Jan. 24, 1950 A. S. DE W. HERRESHOFF 2,495,453

FEATHERING PROPELLER, HUB, AND COUPLING

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Fig. 3.

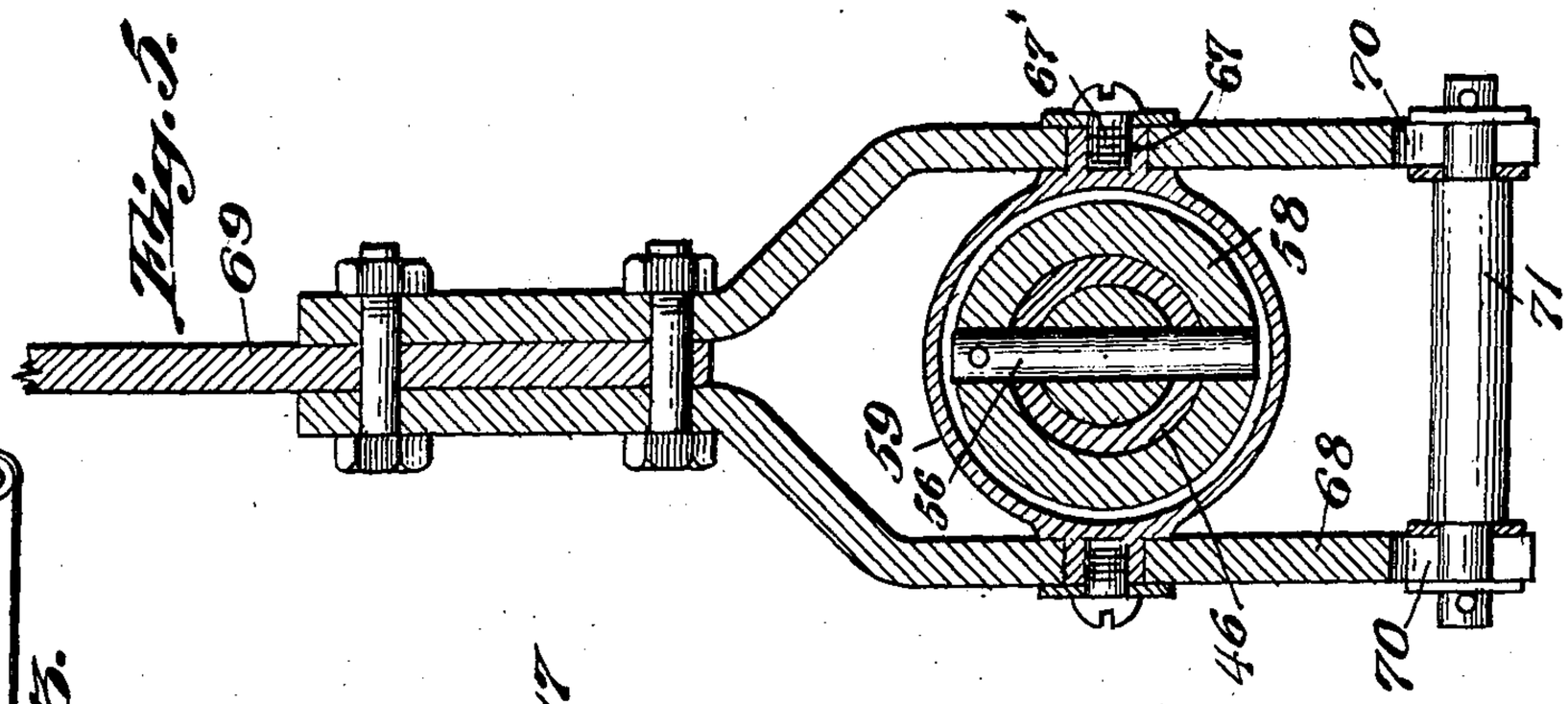

Fig. 1.

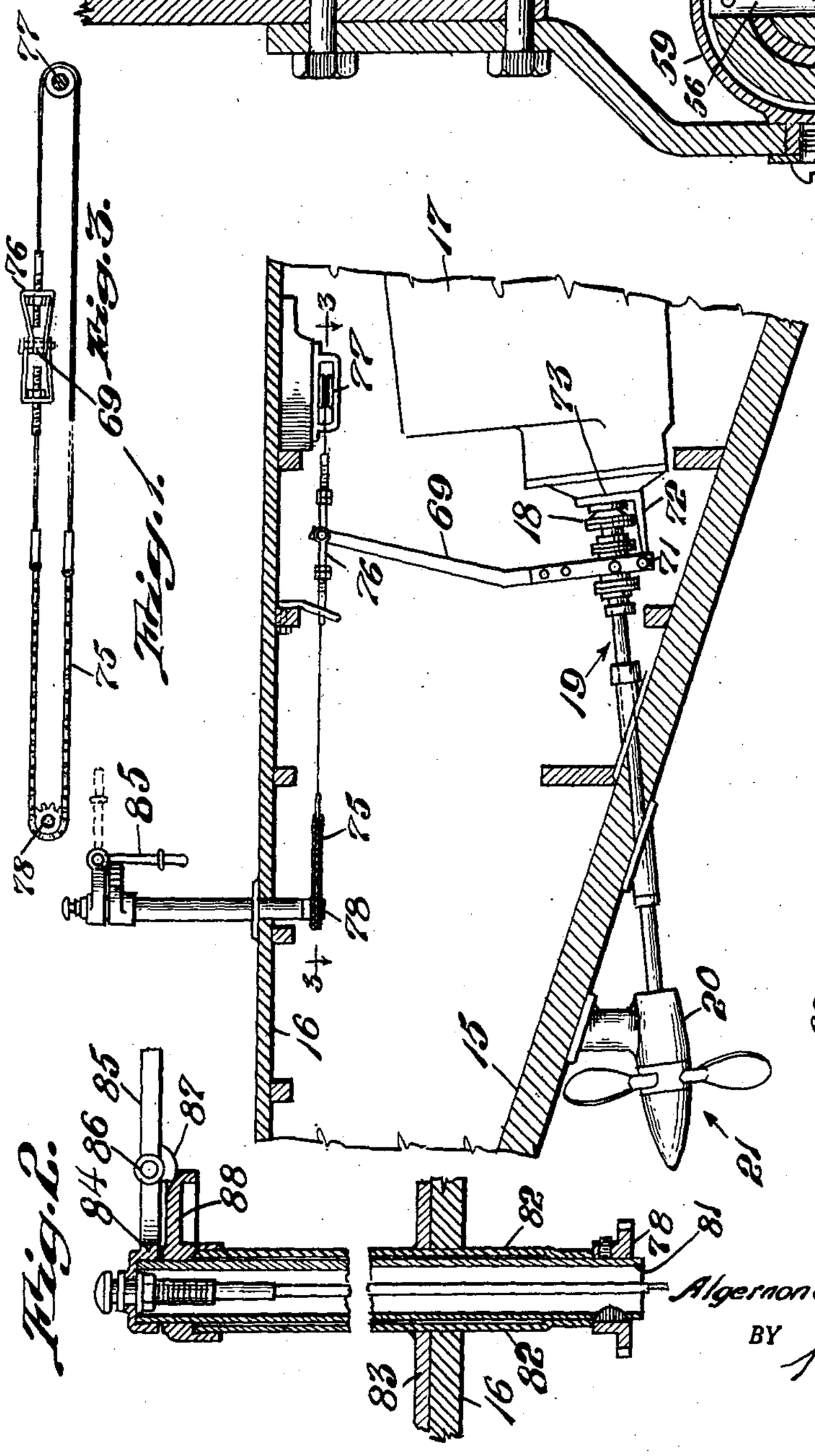

Fig. 4.

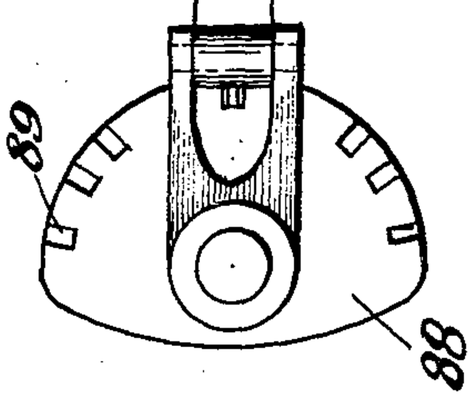

Fig. 2.

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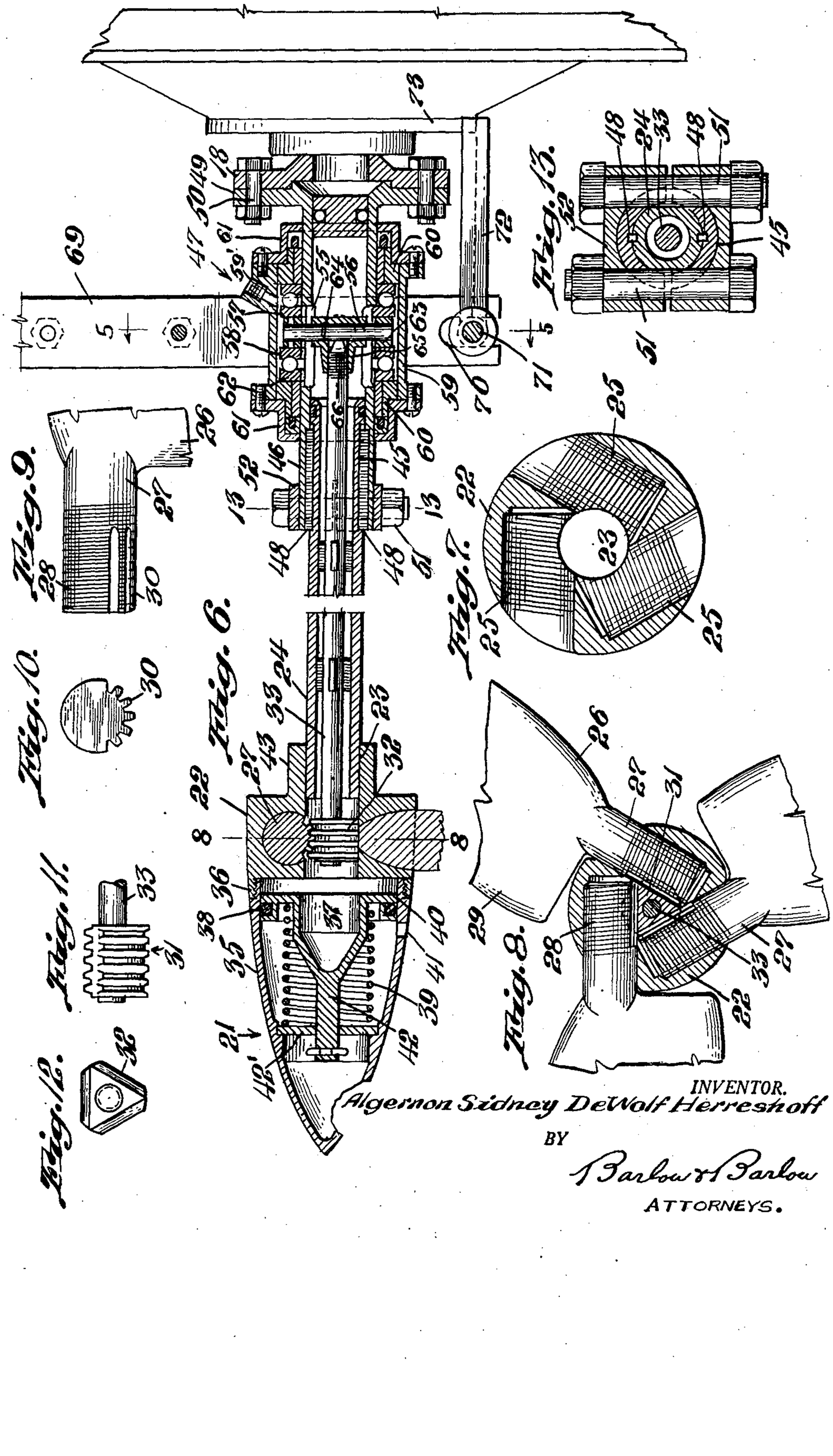

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UNITED STATES PATENT OFFICE

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FEATHERING PROPELLER, HUB, AND COUPLING

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Application January 5, 1949, Serial No. 69,288

9 Claims. (Cl. 170—160.23)

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This invention relates to a propeller for marine propulsion of the type in which the blades of the propeller may vary their pitch and may be moved to either one of two right angular positions. Heretofore, in the use of propellers wherein the blades changed their pitch, a rather complicated construction was provided for the changing of the pitch of the blades, and a rather difficult operation was necessary for the removal of a blade for repair or replacement.

One of the objects of this invention is to provide a more simple construction of blade pitch control.

Another object of the invention is to provide a propeller hub with blades so mounted therein that they may be easily removed and replaced when required.

Another object of the invention is to provide the spindle of the propeller blade with means so that when its pitch operating mechanism engages it, it will be locked in place.

Another object of the invention is to utilize the formation of the spindle in such a fashion that it serves to hold the spindle into the hub and also provides the operating mechanism for varying the pitch of the blade.

Another object of the invention is to prevent water contacting the moving parts by embedding the parts in grease.

With these and other objects in view, the invention consists of certain novel features of construction, as will be more fully described and particularly pointed out in the appended claims.

In the accompanying drawings:

Figure 1 is a sectional view largely diagrammatic illustrating the installation of this invention in a vessel and showing the propeller, its driving shaft and blade shifting mechanism.

Figure 2 is a sectional view through the manual control column;

Figure 3 is a plan view of the flexible belt to which the shifting lever on the propeller shaft is connected;

Figure 4 is a top plan view of this column showing the manual shifting handle;

Figure 5 is a sectional view showing the lower part of this shifting lever;

Figure 6 is a sectional view through the propeller shaft and the operating mechanism for the propeller blades;

Figure 7 is a sectional view through the hub of the propeller with the blades omitted;

Figure 8 is a sectional view on line 8—8 of Figure 6;

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Figure 9 is a view of the spindle of one of the propeller blades which is shown fragmentally;

Figure 10 is an end view of Figure 9;

Figure 11 is an elevational view of the end of the rack for engaging and operating the propeller blades;

Figure 12 is an end view of the structure of Figure 11; and

Figure 13 is a sectional view on line 13—13 of Figure 6.

In proceeding with this invention, I provide a propeller hub with a central axial bore for receiving the power shaft, and in a plane at right angles to this axial bore and symmetrically displaced from the bore, I provide a plurality of threaded bores so as to intersect the central bore offset from the center thereof. Blades having spindles which are threaded are screwed into these different bores in such a manner that they may be rotated about their axes rather freely. The spindles are each provided with teeth extending across their threads and a rack which is common to all of the spindles has teeth to engage the teeth on the spindles, so that as the rod, upon which the rack is mounted, is moved axially and at right angles to the plane in which the threaded bores are located, the blade spindles will be rotated in the bores to vary the pitch of the propeller. This rack also serves to prevent the spindles and their blades from being disengaged from the threaded bores by a rotary movement to unscrew them therefrom. The removal, however, is made very simple by merely moving the rack a sufficient extent to disengage the teeth of the spindles when they may be readily removed from the hub of the propeller by unscrewing them from their threaded bores. Any suitable means may be provided for moving the rack, and I have here shown a mechanical means which is manually operated from the cockpit or pilot position of the vessel in which the apparatus is installed.

With reference to the drawings, the hull of the vessel in which this apparatus is installed is designated 15 with the cockpit floor designated 16 beneath which is housed the engine 17 with the driving flange 18 to which the apparatus, which is more fully hereinafter described, is connected. The driving shaft is designated generally 19, the propeller shaft strut 20 and the propeller, which will be more fully hereinafter described, 21.

The propeller 21 (see Fig. 6) comprises a body portion 22 of generally solid construction having a central axial bore 23 to receive the driving shaft 24 therein. In a plane at right angles to the axis of the bore 23, there are a plurality of

threaded bores **25** (see Fig. 7) which are shown as three in number in this illustration of the invention, each of which bores intersects the bore **23** as more clearly shown in Figure 7. The center of the axis of this bore **25** is offset from the central axial bore, as also shown in this figure.

Blades **26**, each having a spindle **27**, threaded as at **28**, threadingly engage the bores **25**. This spindle extends from one side of the blade **26** so that the portion **29** of the blade (see Fig. 8) will extend inwardly over the hub so that the center line of the blade will be substantially radial of the hub. The threading of the spindle **27** into the bore **25** is such that the blade may freely rotate in this threaded mounting as a bearing. The spindles **27** are each also provided with teeth **30** (see Figure 10) over a certain arcuate extent of the spindle to form in effect a mutilated gear in which the teeth extend but a portion of the circumference thereof, it being only necessary for the operation of the blade that the teeth extend over a sufficient arc to operate the blade from a pitch for giving forward movement to a pitch to giving reverse movement and with a feathering of the blade in either a position at right angles to the axis of rotation of the propeller or at ninety degrees therefrom and in a plane passing radially through the axis of the propelling shaft.

A rack **31** having three sets of teeth **32** is formed on the end of a rod **33** which extends through the hollow shaft **24** and is located in engagement with each of the three sets of teeth on the spindle **27**, as shown in Figures 6 and 8, so that should the rod **33** be moved axially of the shaft **24** and relative thereto, the blades would be simultaneously rotated about their axes in their bearing mounting in the hub **22**, so as to simultaneously adjust the pitch of all their blades. This rack also serves to lock each of the blades in its threaded bore as when the rack is in engagement with the teeth **30** of the spindle, the spindle cannot rotate without movement of the rack: thus, if the rack is held against movement, the blades cannot be removed from their hub. This arrangement also provides for a very easy removal of the blades from their hub as the rack may be moved beyond engagement with the teeth in either an inward or an outward direction by which disengagement of the teeth from the rack will permit the blades to be each easily removed by unscrewing the same from the threaded bore **25** and a replacement of another blade, should occasion require.

The hub also comprises a chamber **35** which is threaded onto the aft side of the solid hub **22** as at **36** and provides a grease chamber **37** having a piston **40** pressed by spring **39** and held against leakage by O ring **38** to keep the rack and teeth of the spindle lubricated. This housing **35** is provided with an opening **41** on the opposite side of the piston so that no fluid will be trapped in the chamber as the piston operates. An abutment **42'** is provided for the spring **39** and the guiding portion **42** of the piston may pass freely through this abutment **42'** as the piston moves.

A fitting **59'** is provided on casing **59** for charging the system with grease. Grease enters the case **59** and the hollow shaft **24** and forces the piston **40** back to provide a reservoir of grease until vent **41** is uncovered. At first air will escape at vent **41** but when the system is sufficiently charged grease will appear. By this arrangement all moving parts are embedded in grease and no water may get to them.

The hollow drive shaft **24** is, of course, fixed to

the collar **43** of the hub **22** at its outboard end and extends inwardly over such extent as may be required to obtain driving connection from the engine. In this particular showing, the inboard end **45** of the drive shaft **24** is keyed to the sleeve **46** of a coupling designated generally **47**, such key being designated as **48**. The other end of this sleeve **46** is flanged as at **49** and connected to the flange **18** of the engine drive shaft by means of bolts **50**, so that as rotation of the engine occurs, rotation of the drive shaft **24** and hub **22** will, also, occur. The sleeve **46** is bound to the shaft **24** by means of the clamp (Fig. 13) having its bolts **51** extending through recesses in the shaft **24** as the sections **52** are drawn down into position about the end of the sleeve **46**.

The sleeve **46** is provided with diametrically opposite slots **55** through which a cross pin **56** extends and enters a ring **63** which is supported at either side by ball bearings **57** and **58**, which are slidably mounted on the outer surface of the sleeve **46**. A slidable casing **59** embraces these ball bearings and the ends of the pin and include supporting blocks **60** and end caps **61** held to the casing **59** by bolts **62**. The pin **56** extends through a cross head **64** which has a collar **65** extending therefrom threadingly engaging the end of the rod **33** as at **66**.

The housing **59** has trunnions **67** extending outwardly therefrom upon which there is mounted the bifurcated arms **68** of a lever **69** by set screws **67'** which has these arms **68** slotted as at **70** so as to engage a fulcrum **71** supported at the outer ends of legs **72** on the bracket **73** mounted on the engine **17**. Thus, as the lever **69** is moved about the fulcrum **71**, the casing **59** with the pin **56** will be moved axially of the drive shaft **24** so as to move the rod **33** and in turn the rack and blades of the propeller to adjust their pitch.

The lever **69** (see Figure 1) is connected to an endless belt or chain **75** as at **76**, which chain is mounted about sprockets **77** and **78** so that as the chain is moved in one direction or the other, the lever **69** will be swung about its fulcrum **71**. In order to move this chain, sprocket **78** is fixed on the end of shaft **81** which is rotatably mounted in the column **82** which extends up through the cockpit deck **16** and is secured thereto by a flange **83**. At the upper end of this shaft **81**, there is a hub **84** having a handle **85** hinged as at **86** thereto so as to rotate the shaft and consequently the gear **78** for manipulation of the lever **69**. This handle **85** has a dog **87** which swings over a quadrant **88** with notches **89** therein, as shown more particularly in Figure 4, so that the movement of the shaft **81** may be locked in any one of a plurality of positions. In this manner, the various notches **89** may be set to provide the various different positions which it is desired the propeller shall be adjusted to. Thus, the propeller blade may be set to feather when not rotating for least resistance of movement of the vessel through the water by having the blades in planes radial and through the axis of the propeller shaft, or the blades may be set at right angles to the axis of the propeller shaft when no movement is desired, but yet the hub is rotating. Other intermediate positions for either forward propulsion or reverse propulsion may be also provided and the notches may be adjusted to the positions found most efficient and satisfactory in connection with the results desired.

I claim:

1. For marine propulsion, a power shaft, a controllable pitch propeller, comprising a hub having

a central axial bore receiving said shaft in a portion thereof, a plurality of threaded bores symmetrically displaced in said hub and intersecting said central axial bore, with the bore centerlines offset from that of said central axial bore, a plurality of blades with their blade spindles threaded into said bores for rotational motion about their centerlines, teeth formed in the surface of said spindles extending lengthwise thereof across said threads and a rack in said central bore engaging said teeth of the spindles and means for moving said rack axially of the power shaft to rotate the blades in their bores.

2. The combination as in claim 1 wherein said rack is mounted for movement out of the spindle teeth to permit removal by unthreading the spindles of the blades from the threaded bores.

3. The combination as in claim 1 wherein the centerlines of said axial bores are all in the same plane at right angles to the axis of the central bore.

4. The combination as in claim 1 wherein said power shaft is hollow and the means for moving the rack is a rod extending therethrough.

5. The combination as in claim 1 wherein said power shaft is hollow and the means for moving

the rack is a rod extending therethrough, and said rod being connected to a pin in a slot in the shaft with a casing slidable over the slot and pin movable by sliding the casing along the shaft.

6. The combination as in claim 1 wherein positive means are provided for maintaining the system charged with lubricant to exclude water therefrom.

7. The combination of claim 1 wherein said power shaft is hollow, said means for moving the rack extends through said hollow shaft and means is provided for filling the hollow shaft and system connected therewith with grease to exclude water from the operating parts.

8. The combination of claim 1 wherein a grease reservoir is in communication with the operating parts of said system.

9. The combination of claim 1 wherein a grease reservoir is in communication with the operating parts of said system and a spring pressed plunger urges grease from said reservoir about the operating parts.

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No references cited.