

(No Model.)

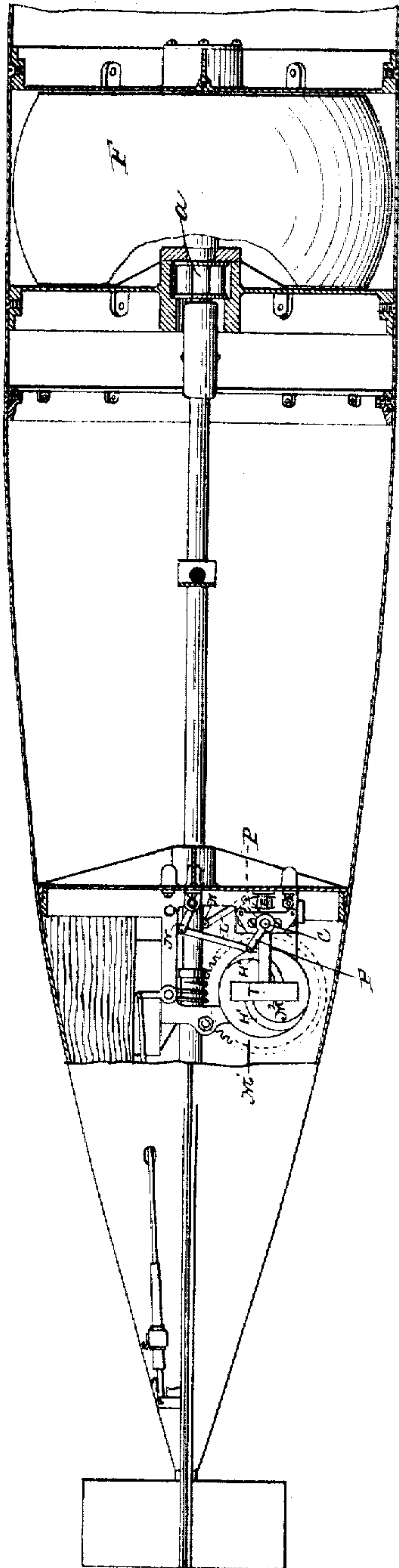
3 Sheets—Sheet 1.

J. A. HOWELL.  
MARINE TORPEDO.

No. 458,677.

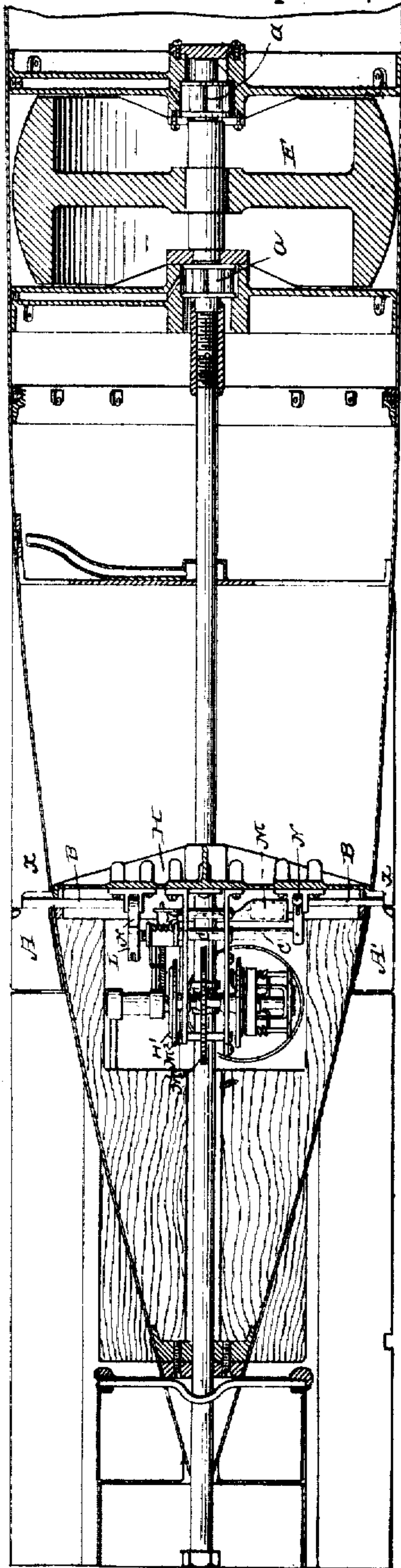
Patented Sept. 1, 1891.

Fig. 1.



Witnesses  
E. Smith  
E. A. Rice

Fig. 2.



Inventor  
John A. Howell  
by Marshall Bailey  
his attorney

(No Model.)

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Fig. 3.

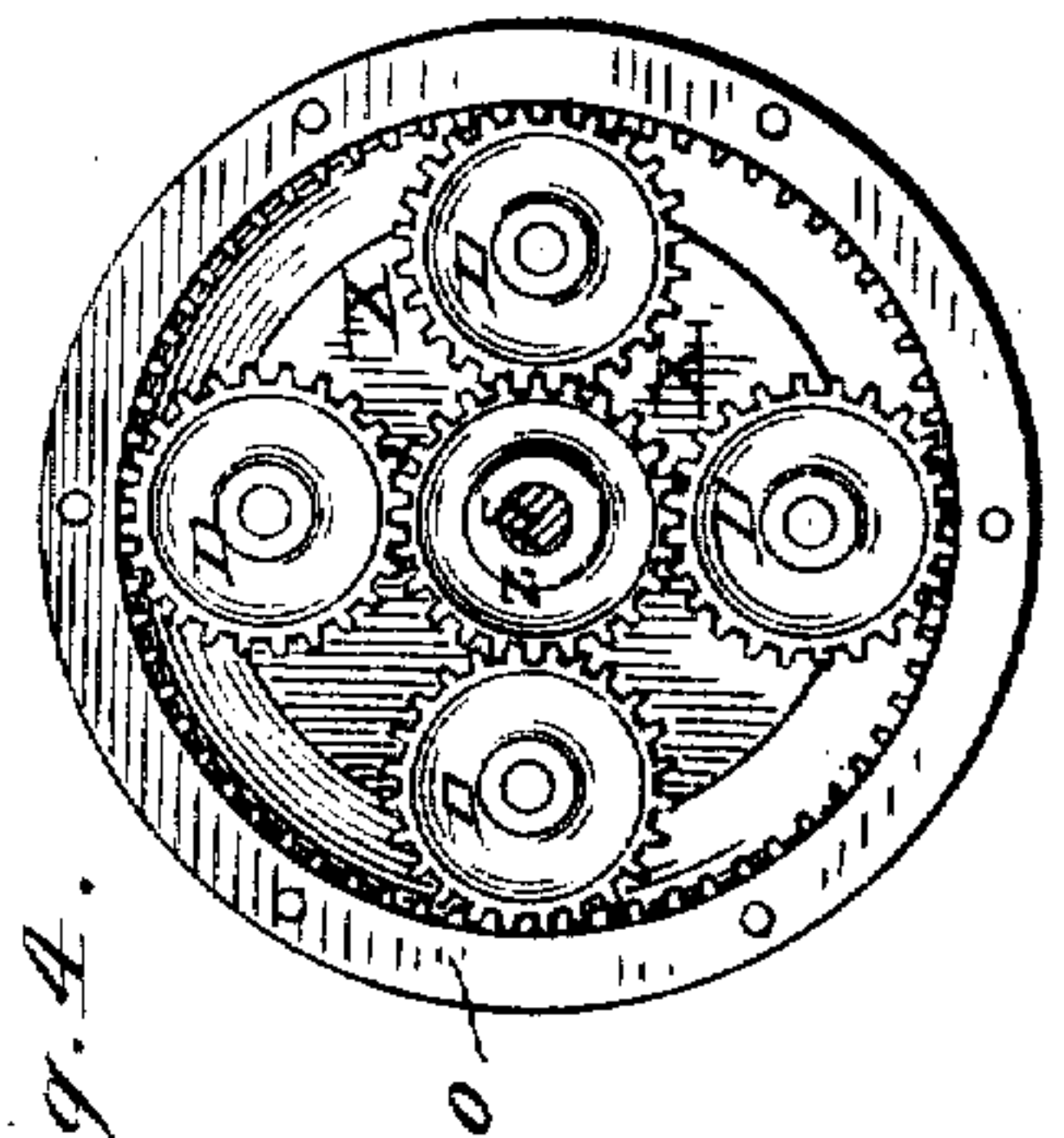
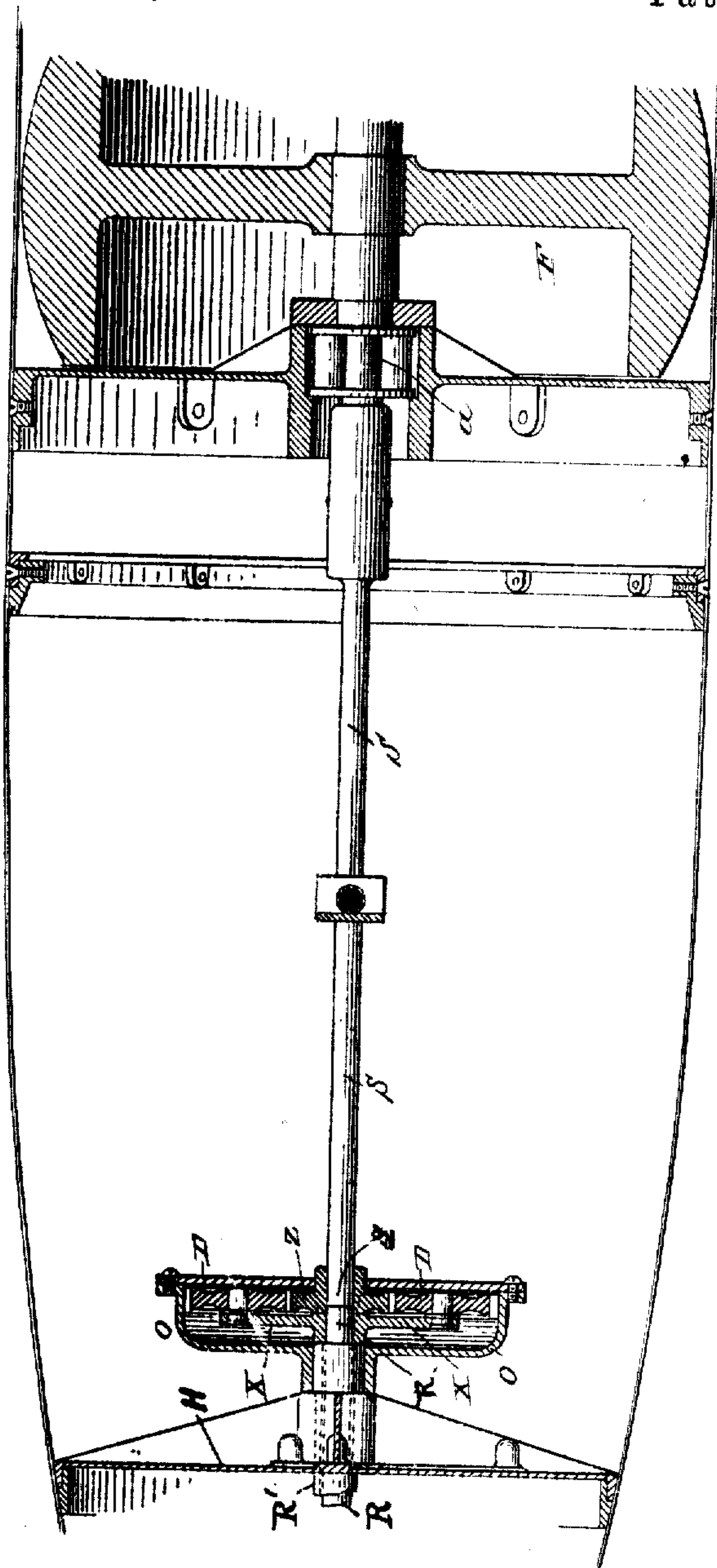


Fig. 4.

Witnesses:—  
E. D. Smith  
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Inventor:—  
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his attorney

(No Model.)

3 Sheets—Sheet 3.

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Fig. 6.

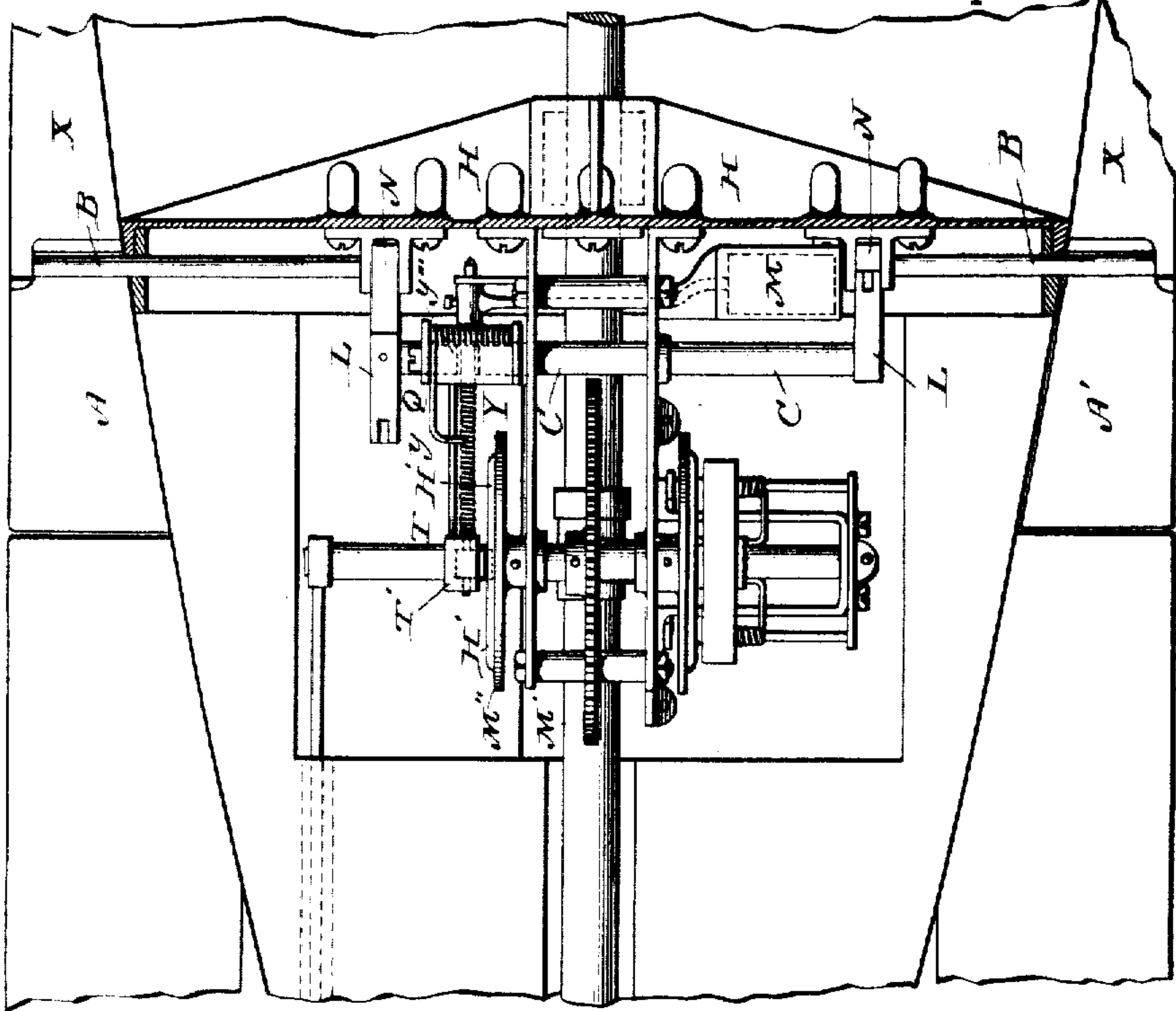
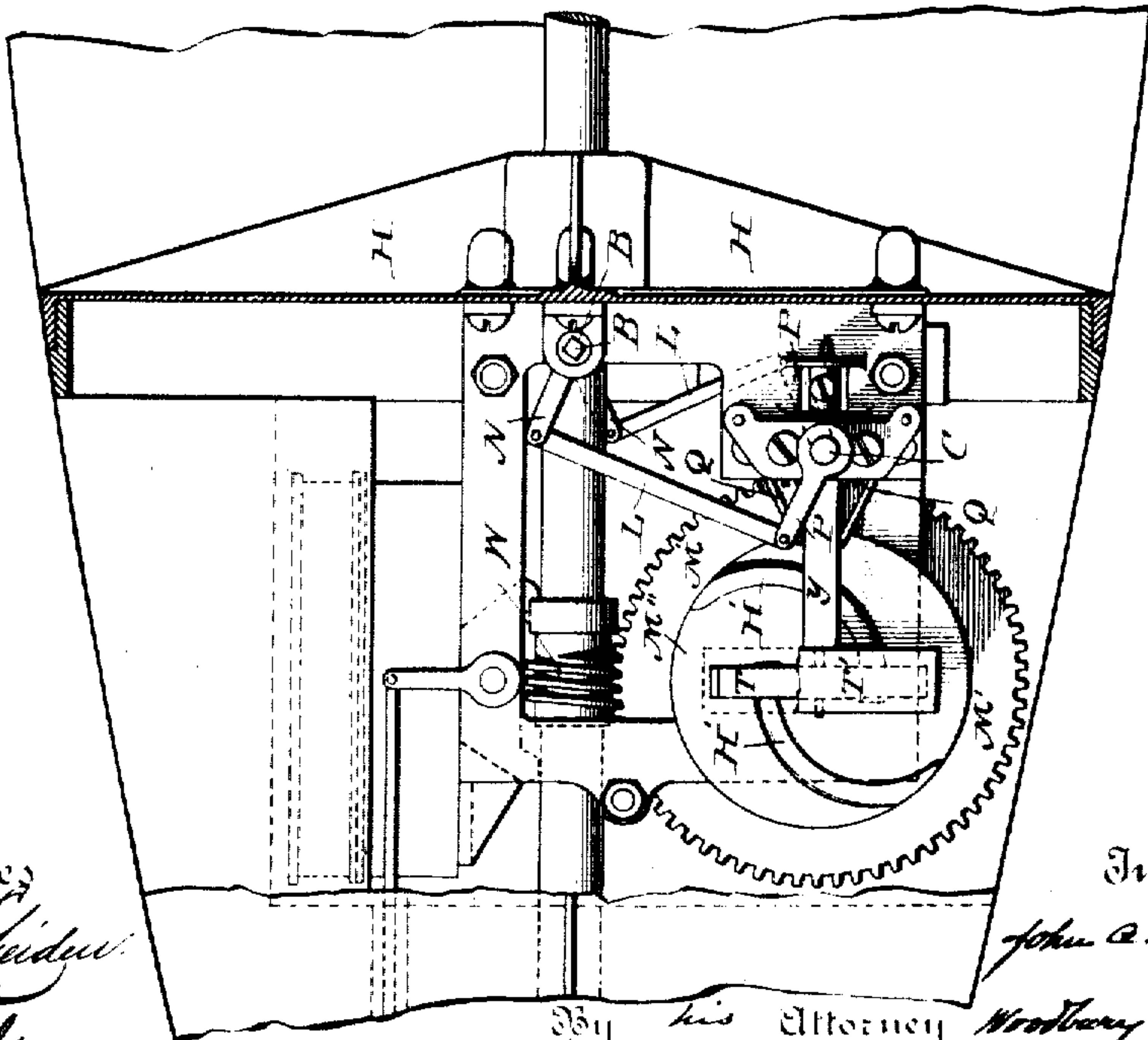


Fig. 5.



Witnesses  
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*E. M. Kinley*

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*John A. Howell*  
By *Wm. L. Shiden* his Attorney



# UNITED STATES PATENT OFFICE.

JOHN ADAMS HOWELL, OF THE UNITED STATES NAVY.

## MARINE TORPEDO.

SPECIFICATION forming part of Letters Patent No. 458,677, dated September 1, 1891.

Application filed February 23, 1889. Serial No. 300,796. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN ADAMS HOWELL, of the United States Navy, have invented certain new and useful Improvements in Marine Torpedoes, of which the following is a specification.

My invention has relation to an automobile or self-propelling marine torpedo of the same general type as that set forth in my Letters Patent, No. 311,325, of January 27, 1885, the motive power being furnished by one or more fly-wheels which, previous to the launching of the torpedo, are put in rapid revolution, and the torpedo being provided with diving and steering rudders, by which it is automatically maintained in a straight course and at a predetermined depth in the water.

My present improvement has more particular reference to a torpedo of the kind in which the axis of the fly-wheel lies in the longitudinal axis of the torpedo; and they consist in certain arrangement or construction of the propelling and diving mechanism by which I am enabled to neutralize the tendency of the torpedo to roll about its longitudinal axis by reason of the friction of the fly-wheel axles and shafts in their bearings and by reason of the rolling leverage which would, in the absence of my improvement, be created in gearing down from the fly-wheel shaft to the propeller shaft or shafts.

The nature of my improvements and the manner in which the same are or may be carried into effect can best be explained and understood by reference to the accompanying drawings, in which—

Figure 1 is a horizontal and Fig. 2 is a vertical longitudinal section of so much of the rear portion of the torpedo as needed to illustrate my invention. Fig. 3 is a longitudinal section, on an enlarged scale, of the main fly-wheel and shaft and its gear to the propeller-shaft. Fig. 4 is a front elevation of the gearing connecting the fly-wheel shaft to the propeller-shaft, and Figs. 5 and 6 are enlarged views of the mechanism shown in Figs. 1 and 2.

The fly-wheel F (shown in Figs. 1, 2, and 3) is mounted on an axle which lies in the longitudinal axis of the torpedo. This axle is supported in suitable roller-bearings *a a*, fixed in place in the frame-work which supports the central section of the torpedo. The friction of

the fly-wheel axle and shaft in their bearings tends to revolve the torpedo itself on its longitudinal axis in the same direction as the direction of the revolution of the fly-wheel. This tendency is counteracted by means of two vertical rudders *A A'*, Fig. 2, which, from the method and effect of their action, are called "helicoidal rudders." When acted upon by their mechanism, they swing in opposite directions, and thus act only as a screw to roll the torpedo. They are operated as follows: The rudder-posts *B B*, Fig. 2, pass vertically through the shell of the torpedo, being pivoted at their outer ends to small fins *x x*, and at their inner ones to supports secured to the bulk-head *H*. To their inner ends are secured arms *N N*, Fig. 1, which are connected by links *L L* to arms *P P*, Figs. 1, 5, and 6, which in turn are secured to the tiller-axle *C C*. The tiller *T*, which is protected by the box *T'*, Figs. 1 and 5, is operated by pallets which are brought to engage in the cams *H' H'* by the action of the pendulum *M*, Figs. 2 and 6, which is connected to the tiller-arm by a flexible axis *Y*. The tiller-arm is pivoted at its center or horizontal axis on the prolongation of the flexible axis *Y*, protected by the box *y*, and at each end is formed or provided with a pallet to engage the cams *H' H'*. The cams *H' H'* are fixed to a wheel or disk *M''*, which is in rigid connection with the cog-wheel *M'*, which is geared to the worm *W* on one of the screw-shafts. The flexible arm *Y* of the tiller and its cover *y* pass through a slot *y'''* in the shaft *C*, and is assisted in maintaining its normal position by the ends of the springs *Q*. When the torpedo is moving through the water, the cog-wheel *M'*, and consequently the cams *H' H'*, is kept in constant revolution by the screw-shafts, the pallets of the tiller-arm being so adjusted that when the torpedo is exactly upright they will both be free from the cams. If the torpedo rolls, the pendulum will maintain the plane of the pallets horizontal, so that the inclination given to the cam-wheel by the roll of the torpedo will throw one of the cams into action with one of the pallets. The tiller is thus swung and with it the rudders, which, by their connections, are thrown in opposite directions, and thus tend to roll the torpedo back to its upright position. The axis of the



fly-wheel, being in the longitudinal axis of the torpedo, may be prolonged to gear to and operate twin propeller-shafts, and these shafts may be concentric, so that their screws will lie one behind the other.

In gearing the fly-wheel shaft to the propeller-shafts, if the connecting-gear be hung directly to the body of the torpedo, it would form a fulcrum and lever for the reaction of the driving force, thus causing the torpedo to revolve about its longitudinal axis and necessitating thereby very large helicoidal rudders to keep the torpedo upright. In order to overcome this effect, the fly-wheel shaft S, Fig. 3, which is locked to the fly-wheel axle, terminates at s, being prolonged by, but not connected directly to, the shaft R. A gear-wheel Z, Figs. 3 and 4, is secured to the end of S, while a necklace or disk X X is secured to the end of R and carries the four gear-wheels D D D D, Fig. 4, which gear between Z and a spur-wheel casing O O O, which is secured to the outer of the two concentric screw-propeller shafts, the shaft R being the inner one. Thus the gearing down of the fly-wheel axle to the screw-propeller shaft is the same as if an axle were revolving in a bushing whose outer cylinder was permitted to revolve. There is therefore no fulcrum for the action of the screws to revolve the torpedo. The outer shaft R' passes through a stuffing-

box, through which the inner shaft R passes. Each shaft of course carries its own propeller or screw. The latter are omitted from the drawings, inasmuch as they are not needed for the purpose of explanation.

Having described my invention, what I desire to secure by Letters Patent is—

1. The combination, with the torpedo shell or case and the fly-wheel having its axis in the longitudinal axis of the torpedo, of the helicoidal rudders and actuating mechanism therefor driven from the fly-wheel and adapted to operate the helicoidal rudders at the times and in the manner substantially as hereinbefore set forth.

2. The combination of the torpedo case or shell, the fly-wheel having its axis on the longitudinal axis of the torpedo, the fly-wheel shaft and gear-wheel thereon, the shaft R, the necklace or disk secured thereon and the gear-wheels carried by said disk, the outer concentric shaft R', and the spur-wheel casing O, these parts being arranged together for joint operation, substantially as and for the purposes hereinbefore set forth.

In testimony whereof I have hereunto set my hand this 29th day of November, 1888.

JOHN ADAMS HOWELL.

Witnesses:

WM. SWANSBORO,  
JOSEPH WATERS.