the percentage of marks allotted and report on the Form Exn. 19b, to the Principal Examiner, with any remarks the Examiner may have to add with respect to the examination.

Note.—The International Code of Signals, with the signal letters of British ships, is prepared by the Registrar-General of Shipping and Seamen, and may be obtained of the publishers, Messrs. Spottiswoode and Co., 54 Gracechurch Street, London, and the principal booksellers at the various ports: price, 4s. 6d.

The Official Mercantile Navy List and Maritime Directory may be obtained in like manner, price 12s.

The British Signal Manual, which in the next edition will be entitled "The British Signal Manual, authorised for use between His Majesty's Ships and British Merchant Vessels, British Merchant Vessels and one Another, and certain Signal Stations," may be obtained, either directly or through any bookseller, from Messrs. Wyman and Sons, Fetter Lane, London, E.C.; price, 1s.

APPENDIX E.

REGULATIONS FOR PREVENTING COLLISIONS AT SEA.

(Order in Council of the 27th November, 1896.)

SCHEDULE I.

Preliminary.

These rules shall be followed by all vessels upon the high seas, and in all waters connected therewith navigable by sea-going vessels.

In the following rules every steam-vessel which is under sail and not under steam is to be considered a sailing-vessel, and every vessel under steam, whether under sail or not, is to be considered a steam-vessel.

The word "steam-vessel" shall include any vessel propelled by machinery.

A vessel is "under way" within the meaning of these rules when she is not at anchor or made fast to the shore or aground.

Rules concerning Lights, &c.

The word "visible" in these rules, when applied to lights, shall mean visible on a dark night with a clear atmosphere.

Art. 1. The rules concerning lights shall be complied with in all weathers from sunset to sunrise, and during such time no other lights which may be mistaken for the prescribed lights shall be exhibited.

Art. 2. A steam-vessel when under way shall carry—

- (a.) On or in front of the foremast, or if a vessel without a foremast, then in the fore part of the vessel, at a height above the hull of not less than 20 ft., and if the breadth of the vessel exceeds 20 ft., then at a height above the hull not less than such breadth, so, however, that the light need not be carried at a greater height above the hull than 40 ft., a bright white light so constructed as to show an unbroken light over an arc of the horizon of twenty points of the compass, so fixed as to throw the light ten points on each side of the vessel—viz., from right ahead to two points abaft the beam on either side—and of such a character as to be visible at a distance of at least five miles.
- (b.) On the starboard side a green light so constructed as to show an unbroken light over an arc of the horizon of ten points of the compass, so fixed as to throw the light from right ahead to two points abaft the beam on the starboard side, and of such a character as to be visible at a distance of at least two miles.
- (c.) On the port side a red light so constructed as to show an unbroken light over an arc of the horizon of ten points of the compass, so fixed as to throw the light from right ahead to two points abaft the beam on the port side, and of such a character as to be visible at a distance of at least two miles.
- (d.) The said green and red side-lights shall be fitted with inboard screens projecting at least 3 ft. forward from the light, so as to prevent these lights from being seen across the bow.
- (e.) A steam-vessel when under way may carry an additional white light similar in construction to the lights mentioned in subdivision (a). These two lights shall be so placed in line with the keel that one shall be at least 15 ft. higher than the other, and in such a position with reference to each other that the lower light shall be forward of the upper one. The vertical distance between these lights shall be less than the horizontal distance.

Art. 3. A steam-vessel when towing another vessel shall, in addition to her side-lights, carry two bright white lights in a vertical line one over the other, not less

than 6 ft. apart, and, when towing more than one vessel, shall carry an additional bright white light 6 ft. above or below such lights, if the length of the tow, measuring from the stern of the towing-vessel to the stern of the last vessel towed, exceeds 600 ft. Each of these lights shall be of the same construction and character, and shall be carried in the same position, as the white light mentioned in Article 2 (a), except the additional light, which may be carried at a height of not less than 14 ft. above the hull.

Such steam-vessel may carry a small white light abaft the funnel or aftermast for the vessel towed to steer by, but such light shall not be visible forward of the beam.

Art. 4. (a.) A vessel which from any accident is not under command shall carry at the same height as the white light mentioned in Article 2 (a), where they can best be seen, and, if a steam-vessel, in lieu of that light, two red lights in a vertical line one over the other, not less than 6 ft. apart, and of such a character as to be visible all round the horizon at a distance of at least two miles; and shall by day carry in a vertical line one over the other, not less than 6 ft. apart, where they can best be seen, two black balls or shapes, each 2 ft. in diameter.

(b.) A vessel employed in laying or in picking up a telegraph cable shall carry in the same position as the white light mentioned in Article 2 (a), and, if a steam-vessel, in lieu of that light, three lights in a vertical line one over the other, not less than 6 ft. apart. The highest and lowest of these lights shall be red, and the middle light shall be white, and they shall be of such a character as to be visible all round the horizon at a distance of at least two miles. By day she shall carry in a vertical line one over the other, not less than 6 ft. apart, where they can best be seen, three shapes not less than 2 ft. in diameter, of which the highest and lowest shall be globular in shape and red in colour, and the middle one diamond in shape and white.

(c.) The vessels referred to in this article, when not making way through water, shall not carry the side-lights, but when making way shall carry them.

(d.) The lights and shapes required to be shown by this article are to be taken by other vessels as signals, that the vessels showing them is not under command, and cannot therefore get out of the way.

These signals are not signals of vessels in distress and requiring assistance. Such signals are contained in Article 31.

Art. 5. A sailing-vessel under way, and any vessel being towed, shall carry the same lights as are prescribed by Article 2 for a steam-vessel under way, with the exception of the white lights mentioned therein, which they shall never carry.

Art. 6. Whenever, as in the case of small vessels under way during bad weather, the green and red side-lights cannot be fixed, these lights shall be kept at hand lighted and ready for use, and shall, on the approach of or to other vessels, be exhibited on their respective sides in sufficient time to prevent collision, in such manner as to make them most visible, and so that the green light shall not be seen on the port side nor the red light on the starboard side, nor, if practicable, more than two points abaft the beam on their respective sides.

To make the use of these portable lights more certain and easy the lanterns containing them shall each be painted outside with the colour of the light they respectively contain, and shall be provided with proper screens.

Art. 7. Steam vessels of less than 40 and vessels under oars or sails of less than 20 tons gross tonnage respectively, and rowing-boats, when under way, shall not be obliged to carry the lights mentioned in Article 2 (a), (b), and (c), but if they do not carry them they shall be provided with the following lights:—

(1.) Steam-vessels of less than 40 tons shall carry—

(a.) In the fore part of the vessel, or on or in front of the funnel, where it can best be seen, and at a height above the gunwale of not less than 9 ft., a bright white light constructed and fixed as prescribed in Article 2 (a), and of such a character as to be visible at a distance of at least two miles.

(b.) Green and red side-lights constructed and fixed as prescribed in Article 2 (b) and (c), and of such a character as to be visible at a distance of at least one mile, or a combined lantern showing a green light and a red light from right ahead to two points abaft the beam on their respective sides. Such lantern shall be carried not less than 3 ft. below the white light.

(2.) Small steam-boats, such as are carried by sea-going vessels, may carry the white light at a less height than 9 ft. above the gunwale, but it shall be carried above the combined lantern mentioned in subdivision 1 (b).

(3.) Vessels under oars or sails of less than 20 tons shall have ready at hand a lantern with a green glass on one side and a red glass on the other, which, on the approach of or to other vessels, shall be exhibited in sufficient time to prevent collision, so that the green light shall not be seen on the port side nor the red light on the starboard side.

(4.) Rowing-boats, whether under oars or sail, shall have ready at hand a lantern showing a white light, which shall be temporarily exhibited in sufficient time to prevent collision.

The vessels referred to in this article shall not be obliged to carry the lights prescribed by Article 4 (a) and Article 11, last paragraph.

Art. 8. Pilot-vessels, when engaged on their station pilotage duty, shall not show the lights required for other vessels, but shall carry a white light at the mast-head visible all round the horizon, and shall also exhibit a flare-up light or flare-up lights at short intervals, which shall never exceed fifteen minutes.

On the near approach of or to other vessels they shall have their side-lights lighted ready for use, and shall flash or show them at short intervals to indicate the direction in which they are heading, but the green light shall not be shown on the port side nor the red light on the starboard side.

A pilot-vessel of such a class as to be obliged to go alongside of a vessel to put a pilot on board may show the white light instead of carrying it at the masthead, and may, instead of the coloured lights above mentioned, have at hand ready for use a lantern with a green glass on the one side and a red glass on the other, to be used as prescribed above.

Pilot-vessels when not engaged on their station on pilotage duty shall carry lights similar to those of other vessels of their tonnage.

Art. 9. Fishing-vessels and fishing-boats, when under way and when not required by this article to carry or show the lights hereinafter specified, shall carry or show the lights prescribed for vessels of their tonnage under way:—

(a.) Open boats (by which is to be understood boats not protected from the entry of sea-water by means of a continuous deck), when engaged in any fishing at night, with outlying tackle extending not more than 150 ft. horizontal from the boat into the seaway, shall carry one all-round white light.

Open boats, when fishing at night, with outlying tackle extending more than 150 ft. horizontal from the boat into the seaway, shall carry one all-round white light, and, in addi-

tion, on approaching or being approached by other vessels, shall show a second white light at least 3 ft. below the first light and at a horizontal distance of at least 5 ft. away from it in the direction in which the outlying tackle is attached.

(b.) Vessels and boats (except open boats as defined in subdivision (a), when fishing with drift-nets, shall, so long as the nets are wholly or partly in the water, carry two white lights where they can best be seen. Such lights shall be placed so that the vertical distance between them shall be not less than 6 ft. and not more than 15 ft., and so that the horizontal distance between them, measured in a line with the keel, shall be not less than 5 ft. and not more than 10 ft. The lower of these two lights shall be in the direction of the nets, and both of them shall be of such a character as to show all round the horizon, and to be visible at a distance of not less than three miles. Within the Mediterranean Sea and in the seas bordering the coasts of Japan and Korea, sailing fishing-vessels of less than 20 tons gross tonnage shall not be obliged to carry the lower of those two lights; should they, however, not carry it, they shall show in the same position (in the direction of the net or gear) a white light, visible at a distance of not less than one sea mile, on the approach of or to other vessels.

(c.) Vessels and boats (except open boats as defined in subdivision (a)), when line fishing with their lines out and attached to or hauling their lines (and when not at anchor or stationary within the meaning of subdivision (b)), shall carry the same lights as vessels fishing with drift-nets. When shooting lines or fishing with towing-lines they shall carry the lights prescribed for a steam or sailing vessel under way respectively. Within the Mediterranean Sea and in the seas bordering the coasts of Japan and Korea sailing fishing-vessels of less than 20 tons gross tonnage shall not be obliged to carry the lower of these two lights; should they, however, not carry it, they shall show in the same position (in the direction of the lines) a white light, visible at a distance of not less than one sea mile, on the approach of or to other vessels.

(d.) Vessels when engaged in trawling, by which is meant the dragging of an apparatus along the bottom of the sea,—

(1.) If steam-vessels, shall carry in the same position as the white light mentioned in Article 2 (a), a tri-coloured lantern so constructed and fixed as to show a white light from right ahead to 2 points on each bow, and a green light and a red light over an arc of the horizon from 2 points on each bow to 2 points abaft the beam on the starboard and port sides respectively; and not less than 6 ft. nor more than 12 ft. below the tricoloured lantern a white light in a lantern so constructed as to show a clear, uniform, and unbroken light all round the horizon.

(2.) If sailing-vessels, shall carry a white light in a lantern so constructed as to show a clear, uniform, and unbroken light all round the horizon; and shall also, on the approach of or to other vessels, show, where it can best be seen, a white flare-up light or torch in sufficient time to prevent collision. All lights mentioned in subdivision (d) (1) and (2), shall be visible at a distance of at least two miles.

(e.) Oyster-dredgers and other vessels fishing with dredge-nets shall carry and show the same lights as trawlers.

(f.) Fishing-vessels and fishing-boats may at any time use a flare-up light in addition to the lights which they are by this article required to carry and show, and they may also use working-lights.

(g.) Every fishing-vessel and every fishing-boat under 150 ft. in length, when at anchor, shall exhibit a white light visible all round the horizon at a distance of at least one mile.

Every fishing-vessel of 150 ft. in length and upwards, when at anchor, shall exhibit a white light visible all round the horizon at a distance of at least one mile, and shall exhibit a second light as provided for vessels of such length by Article 11. Should any such vessel, whether under 150 ft. in length, or of 150 ft. in length or upwards, be attached to a net or other fishing gear, she shall on the approach of other vessels show an additional white light at least 3 ft. below the anchor light, and at a horizontal distance of at least 5 ft. away from it in the direction of the net or gear.

(h.) If a vessel or boat when fishing becomes stationary in consequence of her gear getting fast to a rock or other obstruction, she shall in daytime haul down the day-signal required by subdivision (k); at night show the light or lights prescribed for a vessel at anchor; and during fog, mist, falling snow, or heavy rain-storms make the signal prescribed for a vessel at anchor (see subdivision (d), and the last paragraph of Article 15).

(i.) In fog, mist, falling snow, or heavy rain-storms, drift-net vessels attached to their nets, and vessels when trawling, dredging, or fishing with any kind of drag-net, and vessels line-fishing with their lines out, shall, if 20 tons gross tonnage or upwards respectively, at intervals of not more than one minute, make a blast; if steam-vessels, with the whistle or syren; and if sailing-vessels, with a fog-horn; each blast to be followed by ringing the bell. Fishing vessels and boats of less than 20 tons gross tonnage shall not be obliged to give the above-mentioned signals; but if they do not, they shall make some other efficient sound signal at intervals of not more than one minute.

(k.) All vessels or boats fishing with nets or lines or trawls, when under way, shall in daytime indicate their occupation to an approaching vessel by displaying a basket or other efficient signal where it can best be seen. If vessels or boats at anchor have their gear out they shall, on the approach of other vessels, show the same signal on the side on which those vessels can pass. The vessels required by this article to carry or show the lights hereinbefore specified shall not be obliged to carry the lights prescribed by Article 4 (a) and the last paragraph of Article 11.

Art. 10. A vessel which is being overtaken by another shall show from her stern to such last-mentioned vessel a white light or a flare-up light.

The white light required to be shown by this article may be fixed and carried in a lantern, but in such a case the lantern shall be so constructed, fitted, and screened that it shall throw an unbroken light over an arc of the horizon of twelve points of the compass—viz., from six points from right aft on each side of the vessel—so as to be visible at a distance of at least one mile.

Such light shall be carried as nearly as practicable on the same level as the side-lights.

Art. 11. A vessel under 150 ft. in length, when at anchor, shall carry forward, where it can best be seen, but at a height not exceeding 20 ft. above the hull, a white light in a lantern so constructed as to show a clear, uniform, and unbroken light visible all round the horizon at a distance of at least one mile.

A vessel of 150 ft. or upwards in length, when at anchor, shall carry in the forward part of the vessel, at a height of not less than 20 ft., and not exceeding 40 ft. above the hull, one such light, and at or near the stern of the vessel, and at such a height that it shall be not less than 15 ft. lower than the forward light, another such light.

The length of a vessel shall be deemed to be the length appearing in her certificate of registry.

A vessel aground in or near a fairway shall carry the above light or lights and the two red lights prescribed by Article 4 (a).

Art. 12. Every vessel may, if necessary in order to attract attention, in addition to the lights which she is by these rules required to carry, show a flare-up light or use any detonating signal that cannot be mistaken for a distress-signal.

Art. 13. Nothing in these rules shall interfere with the operation of any special rules made by the Government of any nation with respect to additional station and signal lights for two or more ships of war or for vessels sailing under convoy, or with the exhibition of recognition signals adopted by shipowners which have been authorised by their respective Governments and duly registered and published.

Art. 14. A steam-vessel proceeding under sail only, but having her funnel up, shall carry in daytime, forward, where it can best be seen, one black ball or shape 2 ft. in diameter.

Sound Signals for Fog, &c.

Art. 15. All signals prescribed by this article for vessels under way shall be given—

(1.) By "steam-vessels," on the whistle or siren.

(2.) By "sailing-vessels and vessels towed," on the fog-horn.

The words "prolonged blast," used in this article, shall mean a blast of from four to six seconds' duration.

A steam-vessel shall be provided with an efficient whistle or siren, sounded by steam or some substitute for steam, so placed that the sound may not be intercepted by any obstruction, and with an efficient fog-horn, to be sounded by mechanical means, and also with an efficient bell.* A sailing-vessel of 20 tons gross tonnage or upwards shall be provided with a similar fog-horn and bell.

In fog, mist, falling snow, or heavy rain-storms, whether by day or night, the signals described in this article shall be used as follows, viz.:—

(a.) A steam-vessel having way upon her shall sound, at intervals of not more than two minutes, a prolonged blast.

(b.) A steam-vessel under way, but stopped and having no way upon her, shall sound, at intervals of not less than two minutes, two prolonged blasts, with an interval of about one second between them.

(c.) A sailing-vessel under way shall sound, at intervals of not more than one minute, when on the starboard tack one blast, when on the port

* In all cases where the rules require a bell to be used a drum may be substituted on board Turkish vessels, or a gong where such articles are used on board small sea-going vessels.

tack two blasts in succession, and when with the wind abaft the beam three blasts in succession.

- (d.) A vessel when at anchor shall, at intervals of not more than one minute, ring the bell rapidly for about five seconds.
- (e.) A vessel when towing, a vessel employed in laying or in picking up a telegraph cable, and a vessel under way which is unable to get out of the way of an approaching vessel through being not under command, or unable to manoeuvre as required by these rules, shall, instead of the signals prescribed in subdivisions (a) and (c) of this article, at intervals of not more than two minutes, sound three blasts in succession—viz., one prolonged blast followed by two short blasts. A vessel towed may give this signal, and she shall not give any other.

Sailing-vessels and boats of less than 20 tons gross tonnage shall not be obliged to give the above-mentioned signals; but, if they do not, they shall make some other efficient sound signal at intervals of not more than one minute.

Speed of Ships to be moderate in Fog, &c.

Art. 16. Every vessel shall, in a fog, mist, falling snow, or heavy rain-storms, go at a moderate speed, having careful regard to the existing circumstances and conditions.

A steam-vessel hearing, apparently forward of her beam, the fog-signal of a vessel the position of which is not ascertained, shall, so far as the circumstances of the case admit, stop her engines, and then navigate with caution until danger of collision is over.

STEERING AND SAILING RULES.

Preliminary.—Risk of Collision.

Risk of collision can, when circumstances permit, be ascertained by carefully watching the compass-bearing of an approaching vessel. If the bearing does not appreciably change, such risk should be deemed to exist.

Art. 17. When two sailing-vessels are approaching one another so as to involve risk of collision one of them shall keep out of the way of the other, viz. :—

- (a.) A vessel which is running free shall keep out of the way of a vessel which is close-hauled.
- (b.) A vessel which is close-hauled on the port tack shall keep out of the way of a vessel which is close-hauled on the starboard tack.
- (c.) When both are running free, with the wind on different sides, the vessel which has the wind on the port side shall keep out of the way of the other.
- (d.) When both are running free, with the wind on the same side, the vessel which is to windward shall keep out of the way of the vessel which is to leeward.
- (e.) A vessel which has the wind aft shall keep out of the way of the other vessel.

Art. 18. When two steam-vessels are meeting end-on, or nearly end-on, so as to involve risk of collision, each shall alter her course to starboard, so that each may pass on the port side of the other.

This article only applies to cases where vessels are meeting end-on, or nearly end-on, in such a manner as to involve risk of collision, and does not apply to two vessels which must, if both keep on their respective courses, pass clear of each other.

The only cases to which it does apply are when each of the two vessels is end-on, or nearly end-on, to the other; in other words, to cases in which, by day, each vessel sees the masts of the other in a line, or nearly in a line, with her own, and, by night, to cases in which

each vessel is in such a position as to see both the side-lights of the other.

It does not apply by day to cases in which a vessel sees another ahead crossing her own course, or by night to cases where the red light of one vessel is opposed to the red light of the other, or where the green light of one vessel is opposed to the green light of the other, or where a red light without a green light, or a green light without a red light, is seen ahead, or where both green and red lights are seen anywhere but ahead.

Art. 19. When two steam-vessels are crossing so as to involve risk of collision, the vessel which has the other on her own starboard side shall keep out of the way of the other.

Art. 20. When a steam-vessel and a sailing-vessel are proceeding in such directions as to involve risk of collision, the steam-vessel shall keep out of the way of the sailing-vessel.

Art. 21. Where by any of these rules one of two vessels is to keep out of the way, the other shall keep her course and speed.

NOTE.—When, in consequence of thick weather or other causes, such vessel finds herself so close that collision cannot be avoided by the action of the giving-away vessel alone, she also shall take such action as will best aid to avert collision. (See Articles 27 and 29.)

Art. 22. Every vessel which is directed by these rules to keep out of the way of another vessel shall, if the circumstances of the case admit, avoid crossing ahead of the other.

Art. 23. Every steam-vessel which is directed by these rules to keep out of the way of another vessel shall, on approaching her, if necessary, slacken her speed, or stop, or reverse.

Art. 24. Notwithstanding anything contained in these rules, every vessel overtaking any other shall keep out of the way of the overtaken vessel.

Every vessel coming up with another vessel from any direction more than two points abaft her beam—i.e., in such a position with reference to the vessel which she is overtaking that at night she would be unable to see either of that vessel's side-lights—shall be deemed to be an overtaking vessel; and no subsequent alteration of the bearing between the two vessels shall make the overtaking vessel a crossing vessel within the meaning of these rules, or relieve her of the duty of keeping clear of the overtaken vessel until she is finally past and clear.

As by day the overtaking vessel cannot always know with certainty whether she is forward of or abaft this direction from the other vessel, she should, if in doubt, assume that she is an overtaking vessel and keep out of the way.

Art. 25. In narrow channels every steam-vessel shall, when it is safe and practicable, keep to that side of the fairway or midchannel which lies on the starboard side of such vessel.

Art. 26. Sailing-vessels under way shall keep out of the way of sailing-vessels or boats fishing with nets, or lines, or trawls. This rule shall not give to any vessel or boat engaged in fishing the right of obstructing a fairway used by vessels other than fishing-vessels or boats.

Art. 27. In obeying and construing these rules due regard shall be had to all dangers of navigation and collision, and to any special circumstances which may render a departure from the above rules necessary in order to avoid immediate danger.

Sound-signals for Vessels in Sight of one another.

Art. 28. The words "short blast," used in this article, shall mean a blast of about one second's duration.

When vessels are in sight of one another, a steam-vessel under way, in taking any course authorised or

required by these rules, shall indicate that course by the following signals on her whistle or siren, viz. :—

One short blast to mean, "I am directing my course to starboard."

Two short blasts to mean, "I am directing my course to port."

Three short blasts to mean, "My engines are going full speed astern."

No Vessel under any Circumstances to neglect Proper Precautions.

Art. 29. Nothing in these rules shall exonerate any vessel, or the owner, or master, or crew thereof, from the consequences of any neglect to carry lights or signals, or of any neglect to keep a proper lookout, or of the neglect of any precaution which may be required by the ordinary practice of seamen, or by the special circumstances of the case.

Reservation of Rules for Harbours and Inland Navigation.

Art. 30. Nothing in these rules shall interfere with the operation of a special rule, duly made by local authority, relative to the navigation of any harbour, river, or inland waters.

SCHEDULE II.

*Distress Signals.**

Art. 31. When a vessel is in distress and requires assistance from other vessels or from the shore, the following shall be the signals to be used or displayed by her, either together or separately, viz. :—

In the daytime—

1. A gun or other explosive signal fired at intervals of about a minute;
2. The International Code signal of distress indicated by N.C.;
3. The distant signal, consisting of a square flag, having either above it or below it a ball or anything resembling a ball;†
4. A continuous sounding with any fog-signal apparatus.

At night—

1. A gun or other explosive signal fired at intervals of about a minute;
2. Flames on the vessel (as from a burning tar-barrel, oil-barrel, &c.);
3. Rockets or shells, throwing stars of any colour or description, fired one at a time, at short intervals;
4. A continuous sounding with any fog-signal apparatus.

Lights to be carried by Steam Pilot-vessels.

(Order in Council of the 7th July, 1897.)

A steam pilot-vessel, exclusively employed for the service of pilots licensed or certified by any pilotage authority or the committee of any pilotage district in the United Kingdom, when engaged on her station on pilotage duty, and in British waters, and not at anchor,

* If a master of a vessel uses or displays, or causes or permits any person under his authority to use or display, any of those signals of distress, except in a case of a vessel being in distress, he shall be liable to pay compensation for any labour undertaken, risk incurred, or loss sustained in consequence of that signal having been supposed to be a signal of distress; and that compensation may, without prejudice to any other remedy, be recovered in the same manner in which salvage is recoverable. (Merchant Shipping Act, section 434 (2).)

† A further distress signal is provided in the new International Code of Signals. It is a distant signal consisting of a cone point upwards, having either above it or below it a ball or anything resembling a ball. This signal has not been sanctioned by Order in Council under the provisions of section 434 of "The Merchant Shipping Act, 1894."

shall, in addition to the lights required for all pilot-boats, carry at a distance of 8 ft. below her white mast-head-light a red light visible all round the horizon, and of such a character as to be visible on a dark night with a clear atmosphere at a distance of at least two miles, and also the coloured side-lights required to be carried by vessels when under way.

When engaged on her station on pilotage duty, and in British waters, and at anchor, she shall carry, in addition to the light required for all pilot-boats, the red light above mentioned, but not the coloured side-lights.

When not engaged on her station on pilotage duty she shall carry the same lights as other steam-vessels.

EXAMINATION IN THE REGULATIONS FOR PREVENTING COLLISIONS AT SEA.

All applicants for examination, whether for certificates as masters or mates, are to be examined as to their knowledge of the regulations each time they present themselves for examination.

Questions suggested by the following heads of examination are to be asked in addition to, and are not to supersede, any other questions proper and necessary to be asked by the Examiner.

The following questions need not be adhered to literally by the Examiner, and are not all to be asked; but the substance of the leading questions should be asked; and all that are asked should be satisfactorily answered before an applicant is reported to have passed his examination. The Examiner should make such a selection of the questions as each case appears to him to require.

1. Where and by what vessels are the rules to be followed?

The rules are to be followed by all vessels upon the high seas and in all waters connected therewith navigable by sea-going vessels.

2. When is a steam-vessel considered a sailing-vessel and when a steam-vessel?

Under the rules every steam-vessel which is under sail and not under steam is to be considered a sailing-vessel, and every vessel under steam, whether under sail or not, is to be considered a steam-vessel.

3. What does the word "steam-vessel" in the rules include?

The word "steam-vessel" as used in the rules includes any vessel propelled by machinery.

4. When is a vessel considered to be under way by these rules?

When she is not at anchor, or made fast to the shore, or aground.

5. What does the word "visible" in the rules, when applied to lights, mean?

Visible on a dark night with a clear atmosphere.

6. During what time must the rules concerning lights be complied with?

In all weathers from sunset to sunrise, and during such time no other lights which may be mistaken for the prescribed lights shall be exhibited.

7. What light or lights are required by the regulations to be exhibited by sailing-vessels at anchor?

If they are under 150 ft. in length, one white light; if of 150 ft. or upwards, two white lights—one forward and one aft.

8. What light or lights are required by the regulations to be exhibited by steam-vessels at anchor?

The same as by sailing-vessels.

9. Where is the anchor-light to be exhibited in a vessel under 150 ft. in length?

Forward, where it can best be seen. It must be placed where there is the least chance of obstruction from spars, ropes, &c.; and must not be more than 20 ft. above the hull.

10. Where must the two anchor-lights be shown in vessels of 150 ft. and upwards?

In vessels of 150 ft. or upwards in length one light must be carried in the forward part of the vessel, at a height of not less than 20 ft. and not more than 40 ft. above the hull; and another light at or near the stern, not less than 15 ft. lower than the forward light.

11. In what direction or directions must the anchor-lights show?

They must show a clear, uniform, and unbroken light, visible all round the horizon.

12. At what distance must they be visible?

At least one mile.

13. What shall be deemed to be the length of a vessel?

The length appearing in the certificate of registry.

14. What light or lights must a vessel aground in or near a fairway carry?

The light or lights prescribed for a vessel at anchor, and in addition the two red lights prescribed for a vessel not under command.

15. Does this regulation apply to fishing-vessels?

No; fishing-boats are not obliged to carry these lights.

16. What is the number of lights required by the regulations to be carried by sailing-vessels when under way at night?

Two side-lights, and to have in readiness a white light or flare-up light to show from their stern to any vessel overtaking them.

17. Of what colour are these lights, and how are they to be placed on board the ship?

A green light on the starboard side, and a red light on the port side.

18. What description of light must be shown from the sides of sailing-vessels under way; and over how many points of the compass, and in what directions, and how far are they required to show?

Each light must be so constructed as to show an unbroken light over an arc of the horizon of ten points of the compass, so fixed as to throw the light from right ahead to two points abaft the beam on the starboard and port sides respectively, and of such a character as to be visible at a distance of at least two miles.

19. What lights are they to carry when being towed at night?

The same.

20. Are the side-lights required to be fitted with screens; and, if so, of what length, and how?

Yes, on the inboard side; at least 3 ft. in length measuring forward from the light, so as to prevent the light from being seen across the bow.

21. What is the number of lights required by the regulations to be carried by steam-vessels when under way at night?

Three lights, and to have in readiness a white light or flare-up light to show from their stern to any vessel overtaking them.

22. Of what colour are these lights, and how are they to be placed on board the ship?

A white light on or in front of the foremast, or if a vessel without a foremast, then in the fore part of the vessel, at a height above the hull of not less than 20 ft., and if the breadth of the vessel exceeds 20 ft., then at a height above the hull of not less than such breadth, so, however, that the light need not be carried at a greater height than 40 ft.; a green light on the starboard side, and a red one on the port side.

23. Over how many points of the compass, in what direction, and how far is the foremast head-light of a steam-vessel required to show?

Over twenty points—viz., from right ahead to two points abaft the beam on each side. It must be of such a character as to be visible at a distance of at least five miles.

24. Are the side-lights required to be fitted with screens; and, if so, of what length?

The green and red lights are to be fitted with screens on the inboard side, extending at least 3 ft. forward

from the light, so as to prevent these lights from being seen across the bow.

25. Over how many points of the compass, in what directions, and how far are the coloured side-lights of steam-vessels required to show?

The side-lights must be so constructed as to show an unbroken light over an arc of the horizon of ten points of the compass on each side of the ship—i.e., from right ahead to two points abaft the beam on the starboard and port sides respectively—and of such a character as to be visible at a distance of at least two miles.

26. May a steam-vessel when under way carry any additional light or lights?

Yes; a steam-vessel may carry a similar white light to the masthead-light. These two lights must be so placed in line with the keel that one shall be at least 15 ft. higher than the other, that the lower light shall be forward of the upper one, and that the vertical distance between them shall be less than the horizontal distance.

27. What description of lights are steam-vessels required to carry when they are not under steam, but under sail only?

Side-lights only, the same as sailing-vessels.

28. What exceptional lights may small vessels carry?

Whenever, as in the case of small vessels during bad weather, the green and red side-lights cannot be fixed, these lights shall be kept at hand lighted and ready for use, and shall, on the approach of or to other vessels, be exhibited on their respective sides, in sufficient time to prevent collision, in such manner as to make them most visible, and so that the green light shall not be seen on the port side nor the red light on the starboard side, nor, if practicable, more than two points abaft the beam on their respective sides.

To make the use of these portable lights more certain and easy, the lanterns containing them shall each be painted outside with the colour of the light they respectively contain, and shall be provided with proper screens.

29. Are steam-vessels of less than 40 tons gross tonnage compelled to carry the same lights as other steam-vessels; if not, what lights may they carry instead?

No; but if they do not carry the ordinary lights they must carry in the fore part of the vessel or on or in front of the funnel where it can best be seen, and at a height above the gunwale of not less than 9 ft., a bright white light to show over the same arc as the ordinary masthead-light, and to be visible at a distance of at least two miles. Also a combined lantern showing a green light and a red light from right ahead to two points abaft the beam on their respective sides, such lantern to be carried not less than 3 ft. below the white light.

30. Are small steamboats such as are carried by sea-going vessels obliged to carry the white light 9 ft. above the gunwale?

No; but it must be carried above the combined lantern.

31. What lights may vessels under oars or sails of less than 20 tons gross tonnage carry?

They shall have ready at hand a lantern with a green glass on one side and a red glass on the other, which, on the approach of or to other vessels, shall be exhibited in sufficient time to prevent collision, so that the green light shall not be seen on the port side nor the red light on the starboard side.

32. What lights must rowing-boats, whether under oars or sails, carry?

They must have ready at hand a lantern showing a white light, which shall be temporarily exhibited in sufficient time to prevent collision.

33. What description of lights are pilot-vessels required to carry when on their stations on pilotage duty?

A pilot-vessel, when engaged on her station on pilotage duty, shall not show the lights required for other vessels, but shall carry a white light at the masthead, visible all round the horizon, and shall also exhibit a flare-up light or flare-up lights at short intervals, which shall never exceed fifteen minutes. Also on the near approach of or to other vessels they shall have their side-lights lighted ready for use, and shall flash or show them at short intervals to indicate the direction in which they are heading, but the green light shall not be shown on the port side nor the red light on the starboard side.

34. What light may pilot-vessels which are obliged to go alongside of a vessel to put a pilot on board carry?

They may show the white light instead of carrying it at the masthead, and may, instead of the coloured side-lights, have at hand ready for use a lantern with a green glass on the one side and a red glass on the other, to be used as prescribed for the coloured side-lights.

35. What description of lights are steam pilot-vessels required to carry when on their stations on pilotage duty in British waters, and not at anchor?

A steam pilot-vessel, when engaged on her station on pilotage duty, and in British waters, and not at anchor, shall, in addition to the lights required for all pilot-vessels, carry at a distance of 8 ft. below her white mast-head-light a red light visible all round the horizon for at least two miles, and also the coloured side-lights required to be carried by vessels under way.

36. What description of lights are steam pilot-vessels required to carry when on their stations on pilotage duty in British waters, and at anchor?

A steam pilot-vessel, when engaged on pilotage duty in British waters, and at anchor, shall carry, in addition to the lights required for all pilot-vessels, the red light 8 ft. below her white light, but not the coloured side-lights.

37. What description of lights are pilot-vessels required to carry when not on their station on pilotage duty?

A pilot-vessel, when not engaged on her station on pilotage duty, shall carry lights similar to those of other vessels of her tonnage.

38. What lights are open boats and fishing-vessels of less than 20 tons net register required to carry when under way and not actually engaged in fishing?

Open boats and fishing-vessels of less than 20 tons net registered tonnage, when under way, and when not having their nets, trawls, dredges, or lines in the water, shall not be obliged to carry the coloured side-lights; but every such boat and vessel shall in lieu thereof have ready at hand a lantern with a green glass on the one side and a red glass on the other side, and on approaching to or being approached by another vessel such lantern shall be exhibited in sufficient time to prevent collision, so that the green light shall not be seen on the port side nor the red light on the starboard side.

39. What lights are fishing-vessels and fishing-boats of 20 tons net register, or upwards, required to carry when under way and not actually engaged in fishing?

They must carry similar lights to those of other ships when under way.

40. What lights do open fishing-boats carry?

Open boats when engaged in any fishing at night, with outlying tackle extending not more than 150 ft. horizontal from the boat into the seaway, shall carry one all-round white light, and, in addition, on approaching or being approached by other vessels shall show a second white light at least 3 ft. below the first light and at a horizontal distance of at least 5 ft. away from it in the direction in which the outlying tackle is attached,

41. What lights are vessels whilst actually engaged in drift-net fishing required to carry?

Vessels and boats (except open boats) when fishing with drift-nets shall, so long as the nets are wholly or partly in the water, carry two white lights where they can best be seen. Such lights shall be placed so that the vertical distance between them shall be not less than 6 ft. and not more than 15 ft., and so that the horizontal distance between them, measured in a line with the keel, shall be not less than 5 ft. and not more than 10 ft. The lower of these two lights shall be in the direction of the nets, and both of them shall be of such a character as to show all round the horizon, and to be visible at a distance of not less than three miles.

42. Does this regulation apply to all vessels under the jurisdiction of the Governments who have agreed to the general international regulations?

It applies to all such vessels, with the following exception: Within the Mediterranean Sea and in the seas bordering the coasts of Japan and Korea sailing fishing-vessels of less than 20 tons gross tonnage shall not be obliged to carry the lower of these two lights; should they, however, not carry it, they shall show in the same position (in the direction of the net or gear) a white light, visible at a distance of not less than one sea mile, on the approach of or to other vessels.

43. What lights are line-fishing vessels required to carry?

Vessels and boats (except open boats) when line-fishing with their lines out, and attached to or hauling their lines, and when not at anchor, or stationary in consequence of their gear getting fast to a rock or other obstruction, shall carry the same lights as vessels fishing with drift-nets. When shooting lines, or fishing with towing-lines, they shall carry the lights prescribed for a steam or sailing vessel under way respectively. Within the Mediterranean Sea and in the seas bordering the coasts of Japan and Korea sailing fishing-vessels of less than 20 tons gross tonnage shall not be obliged to carry the lower of these two lights; should they, however, not carry it, they shall show in the same position (in the direction of the lines) a white light, visible at a distance of not less than one sea mile, on the approach of or to other vessels.

44. What lights are steam-trawlers whilst actually engaged in trawling, and not being stationary, required to carry?

All steam-vessels engaged in trawling must carry, in the same position as the white light mentioned in Article 2 (a), a tricolour lantern so constructed and fixed as to show a white light from right ahead to 2 points on each bow, and a green light and a red light over an arc of the horizon from 2 points on each bow to 2 points abaft the beam on the starboard and port sides respectively; and not less than 6 ft. nor more than 12 ft. below the tricoloured lantern a white light in a lantern so constructed as to show a clear, uniform, and unbroken light all round the horizon. These lights should be visible at a distance of at least two miles.

45. What lights are sailing-trawlers whilst actually engaged in trawling, and not being stationary, required to carry?

All sailing-vessels whilst engaged in trawling must carry a white light in a lantern so constructed as to show a clear, uniform, and unbroken light all round the horizon; and shall also, on the approach of or to other vessels, show, where it can best be seen, a white flare-up light or torch in sufficient time to prevent collision. These lights should be visible at a distance of at least two miles.

46. What lights are oyster-dredgers and other vessels fishing with dredge-nets required to carry?

The same lights as trawlers.

47. May fishing-vessels and fishing-boats use flare-up lights?

Yes. They may at any time use a flare-up light in addition to the lights which they are required by the regulations to carry.

48. Do fishing-boats show any distinguishing lights when at anchor?

They show the same lights as ordinary vessels when at anchor, but should any fishing-vessel, whether under 150 ft. in length or of 150 ft. in length or upwards, be attached to a net or other fishing gear, she shall on the approach of other vessels show an additional white light at least 3 ft. below the anchor light, and at a horizontal distance of at least 5 ft. away from it in the direction of the net or gear.

49. What lights or day signal should a fishing-boat show when stationary in consequence of her gear getting fast to a rock or other obstruction?

If in the daytime she would haul down the basket or other distinguishing signal, and at night-time show the light or lights prescribed for a vessel at anchor.

50. What sound signals are fishing-vessels required to make when at anchor in a fog?

When at anchor they should make the same signals as ordinary vessels.

51. What sound signals are fishing-vessels required to make at other times?

In fog, mist, falling snow, or heavy rain-storms, drift-net vessels attached to their nets, and vessels when trawling, dredging, or fishing with any kind of drag-net, and vessels line-fishing with their lines out, shall, if of 20 tons gross tonnage or upwards respectively, at intervals of not more than one minute, make a blast: if steam-vessels, with the whistle or syren; and if sailing-vessels, with a fog-horn; each blast to be followed by ringing the bell. Fishing vessels and boats of less than 20 tons gross tonnage shall not be obliged to give the above-mentioned signals; but if they do not, they shall make some other efficient sound signal at intervals of not more than one minute.

52. Are fishing-vessels required to show any distinguishing signal during the daytime?

All vessels or boats fishing with nets or lines or trawls, when under way, shall in daytime indicate their occupation to an approaching vessel by displaying a basket or other efficient signal where it can best be seen. If vessels or boats at anchor have their gear out they shall, on the approach of other vessels, show the same signal on the side on which those vessels can pass.

53. What lights are steam-vessels required to carry when towing other vessels?

A steam-vessel, when towing another vessel, shall, in addition to her side-lights, carry two bright white lights in a vertical line one over the other, not less than 6 ft. apart; and when towing more than one vessel shall carry an additional bright white light 6 ft. above or below such lights, if the length of the tow, measuring from the stern of the towing vessel to the stern of the last vessel towed, exceeds 600 ft. Each of these lights shall be of the same construction and character, and shall be carried in the same position, as the white light (Article 2 (a)) which other steam-vessels are required to carry, except the additional light, which may be carried at a height not less than 14 ft. above the hull.

54. May a vessel towing carry any other light?

Yes; a small white light abaft the funnel or aftermast for the vessel towed to steer by, but such light shall not be visible forward of the beam.

55. What light is a vessel which is being overtaken by another vessel required to show?

A vessel which is being overtaken by another shall show from her stern to the other vessel a white light or a flare-up light.

56. May the white light be fixed?

Yes; but, if so, it must be so constructed and screened to show an unbroken light over an arc of the horizon of twelve points of the compass—viz., for six points

from right aft on each side of the vessel—so as to be visible at a distance of at least one mile. This light shall be carried as nearly as practicable on the same level as the side-lights.

57. Describe the lights and the day signals that vessels employed in laying or picking up a telegraph cable are required to carry.

A vessel employed in laying or in picking up a telegraph cable shall at night carry, in the same position as the white light which steam-vessels are required to carry, and, if a steam-vessel, in place of that light, three lights in a vertical line over one another, not less than 6 ft. apart; the highest and lowest of these lights shall be red, and the middle light shall be white, and they shall be of such a character as to be visible all round the horizon at a distance of at least two miles. By day she shall carry in a vertical line one over the other, not less than 6 ft. apart, where they can best be seen, three shapes not less than 2 ft. in diameter, of which the top and bottom shall be globular in shape and red in colour, and the middle one diamond in shape and white.

58. Describe the lights and the day signals that vessels which from any cause are not under command are required to carry.

A vessel which from any accident is not under command shall at night carry, at the same height as the white light which steam-vessels are required to carry, where they can best be seen, and, if a steam-vessel in place of that light, two red lights in a vertical line one over the other, not less than 6 ft. apart, and of such a character as to be visible all round the horizon at a distance of at least two miles; and shall by day carry in a vertical line one over the other, not less than 6 ft. apart, where they can best be seen, two black balls or shapes, each 2 ft. in diameter.

59. Are the above-mentioned vessels to carry side-lights?

The above vessels, when not making any way through the water, shall not carry the side-lights, but when making way shall carry them.

60. What are the shapes and lights carried by telegraph ships and ships not under command intended to indicate to approaching vessels?

These shapes and lights are to be taken by approaching vessels as signals that the ship using them is not under command, and cannot therefore get out of the way.

61. Do these rules prevent squadrons and convoys from carrying special lights, or vessels exhibiting recognition signals?

No; nothing in these rules shall interfere with the operation of any special rules made by the Government of any nation with respect to additional station and signal lights for two or more ships of war, or for vessels sailing under convoy, or with the exhibition of recognition signals adopted by ship-owners which have been authorised by their respective Governments, and duly registered and published.

62. May vessels exhibit any other lights in order to attract attention?

Yes; in addition to the lights which she is required to carry she may show a flare-up light, or use any detonating signal that cannot be mistaken for a distress signal.

63. What signal must a steam-vessel proceeding under sail only, but having her funnel up, carry in the daytime?

She must carry forward, where it can best be seen, one black ball or shape 2 ft. in diameter.

64. What sound signals are steam-vessels and sailing-vessels of 20 tons gross tonnage or upwards required by the regulations to be provided with?

A steam-vessel shall be provided with an efficient whistle or syren sounded by steam or some substitute

for steam, so placed that the sound may not be intercepted by any obstructions, and with an efficient fog-horn to be sounded by mechanical means, and also with an efficient bell. A sailing-vessel of 20 tons gross tonnage or upwards shall be provided with a similar fog-horn and bell.

65. When are these signals to be used?

In fog, mist, falling snow, or heavy rain-storms, whether by day or night.

66. What does a prolonged blast mean?

A blast of from four to six seconds' duration.

67. On what are the fog-signals to be made by steam-vessels under way?

On the whistle or siren.

68. On what are the fog-signals to be made by sailing-vessels and vessels towed?

On the fog-horn.

69. What sound signals are to be made by vessels at anchor?

Vessels at anchor shall, at intervals of not more than one minute, ring the bell rapidly for about five seconds.

70. What sound signal is required to be made by a steam-vessel having way upon her?

A steam-vessel having way upon her shall sound at intervals of not more than two minutes a prolonged blast.

71. What sound signal is required to be made by a steam-vessel under way, but stopped, and having no way upon her?

A steam-vessel under way, but stopped and having no way upon her, shall sound at intervals of not more than two minutes two prolonged blasts, with an interval of about one second between them.

72. What sound signals are required to be made by sailing-vessels when under way?

A sailing-vessel under way shall sound, at intervals of not more than one minute, when on the starboard tack one blast, when on the port tack two blasts in succession, and when with the wind abaft the beam three blasts in succession.

73. What sound signals are required to be made by a vessel when towing, a vessel employed in laying or in picking up a telegraph cable, or a vessel under way which is unable to get out of the way of an approaching vessel through not being under command or unable to manœuvre as required by the rules?

A vessel towing, or when laying or picking up a telegraph cable, or when unable to get out of the way, shall at intervals of not more than two minutes sound three blasts in succession—viz., one prolonged blast followed by two short blasts.

74. What sound signal may a vessel being towed make?

A vessel towed may give the same signal as a vessel towing, and she shall not give any other.

75. What sound signal must sailing-vessels and boats of less than 20 tons gross tonnage make?

If they do not give the signals prescribed for other vessels, they must make some other efficient sound signals at intervals of not more than one minute.

76. Do the regulations require vessels to take any other precaution during thick weather?

Yes; Art. 16 says every vessel shall, in a fog, mist, falling snow, or heavy rain-storms, go at a moderate speed, having careful regard to the existing circumstances and conditions.

77. What action must be taken by a steam-vessel hearing apparently forward of the beam the fog-signal of another vessel, the position of which is not ascertained?

She shall, so far as the circumstances of the case admit, stop her engines, and then navigate with caution until danger of collision is over.

78. How can you generally ascertain whether there is risk of collision in approaching another vessel?

By carefully watching the compass-bearing of the other vessel, and if it does not appreciably change such risk should be deemed to exist.

79. When a steam-vessel under way takes any course required by these rules, must she indicate the course to any vessel she has in sight?

Yes; Art. 28 provides that in taking any course authorised or required by the regulations, a steam-vessel under way shall indicate that course to any other vessel which she has in sight by the following signals on her whistle or siren, viz.:—

One short blast to mean, "I am directing my course to starboard."

Two short blasts to mean, "I am directing my course to port."

Three short blasts to mean, "My engines are going full speed astern."

80. What does the expression "short blast" used in the preceding article mean?

It means a blast of about one second's duration.

81. What precaution is to be taken by steam-vessels, which are directed by these rules to keep out of the way, when approaching another vessel?

They shall, if necessary, slacken speed, or stop and reverse.

82. If you see two white lights in a vertical line one over the other, what do they denote as regards the vessel carrying them?

They may denote the presence of a steam-vessel end-on with her side-lights not within sight on account of distance, fog, &c.; or a steam-vessel towing with her side-lights not within sight on account of distance, fog, &c.; or a vessel end-on to me engaged in drift-net fishing, or in line-fishing; or it may be a steam-trawler end-on, or within two points of being end-on, to me; or a vessel of 150 ft. or upwards in length at anchor and end-on to me.

83. If you see a green or a red light with a white light below, what do they denote?

They denote the presence of a steam-vessel engaged in trawling.

84. If you see a white light alone, what does it denote as regards the ship carrying it?

It denotes the presence of a vessel or boat at anchor; or a pilot-vessel on her station; or the masthead-light of a vessel under steam, with her side-lights not within sight on account of distance, fog, &c.; or a fishing-vessel stationary through her gear getting fast to some obstruction; or a sailing-trawler engaged in trawling; or it may be a light shown from the stern of a vessel which is being overtaken.

85. If you see a green or a red light without a white light, or both a green and a red light without a white light, is the vessel carrying the light or lights seen a vessel under steam or a vessel under sail?

A vessel under sail.

86. How do you know?

Because there is no white masthead-light.

87. If you see a white light over a coloured light, is the vessel a vessel under sail or a vessel under steam?

A vessel under steam. The masthead-light denotes that the vessel is under steam.

[The Examiner will then take one model of a vessel, which he will place on the table, and call it A. He will then take the mast or stand with a white and a red ball on it, and place it at the other end of the table, and call it B.

The Examiner should be careful that the model of one vessel only is used when the questions numbered 84 to 89 are asked.]

88. A is a steam-vessel going north seeing a white light and red light ahead at B. Are A and the vessel B showing the two lights meeting end-on or nearly end-on, or is B passing A, or is B crossing the path of A, and in what direction, and how do you know?

Passing to port, because if I see a red light ahead I know that the head of the vessel carrying that red light must be pointing away in some direction to my

own port or left hand. The vessel showing the red light has her port or left side more or less open to A.

89. If A is going north, within what points of the compass must the vessel B showing the white and red lights be steering?

B must be going from a little W. of S. to W.N.W.

90. How do you know this?

Because, the screens being properly fitted, I could not see the red light of B at all with the vessel's head in any other direction.

91. A is a steam-vessel going north, and seeing a white and green light ahead. Are A and B meeting, or is B passing A, or is B crossing the course of A, and in what direction, and how do you know?

B is passing to starboard of A, because if I see a green light ahead I know that the head of the vessel carrying that green light must be pointing away in some direction to my starboard or right hand. The ship showing the green light has her right or starboard side more or less open to me.

92. As A is going north, within what points of the compass must the vessel showing the white and green lights be steering?

B must be going from a little E. of S. to E.N.E.

93. How do you know?

Because, the screen being properly fitted, I cannot see the green light at all with the vessel's head in any other direction.

94. If a steam-vessel (A) sees the *three* or *four* lights of another steam-vessel (B) ahead or nearly ahead, are the two steam-vessels meeting, passing, or crossing?

Meeting end-on, or nearly end-on.

95. Do the regulations expressly require the course of a vessel to be altered to starboard in any case; and, if so, when?

Yes; in the case of two steam-vessels meeting end-on, or nearly end-on.

96. Do they expressly require the course of a vessel to be altered to starboard in any other case; and, if so, in what other?

No. It is not in any other case expressly required by the regulations?

[The Examiner should see that the candidate places the models in the positions indicated by question 93, and following.]

97. If a steam-vessel (A) sees another steam-vessel's red light (B) on her own starboard side, are the steam-vessels meeting, passing, or crossing, and how do you know?

Crossing, because the red light of one is opposed to the green light of the other; and whenever a green light is opposed to a red light, or a red light to a green light, the vessels carrying the lights are crossing vessels.

98. Is A to stand on; and, if not, why not?

A has the other vessel, B, on her own starboard side. A knows she is crossing the course of B because she sees the red light of B on her (A's) own starboard side. A also knows she must get out of the way of B, because Article 19 expressly requires that the steam-vessel that has the other on her own starboard side shall keep out of the way of the other.

99. Is A to starboard or to port in such a case?

A must do what is right so as to get herself out of the way of B, and must, if the circumstances of the case permit, avoid crossing ahead of B.

100. If A gets into collision by porting, will it be because she is acting on any rule?

No; the rule does not require her either to port or to starboard. If she ports and gets into collision by porting, it is not the fault of any rule.

101. If a steam-vessel (A) sees the green light of another steam-vessel (B) on her own (A's own) port bow are the two steam-vessels meeting, passing, or crossing, and how do you know?

Crossing, because the green light of one vessel is shown to the red light of the other.

102. What is A to do, and why?

By the rule contained in Article 21 of the regulations A is required to keep her course and speed, subject to the qualification that due regard must be had to all dangers of navigation and collision; and that due regard must also be had to any special circumstances which may exist in any particular case rendering a departure from that rule necessary in order to avoid immediate danger. The crossing vessel B on A's port side must get out of the way of A, because A is on B's starboard side.

103. A, a steam-vessel, sees the green light of another steam-vessel, B, a point on her (A's) port bow: is there any regulation requiring A to port in such case, and, if so, where is it to be found?

There is not any.

104. Are steam-vessels to get out of the way of sailing-vessels?

If a steam-vessel and a sailing-vessel are proceeding in such direction as to involve risk of collision, the steam-vessel is to get out of the way of the sailing-vessel unless the sailing-vessel is overtaking the steam-vessel.

105. What is to be done by A, whether a steam-vessel or a sailing-vessel, if overtaking B?

A is to keep out of the way of B.

106. When is a vessel considered to be an overtaking vessel?

Every vessel coming up on another vessel from more than two points abaft her beam—*i.e.*, in such a position with reference to the vessel which she is overtaking that at night she would be unable to see either of that vessel's side-lights—is an overtaking vessel; and no subsequent alteration of the bearing between the two vessels can make the overtaking vessel a crossing vessel within the meaning of the rules, or relieve her of the duty of keeping clear of the overtaken vessel until she is finally past and clear.

107. In the daytime how do you know when you are an overtaking vessel?

It is often hard to judge with any degree of certainty, but if in doubt assume you are an overtaking vessel, and keep out of the way.

108. Have sailing-vessels under way to keep out of the way of sailing-vessels and boats fishing?

Yes; they have to keep out of the way of sailing-vessels or boats fishing with nets, or lines, or trawls; but this rule does not give to any vessel or boat engaged in fishing the right of obstructing the fairway used by vessels other than fishing-vessels or boats.

109. When by the rules one of the two ships is required to keep out of the way of the other, what is the other to do?

To keep her course and speed.

110. Is there any qualification or exception to this?

Yes. Due regard must be had to all dangers of navigation and collision, and to any special circumstances which may exist in any particular case and require a departure from the regulations to avoid immediate danger.

111. Is there any general direction in the steering and sailing rules; and, if so, what is it?

Yes; it is this: that nothing in the rules shall exonerate any vessel, or the owner, master, or crew thereof, from the consequences of any neglect to carry lights or signals, or of any defect to keep a proper look-out, or of any neglect of any precaution which may be required by the ordinary practice of seamen, or by the special circumstances of the case.

112. Can you repeat Article (—) of the regulations? I refer to the article containing the rule for (—).

[The Examiner will repeat this question, naming a different article each time.]

113. What does the Act of Parliament provide as the obligation of owners and masters in obeying the regula-

tions respecting lights, fog-signals, and steering and sailing?

Section 419 of "The Merchant Shipping Act, 1894," provides that owners and masters shall be bound to obey the regulations, and it also provides that in cases of wilful default by the master or owner he shall be deemed to be guilty of a misdemeanour for each infringement.

114. What do breaches of the regulations imply?

If an accident happens through non-observance of the regulations, it implies wilful default on the part of the person in charge of the deck at the time, unless it is shown to the satisfaction of the Court hearing the case that the special circumstances of the case rendered a departure from the rules necessary.

115. If collision ensues from a breach of the regulations, who is to be deemed in fault for the collision?

The person by whom the regulations are infringed, unless the Court hearing the case decides to the contrary.

116. Is there any special rule for steam-vessels navigating narrow channels?

In narrow channels every steam-vessel must, when it is safe and practicable, keep to that side of the fairway or midchannel which is on the starboard side of such vessel.

117. Do the regulations for preventing collisions at sea apply to sea-going vessels in harbours and in rivers?

Yes; unless there is any rule to the contrary made by a competent authority.

118. Do they apply to British vessels only?

No; to foreign vessels as well, with the exception provided for in the Order in Council of the 7th July, 1897, which applies only to British vessels.

119. Do you know where the present regulations are to be found?

Yes; in the Orders in Council of the 27th November, 1896, 7th July, 1897, and 4th April, 1906.

120. Is one vessel bound to assist another in case of collision?

Yes.

121. What is the penalty for default?

If the master or person in charge of the vessel fails to render assistance without reasonable excuse, the collision is, in absence of proof to the contrary, to be deemed to be caused by his wrongful act, neglect, or default.

122. Is there any other penalty attached to not rendering assistance?

Yes; if it is afterwards proved that he did not render assistance, his certificate may be cancelled or suspended by the Court investigating the case.

123. Is it not expected that you should understand the regulations before you take charge of the deck of a vessel?

It is.

124. Why?

If I do not understand them and am guilty of default, the consequences will be very serious to me.

125. What would be a serious offence?

To cause a collision by doing anything not in accordance with the regulations.

AIDS TO MEMORY, in Four Verses, by the late Mr. THOMAS GRAY, C.B.

1. *Two Steamships meeting.*

When both side-lights you see ahead,
Port your helm and show your RED.

2. *Two Steamships passing.*

GREEN to GREEN, or RED to RED—
Perfect safety—Go ahead!

3. *Two Steamships crossing.*

NOTE.—This is the position of the greatest danger: there is nothing for it but good look-out, caution, and judgment.

If to your starboard RED appear,
It is your duty to keep clear
To act as judgment says is proper—
To Port—or Starboard—Back—or Stop her.

But when upon your Port is seen
A Steamer's Starboard Light of GREEN,
There's not much for you to do,
For GREEN to Port keeps clear of you.

4. *All Ships must keep a good look-out, and Steamships must stop and go astern if necessary.*

Both in safety and in doubt
Always keep a good look-out;
In danger, with no room to turn,
Ease her, stop her, go astern.

APPENDIX F.

SIGNALS TO BE MADE BY SHIPS WANTING A PILOT.

In the Daytime.—The following signals, numbered 1 and 2, when used or displayed together or separately, shall be deemed to be signals for a pilot in the daytime, viz. :—

- (1.) To be hoisted at the fore, the Union Jack, having round it a white border one-fifth of the breadth of the flag; or
- (2.) The International Code pilotage signal indicated by P.T.
- (3.) The International Code flag S, with or without the Code pennant over it.
- (4.) The distant signal, consisting of a cone point upwards, having above it two balls or shapes resembling balls.

At Night.—The following signals, numbered 1 and 2, when used or displayed together or separately, shall be deemed to be signals for a pilot at night, viz. :—

- (1.) The pyrotechnic light commonly known as a blue light every fifteen minutes; or
- (2.) A bright white light, flashed or shown at short or frequent intervals just above the bulwarks for about a minute at a time.

If a master of a vessel uses or displays, or causes or permits any person under his authority to use or display, any of the pilot-signals for any other purpose than that of summoning a pilot, or uses, or causes, or permits any person under his authority to use any other signal for a pilot, he shall for each offence be liable to a fine not exceeding twenty pounds. ("Merchant Shipping Act, 1894," section 615 (3).)

APPENDIX G.

EXAMINATION IN CHART.

*For all Grades where the Chart is used, including Home-trade Ship Certificates, with the Exception mentioned in Note below.**

[The candidate will be required to work out the following questions on either a "true" or "magnetic" chart,† whichever may be handed to him by the Examiner; and also determine whether the chart is a "true" or "magnetic" one, and whether it is for the Northern or Southern, and Eastern or Western Hemisphere.]

1. Using deviation [card] [curve]‡ No. find

* In examination for master of fishing-boats, and cargo-vessels, and small sailing-vessels carrying passengers in restricted limits only, "magnetic" charts are used.

† The terms "true" and "magnetic" are used for the sake of brevity and convenience, to indicate charts that have compasses delineated upon them showing the "true" or "magnetic" points of the compass respectively.

‡ A candidate for an ordinary master's certificate is expected to use either a card of deviations, or a curve of deviations on a Napier's diagram, whichever the Examiner may put before him.

the course to steer by compass from _____ to _____ ; also the distance.

Answer.—Magnetic course : _____
Compass course : _____
Distance : _____
Variation : _____
Deviation : _____

2. With the ship's head on the above-named compass course, a [point] [lighthouse] _____ bore by compass and _____ bore by the same compass. Find the ship's position.

Answer.—Latitude : _____
Longitude : _____

3. With the ship's head as above, [a point] [lighthouse] _____ bore by compass, and after continuing on the same course _____ miles it [or another point] bore. Find the position of the ship and her distance from _____ at the time of taking the second bearing.

Answer.—Latitude : _____
Longitude : _____
Distance : _____

4. What do you understand the small numbers to indicate that you see placed about the chart, and at what time of tide?

5. What do the Roman numerals indicate that are occasionally seen on the chart near the coasts and in harbours?

6. How would you find approximately the time of high water at any place, the Admiralty tables not being at hand nor any other special tables available?

All the foregoing questions, and those on Form Exn. 9c, must be answered, but this does not preclude the Examiner from putting any other questions of a practical character or which the local circumstances of the port may require.

Additional Questions for Only and First Mates and Masters, including Masters of Home-trade Ships.

7. Find the course to steer by compass from _____ to _____ (see Question 1) to counteract the effect of a current which set _____ at the rate of _____ miles per hour, the ship making by log _____ miles per hour; also the distance the ship would then make good in _____ hours towards _____.

Answer.—Magnetic course : _____
Compass course : _____
Distance : _____

8. On _____ being off _____, took a cast of the lead: required the correction to be applied to the depth obtained by the lead-line before comparing it with the depth marked on the chart.

9. The following horizontal sextant angles were taken to determine the ship's position:—
_____ °, _____ °, _____ °

Find the latitude and longitude, using a station pointer.

Answer.—Latitude : _____
Longitude : _____

All the foregoing questions, and those on Form Exn. 9c, must be answered, but this does not preclude the Examiner from putting any other questions of a practical character or which the local circumstances of the port may require.

APPENDIX H.

QUESTIONS RELATING TO CYCLONES, OR REVOLVING STORMS COMMON IN TROPICAL SEAS.

The candidate must answer in writing, on paper supplied by the Examiner, the following questions, numbering the answers to correspond with the questions:—

1. The direction of the wind in a cyclone being* _____, state the probable bearing of its centre from the ship in the* _____ Hemisphere.

2. And suppose that the wind during the passage of the same cyclone were found to change towards the* _____, what would be the ship's position with reference to the line of progression of the centre of the cyclone, and what action would you take?

3. Under what conditions would the change in the direction of the wind in the cyclone be the reverse of the above?

4. What are the usual indications of a ship being on the line of progression of the centre of a cyclone?

5. What are the usual indications that a ship is (a) approaching the centre of a cyclone, (b) receding from it?

6. Describe the track usually taken by cyclones in the† _____, and state the seasons of the year in which they most frequently occur in that region.

APPENDIX I.

DEVIATION OF THE COMPASS, FOREIGN-GOING SHIPS.

QUESTIONS ON THE DEVIATIONS OF THE COMPASS USED IN THE EXAMINATION OF CANDIDATES FOR CERTIFICATES AS MASTERS OF FOREIGN-GOING SHIPS, AS GIVEN ON EXAMINATION FORMS EXN. 7 AND EXN. 7A.

The candidate is to answer correctly such of the following questions as are marked with a cross by the Examiner. At least twelve will be marked.

The Examiner's attention is specially called to the importance of Questions 11, 12, 13, 14, and 39, which must be marked in all cases.

1. State briefly the essentials of an efficient compass.

2. State briefly the chief points to be considered when selecting a position for your compass on board ship, and what should be particularly guarded against.

3. What do you mean by deviation of the compass, and how is it caused?

4. Describe how you would determine the deviation of your compass: (1) by reciprocal bearings; (2) by figures on the dock-walls; (3) by bearings of a distant object; (4) by the bearings of the sun or other celestial body.

5. Having determined the deviation with the ship's head on the various points of the compass, how do you know when it is easterly and when westerly?

6. Why is it necessary, in order to ascertain the deviations, to bring the ship's head in more than one direction?

7. For accuracy, what is the least number of points to which the ship's head should be brought for constructing a curve or table of deviations?

8. How would you find the deviation when sailing along a well-known coast?

9. Name some suitable terrestrial objects by which you could readily obtain the deviation of the compass.

10. Supposing you have no means of ascertaining the magnetic bearing of a distant object when swinging your ship for deviations, how could you find it, approximately, from bearings of the object taken with the ship's head on equidistant compass points; and what distance, as a rule, should the object be from the ship?

11. *Example.*—Having taken the following compass bearings of a distant object, find the object's magnetic bearing, and thence the deviations:—

* These spaces to be filled in by the Examiners, and frequently varied.

† The Examiners to fill in whether North Atlantic, Bay of Bengal, China Seas, Indian Ocean, &c.

Magnetic Bearing required.

Ship's Head by Standard Compass.	Bearing of Distant Object by Standard Compass.	Deviation required.
North.	S. 4° E.	
N.E. $\frac{1}{2}$	South.	
East. $\frac{1}{2}$	S. 4° W.	
S.E.	S. 1° W.	
South. $\frac{1}{2}$	S. 13° E.	
S.W. $\frac{1}{2}$	S. 23° E.	
West.	S. 21° E.	
N.W.	S. 11° E.	

12. With the deviation as above, construct a curve of deviations on a Napier diagram, and give the courses you would steer by the standard compass to make the following courses magnetic:—

Magnetic courses: S.S.W., W.N.W., N.N.E., E.S.E.
Compass courses required:

13. Supposing you have steered the following courses by the standard compass, find the magnetic courses made from the above curve of deviations:

Compass courses: W.S.W., N.N.W., E.N.E., S.S.E.
Magnetic courses required:

14. You have taken the following bearings of two distant objects by your standard compass as above: with the ship's head at W. $\frac{1}{2}$ S., find the bearings, magnetic:—

Compass-bearings: W. by S., and N. $\frac{3}{4}$ W.
Magnetic bearings required:

15. Do you expect the deviation to change? If so, state under what circumstances.

16. How often is it desirable to test the accuracy of your tables of deviations?

17. What is meant by variation of the compass; what is it caused by; and where can you find the variation for any given position?

18. The earth being regarded as a magnet, which is usually termed the blue and which the red magnetic pole?

19. Which end of a magnet (or compass-needle) is usually termed the red or "marked" end, and which the blue?

20. What effect has the pole of one magnet of either name on the pole of another magnet?

21. What is meant by "transient induced magnetism"?

22. Which is the red and which is the blue pole of a mass of soft vertical iron, by induction; and what effect would the upper and lower ends of it have on the compass-needle (a) in the Northern Hemisphere, (b) in the Southern Hemisphere, (c) on the magnetic equator?

23. Describe what is usually termed the subpermanent* magnetism of an iron ship, and state when and how it is acquired, and which is the red and which is the blue pole, and why it is called subpermanent magnetism.

24. Describe the meaning of the expression "coefficient A."

25. Describe the meaning of the expression "coefficient B," its signs, and effects.

26. Describe the meaning of the expression "coefficient C," its signs, and effects.

27. Describe the meaning of the expression "coefficient D," its signs, and effects.

28. Describe the meaning of the expression "coefficient E," its signs, and effects.

* The term "subpermanent magnetism" in these questions is used in the original sense, as proposed by the late Sir G. B. Airy, to denote the character of the permanent magnetism of an iron ship as distinguished from the permanent magnetism of a magnetized steel bar. The terms "subpermanent" and "permanent" throughout these questions may therefore be considered as synonymous.

29. Would you expect any change to be caused in the error of your compass by the ship heeling over either from the effect of the wind or the cargo, &c.?

30. The compasses of iron ships being more or less affected by what is termed the heeling error, on what courses is this error usually at its minimum, and on what courses at its maximum?

31. Describe clearly the three principal causes of the heeling error on board ship.

32. State to which side of the ship in the majority of cases is the north point of the compass drawn when the ship heels over in the Northern Hemisphere.

33. Under what conditions (that is, as regards position of the ship whilst building, and the arrangement of iron in the ship) is the north point of the compass-needle usually drawn to windward or the high side of the ship in the Northern Hemisphere; and, if not allowed for, what effect has it on the assumed position of the ship when she is steering on northerly and on southerly courses in the Northern Hemisphere?

34. Under what conditions (as in Question 33) is the north point of the compass-needle usually drawn to leeward of the low side of the ship in the Northern Hemisphere; and, if not allowed for, what effect would it have on the assumed position of the ship when she is steering on northerly and on southerly courses in the Northern Hemisphere?

35. The effects being as you state, on what courses would you keep away and on what course would you keep closer to the wind in the Northern Hemisphere in order to make good a given compass course (a) when the north point of compass is drawn to windward or the high side of ship, and (b) when drawn to leeward or the low side?

36. Does the same rule hold good in both hemispheres with regard to the heeling error?

37. State clearly how that part of the heeling error due to the permanent part of the magnetism of the ship varies as the ship changes her position on the globe, and give the reason for it.

38. State clearly how that part of the heeling error due to the induction in transverse iron (which was horizontal when ship was upright), and iron vertical to the ship's deck, varies as the ship changes her position on the globe.

39. Your compass having a large error, show by "Beall's compass-deviascope" how you would correct it by compensating-magnets and soft iron (as usually practised by compass-adjusters in the mercantile marine) in order to reduce the error within manageable limits. Show also how the heeling error can be compensated.

40. As the coefficient B (capable of being corrected) usually consists of two parts—one due to the permanent magnetism of the ship, and the other to vertical induction in soft iron—how should each of the two parts, strictly speaking, be corrected when compensating the compass?

41. If the whole of coefficient B be corrected by a permanent magnet, as is usually done, what is likely to ensue as the ship changes her magnetic latitude?

42. Provided the needles of your compass are not so long and powerful, and so near, as to cause the soft-iron correctors to become magnetised by induction, would the coefficient D, if properly compensated, be likely to remain so in all magnetic latitudes and both hemispheres? If so, state the reason why.

43. State at what distance, as a general rule, the magnets and soft-iron correctors should be placed from the compass-needles, and what will be the consequence if they are placed too near the needles.

44. Is it necessary that the magnets used for compensating coefficients B and C should be placed on the deck? If not, state where they may also be placed, and the rules to be observed in placing them in position.

45. Can the compensation of the heeling error be depended upon when the ship changes her latitude? If not, state the reason.

APPENDIX K.

SYLLABUS OF EXAMINATION IN THE LAWS OF THE DEVIATION OF THE COMPASSES OF AN IRON SHIP, AND IN THE MEANS OF COMPENSATING OR CORRECTING IT.

Candidates for the voluntary examination in compass-deviation and for extra master's certificate will be required to give written answers to twenty-two of the questions; these will be marked by a cross by the Examiner.

They will also be required to show, by means of Beall's deviascope, a sound practical knowledge of the tentative method of compass-adjustment, and be able to demonstrate experimentally the effect of any given disturbing force upon the compass, showing under what conditions (if any) it may vary and what steps should be taken to compensate it. *Viva voce* questions by the Examiner upon the practical application of any of the questions in the compass syllabus must be answered clearly and concisely, and practically demonstrated on the deviascope where possible. Questions 31, 61, 62, 69, 70, 72, and 92 will be marked by the Examiner in all cases, the other questions being constantly varied.

1. Describe an artificial magnet, and how a steel bar or needle is usually magnetized.

2. Which end of the compass-needle, or a magnet, is commonly termed the red, and which the blue pole?

3. Which is the red magnetic pole of the earth, and which the blue? and give their geographical positions.

4. What effect has the pole of one magnet of either name on the pole of the same name of another magnet, and what would be the consequence of the pole of one magnet of either name being brought near enough to affect the pole of contrary name, if in these cases both magnets were freely suspended?

5. By applying this law to all magnets, natural as well as artificial, describe what would be the result on a magnetic bar or needle, freely suspended but constrained by weight or by the nature of its mounting to preserve a horizontal position; and what would be the result, if so mounted, but free to move in every direction, the earth being regarded as a natural magnet?

6. What is the cause of the variation of the compass?

7. What is meant by the deviation of the compass?

8. What is meant by the term "local attraction"; under what circumstances have ship's compasses, from recent careful investigation, been found to be affected by it? and name some of the localities in different parts of the world where this disturbance is to be found, and, consequently, where increased vigilance is necessary.

9. What do you understand by the term "soft" iron; and what are its properties as regards acquiring and retaining magnetism?

10. What do you understand by the term "hard" iron; and what are its properties as regards acquiring and retaining magnetism?

11. Describe the meaning of the term "horizontal force" of the earth. Where is the greatest, and where the least; and what effect has it in respect to the increase or decrease of the directive force of the compass-needle?

12. Does the magnetic equator coincide with the geographical equator? If not, state clearly how it is situated.

13. Where can the values of the magnetic dip, the earth's horizontal force, and the variation be found?

14. State in what parts of the globe lying in the usual tracks of navigation the variation changes very rapidly, and what special precautions should be observed when navigating these localities; also why a "variation" chart is then very useful.

15. Why is a knowledge of the magnetic dip and the earth's horizontal force important in dealing with compass-deviations?

16. Describe the meaning of the term "vertical force" of the earth. Where is the greatest, and where the least?

17. Would you expect a compass to be more seriously affected by any given disturbing force when near the magnetic equator, or near the poles? and state the reason.

18. State briefly, (a) the essentials of an efficient compass; and (b) what you would consider a good arrangement of the needles—that is, whether long or short, single or double, &c.—with a view to good compensation.

19. In stowing away spare compass-cards or magnets, how would you place them with regard to each other, or what might be the probable consequence?

20. State briefly the chief points to be considered when selecting a position for your compass on board ship, and what would be particularly guarded against.

21. What is meant by "transient induced magnetism"?

22. Which is the *red* and which the *blue* pole of a mass of soft vertical iron (or of any soft iron not in a horizontal position) by induction, and what effect would the upper and lower ends of it have on a compass-needle in the *Northern Hemisphere*?

23. Which is the *red* and which the *blue* pole of a mass of soft vertical iron by induction, and what effect would the upper and lower ends of it have on the compass-needle in the *Southern Hemisphere*?

24. What effect would a bar of soft vertical iron have on the compass-needle on the magnetic equator?

25. Describe what is usually termed the subpermanent* magnetism of an iron ship, and state when and how it is acquired, and which is the subpermanent red and which is the blue pole, and why it is called subpermanent magnetism.

26. What is meant by "the composition of forces" and "the parallelogram of forces"? and show how the knowledge of these is valuable in ascertaining and compensating the subpermanent magnetism of an iron ship.

27. Describe the nature of the coefficient B and C plus (+), and minus (-), and the different magnetic forces they represent; also why they are said to produce semicircular deviations.

28. Can semicircular deviations be produced by any other force than the subpermanent magnetism of the ship? If so, by what?

29. On what points, by compass-bearings of the ship's head, does + B give westerly deviation, and on what point does it give easterly; also on what points does - B give westerly, and on what points easterly?

30. On what points does + C give westerly deviation, and on what points easterly; also on what points does - C give westerly, and on what points easterly, deviation?

31. The value of either coefficient B or C being given, also the magnetic direction of the ship's head while she was being built, determine by the traverse tables the approximate value of the other coefficient C or B; and, the value of both these coefficients being given, determine approximately the direction by compass of the ship's head whilst being built, assuming, of course, that these coefficients resulted altogether from subpermanent magnetism.

32. Would you expect the greatest disturbance of the needle from the effects of subpermanent magnetism alone to take place when ship's head is in same direction as

*The term "subpermanent" magnetism in the syllabus is used in the sense proposed by the late Sir G. B. Airey, to denote the character of the permanent magnetism of an iron ship as distinguished from the permanent magnetism of a magnetized steel bar. The terms "subpermanent" and "permanent" throughout the syllabus may therefore be considered as synonymous.

when building, or when her head is at right angles to that direction, and in what direction of the ship's head would you expect to find the least disturbance?

33. Describe quadrantal deviation, and state what coefficients represent it; also on what points of the ship's head, by compass, each of these coefficients gives the greatest amount of deviation, and why it is called quadrantal deviation.

34. On what points of the compass will each of the coefficients, D and E, + and -, give easterly, and on what points westerly, deviation?

35. What conditions of the iron of a ship will produce + D, and what - D?

36. State clearly which end of horizontal iron running athwartship (such as beams, &c.), and of horizontal iron running fore and aft of a ship, acquires red and which blue polarity, by induction, when ship's head is at N.E., S.E., S.W., and N.W. respectively.

37. Describe the nature of the deviation represented by coefficients + A and - A, and describe the errors in the construction of the compass, and other causes, that frequently produce it.

38. What is the object of compensating the compass by magnets, &c., and what are the general advantages of a compensated compass over an uncompensated one?

39. Before adjusting the compass of an iron ship, what is it desirable to do with the view of eliminating as far as possible what may be termed the unstable part of the magnetism of the ship?

40. Describe clearly the tentative method of compass-adjustment—that is, the compensation of coefficients B, C, and D, with ship upright—as generally practised by compass-adjusters in ships of the mercantile marine.

41. State at what distance, as a general rule, the magnets and soft-iron correctors should be placed from the compass-needles, and what will be the consequence if they are placed too near the needles?

42. Is it necessary that the magnets used for compensating coefficients B and C should be placed on the deck? If not, state where they may also be placed, and the rules to be observed in placing them into position.

43. Does the B found on board ship usually arise altogether from subpermanent magnetism, or does part of it usually arise from some other cause or causes?

44. If the part of B due to induced magnetism in vertical soft iron, as well as the part due to subpermanent magnetism, are corrected by a magnet alone, as is generally the case, what is frequently the consequence of the ship changing her magnetic latitude and hemisphere?

45. How should each of these two parts of B, strictly speaking, be compensated?

46. Assuming, for the sake of clearness, that your steering-compass is unavoidably placed very near to the head of the stern-post (and other vertical iron at the stern), thereby causing a very large - B from induced magnetism, describe briefly any method by which the approximate position for the compensating vertical iron bar (Flinder's or Rundell's) could be estimated in order to reduce the error; describe also how you would proceed, in order to improve, if not to perfect, its position after observations have been made on the magnetic equator.

47. State if standard compasses, as well as steering-compasses, are generally subject to this disturbance from induced magnetism in vertical iron; also whether the attraction in all cases found is to be towards the stern; and, if not, state the conditions under which it might be towards the bow, and how the compensating soft iron bar should then be placed.

48. Generally speaking, does the magnetism induced in vertical iron usually have any effect in producing the coefficient C (ship upright) or is it generally produced by subpermanent magnetism alone? State also your reasons for saying so.

49. Provided the needles of your compass are not so long and powerful, and so near, as to cause the soft-

iron correctors to become magnetized by induction, would the coefficient D, if properly compensated as you have described (Ans. 40), be likely to remain so in all latitudes and both hemispheres? If so, state the reason why.

50. Under what circumstances does the character of A and E so change as to render it desirable that these coefficients should be disregarded or modified?

51. Supposing your compasses were allowed to remain uncompensated, explain clearly what would be the probable changes (ship upright) in the deviations produced, separately, by (1) the subpermanent magnetism of the ship alone, (2) by the induced magnetism in vertical soft iron; (a) on reaching the Equator; (b) in the Southern Hemisphere.

52. Assuming you were able to arrive at the proper proportions to be corrected, and were then to exactly compensate the subpermanent magnetism of the ship by means of a permanent magnet, and the induced magnetism in vertical iron by a soft-iron bar, would you expect any deviation to take place in your compass as the ship changed her latitude and hemisphere? And state your reasons for saying so.

53. Supposing the coefficient D from horizontal soft iron were allowed to remain uncompensated, would you, or would you not, expect the D to differ in name or amount on the ship changing her magnetic latitude and hemisphere? And state the reason.

54. Describe how you would determine the deviation of your compass—(1) by reciprocal bearings; (2) by figures on the dock-walls; (3) by bearings of a distant object.

55. Describe, in detail, how you would determine the deviation of your compass by the bearings of the sun; also by a star or planet.

56. Describe the uses to which the Napier's diagram can be applied, and its special advantages.

57. Describe clearly how the Napier's diagram is constructed.

58. For accuracy, what is the least number of points to which the ship's head should be brought for constructing a complete curve of deviations, or a complete table of deviations?

59. Nearing land, and being anxious to check your deviations on a few courses you may probably require to steer, what is the least number of points it would be necessary to steady the ship's head upon, if making use of a Napier's diagram, in order to ascertain the deviation on each of the points, say, in a quadrant of the compass? and describe clearly how you would do this at sea.

60. Supposing you have no means of ascertaining the magnetic bearing of the distant object when swinging your ship for deviations, how could you find it, approximately, from bearings of the object taken with the ship's head on equidistant compass-points; and how far, as a rule, should the object be from the ship when swinging, or steaming round?

61. *Example.*—Having taken the following compass-bearings of a distant object, find the object's magnetic bearing, and thence the deviation:—

(a.) *Magnetic Bearing required.*

Ship's Head by Standard Compass.	Bearing of Distant Object by Standard Compass.	Deviation required.
North.	S. 75° W.	
N.E.	S. 64° W.	
East.	S. 56° W.	
S.E.	S. 50° W.	
South.	S. 34° W.	
S.W.	S. 31° W.	
West.	S. 49° W.	
N.W.	S. 71° W.	

(b.) Construct a curve of deviations on a Napier's diagram, with the deviations as above, and give the

courses you would steer by the standard compass to make the following courses, magnetic:—

Magnetic courses: N.N.W., S.S.E., W.N.W., E.S.E.

Compass courses required:

(c.) Supposing you have steered the following courses by the standard compass, find the magnetic courses made from the above curve of deviations:—

Compass courses: N.N.E., E.N.E., S.S.W., W.S.W.

Magnetic courses required:

(d.) You have taken the following bearings of two distinct objects by your standard compass as above: with the ship's head at N.E. $\frac{1}{2}$ E., find the bearings, magnetic:—

Compass-bearings S.E. by S., and — N.N.W.

Magnetic bearings required:

62. Assuming the deviations observed with ship's head by compass to be as follows [or as in Question 61, whichever may be given], determine the value of the coefficients A, B, C, D, and E, and from them construct a complete table of deviations (or for as many points as the Examiner may direct):—

Deviation at North	[<input type="checkbox"/>]	South	[<input type="checkbox"/>]
N.E.	[<input type="checkbox"/>]	S.W.	[<input type="checkbox"/>]
East	[<input type="checkbox"/>]	West	[<input type="checkbox"/>]
S.E.	[<input type="checkbox"/>]	N.W.	[<input type="checkbox"/>]

63. When swinging your ship, if it be required to construct deviation tables for two or more compasses situated in different parts of the vessel, describe the process, and how you would employ the Napier's diagram for this purpose.

64. State your rule for determining whether deviation is easterly or westerly.

65. Is a knowledge of the value of the various coefficients of any advantage? If so, state why.

66. Describe (a) what is commonly known by the term "retentive" or "retained" magnetism, and how a ship acquires it when in port and at sea; (b) its effect on the compass-needle whilst ship's head continues in the same direction; (c) the immediate consequence when the direction of the ship's head is altered; and (d) the special precautions to be invariably observed at sea on the alteration of the ship's course.

67. Describe a "dumb-card" or "pelorus," and its use (a) in compensating a compass, (b) in determining the deviation.

68. If you determine the deviation by an azimuth or an amplitude of a heavenly body, it is then combined with variation, which together is sometimes called the *correction* for the compass. State when the deviation is the difference between the variation and the *correction*, and when the sum; and when it is of the same name as that of the *correction*, and when of the contrary name.

69. In observing azimuths of heavenly bodies, the best method is by "time azimuths," since these can be observed without an altitude when the ship is in port, or when the horizon cannot be defined from any cause. Give the sun's declination, the hour of the day, and the latitude to find the true bearing of the sun.*

70. By night, if it be desirable to observe the *correction* of the compass: Give the day of the year, and time at ship, also the latitude of the place, to determine what stars will be in good position for this purpose.

* The process of finding time azimuths by the ordinary formula of spherical trigonometry is tedious, and, since on board an iron ship these observations should be often repeated, the candidate will be allowed to use any table or graphic or linear method that will solve the problem within a half of a degree, the altitude of the heavenly body not being given.

71. If your correcting-magnets are so mounted that their positions can be altered, describe the process by which, on open sea, you can place the ship's head magnetic N. (or S.), and magnetic E. (or W.), and can make the correction perfect.

72. Given the name of a star, the time, the place of ship, the variation of the compass, the bearing of the star by compass: determine the deviation, and name it east or west.

73. Would you expect any change to be caused in the error of your compass by the ship heeling over, either from the effect of the wind or the cargo?

74. Describe clearly the three principal causes of the heeling error on board an iron ship.

75. Towards which side of the ship would that part of magnetism induced in continuous transverse iron (which was horizontal while ship was upright) help to draw the north point of the needle when the ship heels over (a) in the Northern Hemisphere, (b) in the Southern Hemisphere?

76. Supposing the compass were placed between the two parts of a divided beam or other athwartship iron, towards which side of the ship would iron so situated help to draw the north point of the needle when ship heels over (a) in the Northern Hemisphere, (b) in the Southern Hemisphere?

77. Would you expect that part of the magnetism induced in iron exactly perpendicular to the ship's deck, such as stanchions, bulkheads, &c., if below the compass, to cause any part of the heeling error when ship heels over, and, if so, towards which side of the ship (a) in the Northern Hemisphere, (b) in the Southern Hemisphere?

78. If an ordinary standard compass placed higher than the iron top-sides be compensated whilst the ship is upright, what coefficient will be affected by heeling?

79. Under what conditions—that is, as regards position whilst building, and the arrangement of iron in the ship—is the north point of the compass-needle usually drawn to windward, or the high side of the ship, in the Northern Hemisphere?

80. Under what conditions, as a rule, is the north point of the compass-needle usually drawn to leeward, or the low side of the ship, in the Northern Hemisphere?

81. State to which side of the ship, in the majority of cases, is the north point of the compass drawn when ship heels over in the Northern Hemisphere; and when this is the case, and it is not allowed for, what effect has it on the assumed position of the ship when she is steering on northerly, and also on southerly, courses?

82. On what courses would you keep away and on what courses would you keep closer to the wind in both the Northern and Southern Hemispheres in order to make good a given compass course (a) when north point of compass is drawn to windward, or the high side of ship, and (b) when drawn to leeward, or the low side.

83. If a ship is beating to windward: when she tacks, under what circumstances will the heeling error retain the same name, and under what circumstances will it take the contrary name?

84. If a ship is placed on the opposite tack by the change of wind, the ship's course being the same by compass, will the heeling error change its name?

85. In which direction of the ship's head does the heeling error attain its maximum value, and in what direction does it generally vanish?

86. Explain clearly how that part of the heeling error due to the permanent part of the magnetism of the ship varies as the ship changes her geographical position, and what is the reason of this?

87. Explain clearly how that part of the heeling error due to the induction in transverse iron (which was horizontal when ship was upright), and iron vertical to the

ship's deck, varies as the ship changes her geographical position.

88. What, then, would be the probable nature of the heeling error—that is, whether to high or low side of the ship; and whether the error would be equal to the sum or difference, &c., of the forces given (1) in high north latitude, (2) on magnetic equator, (3) in high south latitude?—assuming the polarity of the subpermanent magnetism of the ship under and affecting the compass to be as given below; the vertical induction in soft iron, of course, obeying the ordinary laws in the above geographical positions (1), (2), (3):—

- (a.) In cases where the effect of *red* vertical subpermanent magnetism is equal to that of the vertical induction in the soft iron of the ship:
- (b.) Where the effect of *red* vertical subpermanent magnetism is greater than that of the vertical induction in the soft iron:
- (c.) Where the effect of *red* vertical subpermanent magnetism is less than that of the vertical induction in the soft iron:
- (d.) Where the effect of *blue* vertical subpermanent magnetism is equal to that of the vertical induction in the soft iron:
- (e.) Where the effect of *blue* vertical subpermanent magnetism is greater than that of the vertical induction in the soft iron:
- (f.) Where the effect of *blue* vertical subpermanent magnetism is less than that of the vertical induction in the soft iron.

89. Can the heeling error be compensated? If so, state the means to be employed, and how the compensation may be effected.

90. Can the compensation of the heeling error be depended on in every latitude? If not, state the reason.

91. Do the soft-iron correctors used for compensating the coefficient + D have any effect on the compass-needle when the ship heels over, and, if so, do they draw the needle towards the low or the high side of the ship, and do they counteract, or otherwise, the effect produced by the vertical induction in the soft iron, (a) in the Northern Hemisphere, (b) in the Southern Hemisphere; and what is the reason of this?

92. Given the heel, the direction of the ship's head by compass, and the heeling error observed: to find the approximate heeling error, with a greater or less given heel, and with the ship's head on some other named point of the compass, the ship's magnetic latitude being in both cases the same.

93. Describe any instrument to show the ship's heel (generally called a clinometer), and state how and where it should be fixed.

94. Should the clinometer be observed when the ship is swung to determining the deviation when the ship is upright? If so, state the reason why.

95. Would you expect the table of deviations supplied by the compass-adjuster from observations made in swinging the ship to remain good during the voyage, or would you expect the deviations to change? If so, state under what circumstances.

96. Is it desirable that a record of your observations for deviations should be kept as a guide for any subsequent voyage in case the ship should be in the same locality, or for further corrections of the compass? If so, describe some suitable form for keeping such record.

97. Would you under any circumstances consider it a safe and proper procedure to place implicit confidence in your compasses, however skilfully they may have been adjusted? If not, what precautions is it your duty to take at all times?

APPENDIX L.
DEVIATION OF THE COMPASS.

FOR MASTERS' CERTIFICATES FOR HOME-TRADE SHIPS.

The applicant must answer in writing, on paper given him by the Examiner, all the following questions, numbering his answers to correspond with the numbers of the questions:—

1. When taking a meridian altitude, how do you know when the sun is on the meridian; or, in other words, when it is noon?
2. How does the sun bear (*true and magnetic*) when on the meridian of an observer in these latitudes (home-trade limits)?
3. What do you mean by deviation of the compass, and how is it caused?
4. Having determined the deviation, how do you know when it is easterly, and when westerly?
5. On at mean New Zealand time at ship, in latitude S., longitude E., the sun bore by compass ; required the sun's true bearing and error of the compass by the A, B, C Azimuth Tables:* and supposing the variation to be , required the deviation of the compass for the position of the ship's head at the time of observation.
6. How could you find the deviation of your compass when in port, or when sailing along a coast?
7. Name some suitable objects by which you could readily obtain the deviation of your compass when sailing along the coasts of the channel you have been accustomed to see?
8. The bearing of two objects when in line with each other was found on the chart to be magnetic, but when brought in a line on board they bore by your compass; required the deviation of your compass for the direction of the ship's head at the time.
9. What means are there for checking the deviation of your compass by night?
10. Do you expect the deviation to change? If so, state under what circumstances.
11. What is meant by the variation of the compass, and what is the cause of it?

APPENDIX M.
COMPASS-ADJUSTMENT.

It is of the utmost importance that masters of ships should thoroughly understand the tentative method of compass-adjustment as generally practised in merchant ships, and Examiners are therefore directed to fully satisfy themselves that all candidates for masters' certificates have this particular knowledge. It should be tested in connection with the Forms Exn. 7 and 7a, with the aid of Captain Beall's deviascope, and candidates will be required to prove (1) their knowledge of the laws of deviation and the tentative methods of compass-adjustment; (2) that they understand the practical application of the answers given by them to any of the other questions on Forms Exn. 7 and 7a that the Examiner may ask.

A concise statement of the present method of tentative compass-adjustment is appended for the use of Examiners. It is, however, distinctly to be understood that the Marine Department is not in any way advocating the correction of that part of coefficient B which arises from vertical induction in soft iron by a permanent magnet instead of by a soft-iron bar. The Department has no authority to interfere with the methods in use amongst compass-adjusters for the adjustment of compasses in iron ships, but the Examiners must satisfy themselves that masters are acquainted with the ordinary method as at present practised.

* The candidate may use any other time-azimuth tables should he prefer to do so.

THE TENTATIVE METHOD OF COMPASS-ADJUSTMENT AS GENERALLY PRACTISED BY COMPASS-ADJUSTERS IN SHIPS OF THE MERCANTILE MARINE.

Before describing the practice, it will be as well to briefly state the coefficients used to express the different magnetic forces:—

Coefficient A	represents	constant quantity.
„ B „	semicircular deviation due to	fore-and-aft magnetic forces.
„ C „	semicircular deviation due to	transverse magnetic forces.
„ D „	quadrantal deviation due to	horizontal induction in soft iron.
„ E „	quadrantal deviation due to	horizontal induction in soft iron unsymmetrically distributed.

Signs and Effects of Coefficients A, B, C, D, and E.

Coefficient A represents a constant deviation of the same nature and amount on all points of the compass; + A signifying easterly, and - A westerly, deviation.

Coefficient + B represents an attraction towards the ship's head in the eastern semicircle of the compass, and westerly deviations in the western semicircle, attaining a maximum value on the east and west points, decreasing to zero on north and south points, by compass.

Coefficient - B represents an attraction towards the ship's stern, and causes easterly deviations with ship's head in the western semicircle, and westerly deviations with the ship's head in the eastern semicircle, with a maximum value on the east and west points, decreasing to zero on the north and south points, by compass.

Coefficient + C represents an attraction towards the starboard side of the ship, and causes easterly deviations with ship's head in the northern semicircle, and westerly deviations in the southern semicircle, attaining a maximum value on the north and south points, decreasing to zero on the east and west points, by compass.

Coefficient - C represents an attraction towards the port side of the ship, and causes westerly deviations with ship's head in the northern semicircle, and easterly in the southern semicircle, attaining a maximum value on the north and south points, decreasing to zero on the east and west points, by compass.

Coefficient + D gives easterly deviations with ship's head between N. and E., and S. and W.; and westerly deviations between S. and E., and N. and W.

Coefficient - D gives results exactly the reverse to + D.

NOTE.—Both + D and - D have a maximum value on the four quadrantal points, and become zero on the cardinal points, by compass.

Coefficient + E gives easterly deviations with ship's head between N.E. and N.W., and S.E. and S.W., and westerly deviations between N.E. and S.E., and N.W. and S.W.

Coefficient - E gives results exactly the reverse to + E.

NOTE.—Both + E and - E have a maximum value on the cardinal points, and become zero on the four quadrantal points, but are usually small in amount in compasses placed in the middle line of the ship.

Heeling Error.—The heeling error arises partly from vertical induction in transverse iron, and iron vertical to the ship's deck, and partly from the vertical component of the subpermanent magnetism of the ship. In the Northern Hemisphere in the majority of cases the north point of the compass-needle is drawn to windward, or the high side of the ship, with, as a rule, a maximum heeling error on north and south points, and zero on east and west points, by compass. If the compass is

not properly placed in the ship there may be a sensible heeling deviation on east and west courses.

Tentative Corrections.

To correct Coefficient C.—With ship's head north or south, magnetic, place a bar magnet (or more than one if necessary) horizontally and exactly athwart-ship, either on the deck or on any convenient platform, with its centre on the fore-and-aft line passing through the centre of the compass-card, placing its red or marked end to starboard if the north point of the needle deviates to the starboard side, or to port if it deviates to the port side of the ship, moving the magnet to and from the compass until it points correctly.

NOTE.—The deviation represented by coefficient C varies inversely at the earth's horizontal force, providing the iron is symmetrically arranged on each side of the compass.

To correct Coefficient B.—With ship's head east or west, magnetic, place a bar magnet (or more than one if necessary) horizontally and exactly parallel to the fore-and-aft midship line of the ship, either on the deck or on any convenient platform, with its centre on the athwartship line passing through the centre of the compass, the red or marked end of the magnet being directed aft if the north point of the compass-needle deviates towards the stern, or forward if it deviates towards the bow, moving the magnet to or from the compass until it points correctly.

NOTE.—The coefficient B consists of two parts: one is due to the permanent magnetism of the ship, which varies inversely as the earth's horizontal force; the other to vertical induction in soft iron, which varies as the tangent of the dip. As ships in the merchant service are rarely built with a view of providing a satisfactory position for the standard compasses, it is very difficult in many ships to find a position for it where it will not be affected by vertical iron. It follows, therefore, that if this deviation be compensated, as is customary, by a fore-and-aft permanent magnet instead of by a vertical soft-iron bar, the poles of the magnet may in some cases require to be reversed in high southern latitudes.

To correct Coefficient + D.—With ship's head on one of the quadrantal points, magnetic, the + D is generally corrected by boxes of small chain, cylinders of soft iron, or soft-iron globes, placed athwartships on the same level, and at equal distances, on the port and starboard sides of the compass, with the centre of their mass on a level with the compass-needle, moving them to or from the compass till the needle points correctly.

To correct Coefficient - D.—Coefficient - D, which is of very rare occurrence, is corrected by placing the above correctors on the fore and aft sides of the compass.

NOTE.—When once the coefficient D is properly corrected by soft iron it is correct for all magnetic latitudes, provided the distribution of the iron in the ship is not materially changed, and provided the magnetism of the soft iron has not been affected by the compass-needles. With short needles having small magnetic power, such, for instance, as Sir William Thomson's, there will probably be no change; but when a compass with long and powerful needles is employed, soft-iron correctors placed very near it become magnetized by induction according to the power of the needles, and the resulting correction will not remain strictly perfect in all latitudes.

To correct Heeling Error.—The heeling error is corrected for any given magnetic latitude by placing a vertical magnet exactly under the centre of the compass-card, with its north or red pole uppermost if the heeling error is to windward, or to the high side of ship, or

its south or blue end uppermost if to leeward, or to the low side of ship, moving the magnet to or from the compass until the heeling error is corrected.

NOTE.—The heeling error due to the permanent part of the magnetism varies inversely as the earth's horizontal force, and consequently is greatest in high latitudes, diminishes as the ship approaches the magnetic equator, and increases again, still retaining the same name, as the ship recedes from the magnetic equator in the Southern Hemisphere. The heeling error due to transverse and vertical soft iron decreases as the ship approaches the magnetic equator, where it is zero, and is of a contrary name in the Southern Hemisphere. It is probable that the poles of the vertical magnet may require to be reversed in high southern latitudes.

A divided scale should be marked or fitted outside the tube or some other convenient place, so as to show the proper position for the correcting magnet as found in any given magnetic latitude, and the same recorded as a guide for approximately placing the magnet in position on any subsequent voyage in the same locality, and especially on the return of the ship to the United Kingdom.

Candidates should understand that the object of tentative adjustment is to bring the deviations within manageable limits, and also to equalise the directive force of the needle so far as is practicable on all courses; but no system of adjustment whatever is sufficiently reliable in character to absolve the navigator from the necessity of using every precaution, and especially of ascertaining the deviation on every available opportunity by observations of the sun by day and the other heavenly bodies by night.

APPENDIX N.

EXAMINATION OF A MASTER OR MATE IN STEAM.

The regulations under which these examinations are conducted are printed at pages to

A candidate for this examination is required to have a thorough grasp of the construction of the steam-engine and boiler to enable him to understand the nature and importance of any defect which may be reported to him by the engineer, and work in harmony with the engineer in affording time and facilities for disconnections, inspections, adjustments, and repairs.

To have a knowledge of what the principal repairs are which are needed in engines, and boilers, and pipes, and how these repairs are usually accomplished.

To be able to form an independent opinion as to a breakdown, and the consequent propriety or impropriety of proceeding under reduced steam with temporarily repaired or defective machinery.

To understand how to estimate approximately the reduction of fuel required for reduced speed, and consequently to sanction such reduction of speed as may seem to him to be warranted by the report of the engineer, and to satisfy himself before leaving port that there is sufficient coal for the voyage.

To have an intelligent grasp of the general run of pipes and connections in the engine-room, and marking of cocks, the opening and closing of cocks and valves, how mistakes of importance may be made in the confusion of an accident, and how best to guard against such mistakes.

To be capable of being left in charge of the feeding of a set of boilers, to understand the working of the water-gauge, and to be able to guard against being misled by false indications of the gauge-glass.

To understand about blowing-down and surfacing, the reasons for doing so, and the danger which may result from the neglect of these under certain circumstances. A master or mate presenting himself for examination in steam must be understood to have made up for his want of practical experience by reading up about the steam-engine. He ought, therefore, to show that he has given his mind to intelligently understanding the *rationale* of the action of the steam-engine. Under this head he should therefore be able to state approximately the quantity of heat required in the formation of steam, the remarkable relation of "latent" heat to "sensible" heat, how much steam can be raised by the combustion of one pound of coal, what horse-power measure is, what indicated horse-power is, what is the action of the slide-valve, the course of the steam through the engine, and the advantage of working expansively, and how the expansive action is shown by the indicator diagram. To know the uses of the various parts of the engines and dynamos used for electric-lighting, and how they and the cables are fitted in the hull; how wires are joined, insulated, and cased; why it is desirable that they should be led along places which are dry and accessible; what is "sparking," and what are the causes which produce it; what is its danger in coal-bunkers and petroleum-carrying steamers; what are the uses of switches and cut-outs, and why it is so important to prevent short-circuiting taking place.

The candidate has to answer in writing sixteen out of twenty questions selected from the book of Elementary Questions.* Selections for this examination are given of the alphabetic sheet for "Steam." Generally, these answers are given by candidates as learned by rote from a book; the candidates should therefore be asked such *viva voce* questions as will necessitate his giving his answers in different words, so as to discover whether he has the root of the matter in him.

The principal part of the *viva voce* is the examination on board a steamer, preferably one with which he is unacquainted. He is told to look about and try to find out the run of the machinery without the assistance of any one; the Examiner to be in the engine-room to see that this independent examination is properly carried out. When the candidate reports that he thinks he knows the whole arrangement of the machinery, the Examiner will then question him on the uses of the parts, get him to point out the different cylinders, pumps, valves, condenser, &c.; also the dynamo, its field-magnets, armature, commutators, brushes, cables, &c. He must show that he understands the run of the pipes in the bilges, not necessarily that he has gone over every one of them, but he ought to be directed to trace, at least, one important range of pipes, and to thoroughly satisfy the Examiner that he could be safely trusted to manipulate the valves or cocks in connection therewith. It will not often be practicable for the candidate to be asked to actually work engines under steam, but he must satisfy the Examiner that he knows how to do so, and that he is aware what precautions have to be taken in regard to water in the cylinder, &c. It is most important that a candidate should show that, in the event of an accident depriving him of the assistance of engineers, he knows what to do to safely take his vessel to an anchorage, or to stop the engines and proceed under sail alone.

The examination of a mate in steam is the same as that of a master. The knowledge required has no reference to the mate's position. A mate may be examined, but such examination implies that the mate will one day be a master, when the possession of the knowledge will be an advantage to him in the discharge of his duties as master.

* Printed at end of the Regulations relating to the Examinations of Engineers, Exn. 1a.

APPENDIX O.

SEA SERVICE REQUIRED FOR THE VARIOUS GRADES.

TABLE SHOWING THE REQUIREMENTS AS TO SEA SERVICE NECESSARY TO QUALIFY FOR EXAMINATION FOR CERTIFICATES OF COMPETENCY.

Service in Square-rigged Sailing-vessels.

A candidate for an ordinary certificate of any grade who has not previously held an ordinary certificate of a lower grade must prove that he has served twelve months in the foreign trade or eighteen months in the home or coasting trade in a square-rigged sailing-vessel.

Nature of Certificates.

Where foreign-going certificates are required to be held to qualify candidates for examination, they may be either the ordinary certificates, or those for fore-and-aft-rigged vessels or for foreign-going steamships.

Rank.	Minimum Age.	Total Sea Service (Years).	Officer's Service in Merchant Vessels.	
			Lowest Capacity.	Lowest Certificate required.

ORDINARY CERTIFICATES FOR "FOREIGN-GOING" SHIPS.				
Second mate	17	4	No officer's services required	None.
Only mate	19	5	No officer's services required	None.
First mate	19	5	1 Third or fourth mate in foreign trade in charge of watch	Second mate (foreign-going).
			Or	
			1½ Only mate in home or coasting trade	Second mate (foreign-going or home-trade mate).
			Or	
			1 Pilot with first-class pilot's certificate	None.
Master	21	6	1 Only mate in foreign trade	Only mate (foreign-going).
			Or	
			1½ Only mate in home or coasting trade	Only mate (foreign-going).
			And in addition, unless the above service was performed with a first mate's foreign-going certificate, he will also be required to prove one of the following services prescribed for that grade:	
			1 Third or fourth mate in foreign trade in charge of watch	Second mate (foreign-going).
			Or	
			1½ Only mate in home or coasting trade	Second mate (foreign-going) or home-trade mate.
			Or	
			1 Pilot with first-class pilot's certificate	None.
			OR HE MUST HAVE SERVED	
			6½ 1 Second mate in foreign trade	First mate (foreign-going).
			Provided that if this service as second mate was performed under an additional or auxiliary first mate, it will only be accepted if a third and fourth mate were also carried	
			And in addition	
			1½ Third or fourth mate in foreign trade in charge of watch	Second mate (foreign-going).
			OR HE MUST HAVE SERVED	
			9* 3 Master in home or coasting trade	Second mate (foreign-going) or master (home trade) for one year of such service.
			Or	
			1 Master in home or coasting trade	Ditto.
			3 Mate in home or coasting trade	
Extra master			Same as master.	

CERTIFICATES FOR "FOREIGN" FORE-AND-AFT-RIGGED VESSELS.

Second mate } Same as for ordinary certificates; except that no service in square-rigged sailing-vessels is required.
 Only mate }
 First mate }
 Master }

CERTIFICATES FOR "FOREIGN-GOING" STEAMSHIPS.

Second mate } Same as for foreign-going ships; except that the service as officer must have been performed in a steamship, and that no service in square-rigged sailing-vessels is required.
 Only mate }
 First mate }
 Master }
 Extra master }

* If all the service was in home or coasting trade.

Rank.	Minimum Age.	Total Sea Service (Years).	Officer's Service in Merchant Vessels.	
			Lowest Capacity.	Lowest Certificate required.
CERTIFICATES FOR HOME-TRADE SHIPS.				
Second mate	17	4	No officer's service required	None.
Mate	19	5	No officer's service required	None.
Master	20	5	1 Only mate	Mate (home trade), or second mate (foreign-going).
			Or	
			1½ Second mate in charge of watch	Mate (home trade), or second mate (foreign-going).
			Or	
			1 As pilot with first-class pilot's certificate	None.
			1 As master of cargo-vessel	Master of fishing-boat.
			1 As master of a vessel of 50 tons or upwards	Service certificate as master of vessel of 50 tons or upwards.
			1½ As master of a vessel of under 50 tons	Service certificate as master of vessel under 50 tons.

Rank.	Minimum Age.	Total Sea Service.	Lowest Capacity.	Lowest Certificate required.
RIVER-STEAMER CERTIFICATE.				
Master	21	1	Deck hand	None.
RESTRICTED-LIMITS SAILING-VESSEL UP TO 25 TONS.				
Master	21	4	One year of which in a somewhat similar class of sailing-vessel	Deck hand
FISHING-BOAT OR CARGO-VESSEL UP TO 25 TONS REGISTER.				
Master	21	4	One year in same class of vessel	Deck hand

Rank.	Minimum Age.	Total Sea Service.	Lowest Capacity.	Lowest Certificate required.
FISHING-BOAT UP TO 5 TONS REGISTER.				
Master	19	1	One year	Deck hand

APPENDIX P.

LIST OF MARKS OBTAINABLE IN THE EXTRA EXAMINATIONS.

(a.) Marks will be awarded according to the degree of precision with which a candidate does his work, no marks being given for any problem or work in which the candidate is wrong in principle.

(b.) An incorrect figure or incorrect formula will involve the loss of one-third of the marks allotted for the problem in question.

(c.) Marks, at the discretion of the Examiner, but not in any case to exceed fifty, will be given for orderly working and general method, &c.

(d.) Marks, at the discretion of the Examiner, but not in any case to exceed fifty, will be given for supplementary viva voce test on problems and written answers.

(e.) Thirty marks are allotted to each of the following "ordinary" problems. Only four will be set:—

- Multiplication by logarithms.
- Division by logarithms.
- Day's work.
- Latitude by meridian altitude of sun.
- Parallel sailing.
- Mercator's sailing.

- Time of high water.
- Amplitude by sun.
- Longitude by chronometer and altitude azimuth by sun.
- Time azimuth by sun.
- Finding meridian passage of star.
- Tables for finding stars' meridian passage.
- Meridian passage and altitude of planets.
- Where meridian passage of planets can be found.
- Finding name of stars near the meridian.
- Maps, &c., for finding stars.
- Computing approximate meridian altitude of star.
- Latitude by meridian altitude of star.
- Longitude by chronometer by a star.
- Time azimuth by a star.
- Latitude by ex-meridian altitude of sun or star.
- Summer problem by sun.
- Latitude by altitude of Polar Star.
- Latitude by meridian altitude of moon.
- Chart paper Exn. 9c.
- Chart paper Exn. 9d.

(f.) The numbers opposite the following problems represent the full marks obtainable:—

Latitude by double altitudes, sun or star	30
Finding position, &c., by simultaneous altitudes of two stars	40
Error of chronometer with artificial horizon, &c.	25
Explanation in writing <i>re</i> great circle sailing	20
Showing great circle track, &c., by globe	40
Problem in great circle sailing...	50
Drawing figure and giving trigonometrical ratios	25
Right-angled plane trigonometry (problem)	20
Oblique-angled plane trigonometry (problem)	25
Napier's rules for circular parts	20
Right-angled spherical trigonometry (problem)	15
Compass syllabus (5 marks for each written answer, and 10 for each problem)	145
Deviascope	20
Naval architecture	150
Constructing a Mercator's chart	50
Law of storms	20
Orderly working and general method, &c.	50
Supplementary <i>viva voce</i> test on problems and written answers	50

APPENDIX Q.

TEXT-BOOKS TO BE USED IN THE EXAMINATIONS.

For Naval Architecture.—“The Modern Practice of Shipbuilding in Iron and Steel,” by Samuel J. P. Thearle. Published by William Collins, Sons, and Co. Price, 11s. 3d. nett.

For Barometer, Thermometer, and Hydrometer.—“A Barometer Manual for the use of Seamen; with an appendix on the Thermometer, Hygrometer, and Hydrometer,” issued by the authority of the Meteorological Council, and to be purchased, either directly or through any bookseller, from Wyman and Sons, Fetter Lane, E.C.; or Oliver and Boyd, Tweeddale Court, Edinburgh; or Edward Ponsonby, 116 Grafton Street, Dublin.

For Prevailing Winds and Currents of the Globe.—“The Principal Winds and Currents of the Globe, &c.,” compiled from the various Admiralty Sailing Directions, Weather Charts, &c., by Captain Robert Jackson, R.N., and to be purchased, either directly or through any bookseller, from Simpkin, Marshall, and Co., Paternoster Row, London; or Henry Lewis, 114 High Street, Portsmouth. Price, 1s.

For Trade Routes.—“Ocean Passages,” compiled from the various Admiralty Sailing Directions by Captain Robert Jackson, R.N., and to be purchased, either directly or through any bookseller, from Simpkin, Marshall, and Co., Paternoster Row, London; or Henry Lewis, 114 High Street, Portsmouth. Price, 1s.

For Tides.—“Tide Tables for the British and Irish Ports,” published annually by the Admiralty, and to be purchased, either directly or through any bookseller, from J. D. Potter, 145 Minorities E., and 11 King Street, Tower Hill E. Price, 2s.

For Signalling.—The “British Signal Manual” may be obtained, either directly or through any bookseller, from Messrs Wyman and Sons (Limited), Fetter Lane, E.C.; or Oliver and Boyd, Tweeddale Court, Edinburgh; or Edward Ponsonby, 116 Grafton Street, Dublin. Price, 1s.

“The New Zealand Nautical Almanac and Tide Tables.” Price, 2s. 6d.

“The A, B, and C Tables for Azimuth, &c.” 5s.

Intending candidates are advised to procure a copy of these books to take to sea with them, so that they may study them during their leisure hours.

INSTRUMENTS.

The barometer (Kew pattern Marine barometer), thermometer, and hydrometer used in the examinations will be precisely similar to those supplied to shipmasters by the Meteorological Office for making observations on board ship.

