No. 610,370. Patented Sept. 6, 1898.

J. & H. W. RITCHIE.

RECIPROCATING PROPELLER FOR VESSELS.

(Application filed June 9, 1897.)

(No Model.) 4 Sheets—Sheet 1.

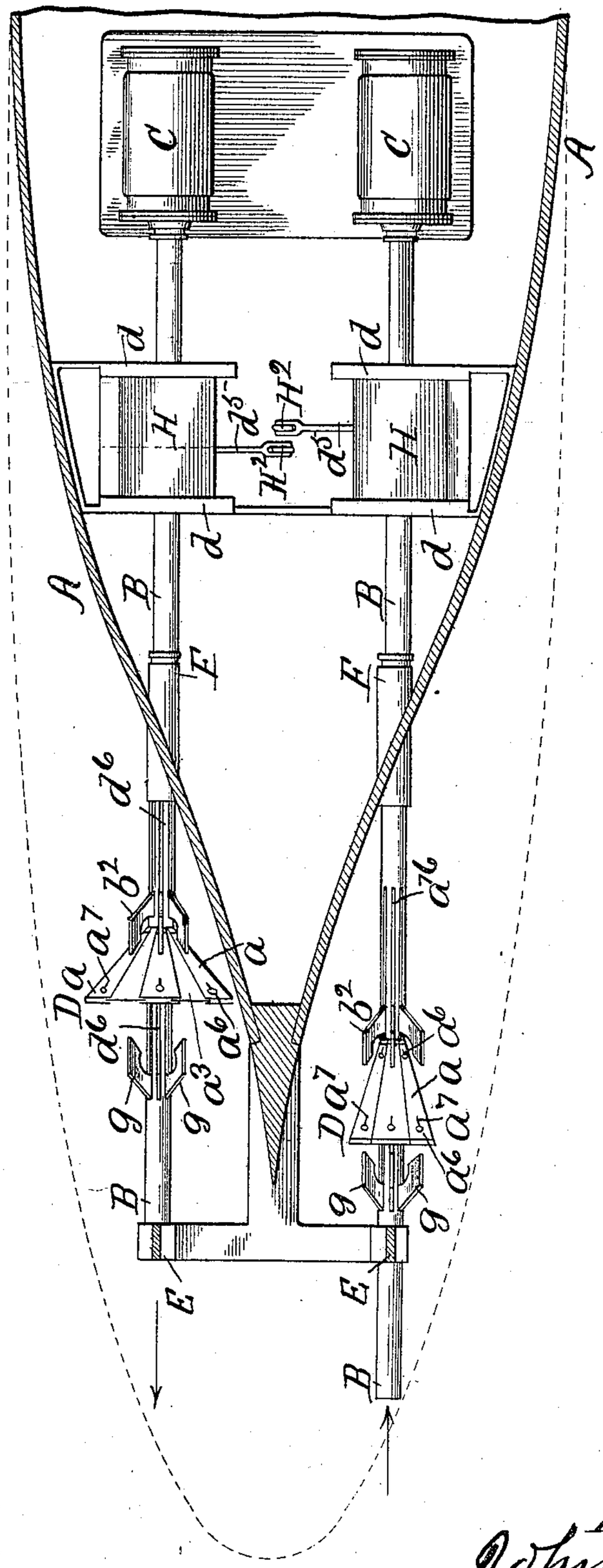

Fig. 1.

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Fig. 2.

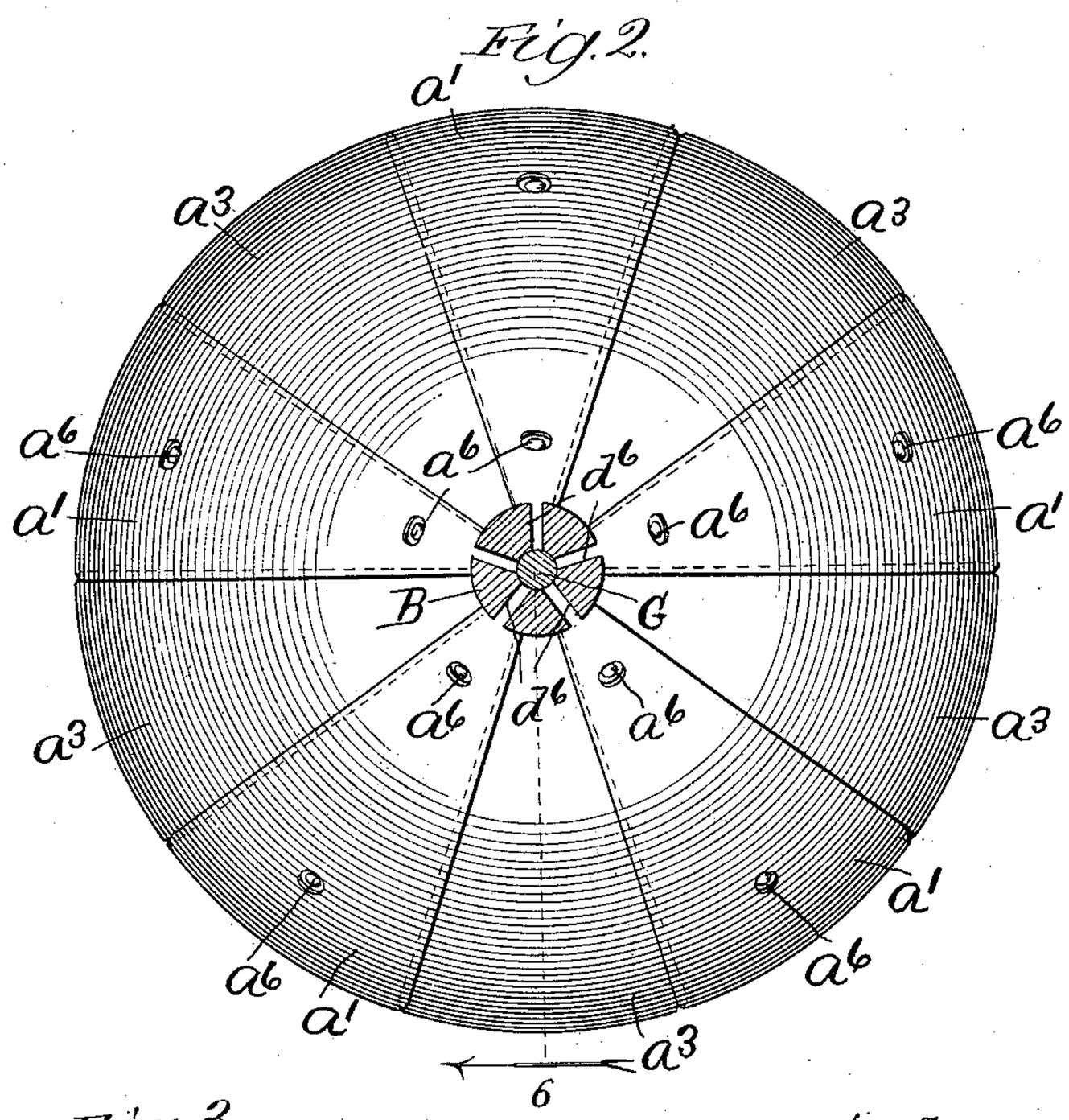

Fig. 3.

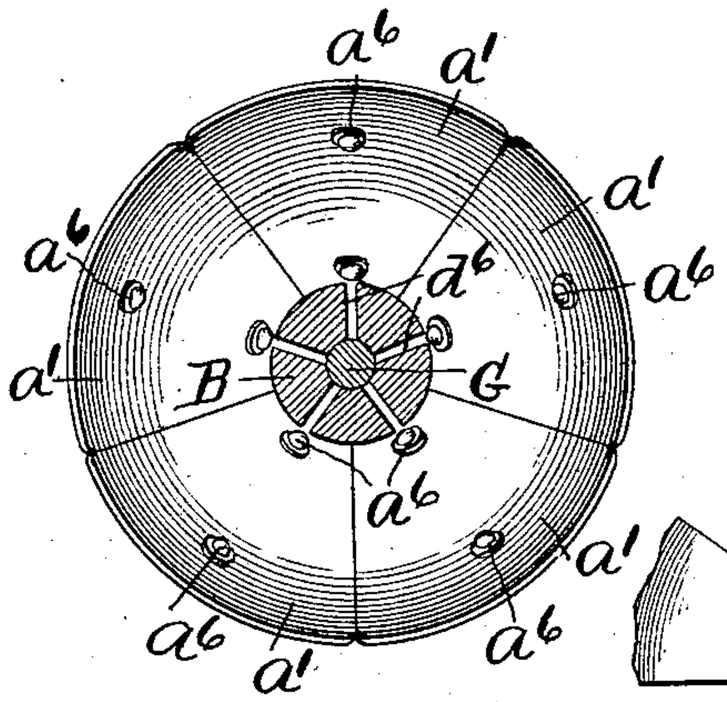

Fig. 4.

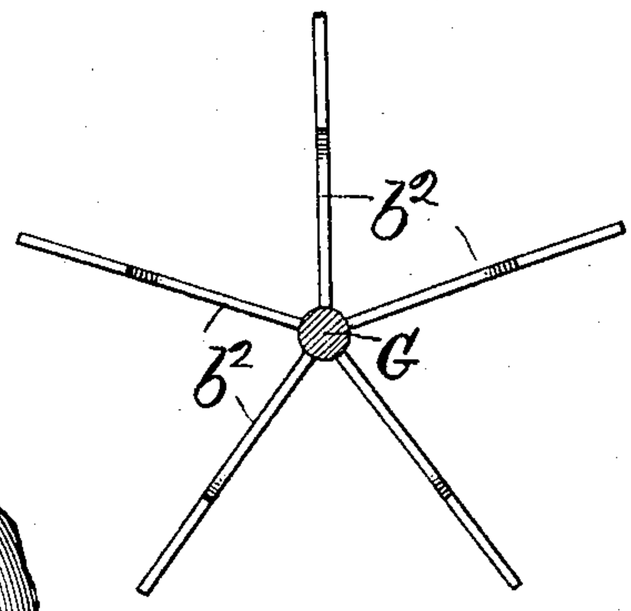

Fig. 5.

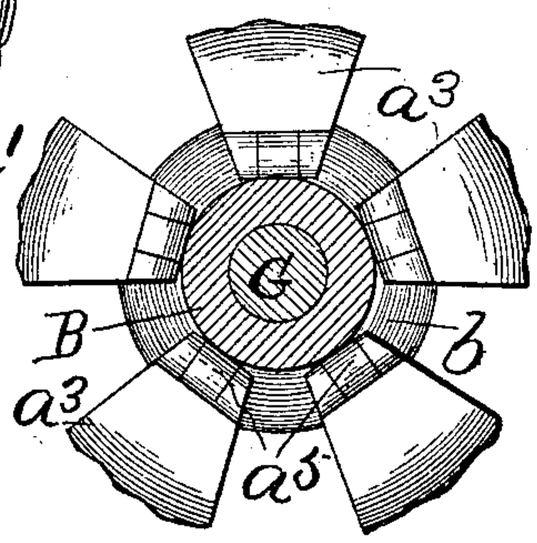

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Fig. 6.

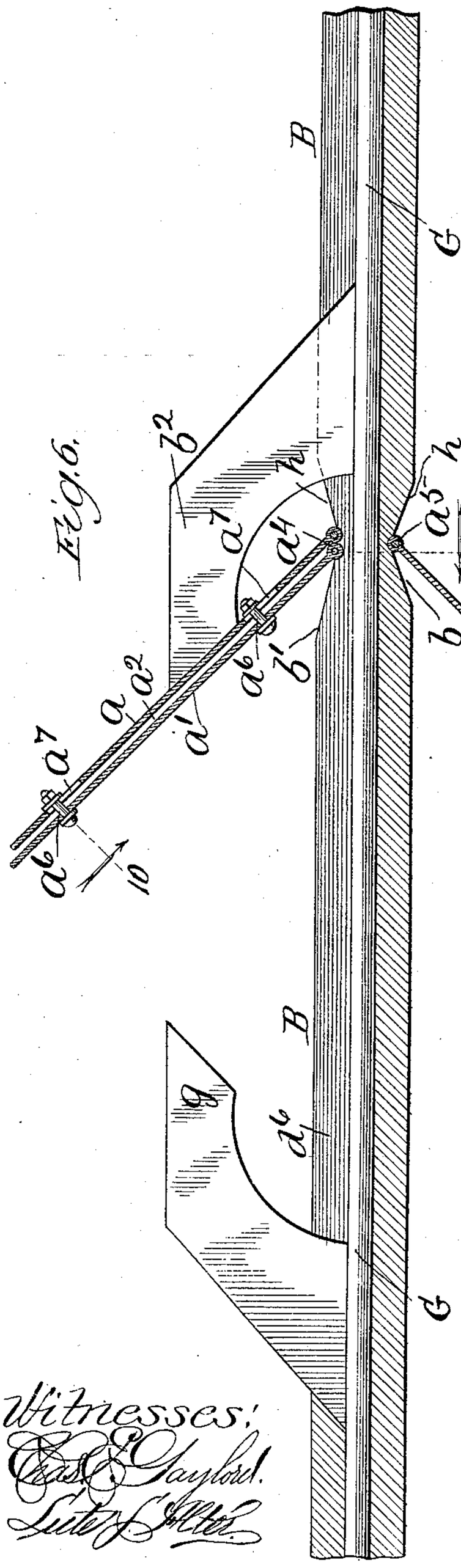

Fig. 7.

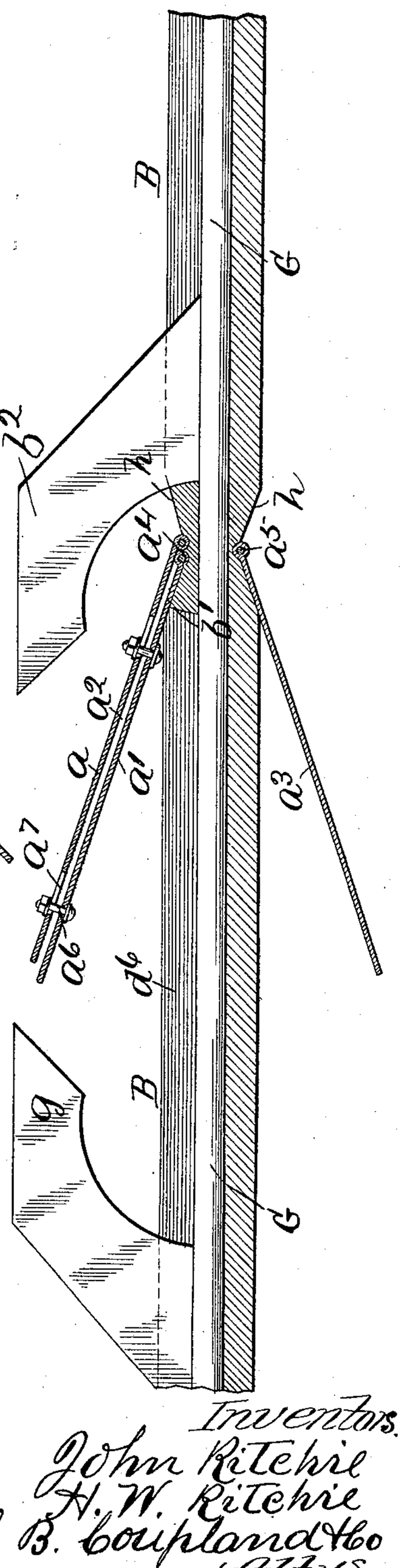

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Fig. 8.

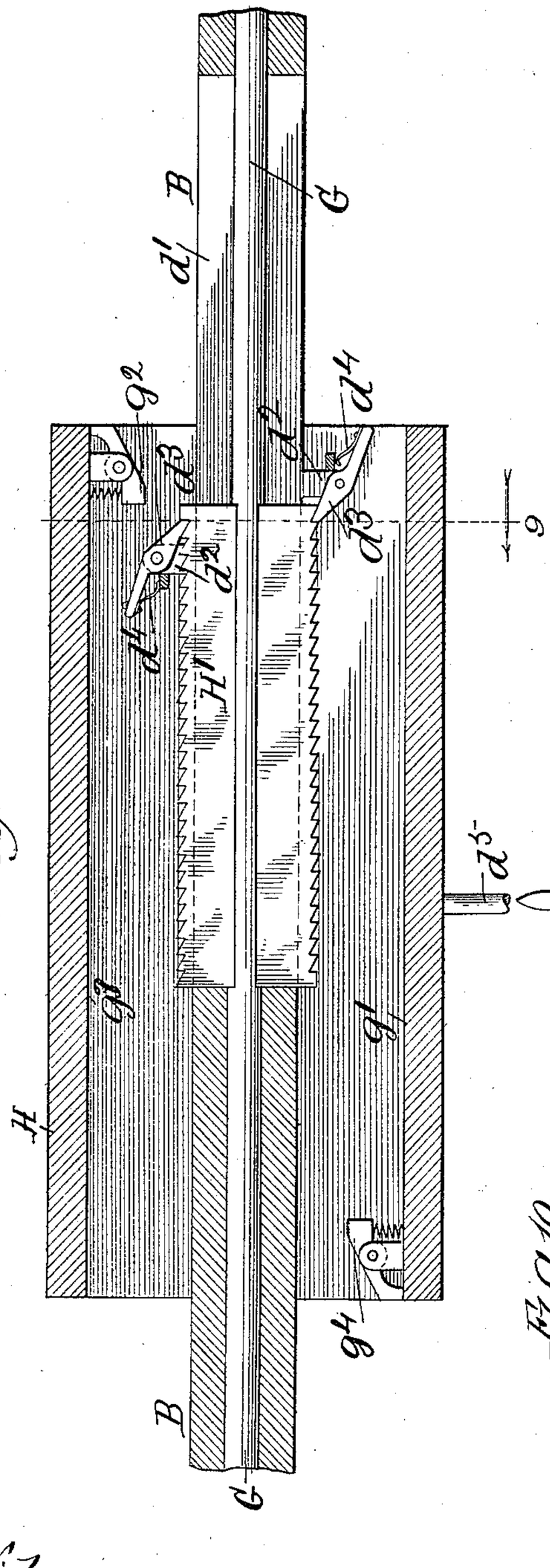


Fig. 9.

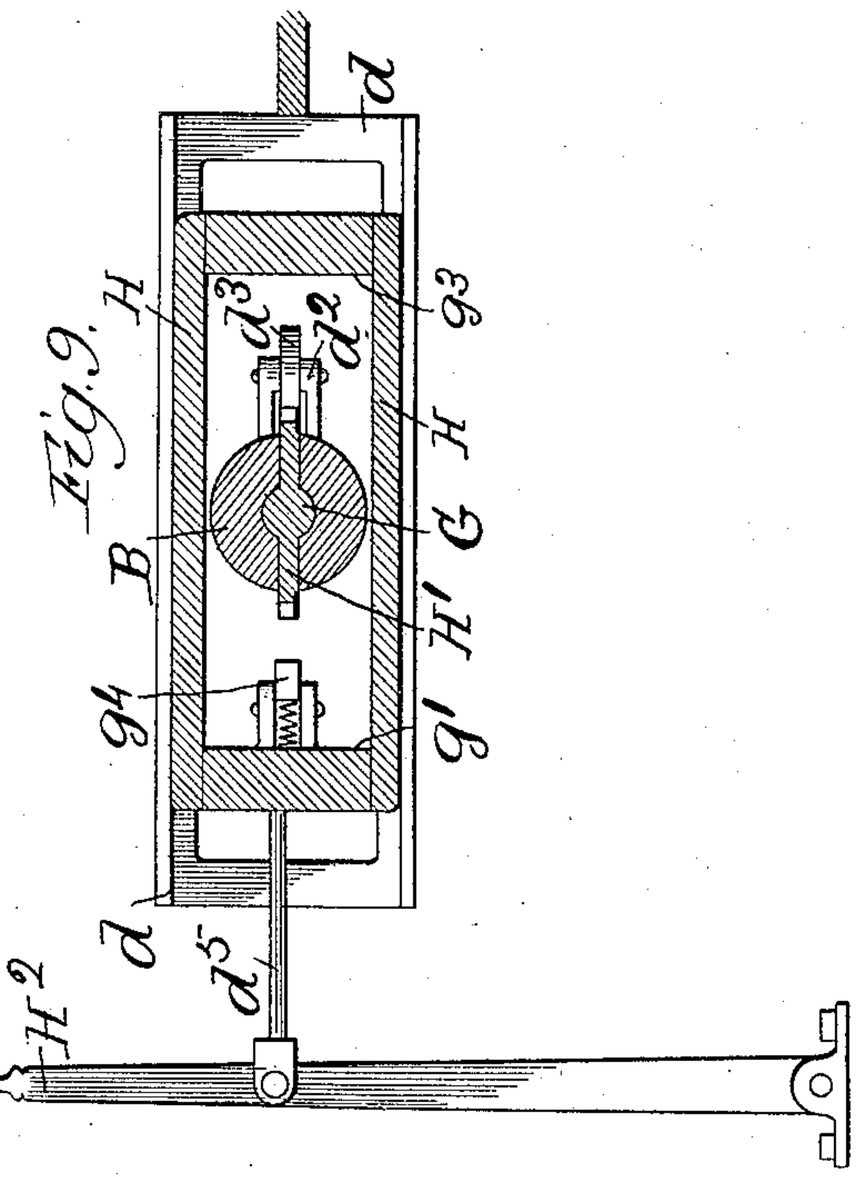
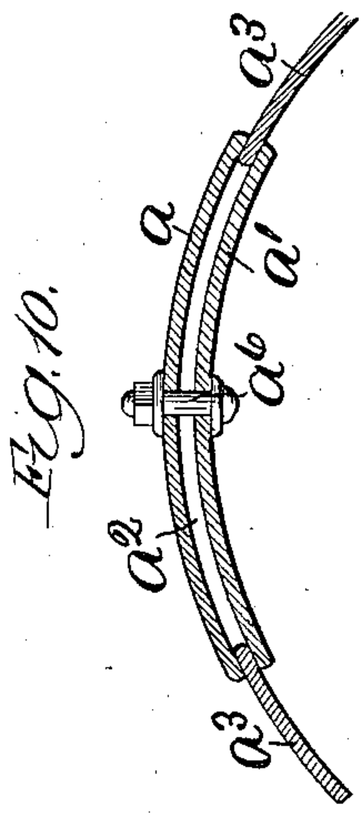


Fig. 10.



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UNITED STATES PATENT OFFICE.

JOHN RITCHIE AND HARVEY W. RITCHIE, OF CHICAGO, ILLINOIS.

RECIPROCATING PROPELLER FOR VESSELS.

SPECIFICATION forming part of Letters Patent No. 610,370, dated September 6, 1898.

Application filed June 9, 1897. Serial No. 639,945. (No model.)

To all whom it may concern:

Be it known that we, JOHN RITCHIE and HARVEY W. RITCHIE, citizens of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Vessel Propulsion; and we 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.

This invention relates to improvements in means for the propulsion of vessels, and has for its object to provide an arrangement of this character that will afford the best possible results as to efficiency and economy of power.

Figure 1 is a broken-away longitudinal plan section of the hull of a vessel embodying the improved features. Fig. 2 is a face view of the propeller in its expanded or open position; Fig. 3, a similar view showing the propeller in its opposite or folded position; Fig. 4, a detached elevation of a series of braces or arms for bracing the propeller-blades; Fig. 5, a transverse section on line 5, Fig. 6, looking in the direction indicated by the arrow; Fig. 6, a broken-away longitudinal section on line 6, Fig. 2; Fig. 7, a similar view, the propelling-blades being shown in their closed position; Fig. 8, a longitudinal section through the shifting case; Fig. 9, a transverse section on line 9, Fig. 8; and Fig. 10, a sectional detail on line 10, Fig. 6.

A may represent the hull of a vessel, B B the companion propeller-shafts, and C C a pair of steam-engine cylinders from which the motive power is derived.

In this improvement the propeller-shafts have a reciprocating endwise movement instead of a rotary one.

The propeller D consists of a number of blades which are arranged radially surrounding the propeller-shaft and which are adapted to have an opening and closing action similar to that of an umbrella and present a continuous unbroken surface in a circular plane.

The outside blades a lie in the same plane with and cover the inside blades a', providing a space a^2 therebetween, as shown in Figs. 6, 7, and 10. These companion or double blades are arranged at intervals, leaving a gap which is filled by the series of single blades a^3, the respective edges of which, Fig. 10, are inserted between the edges of the companion blades and have a movement therein, so as to conform to the change of position—that is, from an open to a closed one and the opposite thereof. The inner ends of the companion blades are hinged to the shaft, as at a^4, and the blades a^3, as at a^5.

The companion blades a a' are adjustably secured together by a number of bolts a^6, having the usual head and nut and inserted therethrough. The outside blades are provided longitudinally with slots a^7, through which the bolts a^6 pass, to allow for the slight change in the relative position of the blades as they close up toward or move away from the propeller-shaft.

The propeller-shaft is cut out, as at b, to provide the inclined shoulder b', against which the blades stop as they close up. The stop-braces b^2 limit the outward movement of the blades and strengthen them in their working position. The folding position is at an oblique angle with reference to the sides of the shaft. On the outward thrust or push of the shaft the blades of the propeller are automatically opened out and expanded to their full limit by the pressure of the water, as shown on the "port" side in Fig. 1. In this position the whole surface of the propeller pushes directly against the body of the water, and the vessel is forced ahead. When the limit of the outward thrust or push is reached and the return movement begins, the pressure of the water on the back side instantly folds or closes the blades up into the position shown on the "starboard" side, presenting but a small surface to the action of the water and offering but little resistance on the return stroke.

The companion or twin propelling-shafts are arranged to work alternately; but they may be arranged to have simultaneous movement. The outboard end of the shafts is provided with bearings E, which are suitably supported from the vessel. At the point where the shafts pass through the hull the stern-pipe or stuffing-box F is provided, which also forms a bearing and excludes the water.

Companion propellers are shown; but it is

obvious that a single shaft may be used the same as in rotary propellers and located in the center of the vessel.

The inboard end of the propeller-shafts is shown as having a direct connection with the motor-cylinders; but in practical working any form of motive power suitable for the purpose may be employed and the connection with the shafts arranged accordingly.

The arrangements for stopping and backing the boat will next be described.

The propeller-shafts are made hollow for the reception of a solid reversing-shaft G, inserted therein, as shown. On the inside of the vessel, Figs. 1, 8, and 9, and inclosing the shafts is located a shifting case H, having a lateral movement in stationary guides *d*. Considerable space is provided for between the respective sides of the case and the shafts, so as to allow for the lateral movement in reversing the position of the propellers. That part of the reversing-shaft passing through the case H is provided with a double ratchet-bar H′, the toothed edges of which project through a slot *d′* in the propeller-shaft from opposite sides and which provides for a limited endwise movement of the reversing-shaft independently of the propeller-shaft proper. The propeller-shaft is provided on opposite sides with companion lugs d^2 d^2, to which are pivoted companion pawls d^3 d^3, that are normally held in engagement with the respective edges of the ratchet-bar by the springs d^4 d^4. An operating-lever H^2 is connected with the case H by a rod d^5. This lever and the other reversing parts (shown in Figs. 8 and 9) are in their normal position, both shafts being locked together and moving in unison. The propeller-shaft is provided longitudinally with a number of slots d^6, through which the stop-braces b^2, Figs. 1 and 4, project. These braces are rigidly secured to the reversing-shaft G. A second series of braces *g* are located back of the propellers and are also rigidly secured to the reversing-shaft and project through the slots d^6. When the propellers are to be reversed, the lever H^2 is moved in the direction of the shifting case from its normal position. (Shown in Fig. 9.) This movement brings the side wall *g′* of the case against the outer end of the pivoted pawl d^3 on that side and disengages the same from the ratchet-bar. This movement at the same time brings a stop g^2 into position to engage with the adjacent end of the ratchet-bar and stops the endwise outer movement of the reversing-shaft, leaving the propeller-shaft free to move on to the outer limit of its stroke. This stopping of the reversing-shaft holds the first series of braces b^2 back out of contact with the propeller-blades, so that the pressure of the water will throw them over into a reversed position from that shown in Fig. 6. Now as the propeller-shaft nears the end of its last outward "go-ahead" stroke the open inside surface of the blades at the moment of reversing their position for backing just come in contact with the second series of braces *g*, which in the meantime have remained stationary with the reversing-shaft. Throwing the lever over to its opposite position brings the side wall g^3 of the case in contact with and releases the pawl d^3 on that side from engagement with the ratchet-bar at the same time the companion pawl d^3 on the opposite side reëngages. The reversing-shaft now moves inwardly far enough to bring the second series of braces full against the propelling-blades in their reversed position, the adjacent end of the ratchet-bar coming in contact with the stop g^4 at the same time and retaining the reversing-shaft in its proper relative position with reference to the movement of the propeller-shaft. The propeller-blades when in their reversed backing position close against the inclined shoulders *h*, which are the opposite of the inclined shoulders *b′* on the go-ahead side.

The reversing mechanism as herein arranged may be dispensed with and an independent shaft placed in position to be used for stopping and backing purposes. A backing-propeller and shaft may also be located in the bow of the vessel and arranged in a trapped passage and run out when it is necessary to use the same.

Having thus described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. A propeller, consisting of a number of double blades, having a space between and adjustably retained in proper relation by a number of bolts inserted therethrough, said double blades being arranged at intervals with a gap between adjacent edges, a series of single blades filling said gaps and forming an unbroken surface and having their edges inserted in the space between the double blades so as to conform to the opening and closing action of the propeller, substantially as described.

2. The combination with a propeller-shaft, of a propeller, consisting of a number of blades, adjustably secured together and hinged to said shaft and adapted to have an opening-out and closing-up action with reference to the reciprocating endwise movement of the propeller-shaft, and the series of braces limiting the opening movement of said blades, substantially as described.

3. The combination with a hollow propeller-shaft, of a reversing-shaft, inserted therein, of a shifting case, inclosing said shafts and adapted to have a lateral movement, a double ratchet-bar, secured to the reversing-shaft and having its toothed edges projecting through a slot in the propeller-shaft, the companion lugs d^2 d^2, the companion pawls, d^3 d^3, pivoted thereto, the springs, d^4 d^4, the stops, g^2, and the operating-lever, connected with said shifting case, substantially as described.

4. The combination with a hollow propeller-

shaft, provided with a number of slots, d^6, of a reversing-shaft, inserted in the propeller-shaft, the series of braces, b^2 and g, rigidly secured to the reversing-shaft and projecting through said slots, and the propelling-blades, hinged to the propeller-shaft, and means for reversing the position of the same, substantially as described.

In testimony whereof we affix our signatures in presence of two witnesses.

JOHN RITCHIE.
HARVEY W. RITCHIE.

Witnesses:
L. M. FREEMAN,
L. B. COUPLAND.