18. Question.—In a paddle steamer, is the paddle shaft and the engine shaft rigidly secured? Explain or sketch the usual arrangement of shafting in a paddle steamer, also show the device to allow for wearing down.

Answer.—In a modern paddle steamer where the crank shaft joins the paddle shaft the flanges are not rigidly bolted to each other but are fitted with a flexible coupling, so as to allow for any out of alignment and prevent the shaft being put under a bending stress due to wear down. Fig. 23 shows in plan the general lay out of a paddle steamer engine room

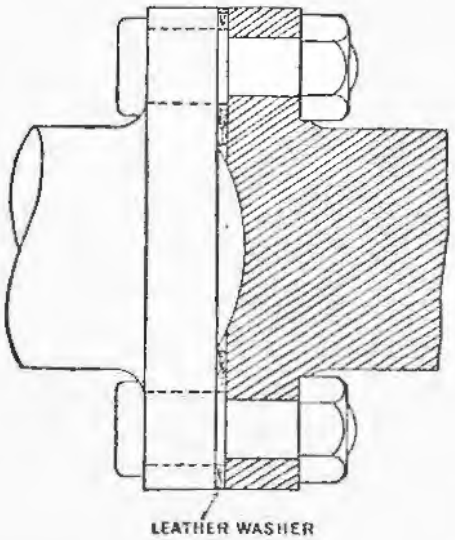

Fig. 21.—Flexible Coupling for Paddle Shafts.

and also the arrangement of the sponson and paddle beams. Fig. 21 shows the detail of the flexible coupling in which there is a ball and socket joint between the paddle and the crank shaft. This coupling is fitted in all modern paddle steamers, and in this case the crank shaft is rigid. The older type of paddle boat had a flexible crank shaft, as shown in Fig. 22, where the crank pin is rigid in one web but is flexible in the other.

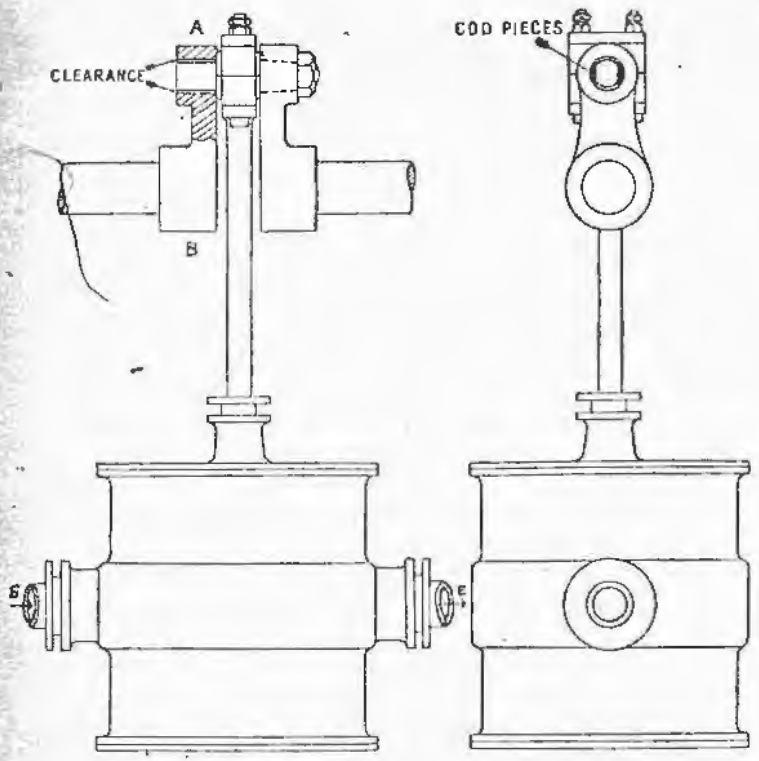

Fig. 22.—Crank Shaft for Oscillating Paddle Steamer.

19. Question.—In a paddle steamer, where is the thrust taken up? Sketch the arrangement.

Answer.—In a paddle steamer the thrusting force on the hull is taken up at the large plummer blocks or bearings which are bracketed to the side of the ship where the paddle shaft projects into the paddle boxes. The paddle wheels are overhung past those plummer blocks and the weight of the paddle wheels is mainly supported by them. The large arrows in Fig. 23 show where the thrusting force is transmitted to the hull

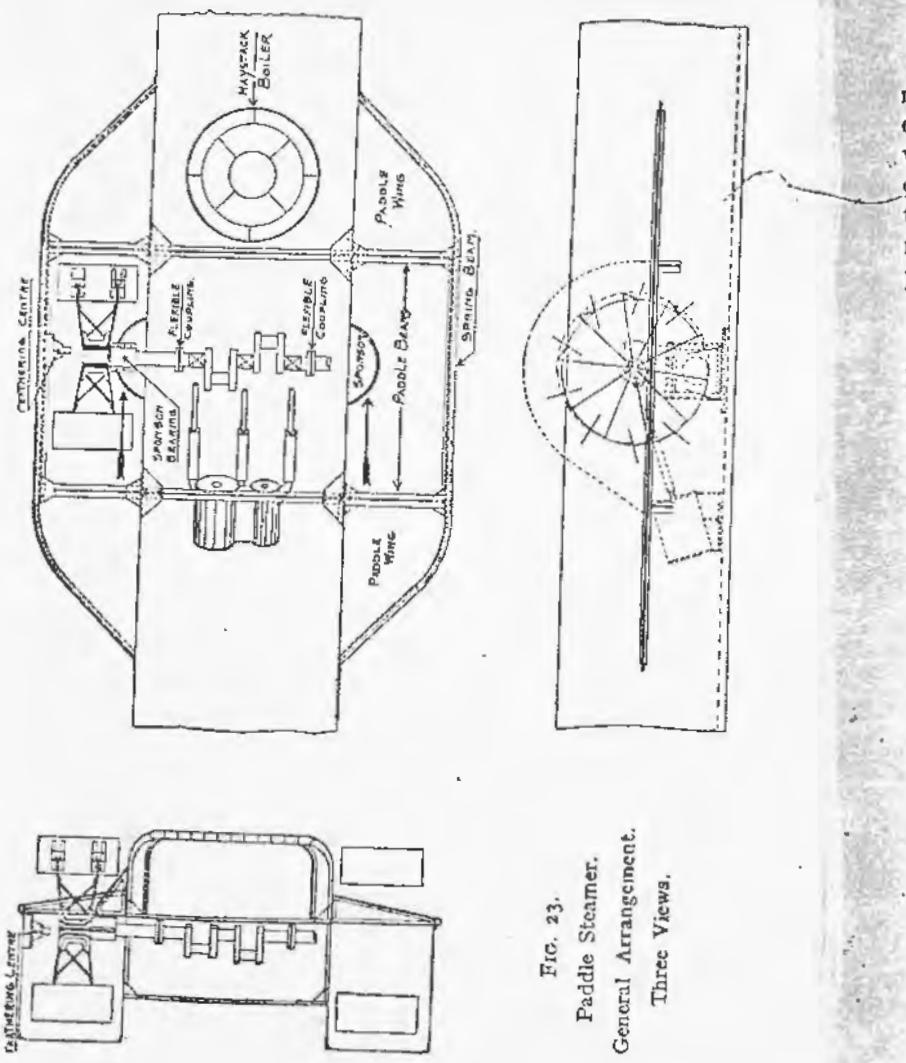

Fig. 23.
Paddle Steamer.
General Arrangement.
Three Views.

Ship Construction. — Paddles.

19a. Question.—Describe a paddle wheel fitted with feathering floats. State the materials of which the wheel is made. What is the function of the driving rod?

Answer.—In the older type of paddle wheel the floats were radial, this was an extremely simple wheel but its driving efficiency was not so great as in the modern feathering paddle wheel. The introduction of a feathering centre which is eccentric to the paddle shaft centre, causes the floats to enter the water in a vertical position and to retain this position as nearly as possible while in the water, so giving a better propelling efficiency.

Fig. 23*a* shows the details of a feathering wheel. The feathering centre is bolted to the outer beam of the paddle box and is from 10 to 15 inches ahead of the main paddle shaft, the eccentricity depending upon the size of wheel. The centre or hub of the wheel is made of cast iron or cast steel while the paddle arms are made of wrought iron, being attached to the centre with fitted bolts, those arms being in a similar way attached to the rims of the wheel. The rims being made of wrought iron, as are also the feathering rods and stays.

The feathering rods are all of the same description except one, which is called the driving rod, this rod is of a heavy rectangular section and is bolted at the inner star centre in order to rotate the feathering gear. The other rods are made of a round section as they are only subject to alternate tension and compression, while the driving rod has in addition a bending stress set up due to having to drive the feathering centre round.

The bearings at the ends of the rods and arms are fitted in a peculiar way, namely, brass working on brass, or brass working on lignum-vitæ, this is done to allow the sea water to act as a lubricant, this it may be remarked, is similar to the way in which tail shafts are lubricated.

Note.—*The feathering centre is usually referred to in Scotland as the Jenny-Nettle centre, in England it is called the Star centre.*

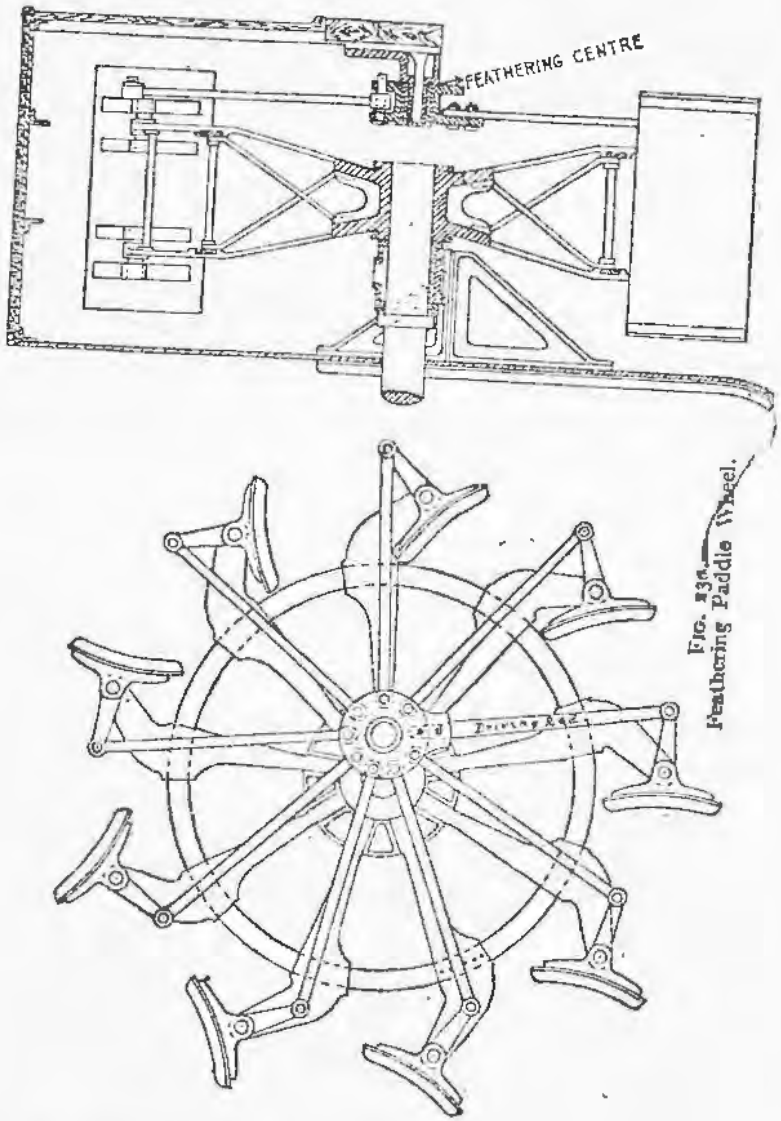

FIG. 136.—Feathering Paddle Wheel.

20. Question.—Describe how the main injection valve is fastened to the skin of the ship. What kind of bolts are used? Why is this valve placed as low down as possible?

Ship Construction.

Answer.—The main injection valve is made fast to the ship's side, as shown in Fig. 24, being bolted with a spigoted flange to prevent corrosion of the ship's plate. Muntz metal

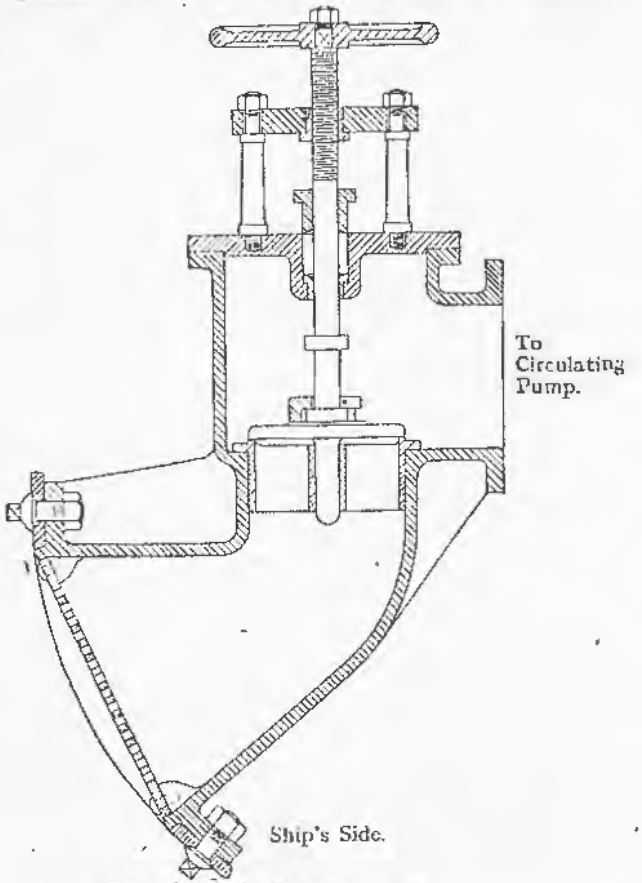

FIG. 24.—Main Injection Valve.

bolts are used and they should have snap heads and be screwed through the ship's plate. The bolts have square heads for screwing them into the plate but they are sawn off after the joint is made.

This valve should be placed as low down as possible to make sure that when the ship is rolling the orifice will not be uncovered and allow the circulating pump to draw air so causing a loss of vacuum. The objection to its being placed