(No Model.)

2 Sheets—Sheet 1.

L. HACHENBERG.

MARINE SCREW PROPULSION.

No. 598,421. Patented Feb. 1, 1898.

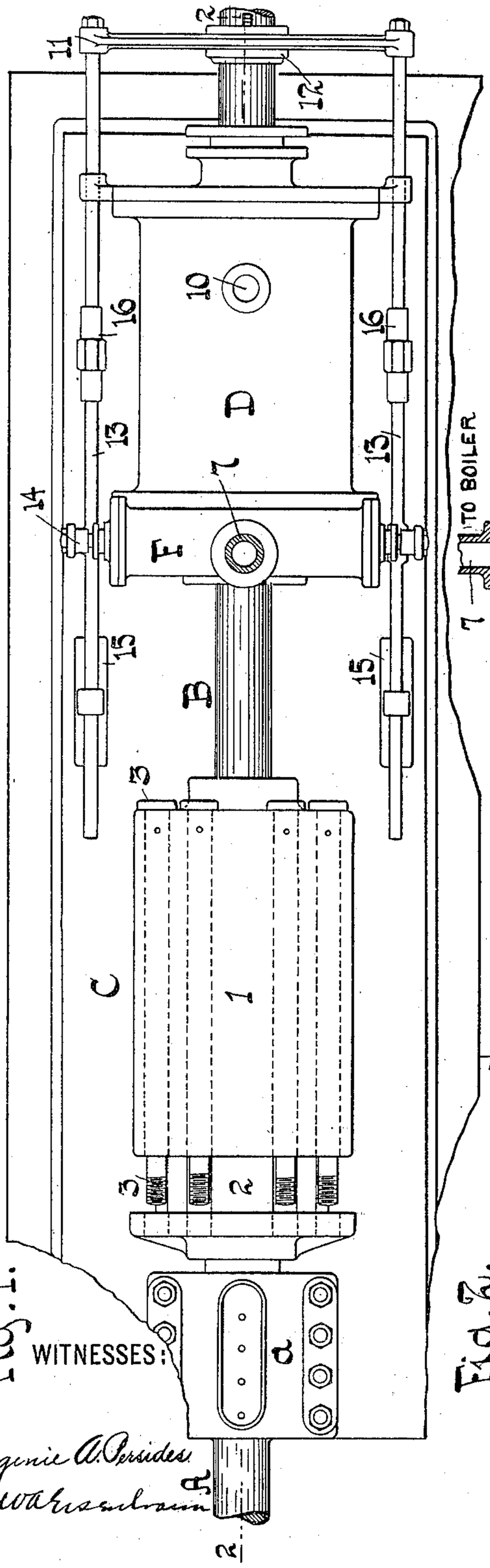

Fig. 1.

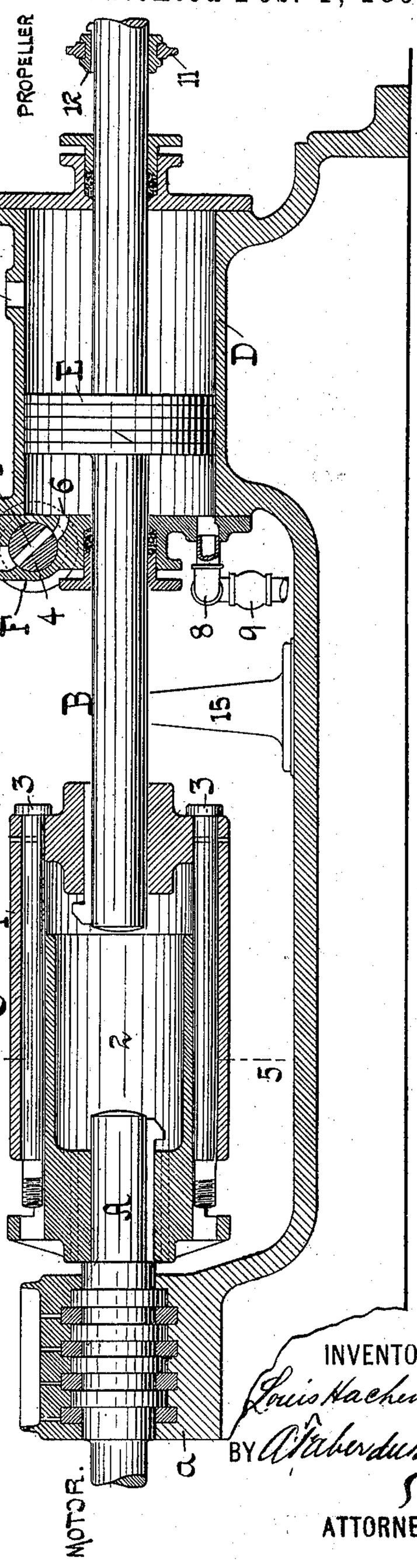

Fig. 2.

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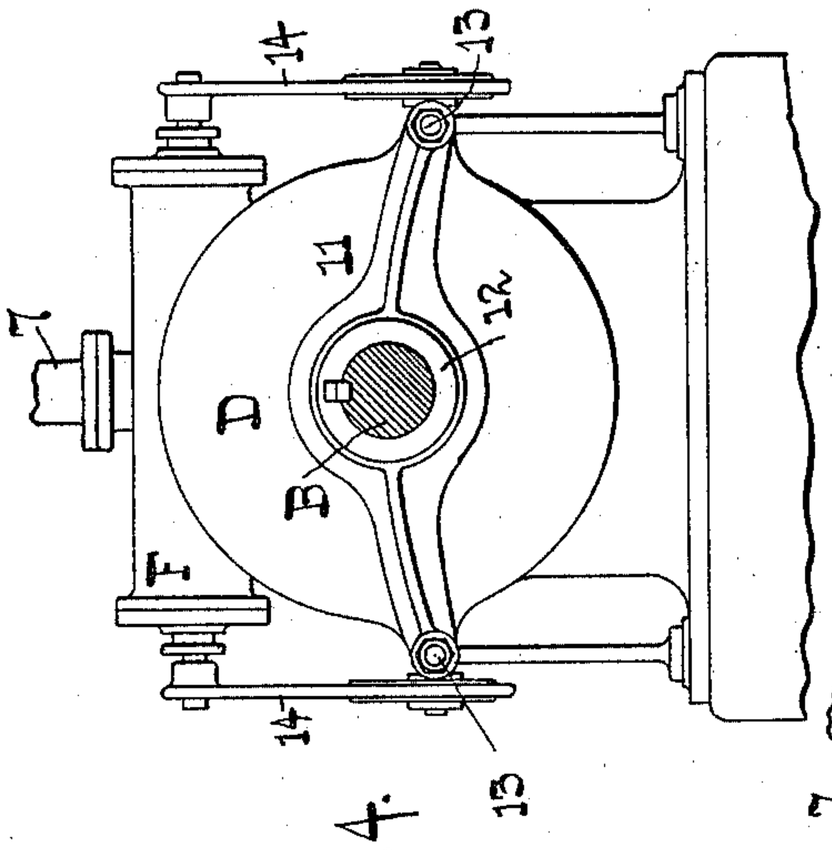

Fig. 4.

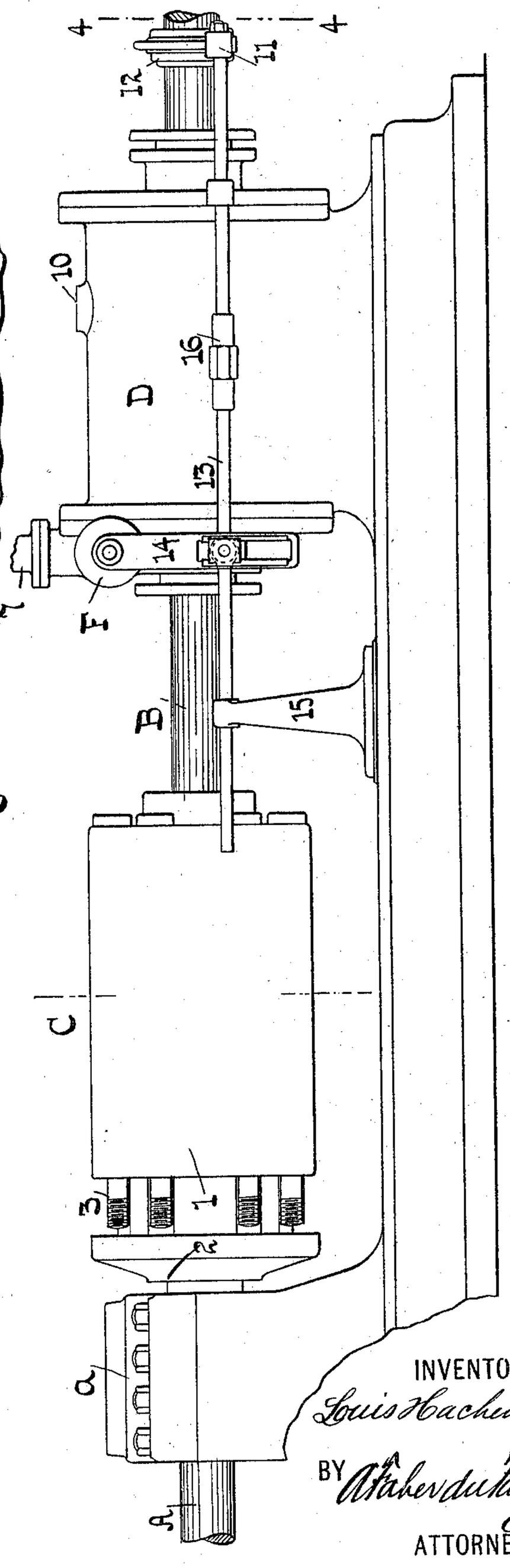

Fig. 3.

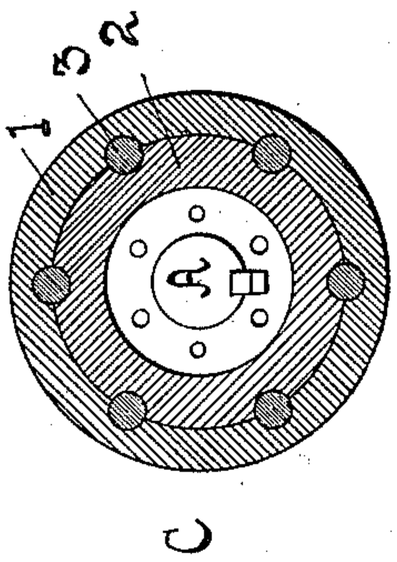

Fig. 5.

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UNITED STATES PATENT OFFICE.

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MARINE SCREW PROPULSION.

SPECIFICATION forming part of Letters Patent No. 598,421, dated February 1, 1898.

Application filed March 21, 1896. Serial No. 584,234. (No model.)

To all whom it may concern:

Be it known that I, LOUIS HACHENBERG, a citizen of the United States of America, and a resident of New York, in the county and State of New York, have invented certain new and useful Improvements in Marine Screw Propulsion, of which the following is a specification.

My invention has reference to improvements in marine screw propulsion, and has for its objects, first, to take up for inequalities in the action of the propeller against the water by imparting to the propeller-shaft a certain longitudinal adjustability to variations of the thrust, and, secondly, to practically relieve the thrust-bearing from pressure.

With these objects in view my invention consists, essentially, in the combination, with a motor-shaft, of a thrust-shaft, means intermediate of said shafts whereby they are slidably connected, a piston formed on said thrust-shaft, a cylinder in which said piston reciprocates, a supply for an elastic fluid under pressure to said cylinder, a valve for controlling the admission of fluid, and a cut-off mechanism operated by the thrust-shaft, all constructed to intermittently supply the elastic fluid to the cylinder, which fluid will maintain a constant equilibrium between the thrust and pressure by expansion or compression under varying conditions of thrust.

The nature of my invention will best be understood when described in connection with the accompanying drawings, in which—

Figure 1 represents a plan or top view of an apparatus constructed according to my invention. Fig. 2 is a vertical longitudinal section on the line 2 2, Fig. 1. Fig. 3 is a side elevation. Fig. 4 is a transverse vertical section on the line 4 4, Fig. 3. Fig. 5 is a vertical section on the line 5 5, Fig. 2, illustrating the construction of the coupling between the motor and propeller shafts.

Similar letters and numerals of reference designate corresponding parts throughout the several views of the drawings.

Referring to the drawings, the letter A designates a shaft driven by a marine engine (not shown) of any approved construction, and *a* is the thrust-bearing of a usual form for the shaft of such engines.

B designates a separate shaft arranged in line with the motor-shaft A. To this shaft B the propeller (not shown) is secured, and to distinguish the same from the motor-shaft I shall hereinafter term it the "propeller-shaft." The propeller-shaft is connected to the motor-shaft by any suitable coupling, as C, which will cause it to rotate with the motor-shaft, but at the same time permit the propeller-shaft to move longitudinally. In the present instance, Figs. 1 and 5, I have shown this coupling to consist of two telescopic sleeves 1 and 2, secured, respectively, to the propeller-shaft and to the motor-shaft and united by a series of bolts 3, passing through grooves formed in the adjacent surfaces of the sleeves and extending throughout the length of the same. In the present instance I have shown the heads of the sleeves, by means of which they are connected to the respective shafts, provided with openings for the escape of air when the sleeves are moved toward each other. On the propeller-shaft B is formed a piston E, which is fitted to the bore of a cylinder D. This cylinder has at its forward end a valve-chest F, extending transversely to the bore thereof and containing a rotary valve 4, provided with a transverse steam-passage 5. In the cylinder-head is formed an induction-port 6, which is controlled by the valve 4, steam being supplied from the boiler to the valve-chest F through the pipe 7. At the bottom of the cylinder is connected a pipe 8, which is placed in connection with a trap 9, of a usual construction, for draining off the water of condensation without permitting escape of steam from the cylinder. At a distance from the end of the cylinder toward the propeller is formed an opening 10, through which the steam can pass from the cylinder when the piston has traveled beyond said opening. The valve 4 is operated by any proper form of valve-gear to cut off the supply of steam at a predetermined point of the piston-stroke. In the present instance I have shown the valve operated from the propeller-shaft through the medium of a cross-head 11, connected with said shaft by a sleeve 12, said cross-head being connected by rods 13 to the rocker-arms 14, connected to the valve-stems of the valve 4. The point of cut-off may be adjusted by varying the length of the valve-rods 13, and consequently the angle

of the rocker-arms 14 by means of the nuts 16 of said valve-rods 13. The valve-rods are suitably guided on the cylinder-head and in brackets 15, projecting from the frame.

In practice the area of the piston should be such that the total pressure on the same is somewhat greater than the thrust of the propeller at a given speed and when the piston is under full boiler-pressure. In consequence thereof the piston will move outwardly while under the full boiler-pressure. After the piston has passed the point of cut-off the steam-pressure decreases and the piston and propeller-shaft will adjust themselves according to existing conditions of thrust. Any variation in the thrust will cause a change in the position of the piston. Should the piston pass the exhaust-opening 10 in the cylinder, the steam escapes and the pressure rapidly decreases, while prior to this an air-cushion is formed between the rear head of the cylinder and the piston by the closing of the exhaust-opening 10 by said piston. This air-cushion is intended to prevent shock. Owing to the reduction of pressure in front of the piston the propeller again forces the piston forward. This extreme motion of the piston will of course take place only when the propeller is lifted sufficiently out of the water to abnormally reduce the thrust.

It will be readily understood that the steam in the cylinder D acts as a cushion to the thrust and practically relieves the thrust-bearing from all stress, while at the same time it takes up inequalities in the action of the propeller by permitting and influencing the longitudinal vibrations of the propeller-shaft. In case of accident to the cylinder D the two sleeves of the coupling C can be drawn together and secured by nuts placed on the threaded ends of the bolts 3, thereby making a unit of the shafts A and B.

While I have herein described the use of steam for forming the cushion and for moving the propeller-shaft longitudinally, it is of course to be understood that air or other gas could be used to the same end. Therefore I do not wish to restrict myself to the use of steam. Furthermore, it is very evident that the construction and positions of the operative parts could be varied without departing from the spirit of my invention.

What I claim as new is—

1. The combination with a motor-shaft, of a thrust-shaft, means intermediate of said shafts whereby they are slidably connected, a piston formed on said thrust-shaft, a cylinder in which said piston reciprocates, a supply for an elastic fluid under pressure to said cylinder, a valve for controlling the admission of fluid, and a cut-off mechanism operated by the thrust-shaft; all constructed to intermittently supply the elastic fluid to the cylinder, which fluid will maintain a constant equilibrium between the thrust and pressure by expansion or compression under varying conditions of thrust, substantially as described.

2. The combination of a motor-shaft, a thrust-shaft, means intermediate of said shafts whereby they are slidably connected, a cylinder, a piston on the thrust-shaft adapted to reciprocate in said cylinder, a valve for admitting an elastic fluid under pressure to the forward end of the cylinder, and a cut-off operated by the thrust-shaft; there being an opening in the cylinder whereby an air-cushion may be established and a direct exhaust for the elastic fluid formed; all constructed to intermittently supply the elastic fluid to the cylinder, which fluid will maintain a constant equilibrium between the thrust and pressure by expansion or compression under varying conditions of thrust, substantially as described.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 19th day of March, 1896.

LOUIS HACHENBERG.

Witnesses:

A. FABER DU FAUR, Jr.,

EUGENIE A. PERSIDES.