(Model.) 4 Sheets—Sheet 1.

J. MacHAFFIE.

SCREW PROPELLER.

No. 483,158. Patented Sept. 27, 1892.

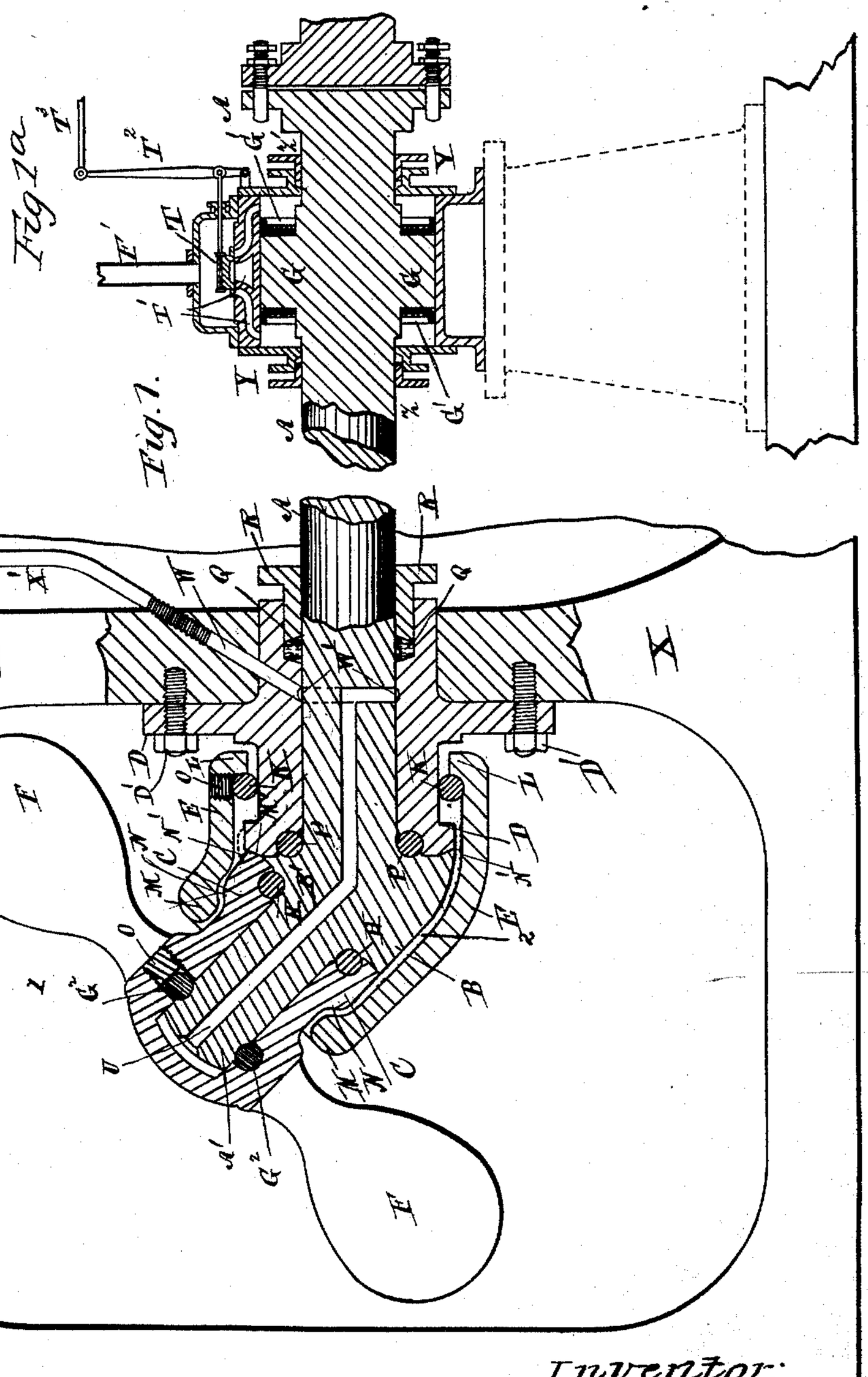

Fig. 1.

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Inventor:
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(Model.)

4 Sheets—Sheet 2.

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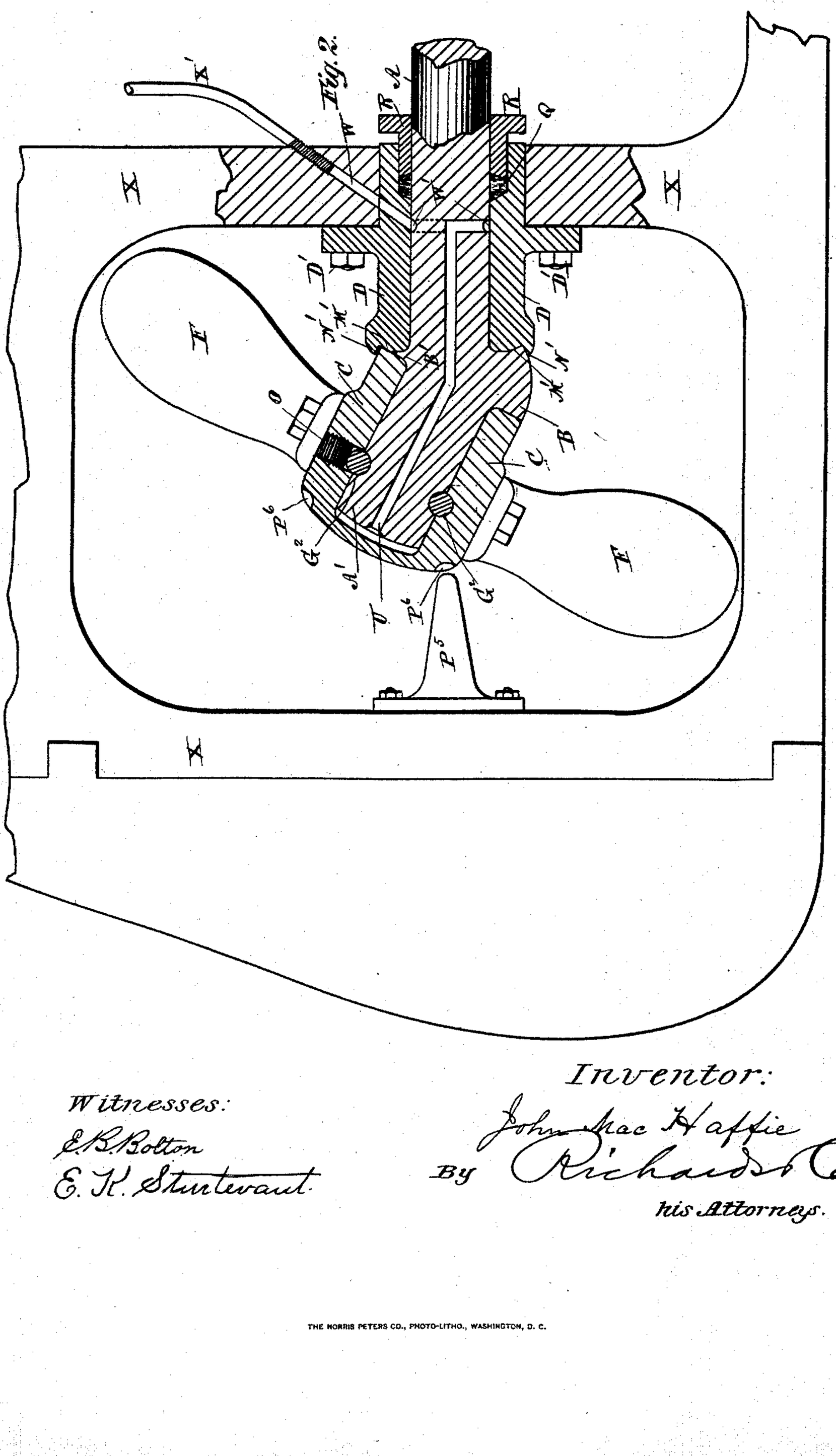

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(Model.) 4 Sheets—Sheet 3.

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SCREW PROPELLER.

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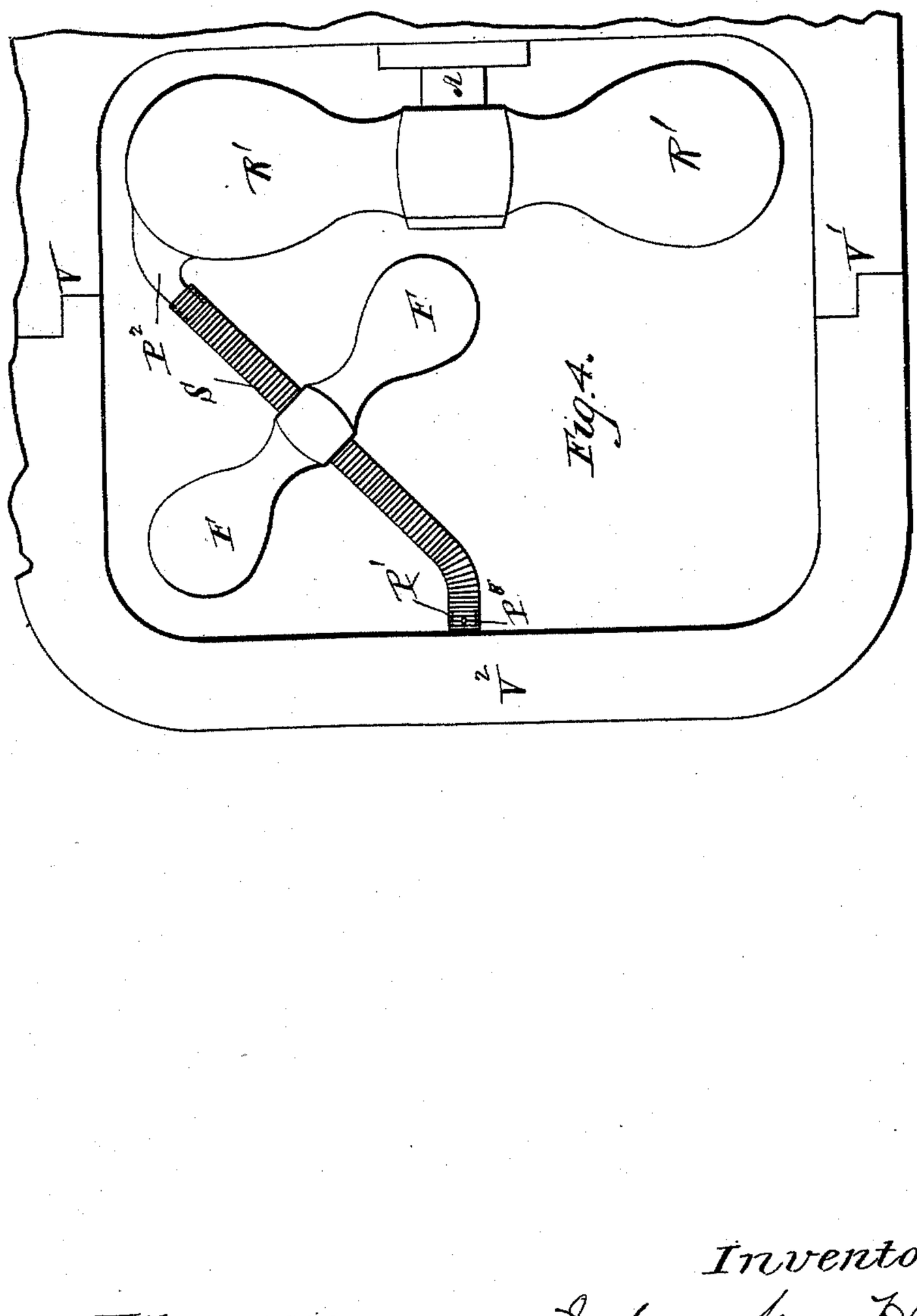

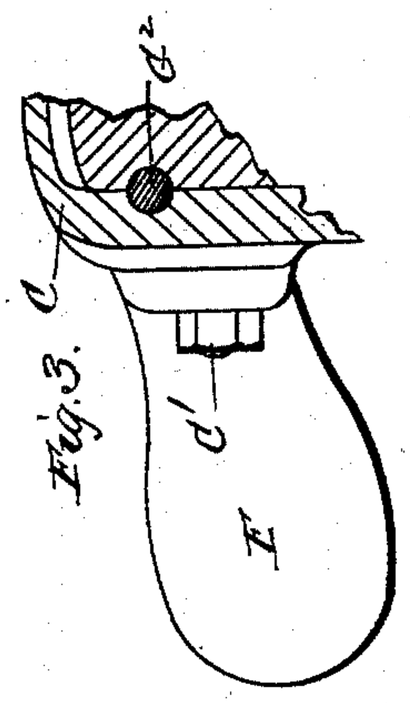

Fig. 3.

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(Model.)

4 Sheets—Sheet 4.

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No. 483,158. Patented Sept. 27, 1892.

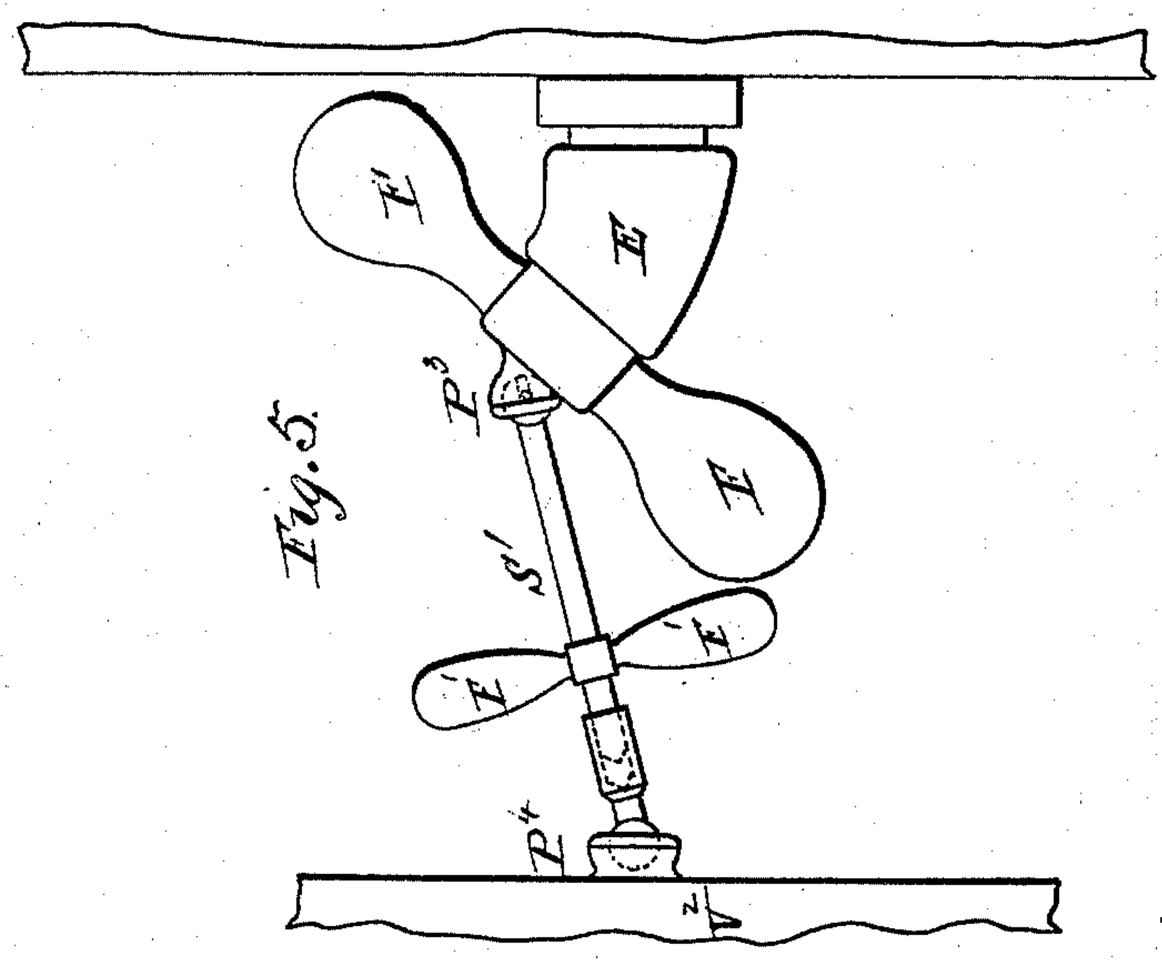

Fig. 5.

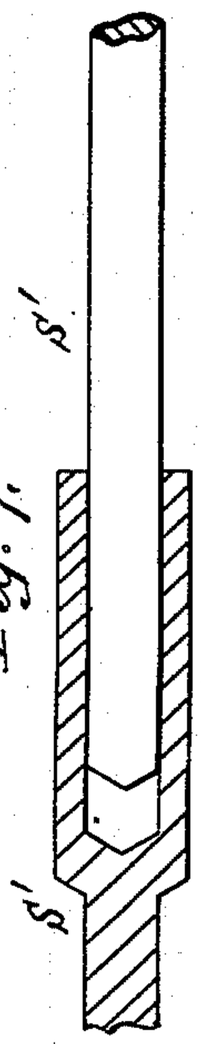

Fig. 7.

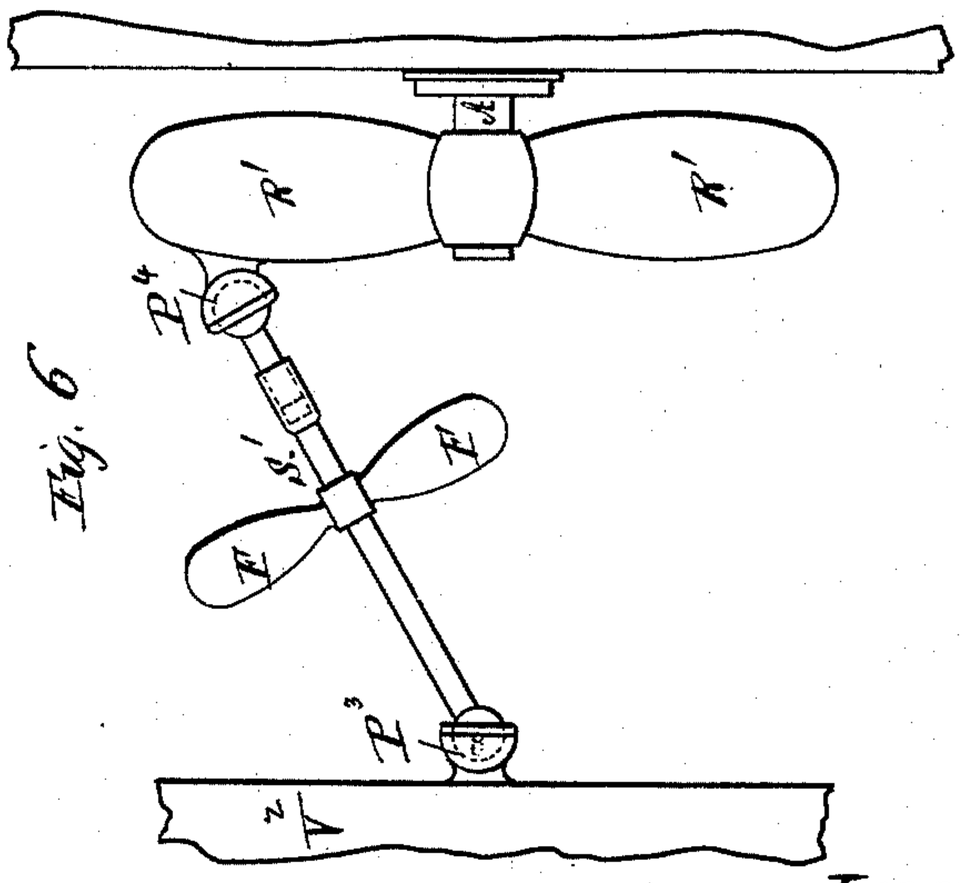

Fig. 6

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UNITED STATES PATENT OFFICE.

JOHN MACHAFFIE, OF SCHENECTADY, NEW YORK.

SCREW-PROPELLER.

SPECIFICATION forming part of Letters Patent No. 483,158, dated September 27, 1892.

Application filed January 14, 1891. Serial No. 377,706. (Model.) Patented in England August 7, 1890, No. 12,361.

To all whom it may concern:

Be it known that I, JOHN MACHAFFIE, a subject of the Queen of Great Britain, and a resident of the city of Schenectady, county of Schenectady, State of New York, United States of America, have invented certain new and useful Improvements in and Relating to Propellers of the Screw Type, applicable for the propulsion and steering of any vessel or body on or in water or air, (patented in England August 7, 1890, No. 12,361,) of which the following is a specification.

This invention relates to an improvement in screw-propellers.

My invention consists in the devices and special arrangement thereof, as set forth hereinafter, and particularly brought out in the claims.

In order that my said invention may be properly understood, I have hereunto appended six explanatory sheets of drawings, whereon—

Figure 1 is a longitudinal sectional elevation of the citropeller with its appurtenances. Fig. 1ª is a sectional view of the device for operating the shaft A longitudinally. Fig. 2 is a longitudinal sectional elevation of the citropeller without clutch-tube arrangement, and showing a pivot-pin in lieu of same, and the floats are the blades of any ordinary screw-propeller here shown as adopted. Fig. 3 shows removable blades fitted to citropeller-boss. Fig. 4 is a longitudinal side elevation of citropeller adopted as a helm in connection with a screw-propeller. Fig. 5 is a longitudinal side elevation of citropeller adopted as a helm in combination with a citropeller proper. Fig. 6 shows a modified form of citropeller of Fig. 7. Fig. 7 is a view of the telescopic link shown in Fig. 6.

In the drawings the same reference letters, wherever repeated, indicate similar or like parts.

As will be seen at Fig. 1, the outer extremity of the driving-shaft A of the citropeller is made or bent or cranked to an angle with the general line of the shafting, and at the bend there is a solid tapering or lobe-sided shoulder B B′, so made or tapered or lobe-sided, as shown, that the boss C, thrust-block D, and clutch-tube E are retained in suitable relation to the shaft A and to each other and to aid in counterbalancing the necessary eccentricity or bend or crank of the outer extremity A′ of the shaft A. The feathering-blades F of the citropeller are preferably similar in shape to the ordinary screw-propeller blades, the twist or angle of the blades being dependent on the angle to which the outhung extremity A′ of the driving-shaft A is bent to the general line of the driving-shaft or to the general line of propulsion. The hub or boss C of the blades F is preferably fitted with a series of balls G^2, partly sunk in the driving-shaft's portion A′, thus enabling the citropeller-boss to be operated simultaneously with the shaft A, the boss engaging with and rolling upon face M′ of the thrust-block D, which block is fitted on the stern-post of any ship, vessel, boat, or any similar craft, while the driving-shaft A revolves freely within the boss C when it, with shaft A, is drawn inward, and said boss C engages with the clutch-tube E, thereby revolving with said clutch and shaft and causing the citropeller to propel in a reverse direction when the shaft A is pushed outward. The apparatus for causing the inward and outward movement of the shaft A will be hereinafter described. The boss C is also preferably fitted with balls H to insure rolling contact with the part A′ of the shaft A and with the shoulder B B′. Over the shoulder B B′ the clutch-tube E is fitted, so as to have sliding contact with the shoulder B B′, which shoulder is of a polygonal (regular or irregular) external form, so as to drive the clutch-tube round with it when the shaft A revolves. The clutch-tube E is fitted with balls K to insure rolling contact between it and the thrust-block D. The clutch-tube is made with a solid collar L to retain it in fixed relation to the thrust-block D, so that when the driving-shaft A is moved inward or outward or held in a midway or neutral position, as hereinafter described, the boss C is engaged in rolling contact with the thrust-block D or clutched to clutch-tube E or is left free, as the case may be, so that the shaft can revolve freely within the boss C, or the boss may revolve with the shaft, thereby propelling forward or backward or not propelling at all, while the engine and driving-shaft A may be revolving continuously in one direction in all three cases. The clutch-tube is also made

fitted with an eccentric collar M to insure clutching action with an eccentric face N, made on the boss C, when the shaft A is pushed outward, and the clutch-tube may preferably be made more lobe-sided than its designed mechanical effects require, so that extra weight so placed may aid in counterbalancing the necessary eccentricity or bend or crank of shaft A, and, moreover, clutch-tube E may be made of more than one piece or of special shape, so that it may be put suitably into its required position.

The plugs O are for filling the holes through which the antifriction-balls are inserted.

The thrust-block D is or may be fitted with a series of balls P to insure rolling contact with the shoulder B B′ on the shaft, and it may be hollowed out at its inner end and closed with any well-known and suitable form of packing, so as to form a stuffing-box Q, through which the shaft A works. The stuffing-box, which is provided with a stuffing-gland R, prevents leakage of water into the ship or vessel or boat or any other craft, as the case may be, floating on or in water.

The thrust-block D and boss C are faced endwise at M′, so as to insure the required end or edge rolling contact between them to transmit "thrust," as well as to produce a slow revolutionary action of citropeller, for the purpose aforesaid, and may be also faced peripherally, as indicated in dotted lines at N′, so as to insure the required peripheral (practically) rolling contact between them to check the off-sliding tendency of boss C while said surfaces are in rolling action, also for the purpose aforesaid.

The hole W, made at a slant through the thrust-block D and the post of a ship, vessel, boat, torpedo, or any water-craft and communicating with a groove W′, made around the inner surface of said block D, is for lubricating purposes. The shaft A is also preferably bored with a channel U, which communicates with the groove W′ and as the shaft revolves carries lubricant to the several bearings of the citropeller. Lubricant is supplied to the channel or hole W from any suitable source of supply through a tube or pipe X′.

The thrust-block D may be secured in position to a ship's, vessel's, boat's, torpedo's, or any craft's post X by means of studs D′.

For drawing in, thrusting out, and holding in a neutral position the driving-shaft A there is provided at any suitable part of a ship, vessel, boat, or any craft, as the case may be, a cylinder Y, Fig. 1ª, having a piston G, connected to or fitted or made as part of the shaft A. The piston has, preferably, cup-leathers G′ shown on each side; but any well known and suitable cylinder or piston-packing may be used. The general construction of the cylinder, with its valve T, ports T′, and the other necessary appurtenances, is of any well-known and suitable type. The driving-shaft passes right through the cylinder and works pressure-tight in stuffing-boxes Z Z′ at each end of the cylinder. The slide-valve T is made and fitted so that in one position the pressure (somewhere aboard conveniently accumulated and ready for use) can act freely on both sides of the piston G, thus retaining the shaft A in a non-propelling relation with the citropeller or in other positions, so that the pressure acts on one side or the other of the piston, thus throwing the boss C in contact with either the clutch-tube E or the thrust-block D, according to whether a forward or reverse propulsion is desired. It will be seen by referring to Fig. 1 that there is a space left between the clutch-tube and the shaft. The amount of travel of the shaft is very small—in fact, only the amount represented by these spaces. By this construction the shaft may be easily forced outward until the boss C thereon engages the inner surface of the clutch-tube. The shaft in this event revolves independently of the propeller, as the friction caused by the contact of the boss with the clutch-tube exceeds greatly any friction between the shaft and propeller, and the clutch-tube, having a movement independent of the shaft, is not affected thereby, and the propelling action is consequently in a reverse direction. The slide-valve T is operated by the lever T^2, which is connected by a rod T^3 with the engine's or motor's valve or valves or regulator or regulators, and also by means of suitable rod and lever or cog-wheel or other suitable connections with the engine room or rooms, helmsman's cabin, the deck, or any other suitable part or parts of a ship, vessel, boat, or any craft, as the case may be, so as to be operated by the engineer, helmsman, or commanding officer or any other officer, any of whom can by operating the valve T start, stop, or reverse the ship's, vessel's, boat's, or any other craft's propulsion or course, as the case may be, independently of one another and without stopping or reversing the engines or driving shaft or shafts, according as to whether one or more citropellers may be used, thus saving time in avoiding collision or certain other accidents to which swift-moving ships or vessels or boats or similar craft are exposed.

F′ is the pipe or tube for the steam, air, water, or other fluid pressure to act on or work the piston G.

In Fig. 2 it will be observed that the antifriction-balls F F and H H, also clutch-tube E, (shown in Fig. 1,) are omitted, and pivot P^5 is shown attached rigidly to aforesaid vessel or body, thus indicating that if in any case the peripheral contact N′ of the boss C and the block D is found to be or is designed to be of sufficient check to the aforesaid off-sliding tendency of boss C, so as to practically cancel the sliding friction in bearings due to strains caused by the bent or cranked extremity A′ of shaft while propelling, and also if in any case said pivot P^5 is preferable to said clutch E, then those omissions of said

balls F F H H and clutch E and insertion of pivot P^5 affords or provides a simpler construction without any detrimental effects or changes to or in the practical working of the citropeller or its applications. The stern-post or "dead-wood" *x* is shown in Fig. 2 as designed to accommodate the pivot P^5 and the citropeller-floats; but this may not necessarily be the method or design in all instances. P^6 is a series of holes all round boss C, so that pivot P^5 will enter one in all positions of citropeller.

In Fig. 4 is shown a citropeller adopted as a helm, V V′ being hinges on which the hoop V^2 acts and P′ a rigid pin (shown dotted) fixed to hoop V^2. To the pin P′ is rigidly fixed by means of pin P^8, so as to prevent any revolutionary action of the citropeller, a suitable circular or spiral spring S, and at or near the mid-length of the spring S are rigidly and suitably attached by any well-known and suitable device any convenient and suitable number of suitable blades F. On one of the blades R′ of an ordinary screw-propeller is fixed a second rigid pin P^2, which is free to revolve within the spring S, and by any well-known and suitable device the pin P^2 at the same time retains the spring S in fixed relation to the propeller-blade R′, so that when the engine or propeller shaft A revolves the blades F of the citropeller perform an oscillatory reciprocative feathering propelling action in unison with the screw-propeller's action, in whichever direction, caused by the hoop V^2 turning on its hinges V V′, thus steering or assisting in propulsion, or both, by thrusting the stern of the ship, vessel, boat, or any similar craft, as the case may be, to one side or other or straight forward or astern.

In lieu of the spring S, as hereinbefore described, Fig. 4, there may be used a telescopable link S′, Figs. 6 and 7, connected to the propeller-blade R′ by means of the ball-and-socket (or any equally universal and suitable arrangement) joint P^4 and connected to hoop V^2, by means of a non-revolutionary ball and socket (as, for instance, a ball and socket with a suitable internal feather) P^3; but any suitable non-revolutionary universal joint may be used in lieu of the ball and socket P^3, thereby affording a less expensive construction, though more rigid device, and therefore more easily broken by obstruction than is that shown in Fig. 4.

Fig. 5 shows a citropeller adopted as a helm in combination with a citropeller proper, the telescopable link S′ also being used in this case; but the non-revolutionary universal joint P^3 is in this case on the boss C of the citropeller proper and is preferably shown as a ball and socket similar to P^3 of Fig. 6; but any suitable form of universal joint may be used, and a telescopable link S′ is preferably shown, Fig. 5, because the universal joint (here shown as ball and socket; but any other type suitable may be used) P^4 is revolutionary and in this case connected to hoop V^2, so that a citropeller adopted thus as a helm acts perfectly in unison with the citropeller proper, and thereby has all the aforesaid advantages in common with the citropeller thus placed on a ship or vessel or boat or any similar craft, and, besides, when thus acting the blades F′ of the steering-propeller perform an oscillatory reciprocative feathering propelling action, in whichever direction, caused by the angle of the hoop V^2 turning on its hinges V V′, thus steering or assisting in propulsion, or both, by thrusting the stern of the ship or vessel or boat or similar craft, as the case may be, to the one side or the other or straight forward or astern, and, moreover, the blades F′ are similar in every respect to the blades F of the citropeller proper and are of any convenient number suitable, from one to any number, and attached to the said telescopable link S′ similarly to the blades F. (Shown in Fig. 6.)

Although I have shown on my drawings convenient methods of carrying out my invention, I do not limit myself to the exact arrangement or arrangements of parts thereon shown, as the arrangements may manifestly be slightly altered to suit different requirements, and although I have only shown the improved propeller or "citropeller" as adapted to marine ships it is to be understood that it may be used efficiently and advantageously for propelling or steering or both propelling and steering any vessel or body on or in water.

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

1. In combination with a driving-shaft, a propeller driven thereby provided with radially-extending blades, the axis of the propeller extending at an angle to the line of the driving-shaft, said propeller being free from restraining connections to prevent rotation, substantially as described.

2. In combination with a driving-shaft having its end bent at an angle to its main portion, a hub fitting over the said bent end, and propelling-blades extending from said hub radially, said hub being free to rotate, substantially as described.

3. A propeller consisting of blades secured to a hub, an eccentric driving-shaft fitting said hub loosely, and means for clamping the hub to the driving-shaft, whereby it is actuated by the rotation of the driving-shaft, substantially as described.

4. A propeller consisting of blades secured to a hub and a cranked shaft having a reduced end portion forming a shoulder, said hub fitting said reduced end and bearing against the shoulder formed by the reduced end of the shaft, substantially as described.

5. A propeller consisting of a shaft having a cranked free end, propeller-blades carried by a hub fitted to said cranked end, and a thrust-block encircling said shaft to sustain the thrust of the parts, substantially as described.

6. A propeller consisting of a cranked shaft,

propelling-blades carried on a hub, said hub being fitted to the cranked shaft, a shoulder on the shaft to sustain the thrust of the hub, a thrust-block encircling the shaft, and a shoulder on the shaft, bearing against the thrust-block, substantially as described.

7. A propeller consisting of a cranked driving-shaft, a hub mounted thereon carrying propelling-blades, and a clutch-tube encircling the end of the hub and shaft, said shaft being longitudinally movable for clamping the parts together, substantially as described.

8. A propeller consisting of a hub carrying propeller-blades, a cranked shaft adapted to receive the hub, a clutch-tube encircling the end of the hub and shaft, a collar on the shaft, and a power device encircling the collar and adapted to apply power to one side or the other of the collar to move the shaft, substantially as described.

In witness whereof I have hereunto set my hand in presence of two witnesses.

JOHN MACHAFFIE.

Witnesses:

GEORGE H. RUPLEY,

ROBERT MILNE.