

in. Employ the remaining time in examining the drawing and in inking in any figures which may have been before overlooked, and in checking the dimensions.

14. Make sure that you will have sufficient room on the drawing-sheet to show all the necessary views. You can have another sheet of drawing-paper if necessary. All the paper used must be forwarded with the drawing.

(Specimen.)

SUBJECT FOR EXAMINATION IN ROUGH WORKING-DRAWING.

*Form Exn. 17a.*

[Read the foregoing general instructions.]

A COMMON SLIDE-VALVE, with its spindle. Show also an outline section of the ports at the cylinder-face. Show the provision for connecting the slide-valve to the spindle.

The candidate is requested to fill up the following, and to attach this paper to his drawing.

*Statement by the Candidate.*

The accompanying drawing, made by me this day without referring to any document, and without the assistance of any person, is intended by me to be sufficient for the new construction of the parts above described, to fit the places of similar parts which are to be removed. The construction is similar to what I have been with in the steamer, but the dimensions may be different.\*

The diameter of the cylinder is . . . . .  
 The stroke of the piston is . . . . .  
 The travel of the valve is . . . . .  
 The cover at top end on steam side is . . . . .  
 The cover at bottom end on steam side is . . . . .  
 The lead at top is intended to be . . . . .  
 The lead at bottom is intended to be . . . . .  
 The inside cover is + . . . . . or - . . . . .  
 The thickness of the face of valve is . . . . .  
 The thickness of the body of valve is . . . . .  
 The greatest opening for steam will be . . . . .  
 That gives an area equal to one . . . . . th of the piston.  
 The opening for exhaust when the crank is on the top centre is . . . . .  
 That gives an area equal to . . . . . th of piston.  
 † The length of the connecting-rod is . . . . .  
 † The valve will cut off steam on the downstroke at . . . . .  
 † The valve will cut off steam on the upstroke at . . . . .

It is required that all the parts shall be fully dimensioned in ink, but, if owing to want of time, this has not been done, the parts not fully dimensioned must be stated, otherwise it will be understood that the candidate considers the dimensions given sufficient.

The parts not fully dimensioned are . . . . .

Dated at . . . . ., this . . . . . day of . . . . ., 191 . . . . .  
 . . . . . Candidate.

\* Run the pen through the words that do not apply.  
 † The candidate may omit this part if he chooses.

## APPENDIX D.

### READING THE WATER-GAUGES.

NOTWITHSTANDING that the reading of the water-gauge is made a special feature in the examination of engineers, many boiler casualties result from the engineer of the watch either not understanding the construction of the water-gauge fittings or not satisfying himself by actual trial that the cocks, pipes, &c., are clear.

In one case two furnace-crowns came down in a steamer that was just starting on a voyage. The engineers were satisfied that there was plenty of water in the boiler, because the water-gauge showed full glass, and they called the attention of a Board of Trade Surveyor to this fact as being conclusive evidence that the casualty could not have resulted from shortness of water. On examination of the fittings, however, it was found that the cock between the boiler and the steam-pipe leading to the gauge was shut, having been carelessly left in that position on the previous day, when the mountings were overhauled for survey. Directly the cock was opened the water disappeared from the gauge-glass, and the second engineer admitted that he had blown down the boiler in order to lower the water-level, as the glass was full.

Many steamers have had their furnaces brought down at sea in a similar manner to the above through what the engineers of the watch have called "false water in the glass," and which, on examination, has been found to result from the top communication being choked.

These casualties resulted from what, to say the least, was bad management, not false water.

Unless a candidate under examination is able to prove that he understands how to verify the indications of the water-gauge, he should not be passed in practical knowledge; and, as failure in practical knowledge involves the candidate going to sea for another three months before being eligible for re-examination, the Examiner should explain to such candidate his error, after failing him, in order to prevent further casualties resulting from his want of knowledge on this subject.

The sketches, Figs. 1, 2, 3, 4, and 5, Plate I, represent the usual methods of attaching water-gauge mountings to marine boilers. The important features in each gauge and the method of verifying its indications are dealt with separately in the following remarks.

*Referring to Fig. 1 only.*

In this case the water-gauge cocks are attached direct to the boiler, and the accuracy of the gauge when the boiler is under steam can be tested as follows:—

First.—Let B remain open, then close cock D and open cock E, and if steam issues it proves that cock B and the passage through the top fitting and gauge-glass are clear. If no steam or water issues, either cock B or the passage through the top fitting and gauge-glass is choked, and the gauge cannot act properly until the obstruction is removed.

Second.—Close cock B and open D and E, and if water issues cock D is clear. If no water or steam issues, either cock D or the passage from the boiler through the lower fitting is choked, and must be cleared before the gauge can act properly.