T. B. TAYLOR.

PROPELLING MEANS FOR VESSELS.

APPLICATION FILED AUG. 17, 1906.

938,911.

Patented Nov. 2, 1909.

4 SHEETS—SHEET 1.

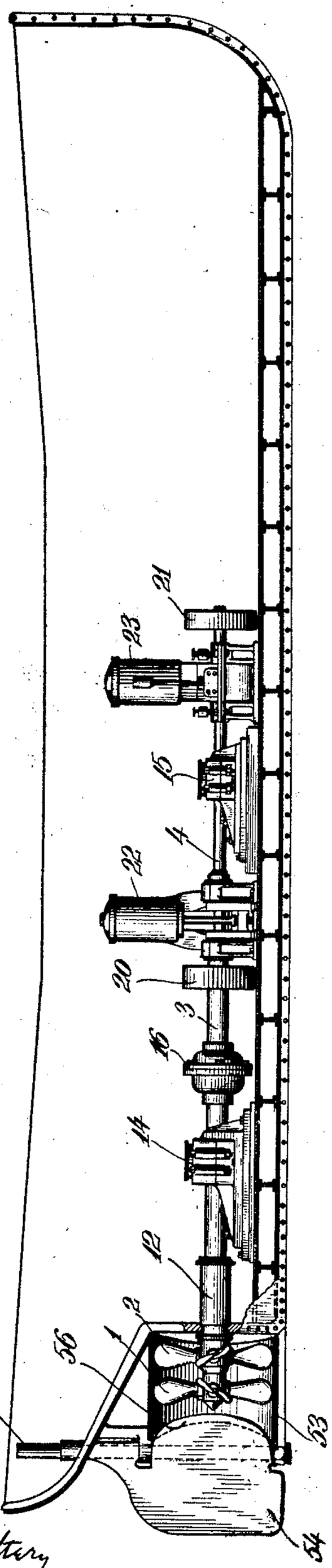

Fig. 1

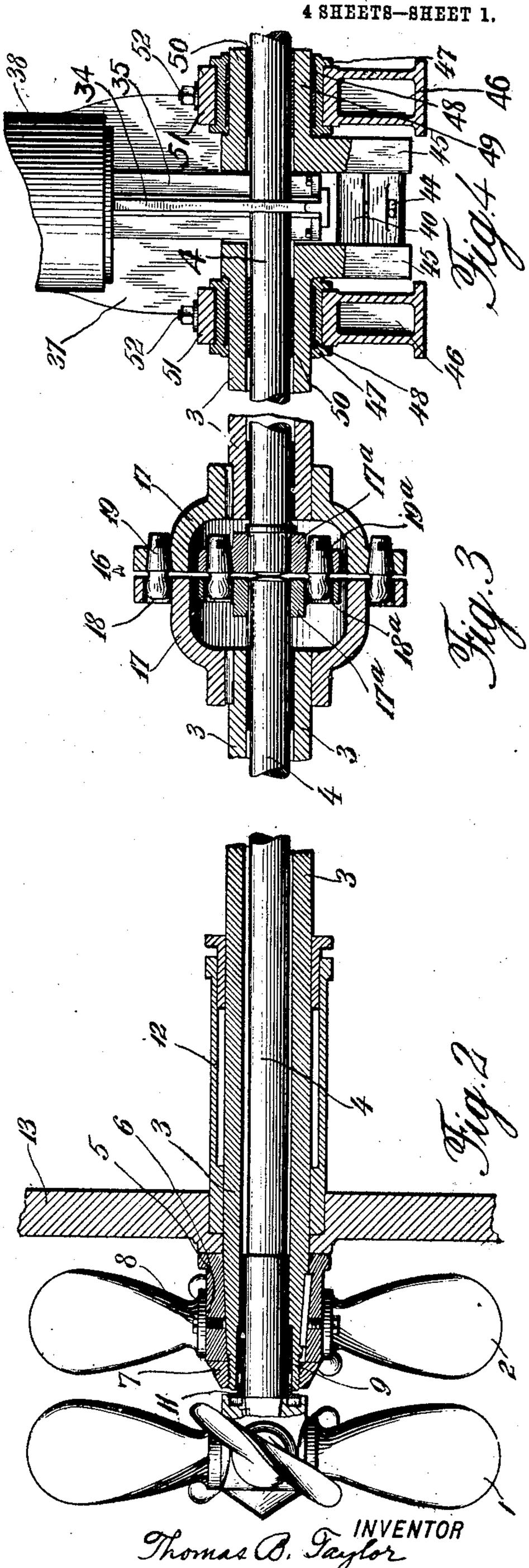

Fig. 3

Fig. 2

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4 SHEETS—SHEET 2.

Fig. 5

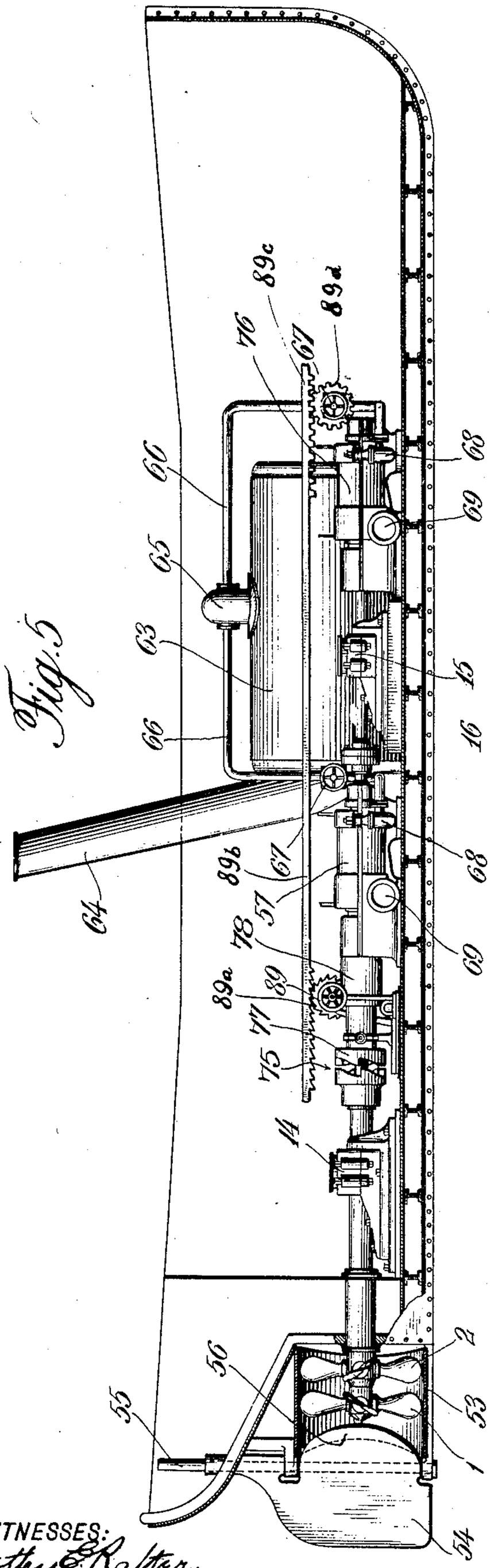
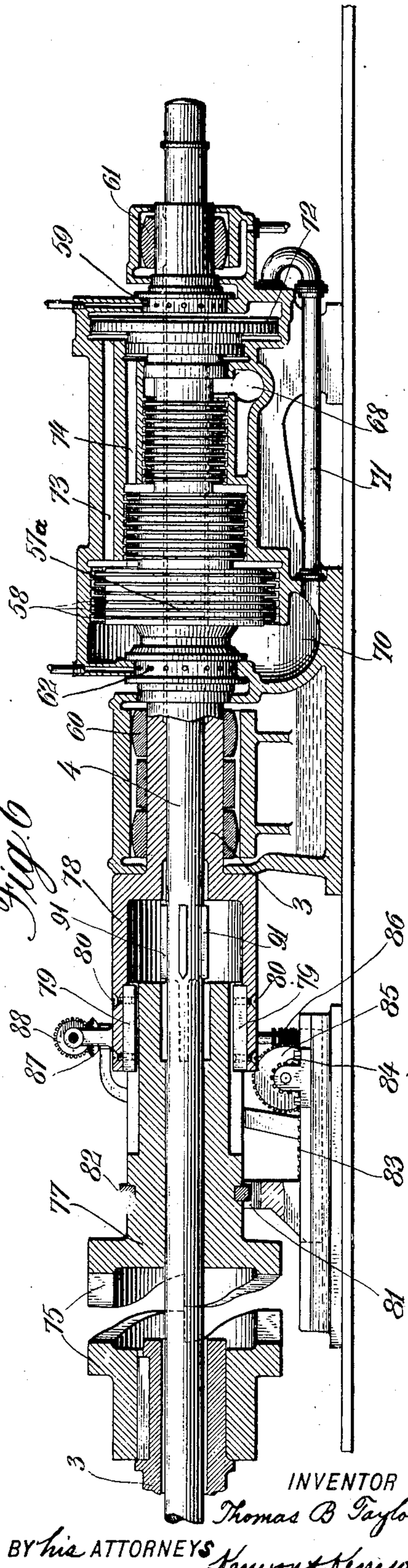


Fig. 6



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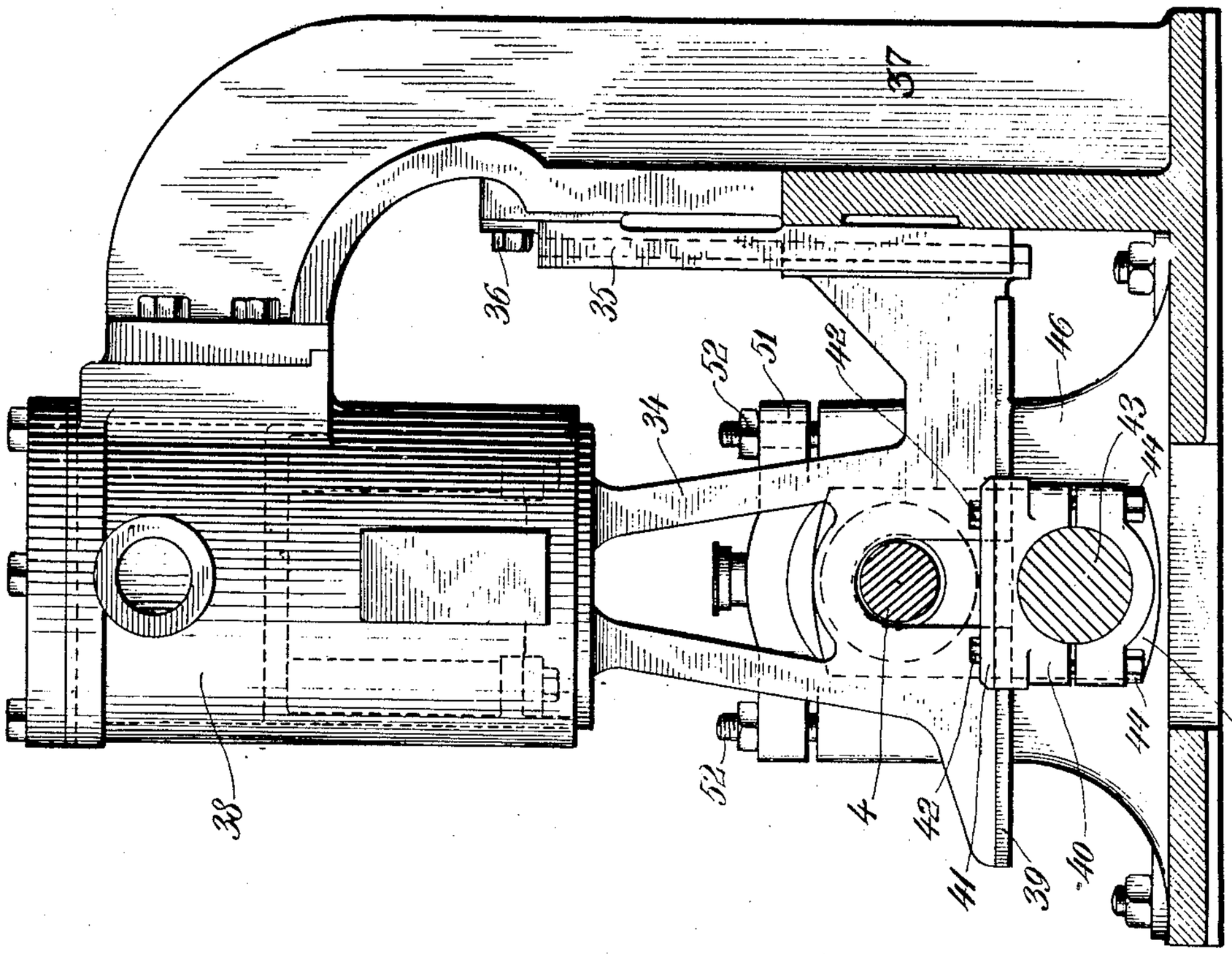

Fig. 8

Fig. 7

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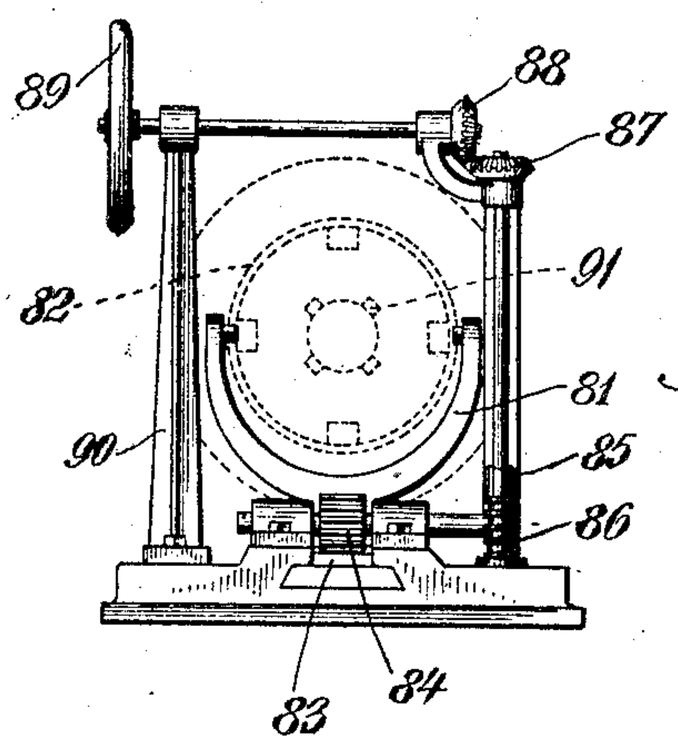


Fig. 9

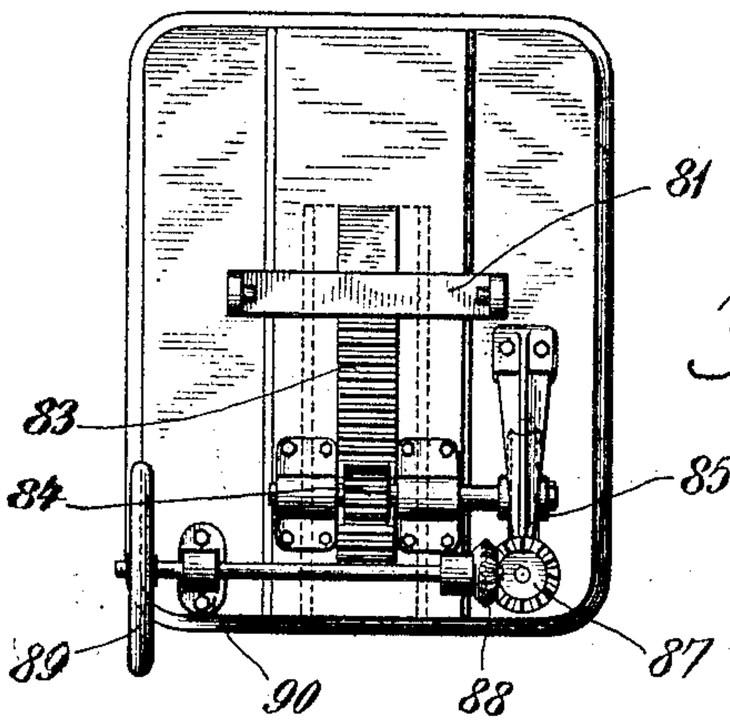
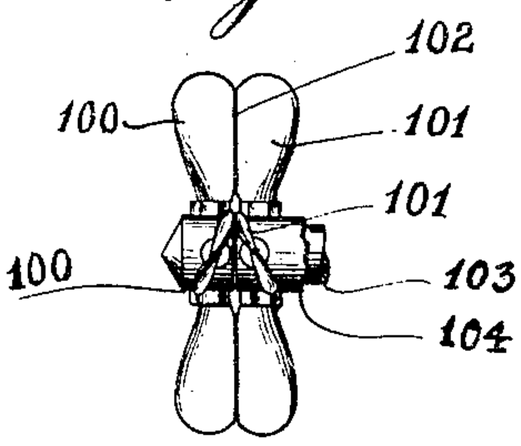


Fig. 10

Fig. 12



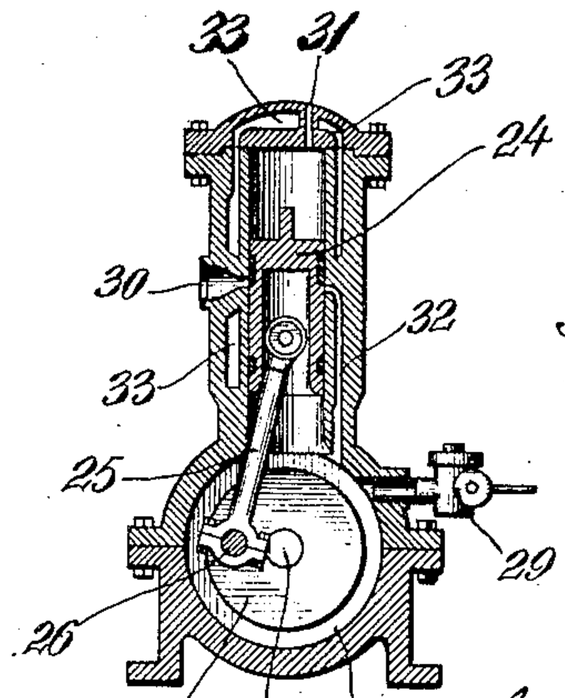


Fig. 11

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UNITED STATES PATENT OFFICE.

THOMAS B. TAYLOR, OF NEW YORK, N. Y.

PROPELLING MEANS FOR VESSELS.

938,911. Specification of Letters Patent. Patented Nov. 2, 1909.

Application filed August 17, 1906. Serial No. 330,940.

To all whom it may concern:

Be it known that I, THOMAS B. TAYLOR, a citizen of the United States, and a resident of New York city, county and State of New York, have invented new and useful Improvements in Propelling Means for Vessels, of which the following is a specification.

The object of my invention is to provide a means for propelling vessels in which a plurality of propellers are used for propelling the vessel, and in which, in the best embodiment of the invention, said propellers are rotated in opposite directions in driving the vessel forward, means being also provided for reversing the direction of rotation of one or both of said propellers, in order to back the vessel.

In accordance with my invention I make use of a plurality of propellers of opposite pitch and provide suitable engines for driving these propellers in opposite directions, in order to propel the vessel forward.

In one form of my invention I make use of turbines for this purpose, and in another form of the invention I make use of reciprocating engines. When using the turbine form of engine I am enabled to do away with the reversing turbine now in use in propulsion systems for vessels. In accordance with this form of my invention both of the turbines are normally active and one of them is used when it is desired to reverse the direction of movement of the vessel. When using reciprocating engines to drive the propellers, one or both of these engines are constructed so that they may be readily reversed, that is to say, so that they may readily reverse the direction of rotation of the shafts with which they are connected. In both forms of my invention I directly connect the prime movers or engines to the shafts that they are designed to rotate. By this means, I avoid the loss of power and uncertainty of action due to intermediate gearing and secure improved reliability of action. The means for dividing one shaft and connecting the two shafts together and to one engine may be employed with reciprocating engines when it is deemed desirable to avoid reversing the engine movement; and the improvement may be employed equally well with turbine engines or with reciprocating engines.

My invention consists in the parts, improvements and combinations more particularly set out in the claims.

Referring now to the drawings, in which two distinct embodiments of my invention are illustrated, the same reference numerals are used to indicate corresponding parts throughout the views.

Figure 1 is a longitudinal sectional view of a vessel showing the propellers and reciprocating engines for driving them. Fig. 2 is a detailed view, partly in longitudinal section, showing the means for supporting the propellers. Fig. 3 is a detailed view illustrating a form of shaft coupling. Fig. 4 is a view of the means used to connect one of the reciprocating engines with its shaft. Fig. 5 is a view, partly in longitudinal section, illustrating another form of my invention in which turbines are used. Fig. 6 is a longitudinal section illustrating a turbine and its connections to its shaft. Fig. 7 is a side view in elevation, of one of the reciprocating engines. Fig. 8 is a transverse section giving another view of the engine shown in Fig. 7. Figs. 9 and 10 are detail views illustrating the means for operating the clutch. Fig. 11 is a sectional view of one of the reciprocating engines illustrated in Fig. 1. Fig. 12 is a view of a form of propeller mechanism adapted to clear itself by cutting sea grass, etc.

I make use of a plurality of propellers, preferably two in number, which are designated by the numerals 1 and 2. These propellers are of opposite pitch, as clearly illustrated upon the drawings. When one of these propellers is driven in one direction and the other in the reverse direction, they combine in their action to propel the vessel forward. If one of these propellers is brought to rest or reversed, and the other propeller rotated in a direction opposite to its normal direction of rotation, the vessel will back.

Suitable means are provided for carrying the propellers and for transmitting power from the engines to them. In the best embodiment of my invention I provide a hollow shaft 3, which carries one of these propellers, and another shaft 4, preferably solid, within the shaft 3, which carries the other propeller. The propellers are secured to their shaft in any desired manner. As illus-

trated in the drawing, the shafts are tapered and provided with hubs 6 with flattened surfaces 5. A nut 7 secures the hub to its shaft, and bolts 8 secure the propeller blades to their hubs. The shaft 4 passes through the shaft 3, and bushings 9, and adjustable stuffing box 11 are provided within the shaft 3 to support and guide the end of the shaft 4. A suitable stufling box 12 is used to mount the hollow shaft 3 in the stern post 13, through which the shaft projects in entering the water. Thrust bearings 14 and 15, one for the hollow shaft and the other for the other shaft, are provided to take up the thrust of the propellers. These bearings are of the ordinary form.

In one embodiment of my invention I make use of a flexible shaft coupling between the sections of the shaft. The construction of this coupling 16 may be widely varied. I have illustrated one form of this coupling in detail in Fig. 3, in which the coupling for the inner shaft is mounted within the coupling for the hollow shaft. In the form of coupling shown in Fig. 3, the two parts of the shaft 3 have secured thereto coupling flanges 17 provided with suitable perforations 18. Pins 19 provided with conical bases and rounded heads pass through the openings in the coupling flanges. The coupling for the inner shaft is constructed in the same manner as the coupling for the hollow shaft. The reference numerals 17ª, 18ª and 19ª refer to the corresponding parts of the inner shaft coupling. Fly wheels 20 and 21, one for each shaft are provided in the embodiment of the invention illustrated in Fig. 1 of the drawings.

In accordance with my invention I make use of a plurality of engines for driving the shafts carrying the propellers. These engines are directly connected to the shafts which they rotate. By this means certainty and reliability of action is secured without disadvantageous loss of power. In the embodiment of my invention illustrated in Fig. 1 of the drawing, I have shown reciprocating engines 22 and 23 for driving the shafts. In the form illustrated gas or explosion engines are used. Either one or both engines are constructed so as to be capable of reversing, that is, of reversing the direction of rotation of the shaft which they rotate. The engine 22 and its connections is illustrated more fully in Figs. 4, 7 and 8, and the engine 23 is illustrated in Figs. 1 and 11. As shown in Fig. 11 the gas engine, which is of an ordinary well known form, consists of a two cycle engine driving the shaft 4 by means of the piston 24, connecting rod 25, crank pin 26 and crank disk 27, the latter being mounted in a closed chamber 28. A carbureter 29 supplies gas to the engine, which gas is exhausted at 30. The igniter is introduced through the tube 31. The admission port is lettered 32, and the water jacket 33. The two cycle engine can be readily reversed and will run in opposite directions by suitably starting the engine through the fly wheel 21. By this means the propeller 1 may be rotated in either direction so as to either advance or back the vessel.

The gas engine 22, in the form illustrated in the drawings, is a four cycle engine, which may be provided with means for reversing if desired. The piston of this engine reciprocates a member 34 which as illustrated upon the drawings takes the form of a yoke straddling the shaft 4. This yoke is guided at 35 by suitable ribs or ways, which are bolted by means of bolts 36 to the uprights 37 carrying engine cylinder 38. In order to overcome the difficulty of driving the inner hollow shaft directly from the engine, and without introducing disadvantageous gearing, I have provided the following means. Yoke 34 is provided with ways 39 which support and guide a block 40 that travels along said ways 39, as the yoke reciprocates. The block 40 is slidably mounted on said ways by means of gibs 41 secured to the block by bolts 42. The block is made in two halves and is mounted and secured to a crank pin 43 by bolts 44. The crank pin 43, in the best embodiment of my invention, connects the two cranks 45, one of which is secured to the hollow shaft 3, and the other is mounted in a suitable bearing. The bearings for the different shafts and connections between the engine 22 and its shaft are clearly illustrated in Figs. 4 and 7. Standards 46, which are suitably bolted to a base plate, are provided with bearings 47 which contain antifriction metal 48. One bearing 47 supports the hollow shaft 3 and the other bearing supports the crank 45, the prolongation 49 of this crank fits into the bearing. The inner shaft 4 is preferably supported within the hollow shaft at this point by suitable bearings 50. Caps 51 are secured by means of bolts 52 to the standards 46 and inclose the bearings. I prefer to make use of tubular members 53 to inclose the propellers 1 and 2, and I also provide a rudder 54 with rudder post 55, the front end 56 of the rudder extending within the tube. This contributes to the efficiency of the propelling and steering mechanism.

In the embodiment of my invention illustrated in Figs. 5, 6, 9 and 10, I make use of turbines for driving the propellers. In accordance with my invention, I have done away with the expense and difficulty of propelling vessels by means of turbines which arose from the fact that an additional turbine was required to reverse the direction of movement of the vessel. In accordance with my invention, the turbines that I use are normally active and always rotate in the same direction. In their ordinary operation

they drive the vessel forward. When it is desired to back the vessel, suitable means are provided, which will now be described, which means connect the propellers with one of the turbines in such a way as to reverse the direction of rotation of the propeller. The turbine that I use may be of any desired form. As illustrated in Fig. 6, the shaft 4 passes freely through rotor 57ª of the turbine. This rotor is provided with the usual blades 58 and is supported by bearings 59, 60, 61 and 62 in the usual manner. Bearings 60 and 61 serve as supports for the hollow shaft and bearings 59 and 62 serve also as stuffing boxes to prevent the escape of steam from the turbines. The steam is supplied to the turbine from the boiler 63, the fire box of which is provided with an ordinary funnel 64. Steam is admitted from the steam dome 65 by means of the steam pipes 66 through throttle valves 67 to the turbine at the inlets 68. The steam exhausts at 69. The turbine illustrated in the drawings has three drums of different radii so as to use the steam expansively. In order to balance the turbine against end thrusts, balancing chambers, steam passages and balancing disks are provided in the usual way. Thus the balancing chamber 70, steam passage 71, and balancing disk 72, balances the end thrust of the steam upon the largest drum. Similar means including the passages 73 and 74, Fig. 6, are provided for the intermediate drum and the smallest drum.

As clearly shown in the drawings, rotor 57ª is directly and rigidly connected to one part of the hollow shaft 3 so as to rotate the shaft. This part of the shaft 3 will drive the propeller 2 by means of the clutch 75. This clutch may be of any desired construction. Another turbine 76 is provided to drive the inner shaft 4. The construction of this turbine is of any ordinary form, as for example, the form that has been illustrated as the one used for driving the shaft 3.

When the vessel is advancing turbines 57 and 76 drive propellers 1 and 2 in opposite directions and this is made possible by giving the propellers opposite pitches with respect to each other. The shafts 3 and 4 are then rotated in opposite directions. When it is desired to back the vessel, means are provided whereby the propeller secured to the shaft 4 may have its normal direction of rotation reversed. The means for accomplishing this result may be widely varied without departing from the spirit of my invention.

As illustrated, one of the clutch members 77 of the clutch 75 is constructed so as to slidably engage a sleeve 78 which is integral with the hollow shaft 3. This sliding connection is obtained by means of keys 79 attached to the sleeve 78 by bolts 80. The keys 79 slide in ways 105. Suitable means are provided for reciprocating the part 77. I provide arms 81 which engage the ring 82 which is connected with the part 77. The arms 81 are attached to a rack 83 which is reciprocated by a pinion 84 and worm wheel 85, worm 86, bevel gears 87, 88 and hand wheel 89 mounted in a bracket 90, all of which will be readily understood by an examination of Figs. 6, 9 and 10. By rotating the hand wheel 89 the clutch member 77 may be reciprocated always remaining in engagement with the hollow shaft 3.

The shaft 4 is provided with suitable means so as to enable it to be coupled and uncoupled from the shaft 3. This means may be widely varied. As illustrated in the drawing I make use of keys 91 which are rigidly attached to the shaft 4. These keys may be made to engage with corresponding recesses in the clutch member 77, when the latter is reciprocated.

It will now be apparent that although the shaft 3 can be driven in one direction only by its turbine, it can be made to reverse the direction of rotation of the propeller attached to the shaft 4. This is accomplished by sliding the clutch member 77 so as to disengage the clutch 75 and thus stop the rotation of the propeller 2, and then sliding the clutch member 77 farther so that it engages the splines 91 and thus rotates the shaft 4 from turbine 57 through the intermediate agency of the shaft 3. The propeller 1 attached to the shaft 4, which normally was being driven in one direction, now has its direction of rotation reversed.

In order to automatically stop the turbine driving the shaft 4 before the direction of rotation of the shaft 4 is reversed, I provide means for shutting the throttle of turbine 76 during the unclutching operation when the hand wheel 89 is turned. A ratchet 89ª, bar 89ᵇ, rack 89ᶜ and pinion 89ᵈ, transmit the movement from the hand wheel 89 to the wheel 67 of the throttle valve.

Fig. 12 shows two reversely driven propellers 100 and 101, whose adjacent surfaces 102 meet so as to form shears. The propeller 100 is mounted on a shaft 103 and the propeller 101 on a rotatable sleeve 104. By these means, when the propellers are running over a grassy bottom, they will cut the grass and clear themselves.

The operation of my invention will be obvious from the above description of the construction and operation.

My invention in its broader aspects is not limited to the particular constructions and relative arrangements of the parts herein shown and described nor to any particular form of apparatus by which the invention may be carried into effect, as many changes may be made in the construction and relative arrangement of the parts as required to adapt the apparatus to the circumstances of

the particular application of the invention or to meet the personal views of the engineer employed to carry the invention into effect without departing from the main principles of the invention and without sacrificing its chief advantages.

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

1. In a boat or vessel the combination of two separate, independently acting engines, two concentric shafts, a direct connection between one engine and one shaft, a direct connection between the second engine and the second shaft, two independent propellers of respectively opposite pitch, one on each shaft, and means for dividing one shaft, stopping one engine and connecting said shafts together.

2. The combination in a boat or vessel of two separate, independent engines, two concentric shafts, a direct connection between one engine and one shaft, a direct connection between the second engine and the second shaft, two independent, separate propellers, one on each shaft, and means for disconnecting one propeller from its engine and connecting said engine to the other propeller.

3. The combination in a boat or vessel of two separate, independent engines, two concentric shafts, a direct connection between one engine and one shaft, a direct connection between the second engine and the second shaft, two independent, separate propellers, one on each shaft, and means for disconnecting one propeller from its shaft and connecting the other propeller to said shaft.

4. The combination in a boat or vessel of two independent driving engines, a hollow shaft driven by one engine, a shaft in concentric relation to the first shaft driven by the other engine, a propeller wheel for each shaft, flexible couplings in each shaft, at coincident points, and means for disconnecting one of said shafts from its engine.

5. The combination in a boat or vessel of two independent driving engines, a hollow shaft driven by one engine, a shaft in concentric relation to the first shaft driven by the other engine, a propeller wheel for each shaft, flexible couplings in each shaft at coincident points, and bearings for the inner shaft in close proximity to said couplings, said bearings being supported upon the interior of said hollow shaft.

6. The combination in a boat or vessel of two independent driving engines, two concentric shafts, one driven by each engine, two propellers, one for each shaft, means for disconnecting the first propeller from its shaft, for automatically stopping the engine of the second shaft and for connecting the first shaft to the second propeller in the order named.

7. The combination in a boat or vessel of two concentric shafts arranged parallel with the keel; two propellers of opposite pitch, one for each shaft; two independent engines, one for each shaft, and means to divide one shaft, automatically stop the engine of the other shaft and couple said shafts together on the engine side of said divided shaft.

8. The combination in a boat or vessel of a hollow shaft, a shaft arranged concentric therewith, two propellers of opposite pitch, one for each shaft; two independent engines, one for each shaft; and means to divide the hollow shaft, to automatically stop the engine of the other shaft and to connect the engine of the hollow shaft to the propeller of the inner shaft.

9. The combination in a boat or vessel of two shafts arranged parallel with the keel, two propellers of respectively opposite pitch, one fixed to each shaft; two independent driving engines, one for each shaft located in a fore and aft line at successive points on said shafts and means for disconnecting one propeller, stopping one engine and coupling said shafts together.

10. The combination in a boat or vessel of suitable driving engines, two concentric shafts arranged parallel with the keel; two propelling wheels, one fixed on each shaft, said wheels being of opposite pitch arranged in the same fore and aft line and having their adjacent faces in close proximity to form shears.

11. In a vessel the combination of two propellers of opposite pitch, a hollow shaft connected to one of said propellers, a shaft passing through said hollow shaft and connected to the other propeller, a reciprocating engine directly connected to said inner shaft, a crank connected to said hollow shaft, a reciprocating engine for driving said hollow shaft, a member reciprocated by said engine, a crank pin connected to said crank, a sliding connection between said crank pin and said reciprocating member, and means for disconnecting one of said engines.

12. In a vessel, the combination of two propellers of opposite pitch, a hollow shaft connected to one of said propellers, a shaft passing through said hollow shaft and connected to the other propeller, a crank connected to said hollow shaft, a crank pin connecting said crank, a block mounted upon said crank pin, a reciprocating member, an engine for reciprocating said member, said member being provided with ways along which said block travels.

13. In a vessel, the combination of two propellers of opposite pitch, a hollow shaft connected to one of said propellers, a shaft passing through said hollow shaft and connected to the other propeller, a crank connected to said hollow shaft, a crank pin connecting said crank, a block mounted upon

said crank pin, a reciprocating member, an engine for reciprocating said member, said member being provided with ways on which said block travels, and means for guiding said reciprocating member.

14. In a vessel, the combination of two propellers of opposite pitch, a hollow shaft connected to one of said propellers, a shaft passing through said hollow shaft and connected to the other propeller, a crank connected to said hollow shaft, a second crank, said second crank being mounted in a bearing in line with said first named crank, a crank pin between said cranks, a block mounted upon said crank pin, a reciprocating member, ways connected to said member, said block traveling on said ways, and an engine for reciprocating said member.

15. In a vessel, the combination of two propellers of opposite pitch, a hollow shaft carrying one of said propellers, a shaft carrying the other propeller and passing through said hollow shaft, a reciprocating engine connected to said last named shaft, a crank connected to said hollow shaft, a second crank, bearings for the hollow shaft, bearings for the second crank in line with said first named bearings, the shaft passing through said hollow shaft also passing through said bearings, a crank pin connecting the two cranks, a block mounted upon said crank pin, a reciprocating yoke straddling said inner shaft, said reciprocating yoke being provided with ways upon which said block travels.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

THOMAS B. TAYLOR.

Witnesses:

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D. HAROLD BUSH.