

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. Elementary mensuration, up to and including the measurement of ship-shaped bodies; plane geometry, up to and including the properties of the circle in relation to rectilinear figures; plane and spherical trigonometry, up to and including the solution of oblique-angled spherical triangles.
- h. Magnetism as relating to the compass.
- i. Construct a plan or chart on Mercator's principle and solve a given problem thereon.
- j. Naval architecture, including ship construction and stability.
- k. General knowledge, including shipping business, imports and exports, astronomy, and general elementary science (except chemistry).

He will be examined orally on the following subjects:—

- l. Leading principles of the construction of the sextant and vernier, mechanical logs, and sounding-machines.
- m. 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.

In signalling he will be required to attain a minimum speed of 12 words a minute in semaphore, 10 words a minute in Morse lamp-flashing, and 6 words a minute in Morse flag-waving.

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

- i. A circle must be drawn representing the stereographic projection of the celestial concave on the plane of the earth's rational horizon—unless the problem can be better shown otherwise—and a correct figure drawn in it, the magnitude of the sides and angles being estimated approximately by eye.
- ii. The sides and angles used in solving the problem must be marked by distinguishing letters in the figure, and the candidate must, 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.
- iii. Opposite each quantity in the computation he must 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 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.

All sketches and drawings required in the paper on naval architecture should be neatly done on paper supplied by the Examiner.

78. 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 ask.

EXTRA CERTIFICATES, STEAMSHIPS.

79. Extra Certificates, Steamships.—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 sit for a certificate as master of a foreign-going steamship, or who have already obtained that 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 of square-rigged sailing-vessels. (See para. 23.)