BREAKAGE AND REPAIR AT SEA OF THE MAIN SHAFT OF THE STEAMSHIP UMBRIA.

The Umbria is a splendid first-class mail steamship, single screw, belonging to the Cunard line, plying between New York and Liverpool. Her dimensions are: 501½ feet length, 57 feet 2 inches beam, depth 38 feet 2 inches, 8,128 tonnage, 10,500 horse power. She is one

Fig. 1.—THRUST COLLARS OF THE SHAFT.

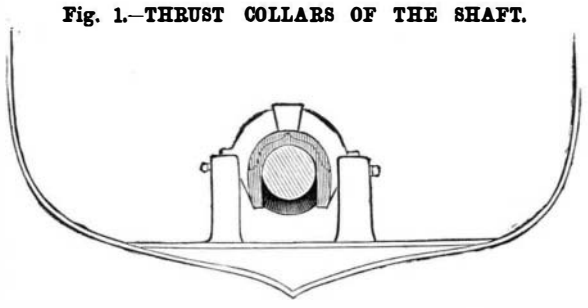

Fig. 3.—SHAFT AND THRUST BLOCK.

of the fastest of the large ocean steamers, her average of all passages being 18·15 knots or about 20 miles per hour.

On the 23d of December last, when off the Newfoundland coast, while flying along under full speed, on her voyage to New York, the chief engineer, Tomlinson, discovered cracks in the main shaft. The engines were immediately stopped and measures taken to repair the break.

The highly successful nature of the repairs and the size of the ship which, by their aid, was brought into port make it a subject of unusual interest.

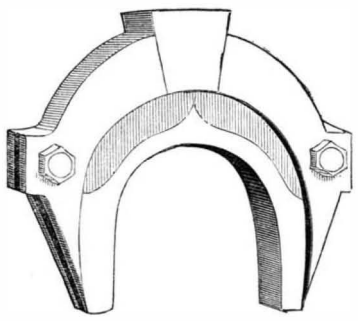

Fig. 2.—THRUST YOKE OR COLLAR BLOCK.

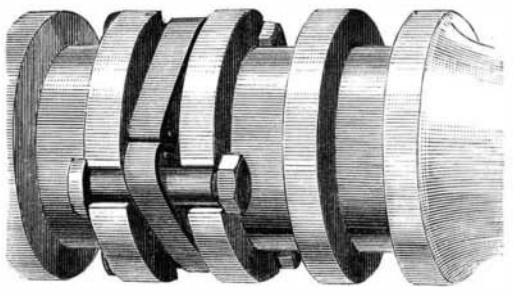

Fig. 5.—THE BOLTS STRAPPED IN PLACE.

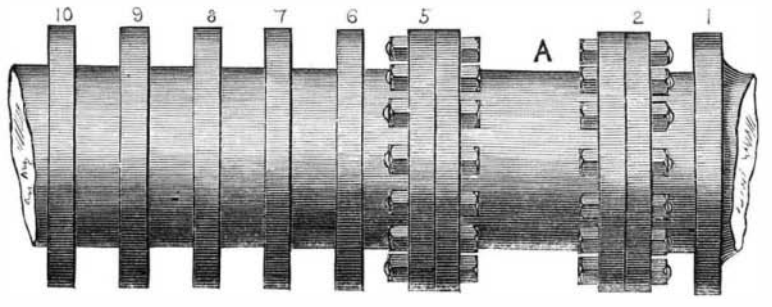

Fig. 6.—THE FINAL REPAIRS OF THE UMBRIA'S SHAFT.

Upon the shaft of a screw steamer there is a section which is provided with a number of collars, larger in diameter than the shaft, that receive the longitudinal thrust of the propeller shaft. Fig. 1 shows the collared portion of the Umbria's shaft.

This portion of the shaft rotates between two longitudinal abutments of iron, called the thrust block. Into grooves in this thrust block Π-shaped yokes or collars of iron are set from above (see Fig. 2), one of these yoke or collar blocks coming behind each of the collars of the shaft. The shaft collars exert their thrust against the yoke or collar blocks just described. (See Fig. 3.)

The fracture of the Umbria's shaft occurred in a very inconvenient place, namely, between two collars of the shaft, as indicated in Fig. 4. There were two distinct cracks in the shaft, the most serious one running diagonally from flange to flange on one side of the shaft. The first thing done on discovering the injury was to support the shaft by passing a chain cable under the shaft, which chain was secured to the steel beams above it. To enable these beams to take the strain they were shored up with timbers. Next, three holes were drilled through the collars of the shaft on each side of the break for the reception of large bolts. This was a work of great difficulty, owing to the limited space, and only five men could advantageously work at once. Shifts of five men each were employed, who worked night and day in six hour watches, operating with hand drills. The metal remaining outside the edge of the holes was chiseled away to permit the insertion of the coupling bolts, which were then dropped in and the nuts screwed up so as to strain the fractured edges of the shaft tightly together. In these operations it is estimated 180 inches of iron were drilled through. A clamp or strap was bolted around the shaft between the collar before the bolts were put in place. After the bolts were screwed up another strap was put around them, its flanges being turned inward. (See Fig. 5.)

To get at the shaft collars and permit the rotation of the shaft after repairs were made, several of the thrust block yokes were removed. On the completion of the repairs the engines were slowly started, and the work done proved to be safe and successful, with the exception that, in the course of the first two hours, the head of one of the bolts flew off and a new one had to be inserted, causing several hours' delay. After this all went very smoothly, the ship making about nine miles an hour, and safely reaching New York on the night of December 30. The work of repairing occupied four days' time.

A very fortunate circumstance was the early discovery of the break. Chief Engineer Tomlinson noticed that the engine was not running truly and became suspicious; this led to an investigation on his part. Going over the line of shaft and lifting the covers of the first thrust box, the fracture was discovered and the engines stopped. The crack had not then penetrated entirely through the shaft, so that the alignment of the shaft was but slightly disturbed.

On the arrival of the ship in New York telegraphic communication was had with the owners relative to the permanent repair of the machinery. To effect this it would be necessary to remove and reheat the present shaft or put in a new one. This would occasion great delay. It was finally decided to make a temporary but more secure repair than that already made, and to take the ship to England, where a new shaft could be more quickly put in; while the vessel could at the same time be generally overhauled for the expected great passenger traffic of next summer, due to the opening of the World's Columbian Exposition.

The plan of final repair is as follows (see Fig. 6): The fractured portion of the main shaft is cut out even with the faces of two of the thrust collars. A short section of steel, corresponding in diameter to the shaft, and flanged or collared at both ends, is then set in to fill the space that was occupied by the fractured parts. The collars of the shaft and the collars of the inserted section are then strongly bolted together, as shown in Fig. 6. In this way it is expected a strong and reliable coupling can be made, whereby the ship may safely proceed to England. These repairs are now in progress, and in a few days the great vessel will move homeward.

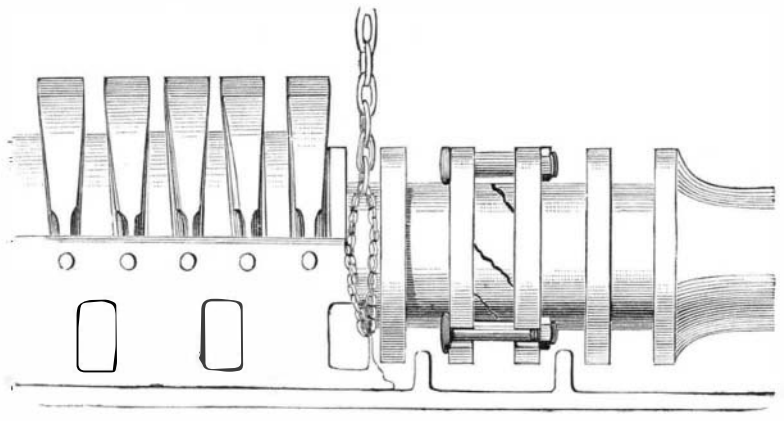

Fig. 4.—THE BROKEN SHAFT OF THE UMBRIA AS REPAIRED.

Great credit is due to Chief Engineer Tomlinson, of the Umbria, for the skill and promptness with which the fracture was discovered and repaired.

In this connection, we have thought it would be of interest to show how broken shafts are ordinarily repaired at sea. Most of the steamers carry on board what is called the Thompson coupling. (See Figs. 7 and 8.) This consists of three strong, flanged cylindrical sections of steel, which bolt together, and when thus combined they grasp and hold the broken ends of the shaft firmly together, as illustrated in Fig. 8. Fig. 9 shows how the Thompson coupling was successfully applied to the main shaft of the large steamer Veendam, which suddenly gave way at sea, in May, 1891. In this case it was necessary to re-enforce the Thompson coupling by means of chains and wedges.

This coupling could not be applied in the case of the Umbria, owing to the fact that the break took place at the collared portion of her shaft.

ONE of the uses to which rubber has been put is for horseshoes; it is light and durable, and improves the hoof.

Fig. 7.

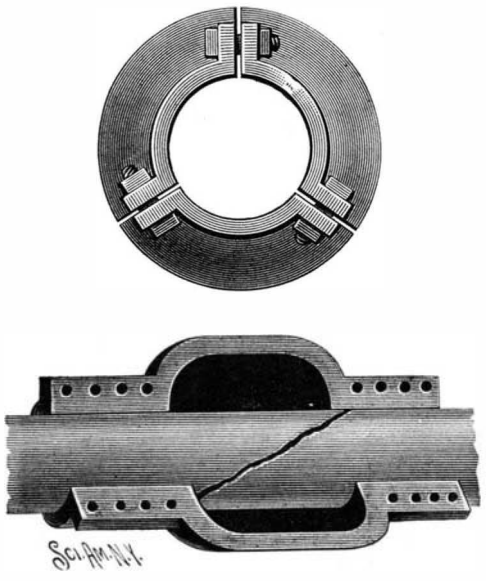

Fig. 8.—THE THOMPSON COUPLING.

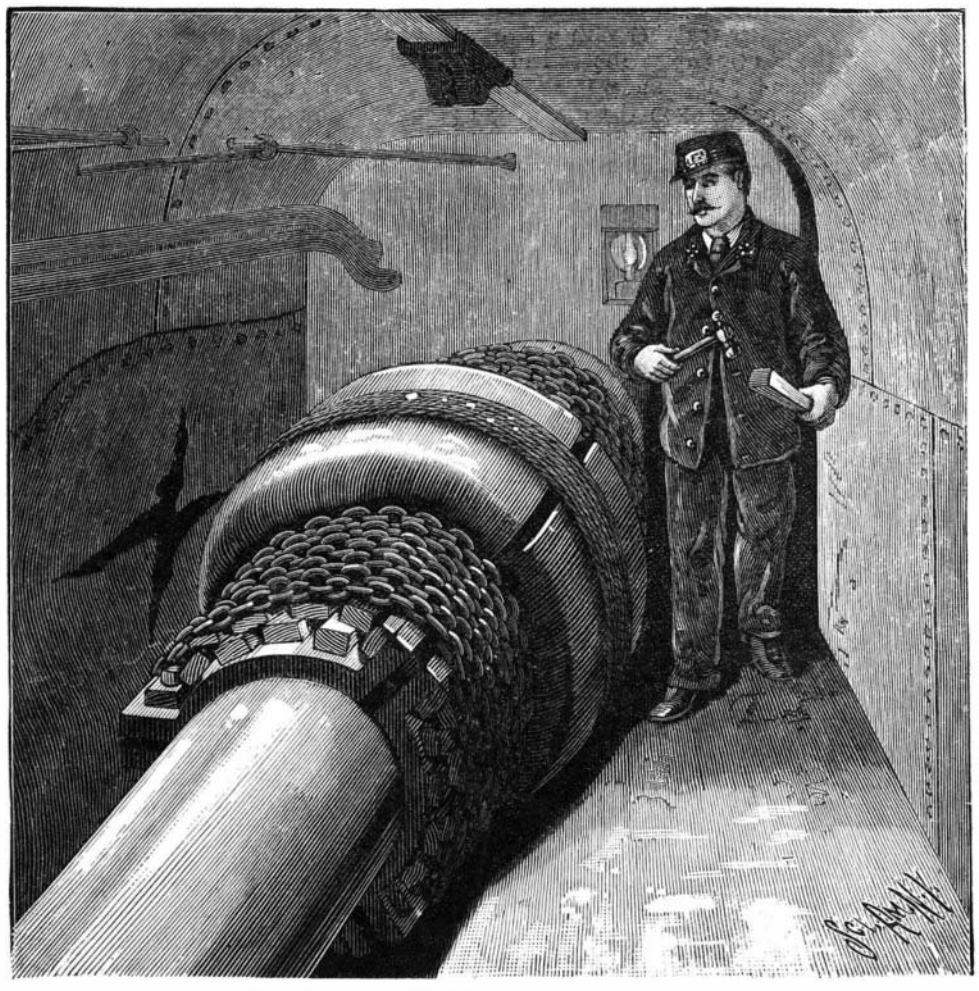

Fig. 9.—THE THOMPSON COUPLING AS APPLIED.