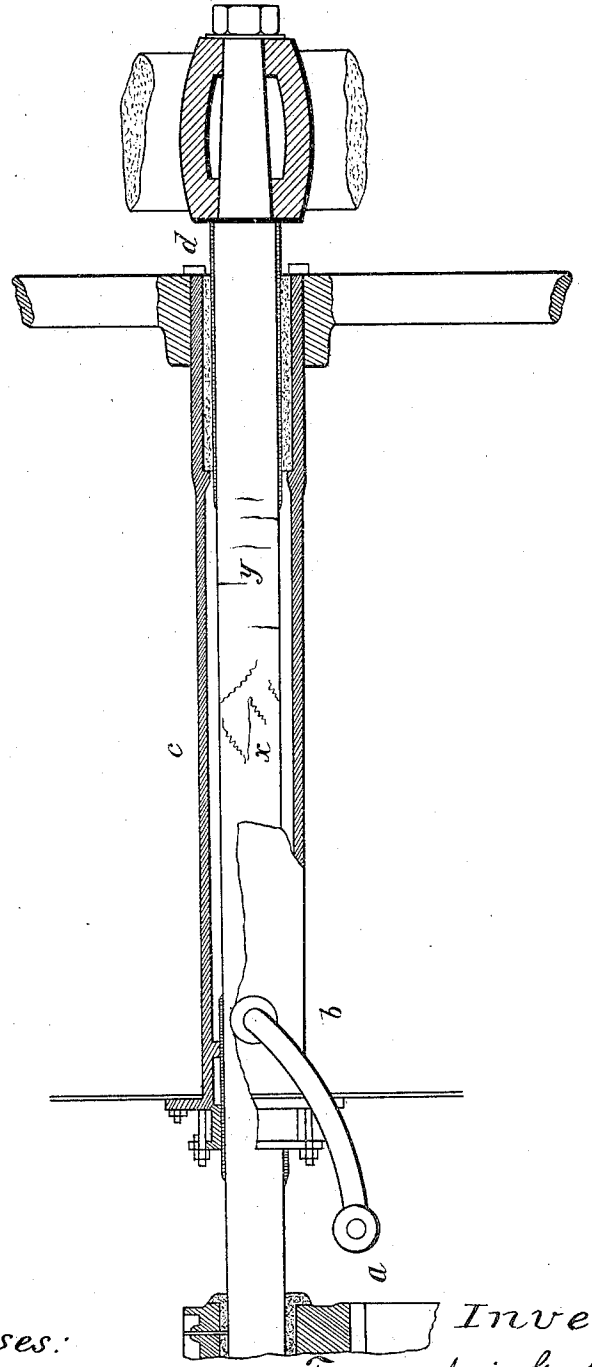
No. 676,889. Patented June 25, 1901.

F. M. GASPARINI.

MEANS FOR PREVENTING BREAKING OF PROPELLER SHAFTS.

(Application filed Mar. 16, 1901.)

(No Model.)



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UNITED STATES PATENT OFFICE.

FRANCESCO MARINO GASPARINI, OF VENICE, ITALY.

MEANS FOR PREVENTING BREAKING OF PROPELLER-SHAFTS.

SPECIFICATION forming part of Letters Patent No. 676,889, dated June 25, 1901.

Application filed March 16, 1901. Serial No. 51,440. (No model.)

To all whom it may concern:

Be it known that I, FRANCESCO MARINO GASPARINI, mechanical engineer, a subject of the King of Italy, residing at 1494 Via Garibaldi, Venice, Italy, have invented certain new and useful Improvements in Means for Preventing the Breaking of the Propeller-Shafts of Screw-Steamers, (for which I have obtained Letters Patent of the Kingdom of Italy, Reg. Att., Vol. 131, No. 2, under application filed on August 17, 1900,) of which the following is a clear and full description.

Ever since screw-propelled steamships have been in use the shafts of such screw-propellers have very often been found broken, which involves great danger to life and property. The point where such breakages ordinarily take place appears to be that part of the screw-shaft which is contained in the stern-bearings or screw-tunnel passing from the inside of the ship to the stern. The cracks which precede the breakage are found to be in form of cuts transverse to the axis of the shaft if it is made of wrought-iron, and in form of fractures of the fiber if the shaft is composed of fagoted or broken iron. In the surveys almost in every case it has been reported that the breakage was due to the flexion. In some instances when the bronze bearings were found to be melted on the shaft the breakage was attributed to the deleterious influence of the fusion. In every case the unanimous opinion was that the quality of the material was bad. People therefore tried to manufacture the propeller-shafts of the finest quality of iron or steel in very ample dimensions. The fusion of the bronze collars or bearings on the body of the shaft was avoided by applying them cold, and a second bearing of gaiac wood was provided to better sustain the shaft and avoid flexion. Notwithstanding all this the breakages occurred the same as before.

Causes of breakage of the propeller-shaft.—After having carefully examined various broken and cracked shafts and the symptoms observed in long voyages I have found the true and sole cause of the said breakages of the propeller-shafts. The stern-bearing or screw-tunnel containing the propeller-shaft is tightly closed at the inner side of the ship by pressed hemp packing and communicates with the water only toward the stern through the intervals between the staves of the gaiac bearing. During long journeys it was stated that the propeller-shaft, owing to its own weight, is heated through the friction on the gaiac bearing and through insufficient lubrication to such an extent that, especially in long runs, the little water contained in the stern-bearing is expelled and lubrication reduced to zero, thus favoring the heating. Oftentimes the gaiac bearing is worn away and it is customary to replace the worn staves with new ones without reflecting on the logical causes of the phenomenon. The mass of the heated part of the shaft expands sensibly at a sufficiently high temperature, and the greater the expansion the higher is the number of calories incorporated. When the vessel stops, the water comes in direct contact with the surface of the shaft, the molecules of which at the circumference contract instantaneously on cooling, thus making a contrast with the internal mass, which is not able to follow this contraction until after a given time, when it is also subjected to the contrast of the outer molecules, which are already cooled. By the repeated heating and cooling the outer or peripherical molecules of the shaft lose their cohesive affinity and detach from each other, forming cracks x transverse to the axis of the shaft or fractures of fiber y, according to the material of the shaft. Each time the cracks become deeper, until the remaining coherent section has become so thin that the shaft is liable to break at the first serious shock, which involves a great danger if the ship is near the coast during a gale. By carefully observing the said phases and by examining the gradual effects produced I obtained the absolute certainty that the breakages of the propeller-shafts were only produced by the disgregation of its molecules consequent of abnormal expansions and contractions.

Lubricating and cooling device to preserve the propeller-shaft intact.—After having discovered the cause of the fractures I have found the means to prevent them by means of a lubricating and cooling device for the propeller-shaft in the stern-bearing or screw-tunnel by means of circulating water, which

consists in conducting the water into the stern-bearing through a tube *b*, the free end of which is turned in the direction of movement of the ship, so that the water enters in consequence of the movement of the ship and escapes at the rear end of the stern-bearing. The current being developed in a direction opposite to the movement of the vessel will be stronger the greater is the speed of the floating body and will correspond perfectly to the purpose of preserving the propeller-shaft in its normal condition of potentiality without the least heating at any speed, no matter how long the voyage is.

The application of the above-described cooling device, besides preserving intact the propeller-shaft, offers a direct material advantage by the abundant lubrication in reducing the friction, which means economy of motive power.

Having now described my said invention and the manner in which the same is to be performed, I declare that what I claim is—

The combination with the propeller-shaft of a vessel, having a cooling chamber or space around said shaft, of a water-feed pipe having one end connected with said chamber and its opposite end opening into the water and toward the direction of movement of the vessel, substantially as described.

In witness whereof I have hereunto set my signature in the presence of two witnesses.

FRANCESCO MARINO GASPARINI.

Witnesses:

G. W. ZANARD,

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