

301. Explain clearly what is being done by a helmsman manipulating the wheel of a steam steering-engine.

302. Is there any difference between the amount of horse-power required to put a helm hard over, in a given time, when the vessel is going full speed ahead and when she is going full speed astern? [This question refers to the case of a steamer fitted with one rudder only, and demands a more complete answer than merely "Yes" or "No."]

303. What precautions should be taken before removing a manhole-door of a steam boiler? In the absence of such precautions what casualties might occur?

304. Describe the chief features of the engine-governor fitted to a steamer you have served in. Describe its action. Give the maker's name, and name of ship.

NOTE.—The following six questions refer to oil-motors fitted to launches which carry passengers:—

305. Name the principal parts of an oil-motor, and briefly state their functions. Give the name of the makers of the motor.

306. What kind of oil is usually employed in oil-motors? What is its flash-point? What is its specific gravity? What is its calorific power? What precautions are taken in its storage to guard the public against casualty by fire or explosion?

307. How many cylinders are generally used in oil-motors? What kind of pistons are fitted? How frequently (measured in revolutions) is explosion per cylinder effected? How is explosion in the cylinder carried out?

308. Describe how an oil-motor is started. If starting prove difficult, where would you chiefly look for defects? How is piston speed modified? How is the speed of vessel varied? How is reversing effected?

309. Before examining an oil-motor with a naked light, what steps should be taken for safety's sake?

310. How frequently should an oil-motor, working 12 hours a day, be opened up for examination, cleaned, and its parts readjusted? What difficulty arises when the internal parts become foul with carbonised oil?

NOTE.—Questions should be read in the light of the context. Thus, the "sparking" referred to in question 283 relates to the sparking in an electric-lighting circuit on board ship (see question 281).

APPENDIX C.

EXAMINATION IN ROUGH WORKING-DRAWING FOR A FIRST-CLASS ENGINEER'S CERTIFICATE OF COMPETENCY.

Form Exn. 17.

1. THE regulations of the Marine Department in regard to the qualifications of a candidate for a first-class engineer's certificate of competency specify that—

"He will be required to make an intelligible hand-sketch, or a working-drawing of some one or more of the principal parts of a steam-engine, and to mark in, without a copy, all the necessary dimensions in figures, so that the sketch or drawing could be worked from:

"He must be able to state the general proportions borne by the principal parts of the machinery to each other."

2. In accordance with these clauses a candidate for a first-class certificate is required to make a rough working-drawing of the parts specified, as on pages and . An engineer who has been some years in charge of marine engines and boilers ought by this time to have familiarly in his mind the general construction of at least one set of engines and boilers—say, that set he was last with. Fine drawing is not expected, and in the proportion of the parts a wide margin will be allowed. Absurd dimensions will be failure in practical knowledge.

3. The drawing must, however, be practically a working-drawing, giving a sufficient number of views to show the parts fully—sections, plans, or elevations, just as the candidate would require to be supplied to him if he had to make the parts to the design of another person.

4. A clear hand-sketch, showing the construction completely, and fully dimensioned, will be accepted if the candidate prefers this alternative.

5. A portion only of the parts specified may be accepted in place of the whole, if that portion is sufficient to show that the candidate has a good practical idea of the construction of the parts, and a fair notion of their general proportions or dimensions.

6. Candidates are cautioned not to put on paper what they have not fully considered, and deliberately intend to be understood, as evidence of what they know about the construction of any part required.

7. The statements given in by a candidate may be in themselves apparently of little importance; but, as sample material from which the state of the candidate's knowledge of engines and boilers is to be inferred, every detail which is glaringly inconsistent with a sound knowledge of the use of the part, or in which an essential consideration has evidently been overlooked, is an important element in the description which the candidate is giving of his own qualifications.

8. The candidate is advised not to begin more than he can clearly finish in the time allowed. An important object in this part of the examination is to ascertain whether the candidate can be trusted to mark all necessary dimensions upon a sketch or a drawing. The test of this is practically the making of the part from the sketch without having to supply additional dimensions, and without measuring the drawing. To prove this ability the candidate must fully dimension the parts shown in his sketch or drawing, notwithstanding that the parts may be correctly drawn to scale. A drawing is fully dimensioned when no part of it is left to the option of the party who is to work to the drawing.

9. To prevent misunderstanding, however, when the candidate has been led into showing more of the details than he has time fully to finish, he should name, in the statement on the other side, the particular parts which he has not fully dimensioned.

10. All dimensions should have lines and darts, to indicate distinctly the points between which the dimensions are given.

11. Beware of writing cross-dimensions upon centre lines, or upon longitudinal-dimension lines. [This is not an order, but a recommendation.]

12. The candidate is not expected to design anything; he has merely to sketch or draw something with which he is expected to be already familiar. At the same time he should call attention to any defect in the design of the article or apparatus. Omission to do so will imply want of practical knowledge.

13. Pencil in nothing after half past 3. All the dimensions, the figures, and the darts must be inked