L. DIEHL.

MECHANISM FOR PROPELLING SHIPS AND OTHER WATER VEHICLES.

APPLICATION FILED JULY 21, 1908.

930,359.

Patented Aug. 10, 1909.

3 SHEETS—SHEET 1.

Fig. 1.

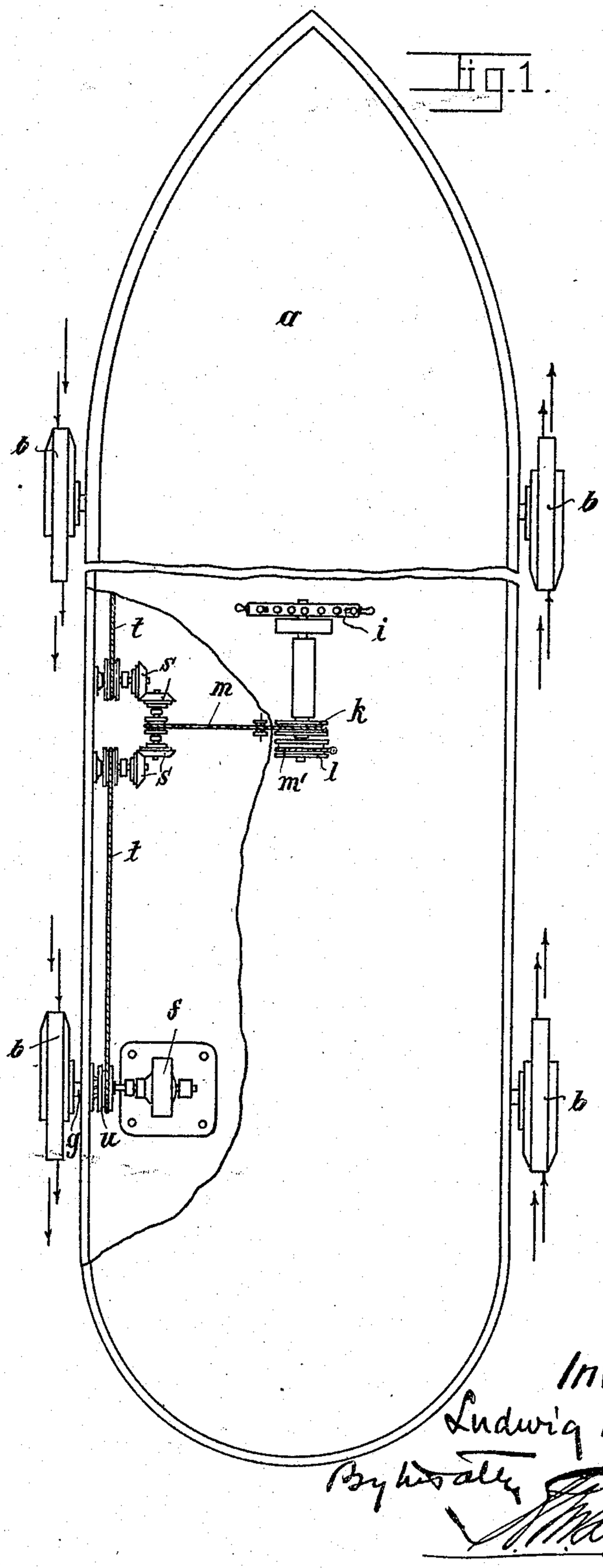

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Fig. 2.

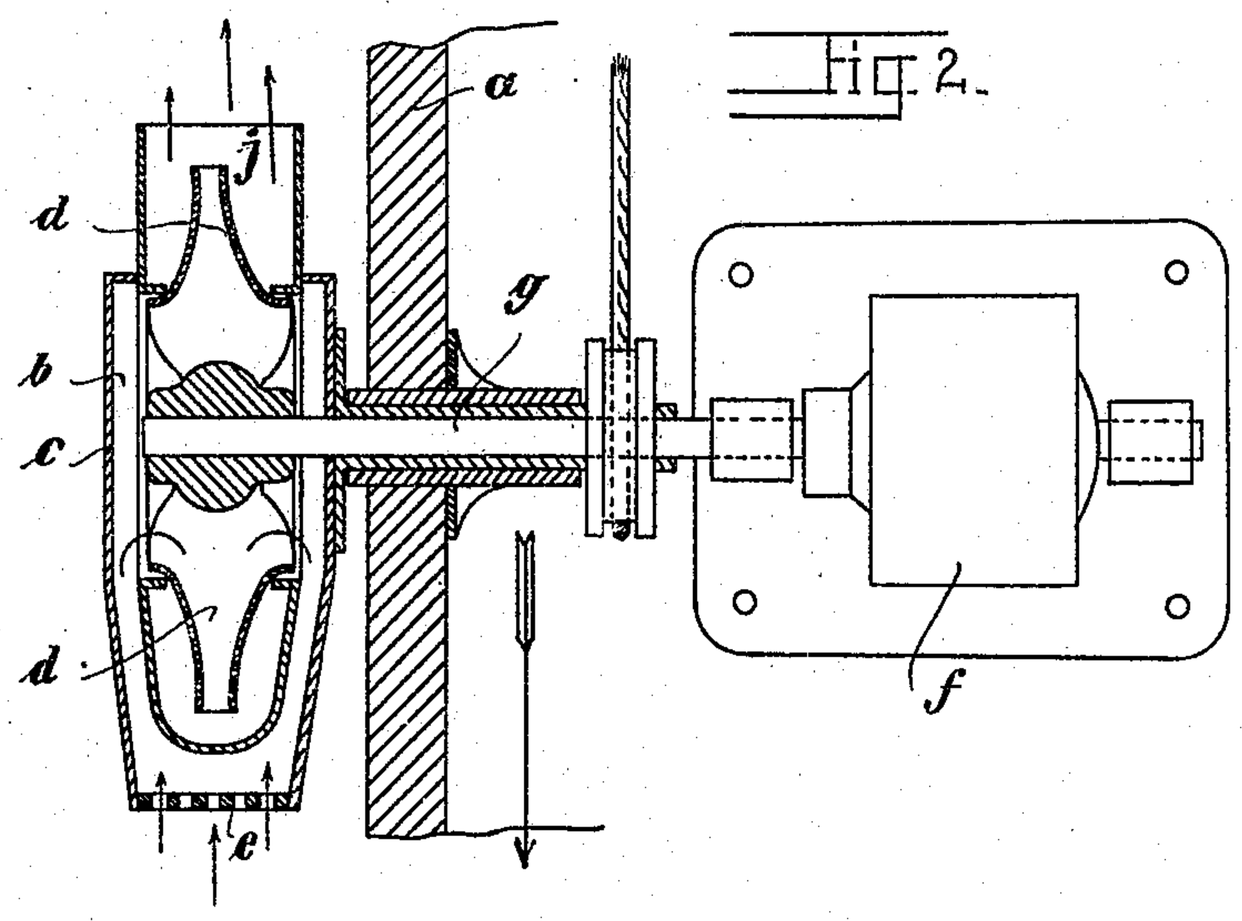


Fig. 3.

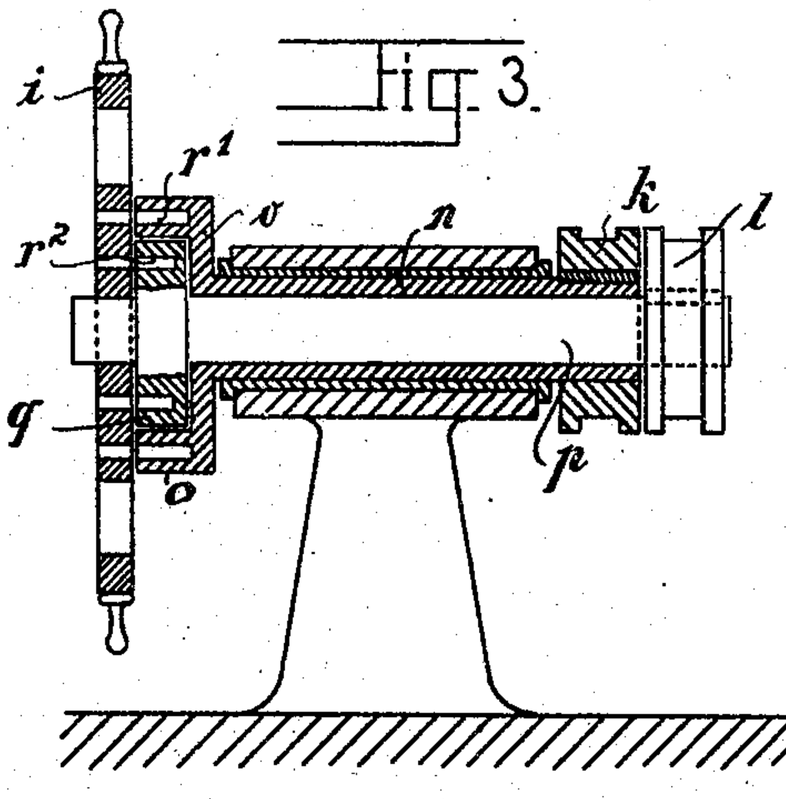
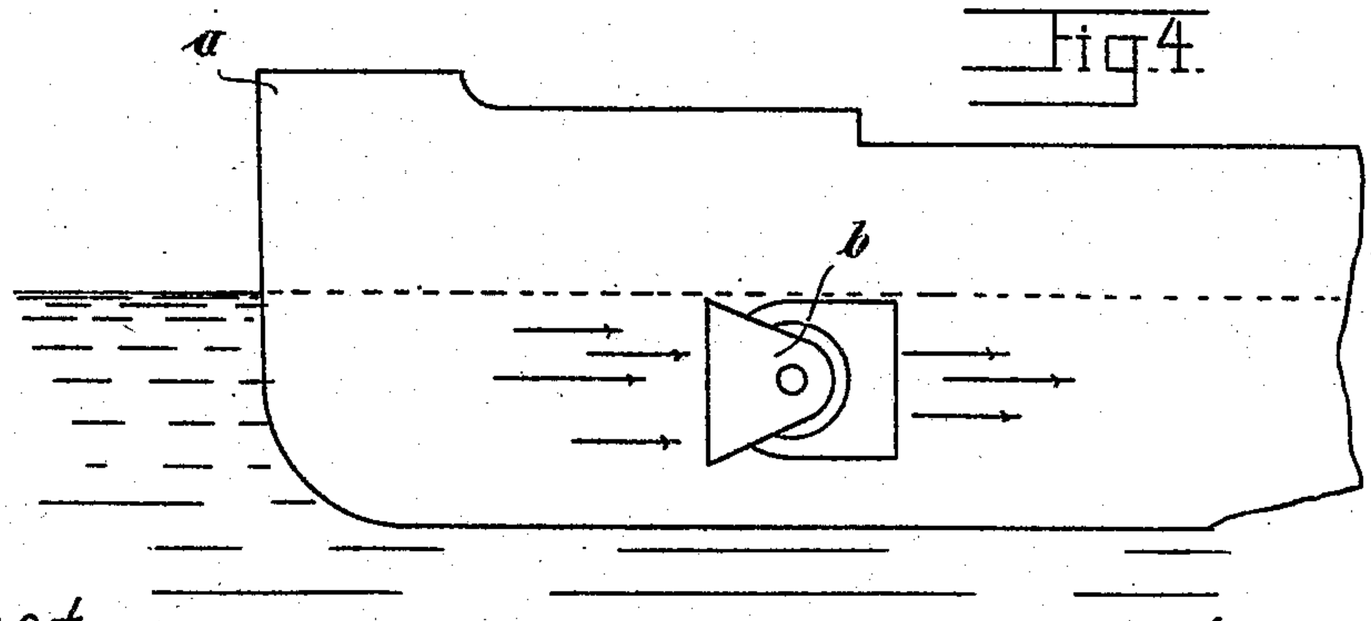


Fig. 4.



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3 SHEETS—SHEET 3.

Fig. 5.

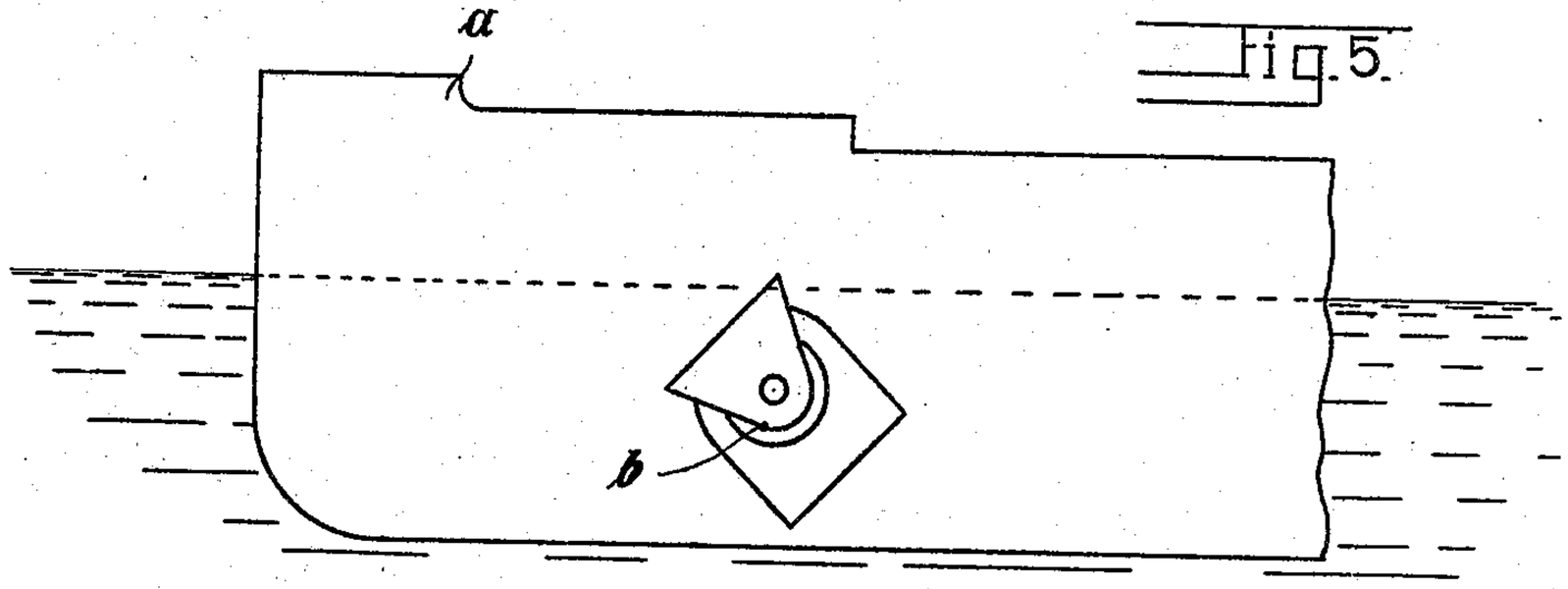


Fig. 6.

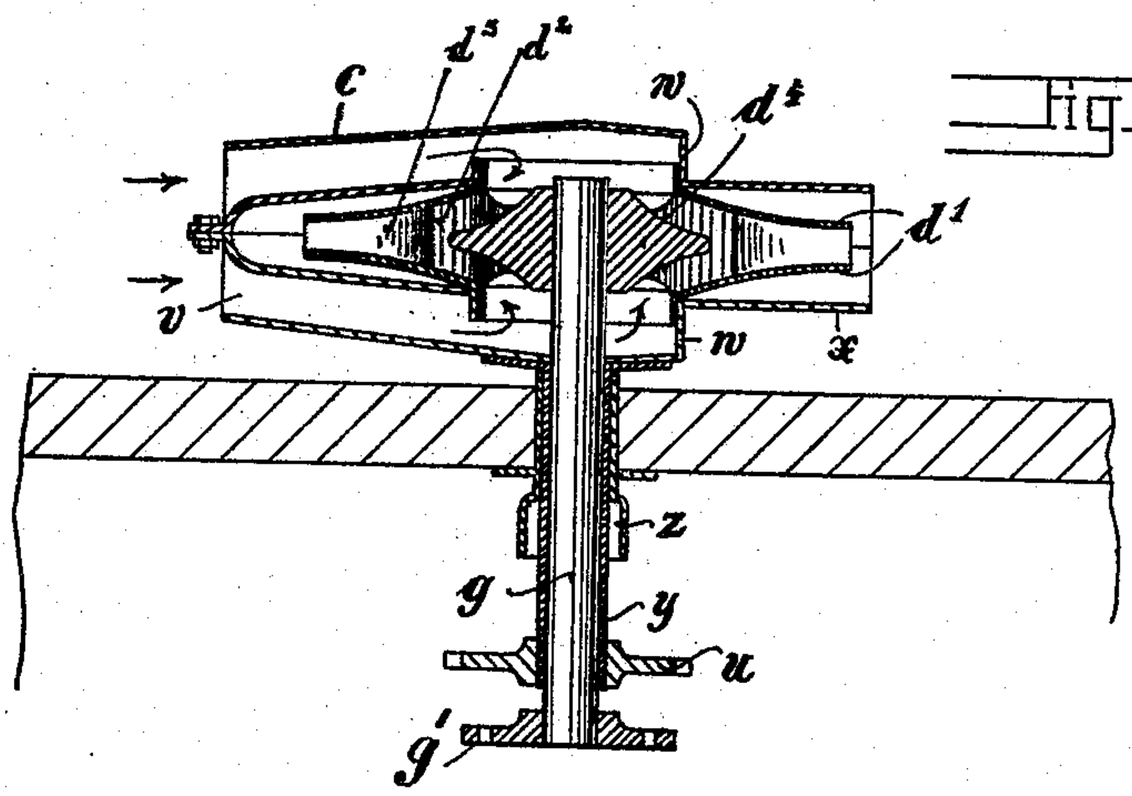
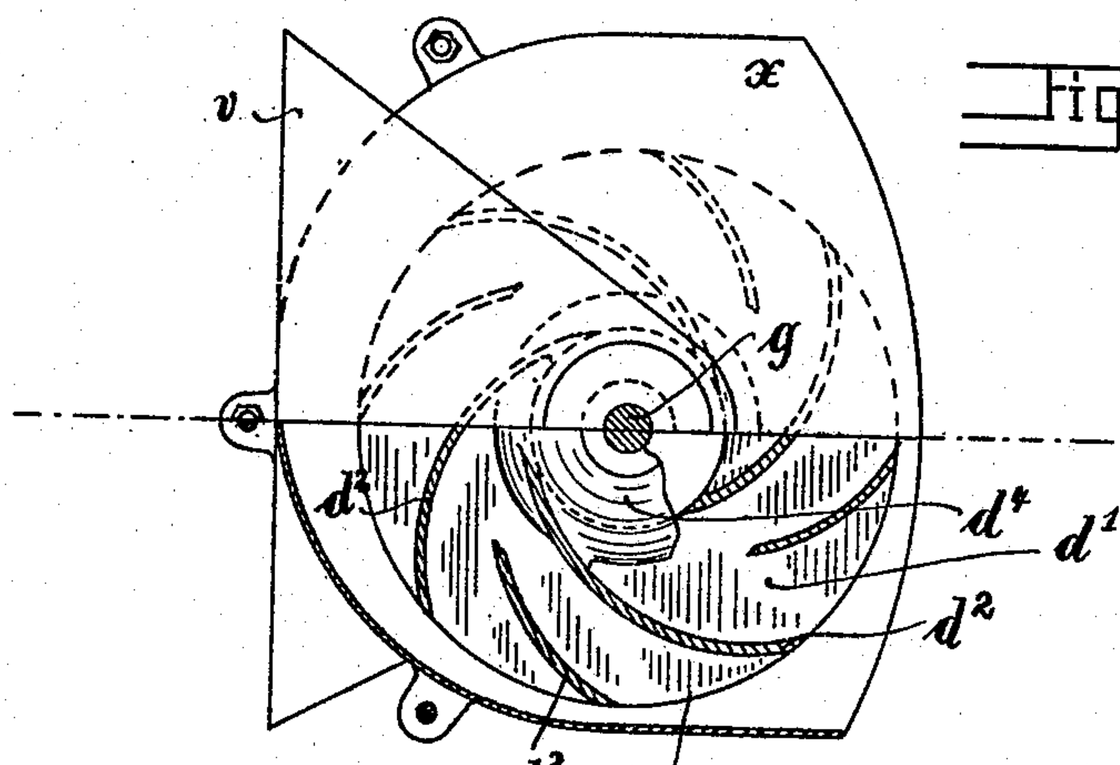


Fig. 7.



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UNITED STATES PATENT OFFICE.

LUDWIG DIEHL, OF ZWEIBRÜCKEN, GERMANY.

MECHANISM FOR PROPELLING SHIPS AND OTHER WATER-VEHICLES.

No. 930,359. Specification of Letters Patent. Patented Aug. 10, 1909.

Application filed July 21, 1908. Serial No. 444,686.

To all whom it may concern:

Be it known that I, LUDWIG DIEHL, manager, a subject of the Emperor of Germany, and a resident of Zweibrücken, Germany, have invented certain new and useful Improvements in Mechanism for Propelling Ships and other Water-Vehicles, of which the following is a full, clear, and exact specification.

The present invention has for its object mechansim for propelling and steering ships and other water vehicles and consisting of quickly-rotating mechanism arranged upon both sides of the ship in suitable turnable casings; the ship being driven forward or astern, turned or steered or caused to be submerged or raised, according to the manner in which these casings are set or adjusted.

For steering ships hitherto only a rudder adapted to be set obliquely to the longitudinal axis of the ship has alone been used practically speaking. This method of steering presents the disadvantage, however, that the turning of the ship can only be produced by causing it to traverse an arc of large radius, or under the most favorable conditions by turning around the stern of the ship or its rudder. This renders the maneuvering of the ship slow and troublesome. It has already been suggested (British Patent No. 18253/94) in order to obviate this defect to provide a steering member in the form of a centrifugal pump with a vertical axis rotating in a special receptacle, an arrangement which has never been adopted in practice. It has also been proposed in the American Patents Nos. 480,533 and 513,591 to provide one or more passages passing through the ship and centrifugal pumps drawing the water through these passages and forcing it out again through appropriate nozzles arranged upon either side of the ship. In view of the many defects inherent in this construction, it likewise has never been adopted, or at most it has been utilized in a few special cases, so that the problem of a simple steering gear for ships which is capable of producing an intense or concentrated effect has not hitherto been solved.

The present invention has for its object an extremely simple form of steering, consisting broadly in arranging on the sides of ship, driving mechanism such for example as rotary pumps located in oppositely arranged casings for sucking the water and discharging it in the same direction toward the stern. In this manner a propelling force is exerted on the ship and it is rendered steerable in addition, by rotating the casings, containing the driving mechanisms by different amounts on the two sides of the ship, so that on one of its sides the discharge apertures are differently directed from those on the other side, the ship can be turned in place about a vertical axis passing through its middle, in the manner say of a magnet needle, while heretofore by displacing the rudder the ship has been turned in an arc of a circle or around one of its extremities in the manner of the hand of a clock.

The ship may be caused to back very speedily by turning the discharge orifices forward so that it is very readily maneuvered, a point which is of the greatest advantage in war time or in case of accident.

The driving mechanism may also be utilized in submarine boats, and by means of it the boat may be readily raised or submerged by appropriately adjusting the casings.

While the invention is adapted for propelling and steering vessels on the surface of the water, and is also adapted for propelling and steering submarine vessels, both in vertical and horizontal planes and also in any oblique planes, it is evident that with the proper adaptation of the buoyancy of the vessel to the medium in which it floats any character of vessel may be enabled to be propelled and maneuvered without the requirements of a rudder or variable ballast.

An embodiment of the invention is illustrated in the accompanying drawing, in which:

Figure 1 is a top view of the ship partially in section. Fig. 2 represents a section through the driving mechanism with its motors, Fig. 3 shows the steering wheel, Fig. 4 is a side view of the ship, showing the driving mechanism arranged in horizontal adjustment, Fig. 5 is a similar view but showing the driving mechanism adjusted obliquely, Fig. 6 is a sectional view similar to Fig. 2 but showing a modification of the driving apparatus, and Fig. 7 in its upper half is a side view and in its lower half is a vertical section through the driving apparatus of Fig. 6.

In the example illustrated, *a* is the hull of the ship having the driving or propelling mechanisms *b*, *b* arranged in pairs outside its walls, as shown in Fig. 1. These mechanisms consist of a casing *c*, having a sucking

part and a discharging part. The mouthpiece v of the sucking part may be furnished preferably with a grating e, to prevent the entrance of foreign bodies. The discharging part x of the casing is arranged on both sides of the pump and having its flanges w forming a tight joint with the side walls of the rotating pump, so that the whole of the entering water is compelled, as the arrows indicate, to go from the sucking part through the rotating body of the pumps and be discharged from the discharging part. A casing c of the pump mechanism is integral with the hollow shaft y, which enters through an opening in the shell of the ship, the opening being made tight by the stuffing box z and which shaft terminates into the driving devices u, which latter are either pulleys, driven by ropes t, as shown in Figs. 1 and 2, or are sprocket wheels adapted to be actuated by chains, as Fig. 6 shows, or by any other suitable means. Within the casing c is arranged the rotor or driving wheel of the propelling and steering mechanisms, the shaft g of said rotor having on its inner end the coupling part g', which may be fastened to the respective driving motor f.

In the illustrated example, the driving wheel itself is formed by two side walls d' and longer and shorter paddles d^2 and d^3, cast alternating into the side walls and further by central tongue d^4, arranged circumferentially in the plane of revolution through the middle of the wheel and forming lateral annular channels for the water on each side of the hub. The longer paddles d^2 extend from the outer end of the side walls in to the central tongue, and the shorter paddles d^3 extends only over the outer ring part of the wheel, the inner ends of the paddle d^3 terminating at a point of greater radius than the outer periphery of the central tongue. The central tongue d^4 which, as above stated, is integral with the inner ends of the longer paddles d^2, transmits the rotating movement of the shaft g to the whole rotor of the propelling and steering mechanism, and further it is formed in curved shape, annularly from the sides to the middle plane to provide for the free admission of water without shocks and frictional loss. For this purpose the side walls d' are formed as shown in the upper parts of Figs. 2 and 7, that is to say, as annular plates, so that they have an opening for free passage of the water, which after being sucked by the mouthpiece of the passage, is guided axially into the driving wheel from its center. In the direction of the movement of the ship the driving wheels d are inclosed by casings x secured to the casing c, whereas on the side opposite to the direction of the movement of the ship the shells of the casing x terminate in the discharge orifices j. The hollow spacing between the casing x and the driving wheel d, is preferably enlarged spirally, (Fig. 7), similarly to the practice in rotating pumps.

The preferred form of driving and steering wheels comprise the two annular plates d' joined together by the longer and shorter paddles d^2 and d^3 preferably formed integral therewith and arranged alternately between the said plates d' extending from the periphery of said plates in curved lines toward the middle or hub portion of the wheel or axle g. The longer of these plates d^2 meet and are formed integral with a hub portion which is directly secured upon the axle or shaft g and extended circumferentially in a middle or central plane between the two annular side plates d' to form an annular tongue d^4 which extends outward and blends with the inner ends of the curved paddles d^2, as clearly shown in Figs. 6 and 7. This construction provides curved water passages laterally from each side of the annular plates d' and through apertures adjacent to the hub portion and which apertures curve inwardly and then radially between the said curved paddles d^2, whereby the water may be sucked in from each side by centrifugal action, caused to flow radially outward under the action of the paddles, the water entering from each side of the center of the wheel, uniting beyond the center tongue b^4 and then being co-acted upon by the curved paddles d^2 and d^3 which impart motion to it. Other forms of propelling wheels may be employed in place of the particular form shown so long as they accomplish the same general results, without departing from the spirit of the invention.

The mechanism is driven by electric motors, steam or gas turbines f or any other suitable means driving the shafts g of the propelling wheels d either directly or through suitable transmission members. By turning the casing c the admission aperture can be directed forward or rearward so that a force propelling the ship forward or rearward can be exerted. The casing is adjusted by means of the operating gear arranged at the middle of the ship, and provided with an operating wheel i acting upon two cable-pulleys k and l. The cable-pulley k is connected by means of a sleeve n with a pulley o and the cable pulley l is mounted on a shaft p carrying at its front portion a pulley q concentric with o. By means of pins inserted in openings r^1, r^2 in the pulleys o and q, the operating wheel i may be coupled with these pulleys. By means of an endless cable m the cable pulley k is connected with the setting mechanism of the casings on the left hand side of the ship, while similarly the cable pulley l acts upon the casings on the right hand side of the ship. By means of the cable m, bevel wheels s and cables t, t the pulleys u connected with the casings c are rotated. By rotating the operating wheel i after it has been coupled

with the pulley *o* the casings on the left hand side of the vessel are adjusted, and when the operating wheel *i* has been coupled with the pulley *q* the casings on the right hand side can be adjusted, and according to the adjustment or setting of these casings the ship can be driven forward or astern or be speedily turned.

Fig. 4 shows the position of the propelling mechanism, having its axis arranged parallel to the length of the ship, which arrangement results in the forward propelling of the ship. Fig. 5 shows an arrangement of the driving or propelling mechanism, having its axis arranged obliquely with reference to the length of the ship. This latter position of Fig. 5 would cause this side of the ship to be lifted obliquely upward, while in submarines it would cause upward movement, bodily, of the ship while advancing. It is evident that by other adjustments of the casings of the driving or propelling mechanisms, other movements of the ship may be produced.

Steam, electricity, compressed air, or the like may be utilized for driving the driving gear. If electric motors are used, series resistance are preferably employed, so that by switching them in the speed of rotation of the motors may be varied; in the case of steam, compressed air or the like, the regulation may be produced by throttling or in any other convenient manner. In place of the operating or steering gear actuated by hand which is here shown, and which is only suitable for ships of small size, in the case of larger ships, mechanical actuation by means of steam, compressed air, liquids under pressure, or electricity, may be resorted to and the actuation of the casings containing the driving mechanism may if necessary be produced by special auxiliary motors or relays and these may be actuated by special gear of the most recent and effective construction.

Instead of the device for propelling and steering of ships as described hitherto in which the driving mechanisms are arranged in turnable casings and the steering is done by adjusting those casings into the one or the other direction, there may be used varied embodiment of the invention which consists in that the casings are fixed at the wall of the ship so as to be immovable and only the propellers or driving mechanism in the different casings are driven with different velocity or eventually in opposite direction to each other. It is evident that by such means likewise the direction of the ship may be altered at liberty, if the different driving-mechanisms are combined in a suitable way for instance by driving those of the one side with greater velocity than those of the other side.

As already stated, a ship constructed in this manner is characterized by the readiness with which it can be maneuvered, likewise by its quiet running and the low cost of driving it. It is unnecessary to provide a rudder for steering the ship. That apparatus may however be used in combination with existing ships' propellers so that by arranging two or more mechanisms on a ship its speed or ability for maneuvering may be largely increased.

It is evident that the invention may be applied likewise for the propelling and steering of air ships, either in the form illustrated and described above or in any modification adapted especially for this purpose.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:

1. Apparatus for propelling and steering ships and other vehicles which consists of the combination of a plurality of high speed propelling mechanisms, casings inclosing said propelling mechanisms and having a front mouth-piece adapted to suck the water or medium acted upon, and also provided with a rear discharge mouth-piece, said rear discharge mouth-piece guiding the ejected water or other medium rearward after it has passed through the driving mechanisms, means for driving the propelling mechanisms, and means for adjusting the casings to change the direction of suction and discharge whereby the ship may be driven forward or backward, steered or turned, submerged, lowered or raised.

2. Apparatus for propelling and steering ships and other vehicles, which consists of the combination of a plurality of high speed propelling mechanisms each of said mechanisms consisting of two annular side plates d' connected by transverse long paddles d^2 and short paddles d^3, and having a hub provided with a central annular tongue d^4 adapted to direct the water or other medium between the inner ends of the paddles, means for driving the propelling mechanism, casings inclosing the propelling mechanisms provided with suction and discharge orifices oppositely arranged for entrance and discharge of the water or other medium, and means for adjusting the casings to change the direction of suction and discharge whereby the ship may be driven forward or astern, steered or turned, submerged, lowered or raised.

3. Apparatus for propelling and steering ships and other vehicles, consisting of the combination of a plurality of high speed propelling wheels arranged in pairs in appropriate turnable casings on both sides of the ship said casings having suction and discharge openings, means for driving said propelling wheels, means for adjustment of the casings of the propelling wheels consisting of a steering wheel *i*, concentric disks *o*, *q*, the one of which is arranged to be coupled to the steering wheel, and intermediating means for

transferring the movement of said disks to the casings of the different propelling mechanisms.

4. Apparatus for propelling and steering vessels, which consists in rotating centrifugal pumps upon each side of the vessel and provided with inclosing adjustable casings having oppositely directed suction and discharge orifices, combined with means for simultaneously adjusting the casings of the pumps upon each side of the vessel to change the position of the suction and discharge orifices to the axial line of the vessel.

5. Apparatus for propelling and steering vessels which consists in rotating centrifugal pumps upon each side of the vessel and provided with inclosing adjustable casings having opposite directed suction and discharging orifices, combined with means for independently adjusting the casings of the two pumps, whereby said casings may be rotated about the axis of the pumps in the same or opposite directions as desired.

6. Apparatus for propelling and steering vessels which consists in rotating centrifugal pumps upon each side of the vessel and provided with inclosing adjustable casings having opposite directed suction and discharge orifices, combined with means for independently adjusting the casings of the two pumps whereby said casings may be rotated about the axis of the pumps in the same or opposite directions as desired, and a hand operated means to simultaneously control the adjustment of the casings upon both sides of the vessel.

7. Apparatus for propelling and steering vessels, which consists of a centrifugal acting device having suction and discharge ports and arranged upon the outside of the vessel and for creating a current of the medium in which the vessel floats, combined with means extending through the side of the vessel for adjusting the centrifugal acting device whereby the discharge of the medium circulated may be directed in different directions, and hand controlled devices for regulating the adjustment of the means for directing the discharge of the medium.

LUDWIG DIEHL.

Witnesses:
LUITPOLD QUELL,
CARL WEINMANN.