

No. 834,161.

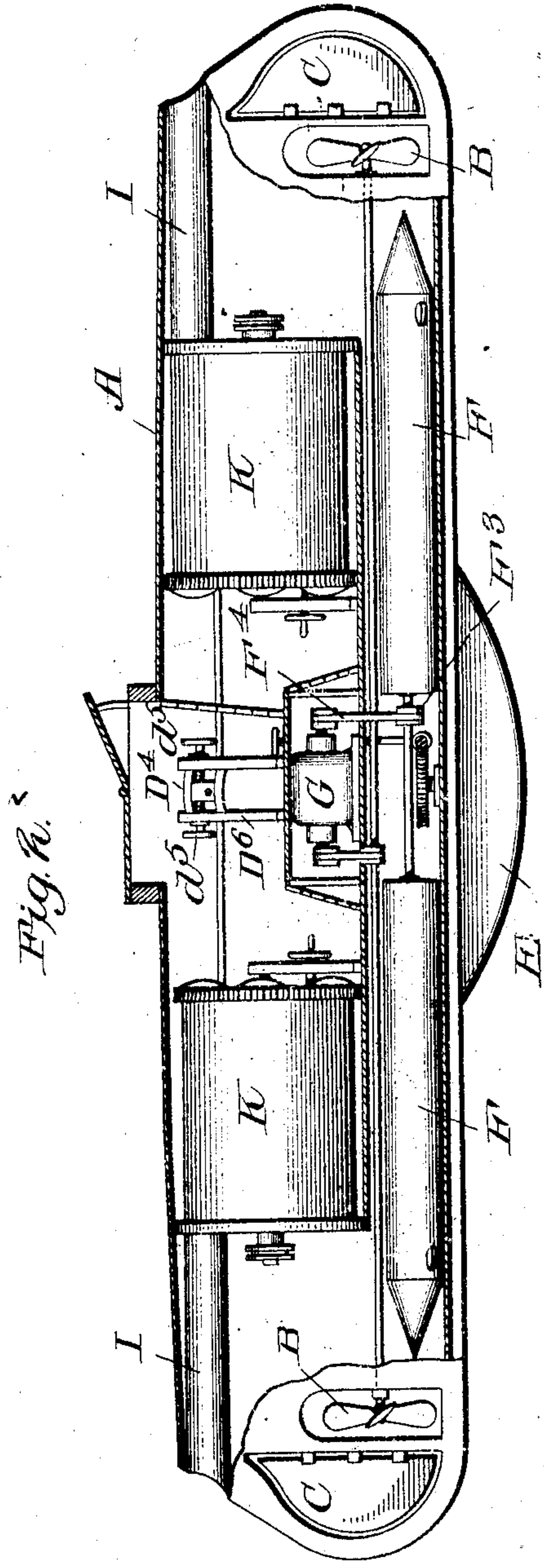
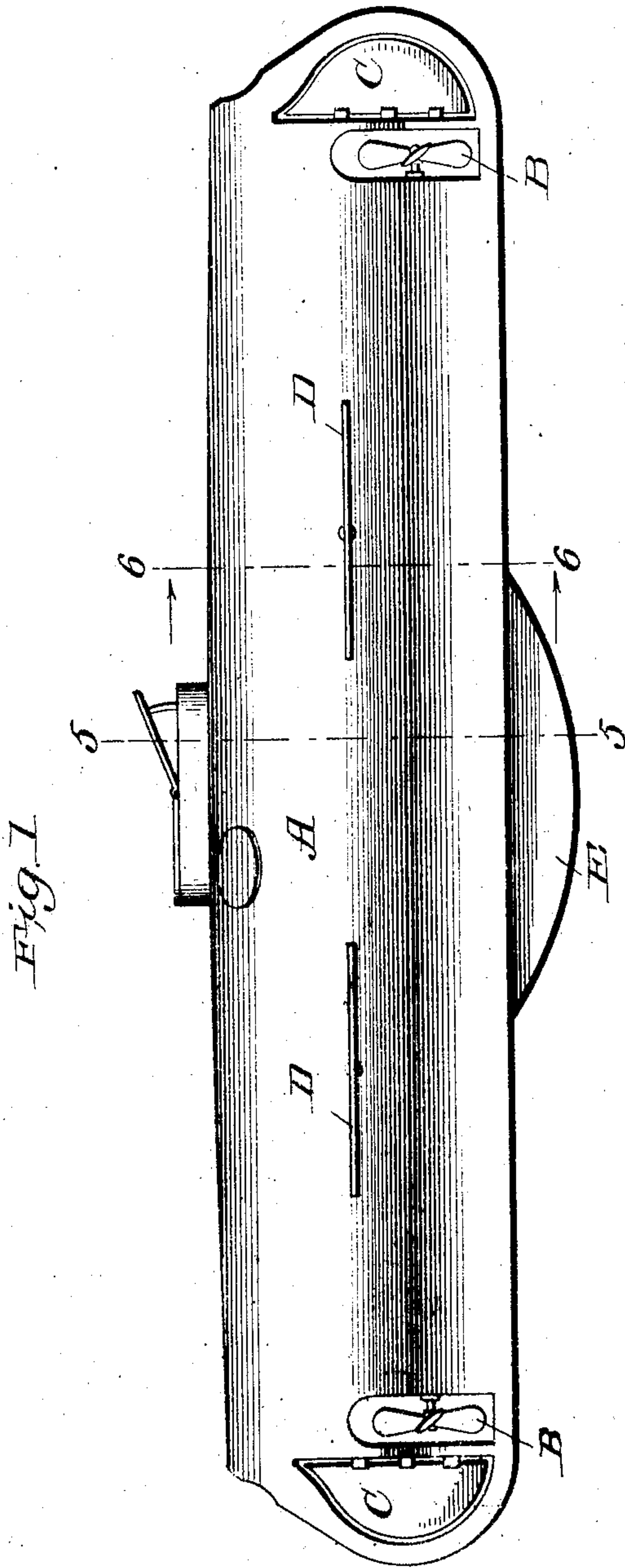
PATENTED OCT. 23, 1906.

E. A. NILSEN.

IMMERSION APPARATUS FOR SUBMARINE BOATS.

APPLICATION FILED SEPT. 28, 1905.

3 SHEETS—SHEET 1.



Witnesses

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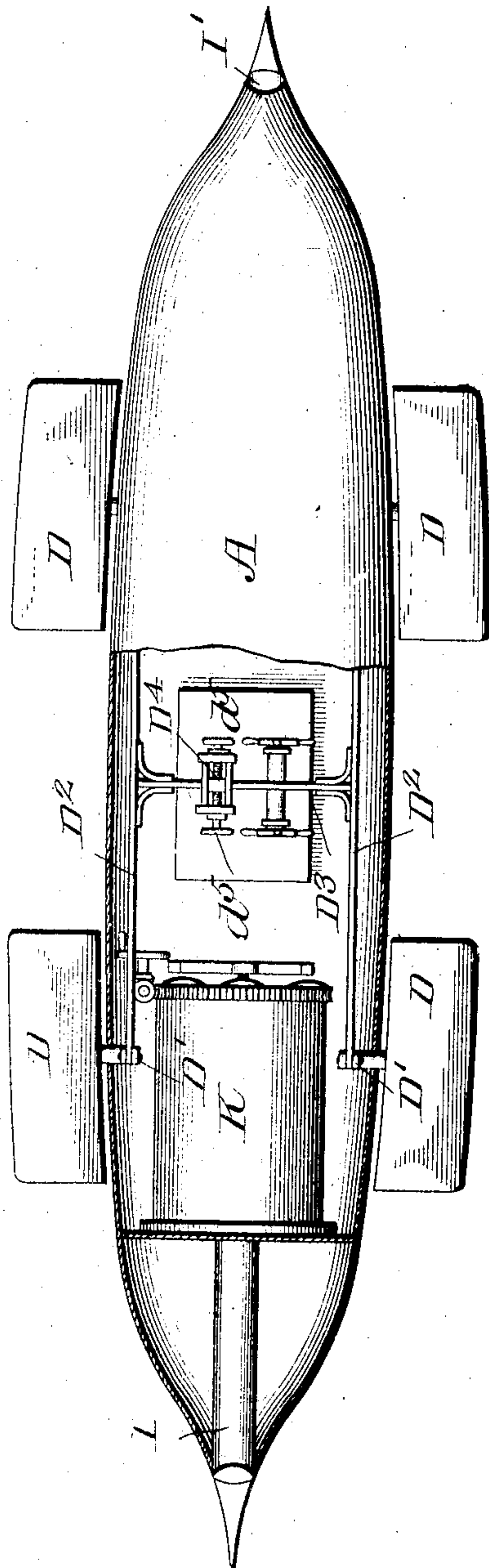
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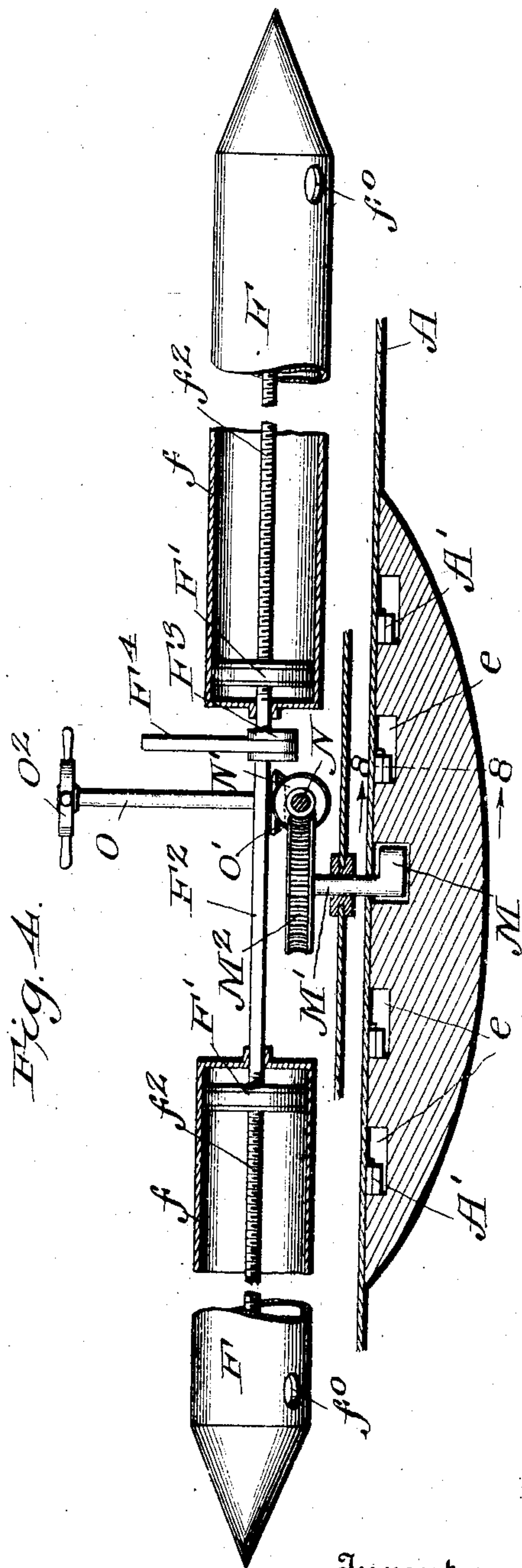
3 SHEETS—SHEET 2.

Fig. 3.



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Fig. 4.



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3 SHEETS—SHEET 3.

Fig. 5.

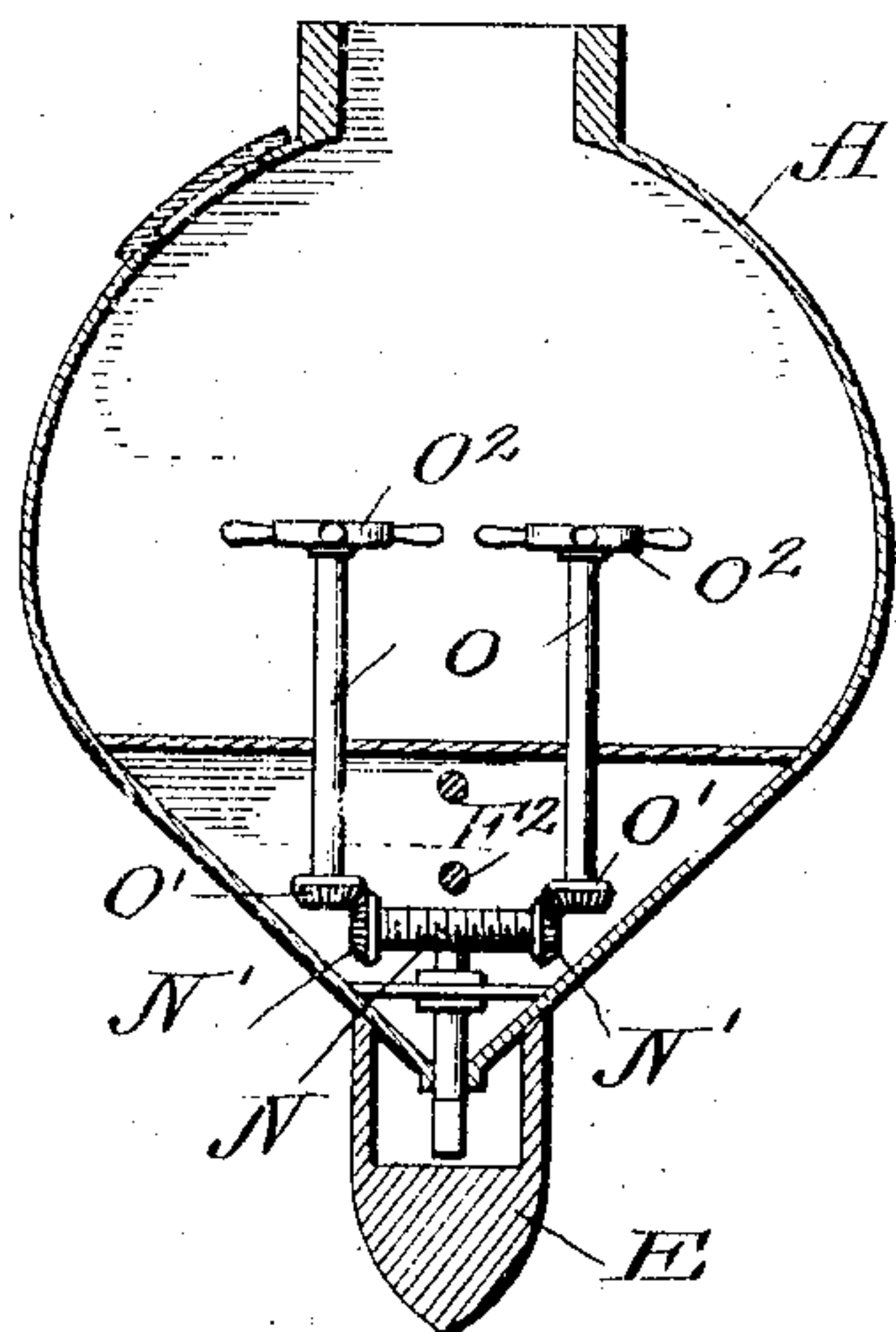


Fig. 6.

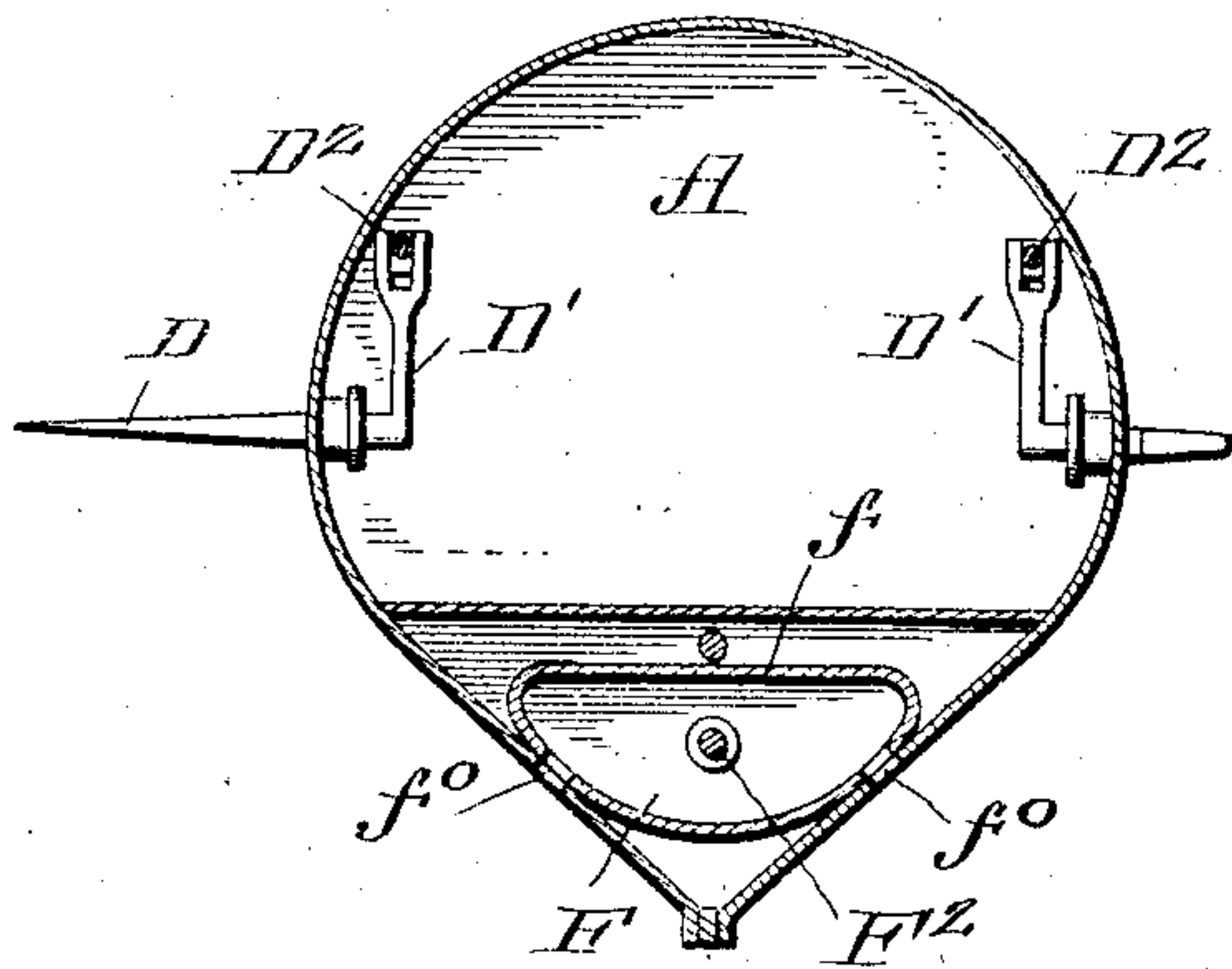


Fig. 8.

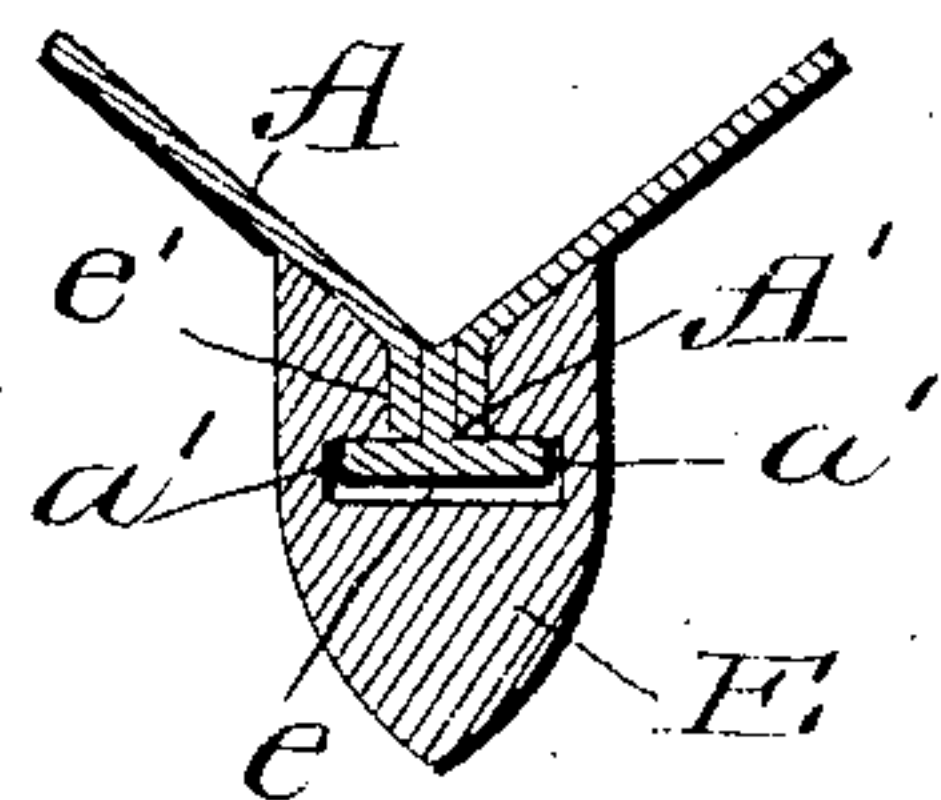


Fig. 7.

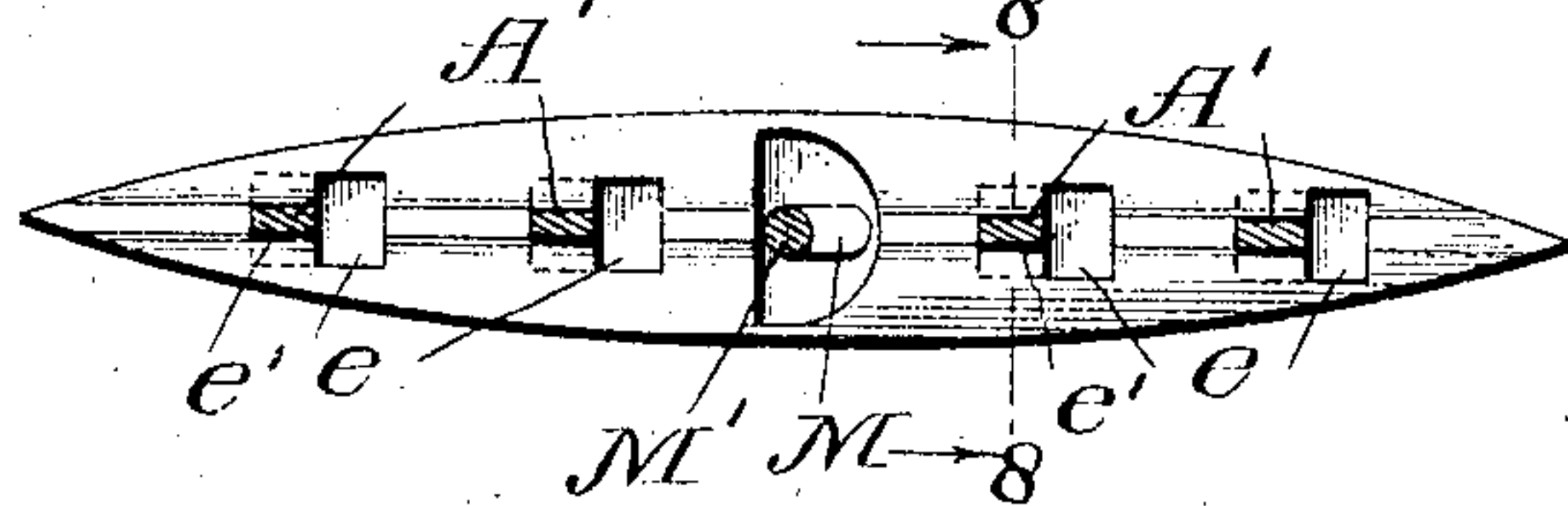


Fig. 9.

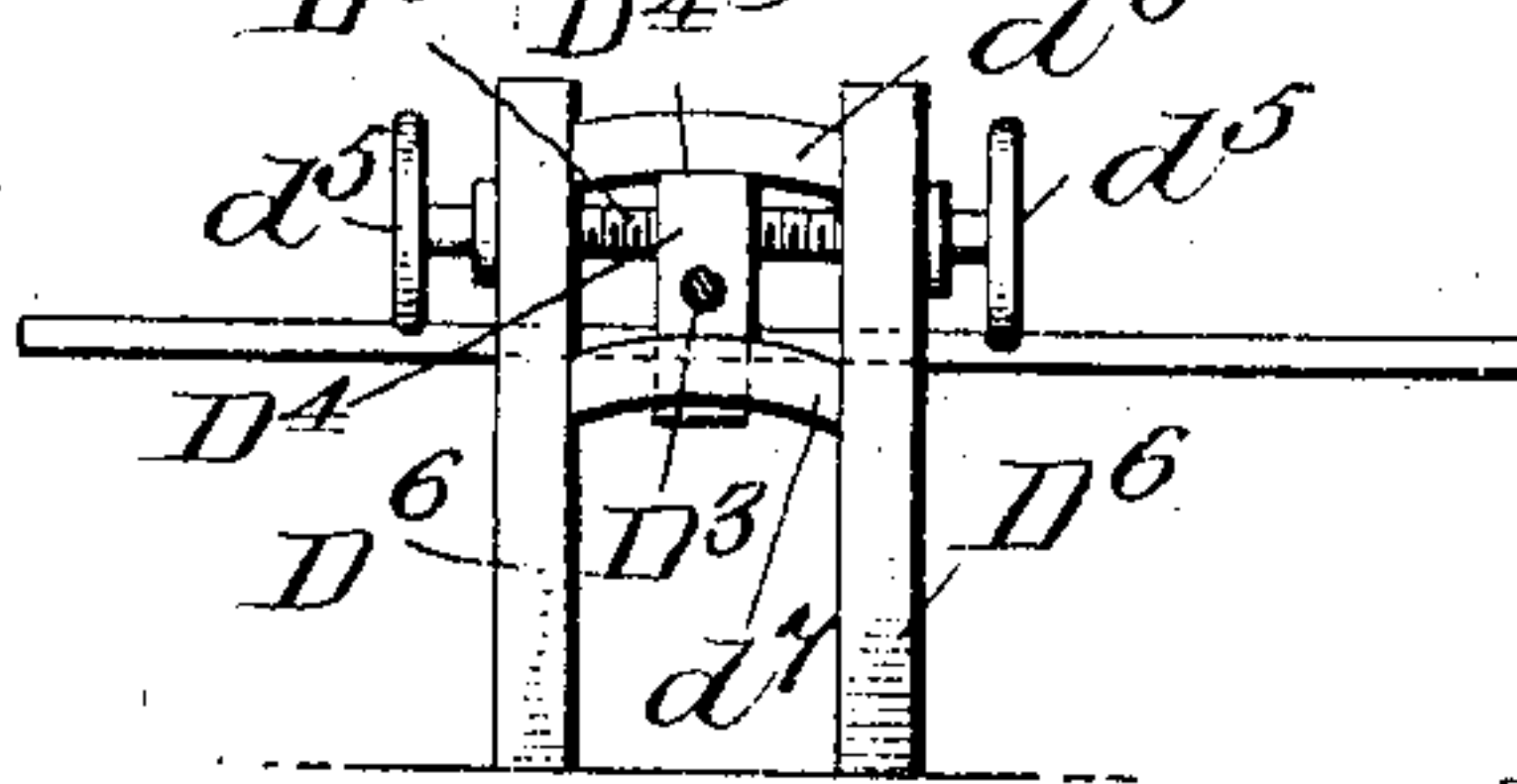
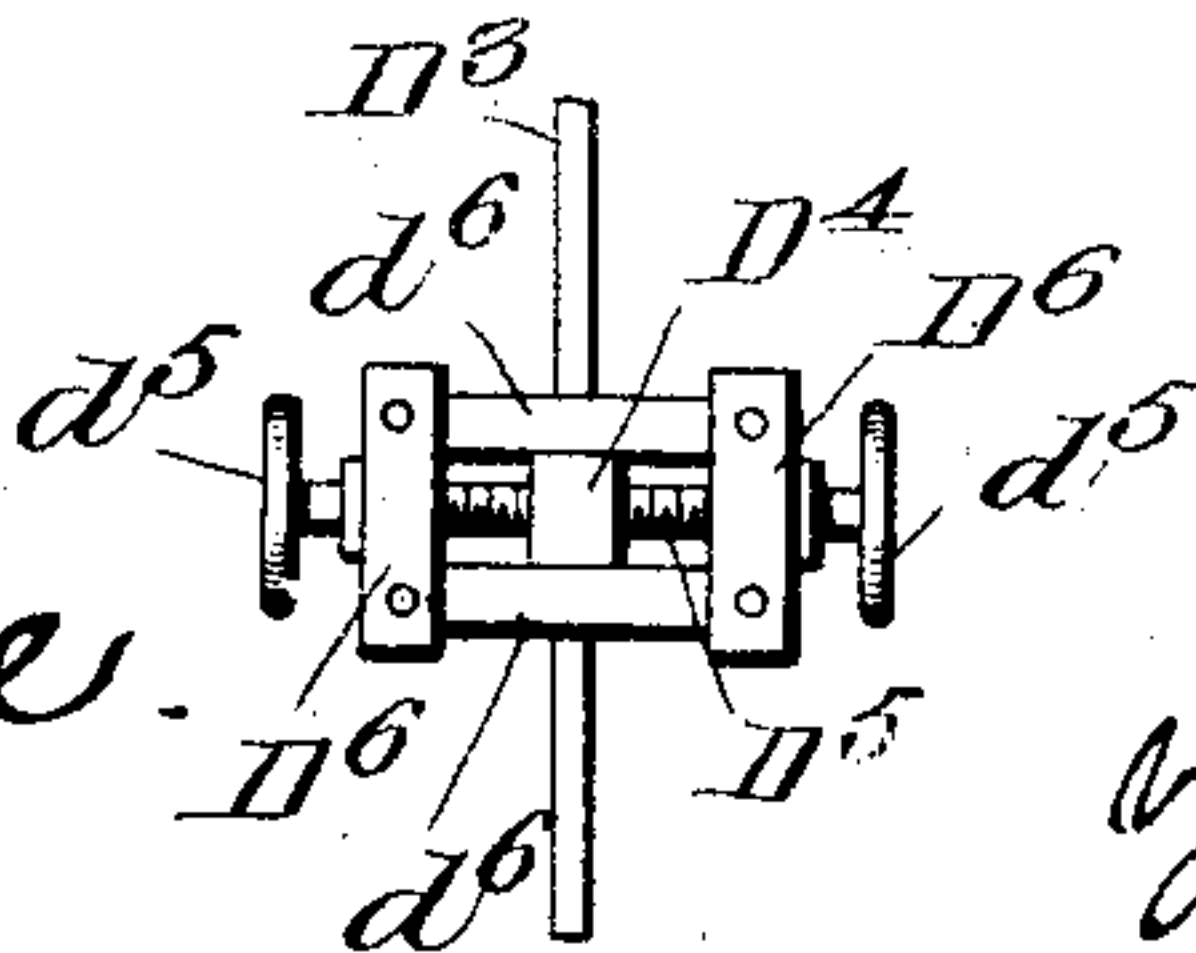


Fig. 10.



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# UNITED STATES PATENT OFFICE.

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## IMMERSION APPARATUS FOR SUBMARINE BOATS.

No. 834,161.

Specification of Letters Patent.

Patented Oct. 23, 1906.

Application filed September 28, 1905. Serial No. 280,522.

*To all whom it may concern:*

Be it known that I, ERNST ALFRED NILSEN, a subject of the King of Norway, residing in the city of Christiania, in the Kingdom of Norway, have invented certain new and useful Improvements in Immersion Apparatus for Submarine Boats; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in submarine boats; and it consists more especially in providing an apparatus by means of which the boat may be brought to the desired depth and may be returned to the surface again, regardless of any ordinary accident to the diving mechanism.

I have shown my invention as embodied in a double-ended submarine torpedo-boat; but it will be obvious that it may be applied to boats of different construction and to submarine vessels generally other than torpedo vessels.

Reference is had to the accompanying drawings, in which the same parts are indicated by the same letters throughout the several views.

Figure 1 is a side elevation of the boat. Fig. 2 is a central vertical section through the boat, parts being shown in elevation. Fig. 3 is a plan view, parts being broken away. Fig. 4 shows diagrammatically the operation of the immersion-chambers and of the detachable keel. Fig. 5 shows a section along the line 5 5 of Fig. 1, parts being omitted. Fig. 6 shows a section along the line 6 6 of Fig. 1 and looking in the direction of the arrows, parts being shown in elevation. Fig. 7 is a plan view of the detachable keel, showing the connections with the boat in section. Fig. 8 shows a section along the line 8 8 of Figs. 4 and 7 looking in the direction of the arrows. Fig. 9 is a diagram illustrating the operation of the diving-rudders. Fig. 10 is a detail showing a plan view of part of the device of Fig. 9.

A represents the body or hull of the boat; B, the propellers; C, the steering-rudders; D D, the diving-rudders; E, the detachable keel; F F', the immersion-chambers, and G the motor.

I and I' represent the forward and aft torpedo-launching tubes, and K and K' represent the rotary magazine-drums for supply-

ing torpedoes, the operation of which is described in my application of even date herewith, Serial No. 280,521, and entitled "Improvements in torpedo boats."

The immersion apparatus herein described consists of three special features which coact to accomplish the same desired result. These features comprise the diving-rudders and the means for operating the same, the detachable keel and the means for detaching the same when desired, and the immersion-chambers and the means for regulating the amount of water ballast contained in the same. These devices are shown in detail in Figs. 4 to 10.

Referring first to Figs. 4 and 6, F represents an immersion-chamber, two being shown in Fig. 4. This immersion-chamber is preferably flattened on top, as at *f* in Fig. 6, and with the bottom in the form of a segment of a circle; but, if preferred, the immersion-chamber may be cylindrical in form. Near the outer end of each immersion-chamber suitable openings *f*<sup>0</sup> are provided, connecting the immersion-chamber with the water of flotation. Mounted in each immersion-chamber is a piston F', which is screw-threaded to form a nut to engage the screw-threads *f*<sup>2</sup> on the shaft F<sup>2</sup>. Where two of these immersion-chambers are coupled up tandem, as shown in Fig. 4, this shaft F<sup>2</sup> has right and left screw-threads on it, so that the two pistons F' may be moved out or drawn in simultaneously. This shaft F<sup>2</sup> is rotated in any suitable way from the motor G by means of the crank F<sup>3</sup> and the connecting-rod F<sup>4</sup>. It will be seen that rotating the shaft in one direction will move the pistons F' outward, forcing the water out of the immersion-chambers, while moving the pistons in the opposite direction will allow the water to flow into the immersion-chambers, and thus the weight of the boat may be increased or diminished, whereby the boat may be caused to sink or rise in the water, as desired. This action of the immersion-chambers may be supplemented by the diving-rudders D, whose operation will be most clearly understood from reference to Figs. 2, 3, 9, and 10. These rudders are mounted in pairs on each side of the boat and are simultaneously operated by means of the mechanism that will now be described.

Each rudder is fast on a short shaft journaled in the side of the boat and carrying on



the inside of the boat the crank  $D'$ , connected to the rod  $D^2$ . These two rods  $D^2$ , one on each side of the boat, are connected together by the cross-rod  $D^3$ , which rod passes through the block  $D^4$ , which is internally screw-threaded to receive the screw  $D^5$ , which is rotated by one or the other of the handles  $d^5$ . This block  $D^4$  travels between the curved guides  $d^6$  and  $d^7$ , carried by the frame  $D^6$ , so that the cross-rod  $D^3$  will always move parallel to the crank-pins  $d'$ . It will be obvious that by turning the screw  $D^5$  in one direction or the other the diving-rudders  $D$  will be all set to rise or dive and that the tendency of these rudders will be to cause the boat to pursue a crab-like motion downward instead of diving like a porpoise.

The boat is preferably provided with a detachable keel  $E$  of sufficient weight to give to the boat when cruising the required reserve buoyancy and no more, but which keel may be quickly detached should the boat spring a leak or other emergency require that the boat rise promptly to the surface. The construction and operation of this keel are shown most clearly in Figs. 4, 5, 7, and 8, in which  $E$  represents the keel provided with a series of sockets  $e$ , having overhanging lips  $e'$  throughout part of their length to engage the flange  $a'$  of the T-shaped bottom pieces  $A'$ , fast to the bottom of the boat, as shown most clearly in Fig. 8.  $M$  represents a key which is carried on the shaft  $M'$  and is turned by a worm-wheel  $M^2$ , which meshes with the worm  $N$ , turned by the bevel-gears  $N'$  and  $O'$  and the shafts  $O$  and hand-wheels  $O^2$ . There are two sets of these bevel-gears and hand-wheels shown in Fig. 5, but a single hand-wheel with corresponding gears would be ordinarily sufficient. It will be seen that by turning one of these hand-wheels  $O^2$  the key  $M$  may be so turned as to push the keel forward, disengaging the lips  $e'$  from the flanges  $a'$  and allowing the keel to drop from the boat. This will immediately relieve the boat of a considerable weight and will make the boat promptly float to the surface. This keel  $E$  not only serves to keep the boat in an upright position and to render her stable, but also serves as a safety device which in cases of emergency may be detached and will allow the boat to promptly rise to the surface. This action of the keel in bringing the boat down below the surface may of course be supplemented by the action of the diving-rudders and also by filling or partly filling the immersion-chambers, while the effect of detaching the keel may also be supplemented by emptying the immersion-chambers and by setting the diving-rudders to the position tending to cause the boat to rise.

It will be obvious that various modifications in the herein-described apparatus might be made which could be used without departing from the spirit of my invention.

Having thus described my invention, what I claim, and desire to secure by Letters Patent of the United States, is—

1. In a submarine boat, the combination of a plurality of diving-rudders journaled in the hull of the boat, and each provided with a crank on the interior of the hull, connecting-rods connecting pairs of cranks, a cross-rod connecting two oppositely-disposed connecting-rods, and a hand-operated screw and mechanism operated thereby for moving said cross-rod and thus simultaneously operating all of said diving-rudders, substantially as described.

2. An immersion apparatus for submarine boats, comprising diving-rudders, with means for operating the same, immersion-chambers with means for varying the supply of water admitted thereto, a detachable weighted keel, with a key and worm gearing for operating said key for releasing said keel when desired, substantially as described.

3. An immersion apparatus for submarine boats, comprising a plurality of diving-rudders symmetrically disposed on opposite sides of the boat, means for simultaneously operating these diving-rudders, immersion-chambers with means for varying the supply of water admitted thereto, and a weighted keel with a key and worm gearing for operating said key for releasing said keel when desired, substantially as described.

4. In a submarine boat, the combination of a plurality of diving-rudders journaled in the hull of the boat, and each provided with a crank on the interior of the hull, connecting-rods connecting pairs of cranks, a cross-rod connecting two oppositely-disposed connecting-rods, a block carried by said rod, a screw engaging said block, and a hand-wheel for turning said screw thus moving said cross-rod and simultaneously operating all of said diving-rudders, substantially as described.

5. In a submarine boat, the combination of a plurality of diving-rudders journaled in the hull of the boat, and each provided with a crank on the interior of the hull, connecting-rods connecting pairs of cranks, a cross-rod connecting two oppositely-disposed connecting-rods, a block carried by said cross-rod and provided with internal screw-threads, curved guides for said block, and a screw engaging in said screw-threads, with means for turning said screw, substantially as described.

6. In a submarine boat, the combination with a series of tenons attached to the bottom of the boat, of a keel detachably connected to said tenons, and a key operated from within the boat for moving said keel longitudinally and thus releasing it from engagement with said tenons, substantially as described.

7. In a submarine boat, the combination with a series of fastening devices attached to



the bottom of the boat, of a keel detachably connected to said fastening devices, gearing within the boat, and unlocking means operated by said gearing for detaching said keel from said fasteners, substantially as described.

5 8. In a submarine boat, the combination with fasteners attached to the bottom of the boat, of a keel adapted to be detachably connected to said fasteners, a key adapted to dis-  
10 connect said keel from said fasteners, but to

unlock same in position when desired, and hand-gearing operated from within the boat for detaching said keel, substantially as described.

In testimony whereof I affix my signature 15  
in presence of two witnesses.

ERNST ALFRED NILSEN.

Witnesses:

HENRY BORDEWICH,  
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