No. 776,687. PATENTED DEC. 6, 1904.

D. W. RANTINE.

PROPELLING AND STEERING MECHANISM.

APPLICATION FILED FEB. 28, 1902. RENEWED MAY 26, 1904.

NO MODEL. 4 SHEETS—SHEET 1.

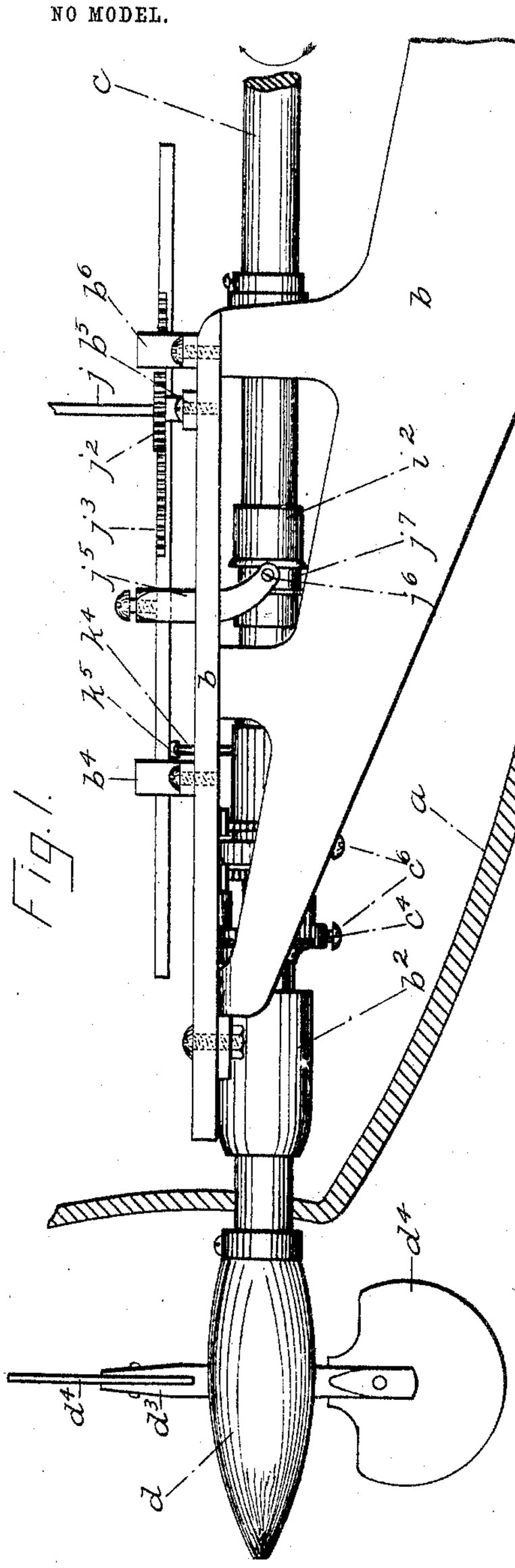

Fig. 1.

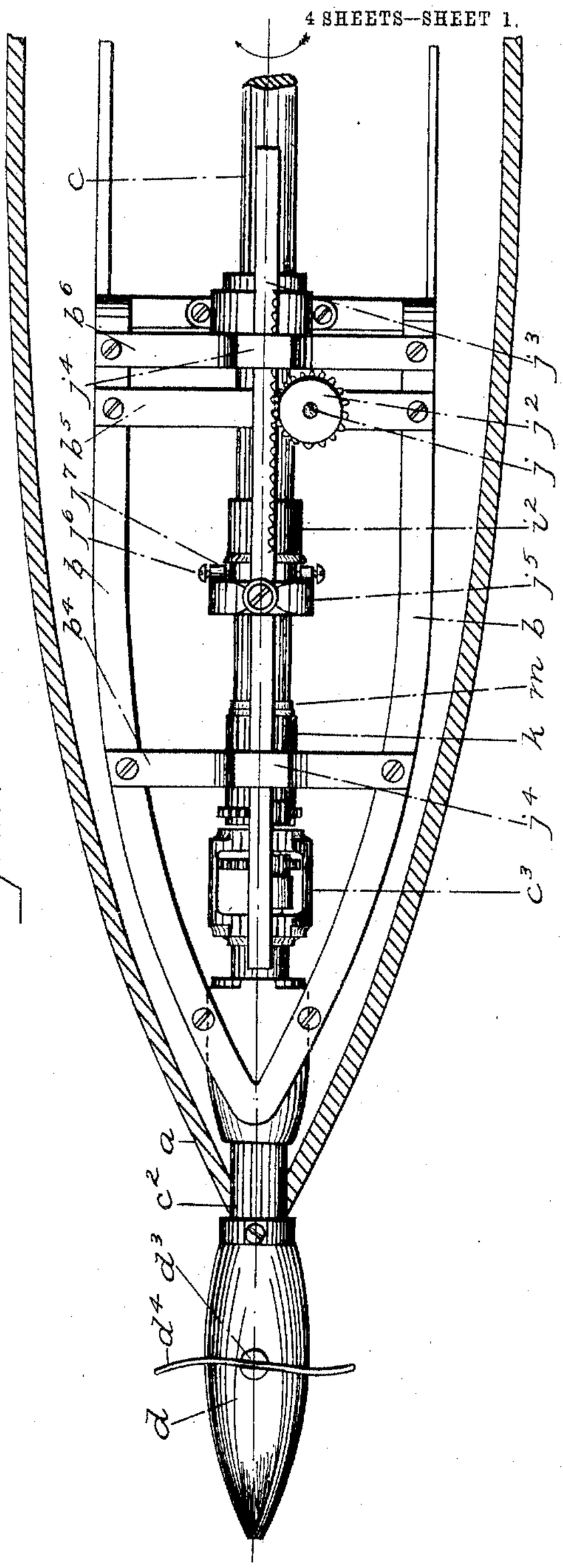

Fig. 2.

WITNESSES

L. A. Stewart

C. E. Mulreany

INVENTOR

Daniel W. Rantine

BY Edgar Tate & Co

ATTORNEYS

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NO MODEL. 4 SHEETS—SHEET 2.

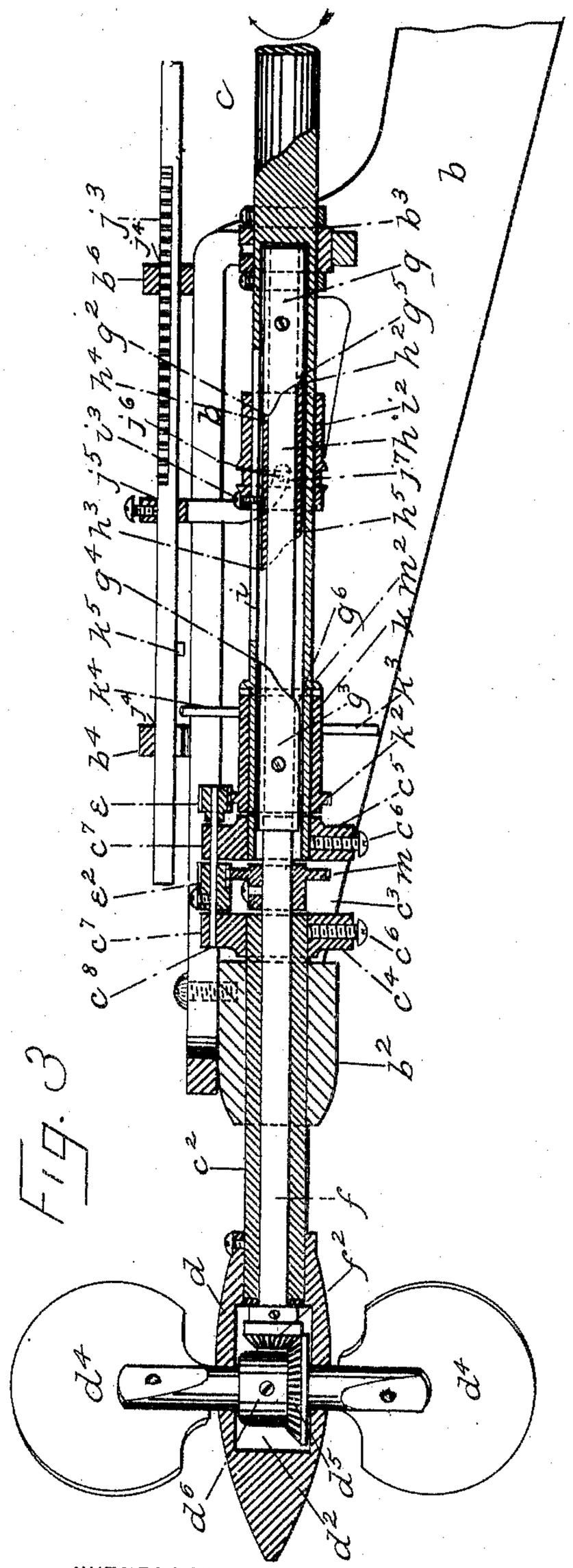

FIG. 3

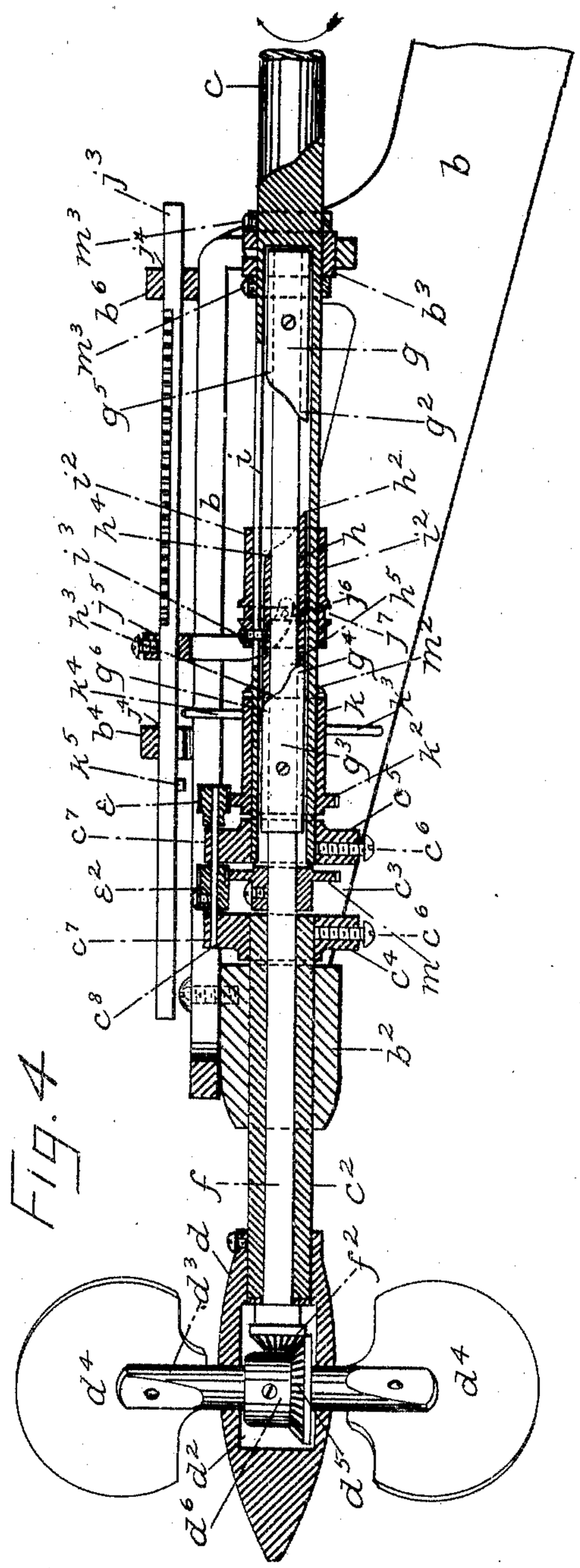

FIG. 4

WITNESSES

F. A. Stewart

C. E. Mulkamy

INVENTOR

Daniel W. Rantine

BY

Edgar Tate & Co

ATTORNEYS

No. 776,687. PATENTED DEC. 6, 1904.

D. W. RANTINE.

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NO MODEL. 4 SHEETS—SHEET 3.

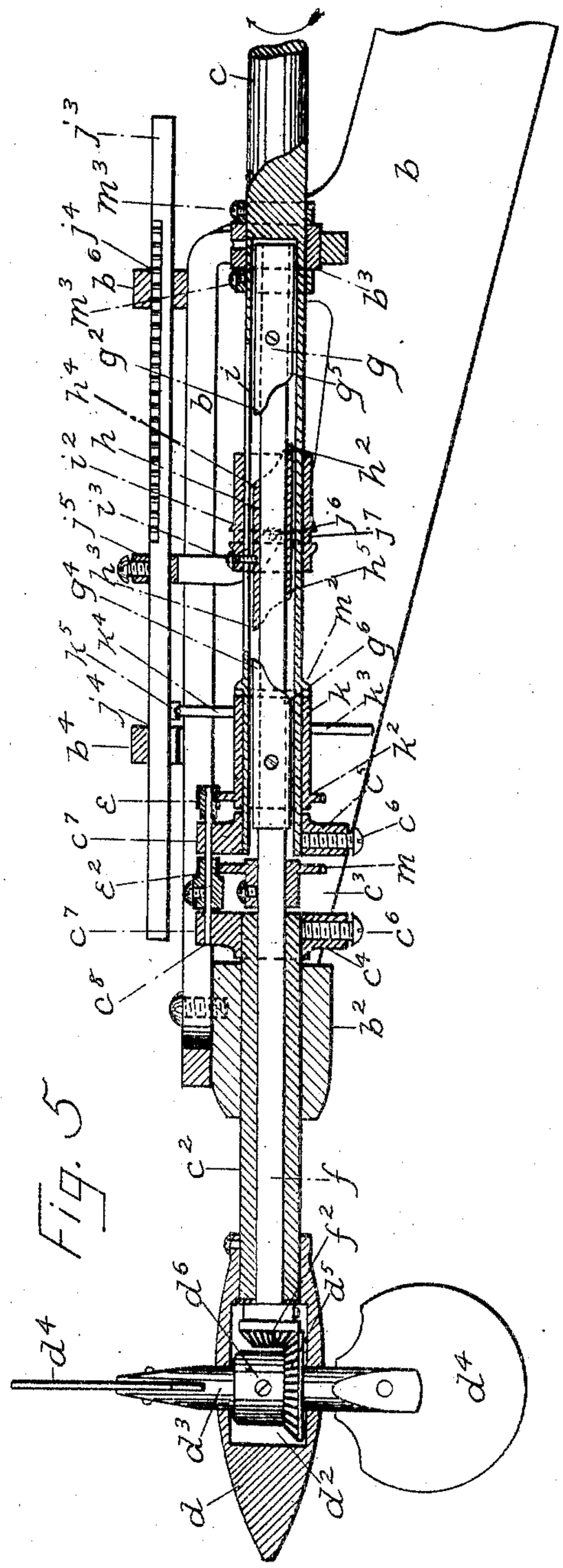

Fig. 5

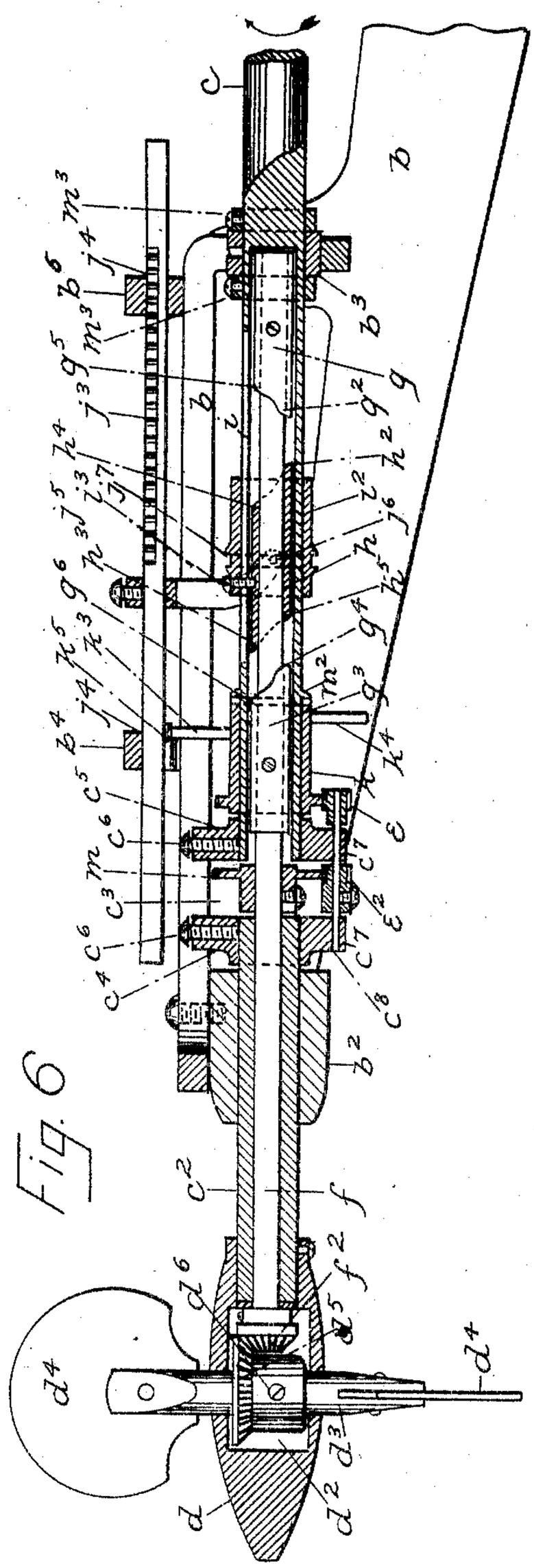

Fig. 6

WITNESSES

F. A. Stewart

C. E. Mulreany.

INVENTOR

Daniel W. Rantine

BY Edgar Tate & Co

ATTORNEYS

No. 776,687. PATENTED DEC. 6, 1904.

D. W. RANTINE.

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NO MODEL. 4 SHEETS—SHEET 4.

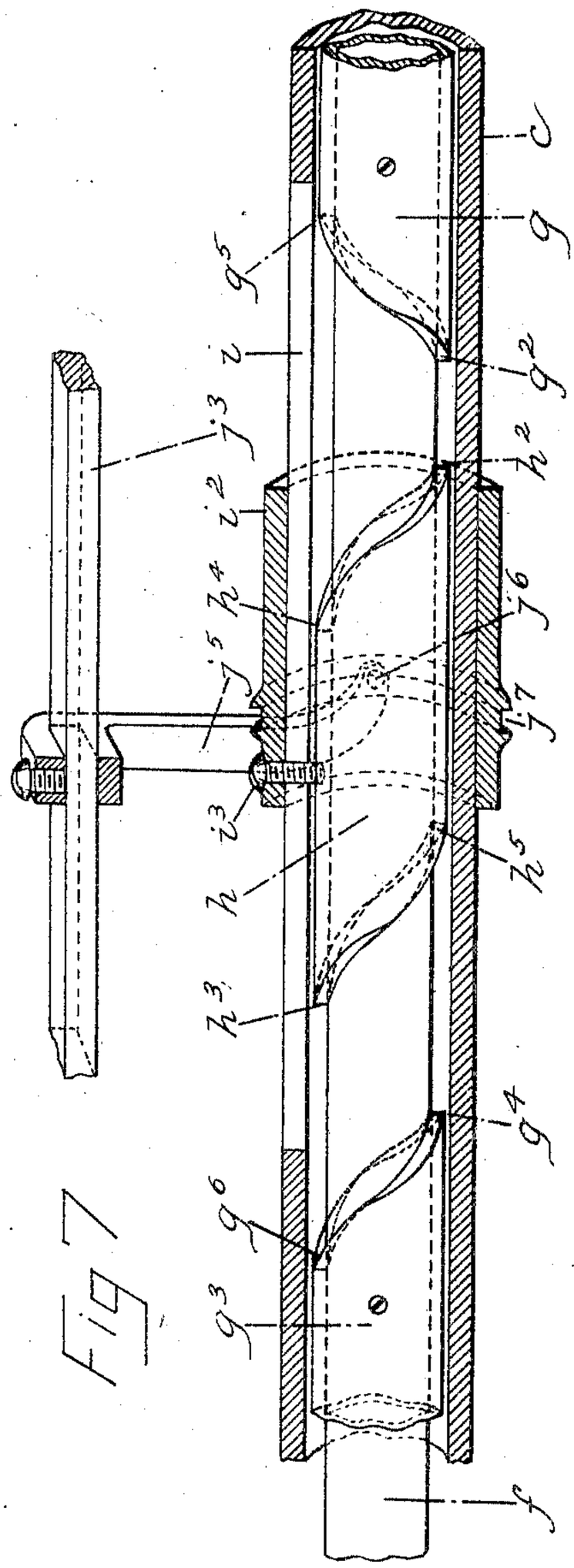

FIG. 7

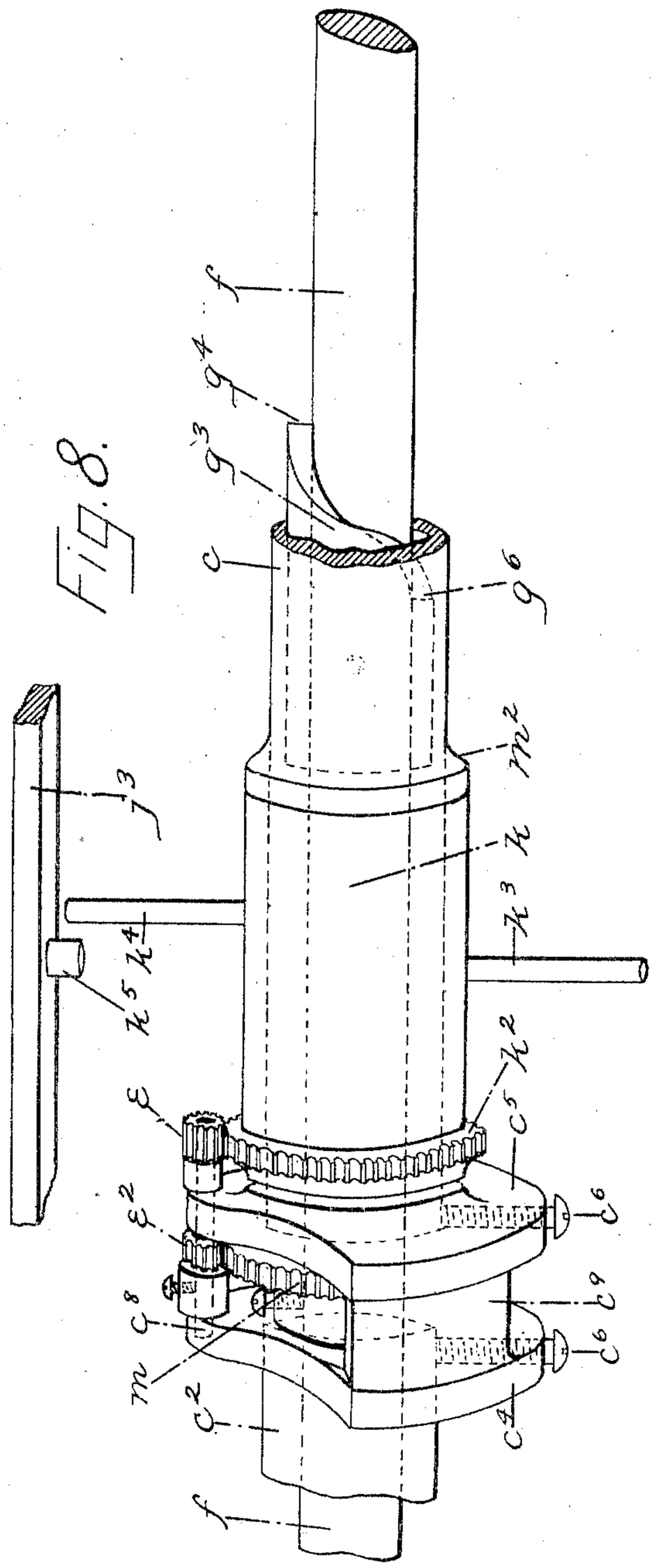

FIG. 8.

WITNESSES

F. A. Stewart

C. E. Mulreany

INVENTOR

Daniel W. Rantine

BY Edgar Tate & Co

ATTORNEYS

No. 776,687. Patented December 6, 1904.

UNITED STATES PATENT OFFICE.

DANIEL W. RANTINE, OF BROOKLYN, NEW YORK.

PROPELLING AND STEERING MECHANISM.

SPECIFICATION forming part of Letters Patent No. 776,687, dated December 6, 1904.

Application filed February 28, 1902. Renewed May 26, 1904. Serial No. 209,926. (No model.)

To all whom it may concern:

Be it known that I, DANIEL W. RANTINE, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Propelling and Steering Mechanism, of which the following is a full and complete specification, such as will enable those skilled in the art to which it appertains to make and use the same.

The object of this invention is to provide an improved propelling and steering mechanism for vessels of various kinds and classes which involves a main tubular propeller-shaft which in the operation of steering and propelling the vessel is always turned in the same direction and a propeller connected therewith the blades of which are adapted to be turned into different position according to the object to be accomplished, the turning of the propeller-blades being effected by means of a supplemental inner shaft located in the main propeller-shaft and geared in connection with said blades and devices connected with the main propeller-shaft and the supplemental inner shaft, whereby the turning of the supplemental shaft is effected.

The invention is fully disclosed in the following specification, of which the accompanying drawings form a part, in which the separate parts of my improvement are designated by the same reference characters in each of the views, and in which—

Figure 1 is a side elevation of my improved propelling mechanism, a portion of the hull of the vessel being indicated in section; Fig. 2, a plan view thereof; Fig. 3, a sectional side elevation of my improved propelling and steering mechanism and showing the propeller-blades in the position they occupy for moving the vessel forward; Fig. 4, a view similar to Fig. 3 and showing the parts of the apparatus and the propeller-blades in the position they occupy when it is desired to move the vessel backward; Fig. 5, a view similar to Figs. 3 and 4, but showing the parts in position to turn the vessel to the right; Fig. 6, a view similar to Fig. 5, but showing the parts in position to turn the vessel to the left; Fig. 7, a sectional side view of the main propeller-shaft and the supplemental inner shaft and certain parts connected therewith, all of which are shown on an enlarged scale; and Fig. 8, a perspective view of the parts shown in Fig. 7 on an enlarged scale.

In the drawings forming part of this specification, reference being made to Figs. 1 and 2, I have shown at a a part of the hull of a vessel and at b a framework or support placed therein and in which the main propeller-shaft and operative parts are placed or supported, and in the practice of my invention I provide a main propeller-shaft c, which, as shown in Figs. 3 to 7, inclusive, is tubular in form and passes through a suitable bearing b^2 at the extreme stern of the vessel, and said shaft is also provided with another bearing b^3 within the frame or support b, and other bearings may be provided, if desired. The main propeller-shaft is divided into two parts, and the rearmost end thereof, which passes through the bearing b^2, is indicated by the reference character c^2 and is provided with a propeller-head d. The point of division of the main propeller-shaft c is at c^3, just within the hull of the vessel, and the adjacent ends thereof are provided with collars c^4 and c^5, which are secured thereto by screws c^6 or in any desired manner, and said collars are provided at one side with shoulders or projections c^7, through which is passed a bolt or shaft c^8, which is provided at its inner end with a pinion e and midway thereof between the shoulders or projections c^7 with a similar pinion e^2, both of which are secured to the bolt or shaft c^8.

The propeller-head d is provided with a central chamber d^2, and passing centrally therethrough is a propeller-blade shaft or journal d^3, provided at its opposite ends with propeller-blades d^4, which are set at right angles to each other or in planes cutting each other at right angles, and the shaft d^3 is provided within the propeller-head d with a beveled gear-wheel d^5, having a hub d^6, rigidly secured to said shaft.

Mounted longitudinally in the main propeller-shaft c, which is tubular in form, is a supplemental propeller-shaft f, the end of which within the propeller-head d is provided with a beveled gear wheel or pinion f^2, having one-

half the number of teeth of the wheel d^5 and adapted to operate in connection with said wheel. The supplemental propeller-shaft f is provided at its inner end with a cam-sleeve g, rigidly secured thereto, and the end thereof in the direction of the propeller is cut away at an inclination, so as to form a projection g^2, which in the position of the parts shown in Figs. 3 and 5 is on the upper side of the supplemental shaft and in the position of the parts shown in Figs. 4 and 6 at the bottom of said shaft. The supplemental shaft f is also provided midway thereof with another cam-sleeve g^3, which is rigidly secured thereto and the end of which in the direction of the sleeve g is cut away similar to the corresponding end of the sleeve g, so as to form a projecting point g^4, which in the position of the parts shown in Figs. 3 and 5 is on the upper side of said supplemental shaft and in the position of the parts shown in Figs. 4 and 6 is on the lower side of said shaft. Mounted on the supplemental shaft f within the propeller-shaft c and between the cam-sleeves g and g^3 is a third cam-sleeve h, which is adapted to slide on the supplemental shaft, and this cam-sleeve h is cut away at an inclination at both ends, so as to form projecting points h^2 and h^3, the projecting point h^2 being in the direction of the cam-sleeve g, while the projecting point h^3 is in the direction of the cam-sleeve g^3. The cutting away of the end of the cam-sleeve g at an inclination so as to form the point or projection g^2 also forms at the opposite side of said sleeve a V-shaped notch or recess g^5, and the corresponding cutting away of the end of the cam-sleeve g^3 to form the point or projection g^4 also forms at the opposite side of said sleeve a V-shaped notch or recess g^6. The cutting away of the opposite ends of the sleeve h so as to form the projections h^2 and h^3 also forms at the corresponding opposite sides of said sleeve V-shaped notches or recesses h^4 and h^5, the V-shaped notch or recess h^4 being in the direction of the sleeve g, while the V-shaped notch or recess h^5 is in the direction of the sleeve g^3.

The main propeller-shaft c, which is tubular in form, is provided in one side thereof with a longitudinal slot i, and mounted on said shaft is a tubular slide i^2, which is adapted to slide thereon, and said tubular slide i^2 is connected with the sleeve h by a screw, pin, bolt, or other device i^3, which passes therethrough and through the slot i and into the sleeve h. The main frame or support b of the propeller mechanism is provided at the top with cross-bars b^4, b^5, and b^6, and mounted on the cross-bar b^5 is a vertically-arranged operating-shaft j, which in practice extends upwardly into the pilot-house and is provided with any suitable supports or bearings, and this shaft is provided with a gear-wheel j^2, which operates in connection with a rack-bar j^3, which is provided with bearings j^4, through which it passes and through which it is longitudinally movable, said rack-bar being arranged directly over and in line with the main propeller-shaft. The rack-bar j^3 is provided with a yoke j^5, the side arms of which project downwardly and inclose the tubular slide i^2, and the side arms of the yoke j^5 are provided at their ends with pins, screws, or equivalent devices j^6, which operate in an annular groove j^7, formed in the tubular slide i^2, and by moving the rack-bar j^3 longitudinally the tubular slide i^2 may also be moved longitudinally of the main propeller-shaft. The main part of the propeller-shaft is also provided adjacent to the collar c^5 with a sleeve k, which is provided with an annular gear k^2, in connection with which the pinion e operates, and this sleeve k is provided at its opposite sides with projecting pins or fingers k^3 and k^4, the finger k^4 being nearest the inner end of said sleeve or nearest the slide i^2, or, in other words, these pins or fingers are arranged in different vertical planes. The rack-bar j^3 is provided with a downwardly-directed stop k^5, in connection with which in the operation of the apparatus, as hereinbefore described, the pins or fingers k^3 and k^4 operate, and mounted on the supplemental shaft f between the collars c^4 and c^5, which are secured to the adjacent ends of the separate parts of the main propeller-shaft, is a gear-wheel m, which is provided with a hub rigidly secured to said supplemental shaft and which operates in connection with the pinion e^2 on the shaft or bolt c^8, and the gear-wheel m is of the same diameter as the gear k^2 on the sleeve k, and, as hereinbefore stated, the pinions e and e^2 are also of the same size or diameter.

The main propeller-shaft c is provided with a collar m^2, which serves to hold the sleeve k in position and prevent its longitudinal movement on said shaft in one direction, while the collar c^5 prevents the movement of said sleeve in the opposite direction. The said main shaft is also provided at the opposite sides of the bearing b^3 with collars m^3, which are rigidly secured thereto and which serve to prevent the longitudinal movement of said shaft.

As hereinbefore stated, the vertically-arranged operating-shaft j is in practice extended upwardly into the pilot-house, which is not shown, and said shaft is also in practice provided with suitable means for turning the same and also for indicating in what direction it is turned and the extent of said movement. In practice I prefer to employ for this purpose the apparatus described and claimed in an application for Letters Patent of the United States filed by me on the 10th day of February, 1902, Serial No. 93,291; but, as hereinbefore stated, any suitable means or devices may be employed to accomplish this result.

The operation will be readily understood from the foregoing description, taken in connection with the accompanying drawings and

the following statement: Suppose the parts to be in the position shown in Fig. 3, in which position of the parts the propeller-blades d^4 are in position to propel the vessel forward. If it is desired to back the vessel, the operating-shaft j is turned to the left, so as to move the rack-bar j^3 backwardly into the position shown in Fig. 4. In this operation the sleeve h is also moved backwardly on the supplemental shaft and within the main propeller-shaft, and in this operation the pointed end h^3 of said sleeve strikes on the inclined end of the sleeve g^3 and turns the supplemental shaft through one-half a revolution, the pointed end h^3 of the sleeve h passing into the notch or recess g^6 of the sleeve g^3. In this position of the parts the two shafts or the main and supplemental shafts are locked together and revolve together, and the propeller-blades assume the position shown in Fig. 4 and operate to back the vessel, it being understood that the turning of the supplemental shaft f, as above described, also turns the propeller-blades by means of the gear-wheels f^2 and d^5, and said propeller-blades are turned one-quarter of a revolution by reason of the relative size of the wheels f^2 and d^5. If now it it is desired to turn the vessel to the right, the operating-shaft j is manipulated so as to move the rack-bar j^3 forwardly until the stop k^5 thereon comes in the line of movement of the finger k^4, which is connected with the sleeve k, as shown in Fig. 5. In this position of the parts the sleeve k cannot turn; but the main shaft c continues to turn and carries around the collars c^4 and c^5, and the shaft c^8 also is carried around by said collars, and the pinion c^2 moves around the gear-wheel m, which remains stationary with the supplemental shaft f. At the beginning of this movement the propeller-head d turns with the propeller-shaft about one-eighth of a revolution until the propeller-blades d^4 are in the vertical position and assume the position shown in Fig. 5, in which the lower blade strikes the water side on, while the upper blade divides the water edgewise, and this position of these blades as the main propeller-shaft continues to revolve is maintained, the lower blade being always in position to strike the water side on, while the upper blade passes edgewise through the water, this operation of the blades being accomplished by the continual revolution of the propeller-head d around the stationary supplemental shaft and by the gear-wheels d^5 and f^2, as will be readily understood. If it is desired to turn the vessel to the left, the parts of the apparatus must be thrown into the position shown in Fig. 6, and in order to accomplish this result the rack-bar j^3 is moved backwardly or toward the stern of the vessel until the stop k^5 comes in the line of movement of the pin or finger k^3, with which the sleeve k is provided, and before the pin or finger strikes the stop k^5 the main shaft turns through one-half a revolution, together, with the supplemental shaft and parts connected therewith, and in this operation the propeller-blades are thrown into the position shown in Fig. 6, in which the upper blade strikes the water side on, while the lower blade divides the water edgewise, and the said blades maintain this position during the time that the apparatus is operated with the parts in the position shown in Fig. 6, it being understood that the main shaft and the parts connected therewith revolve around the supplemental shaft f in the position shown in Fig. 6 exactly as when in the position shown in Fig. 5. In order to propel the vessel straight ahead, the parts must be thrown into the position shown in Fig. 3, which is accomplished by moving the rack-bar j^3 until the movable cam-sleeve h engages the stationary cam-sleeve g, which is secured to the supplemental shaft f, and in this position of the parts of the propeller-blades d^4 assume the position shown in Fig. 3 and both the main and supplemental shafts continue to revolve to the right or in the same direction. The collars c^4 and c^5 are also connected opposite the shaft or bolt c^8 by a transverse piece c^9, which may be formed integral with said collar or connected therewith in any desired manner, so as to give strength and stability to these parts, and the propeller-blades d^4 may be of any preferred form, shape, or construction, and said blades may be connected with the shaft d^3 in any desired manner.

It will be understood that any suitable power may be employed for turning the main propeller-shaft, and said propeller-shaft is always turned in the same direction and the same propeller-shaft may be connected with a source of power by the usual or any preferred means.

The entire apparatus is simple in construction and operation, and the various parts thereof may be made of any desired strength, and by means thereof the propelling, backing, and steering or guiding of a vessel may be accomplished without reversing the main propeller-shaft and without stopping the engine, the entire apparatus being under the control of a pilot within the pilot-house.

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

1. In an apparatus of the class described, a main propeller-shaft which is tubular in form, a propeller-head connected therewith, a supplemental propeller-shaft mounted in the main propeller-shaft and extending into the propeller-head, a blade-shaft passing transversely through said head and geared in connection with the supplemental propeller-shaft, propeller-blades rigidly connected by their shanks to said blade-shaft and arranged at right angles to each other, and means whereby the supplemental shaft may be turned in either direction while the main propeller-shaft is

turned in one direction, substantially as shown and described.

2. In an apparatus of the class described, a main tubular propeller-shaft provided with a propeller-head, a blade-shaft passing transversely through the propeller-head, a supplemental shaft mounted in the main shaft and geared in connection with the blade-shaft, said main shaft being composed of separate parts, the adjacent ends of which are provided with collars connected at one side by a bolt or shaft, a pinion secured to said bolt or shaft between said collars, another pinion secured to the inner end of said shaft, a gear-wheel connected with the supplemental shaft and operating in connection with the first-named pinion, a sleeve mounted on the main shaft and provided with a gear which operates in connection with the last-named pinion, and means for locking said sleeve against rotation, substantially as shown and described.

3. In an apparatus of the class described, a main tubular propeller-shaft provided with a propeller-head, a blade-shaft passing transversely through the propeller-head, a supplemental shaft mounted in the main shaft and geared in connection with the blade-shaft, said main shaft being composed of separate parts, the adjacent ends of which are provided with collars connected at one side by a bolt or shaft, a pinion secured to said bolt or shaft between said collars, another pinion secured to the inner end of said shaft, a gear-wheel connected with the supplemental shaft and operating in connection with the first-named pinion, a sleeve mounted on the main shaft and provided with a gear which operates in connection with the last-named pinion, and means for locking said sleeve against rotation, consisting of radially-projecting fingers connected with said sleeve and a longitudinally-movable rack-bar provided with a stop adapted to engage said finger and a vertically-arranged shaft for operating said rack-bar, substantially as shown and described.

4. In a propelling apparatus for vessels, a main tubular propeller-shaft provided at its outer end with a propeller-head, a blade-shaft passing transversely through the propeller-head, a supplemental shaft mounted in the main shaft and geared in connection with said blade-shaft, two cam-sleeves secured to the supplemental shaft, a movable cam-sleeve mounted on the supplemental shaft and adapted to operate in connection with the first-named cam-sleeves, and means for operating the movable cam-sleeve, substantially as shown and described.

5. In a propelling apparatus for vessels, a main tubular propeller-shaft provided at its outer end with a propeller-head, a blade-shaft passing transversely through the propeller-head, a supplemental shaft mounted in the main shaft, and geared in connection with said blade-shaft, a movable cam-sleeve mounted on the supplemental shaft two cam-sleeves secured to the supplemental shaft and adapted to operate in connection with the first-named cam-sleeve, and means for operating the movable cam-sleeve, consisting of a slide mounted on the main shaft and in operative connection with said movable cam-sleeve, a yoke connected with said slide, a rack-bar connected with said yoke and a vertically-arranged operating-shaft for moving said rack-bar, substantially as shown and described.

6. In an apparatus of the class described, a main tubular propeller-shaft provided at its outer end with a propeller-head, a blade-shaft passing transversely through said propeller-head, a supplemental shaft mounted in the main shaft and geared in connection with said propeller-head, said shaft being also provided in one side thereof with a longitudinal slot and said supplemental shaft being provided with two cam-sleeves rigidly secured thereto at a predetermined distance apart, a movable cam-sleeve mounted on the supplemental shaft between the first-named cam-sleeve, a slide mounted on the main shaft and in operative connection with the movable cam-sleeve and devices for operating said slide, substantially as shown and described.

7. In an apparatus of the class described, a main tubular propeller-shaft provided at its outer end with a propeller-head, a blade-shaft passing transversely through the propeller-head, a supplemental shaft mounted in the main shaft and geared in connection with the blade-shaft, said main shaft being composed of separate parts, the adjacent ends of which are provided with collars, a bolt or shaft passing through said collars at one side, a pinion secured thereto between said collars, another pinion secured to the inner end of said bolt or shaft, a gear-wheel connected with the supplemental shaft and operating in connection with the first-named pinion, and a sleeve mounted on said main shaft which operates in connection with the last-named pinion and devices for locking said sleeve against rotation and devices for turning the supplemental shaft within the main shaft through a part of a revolution, substantially as shown and described.

8. In an apparatus of the class described, a main tubular propeller-shaft provided at its outer end with a propeller-head, a blade-shaft passing transversely through the propeller-head, a supplemental shaft mounted in the main shaft and geared in connection with the blade-shaft, said main shaft being composed of separate parts, the adjacent ends of which are provided with collars, a bolt or shaft passing through said collars, at one side, a pinion secured thereto between said collars, another pinion secured to the inner end of said bolt or shaft, a gear-wheel connected with the supplemental shaft and operating in connection with the first-named pinion, and a sleeve mounted on said shaft which operates in con-

nection with the last-named pinion and devices for locking the said sleeve against rotation and devices for turning the supplemental shaft within the main shaft through a part of a revolution, said devices being operated by a vertically-arranged operating-shaft, substantially as shown and described.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of the subscribing witnesses, this 27th day of February, 1902.

DANIEL W. RANTINE.

Witnesses:
T. A. STEWART,
C. E. MULREANY.