

Sept. 29, 1953

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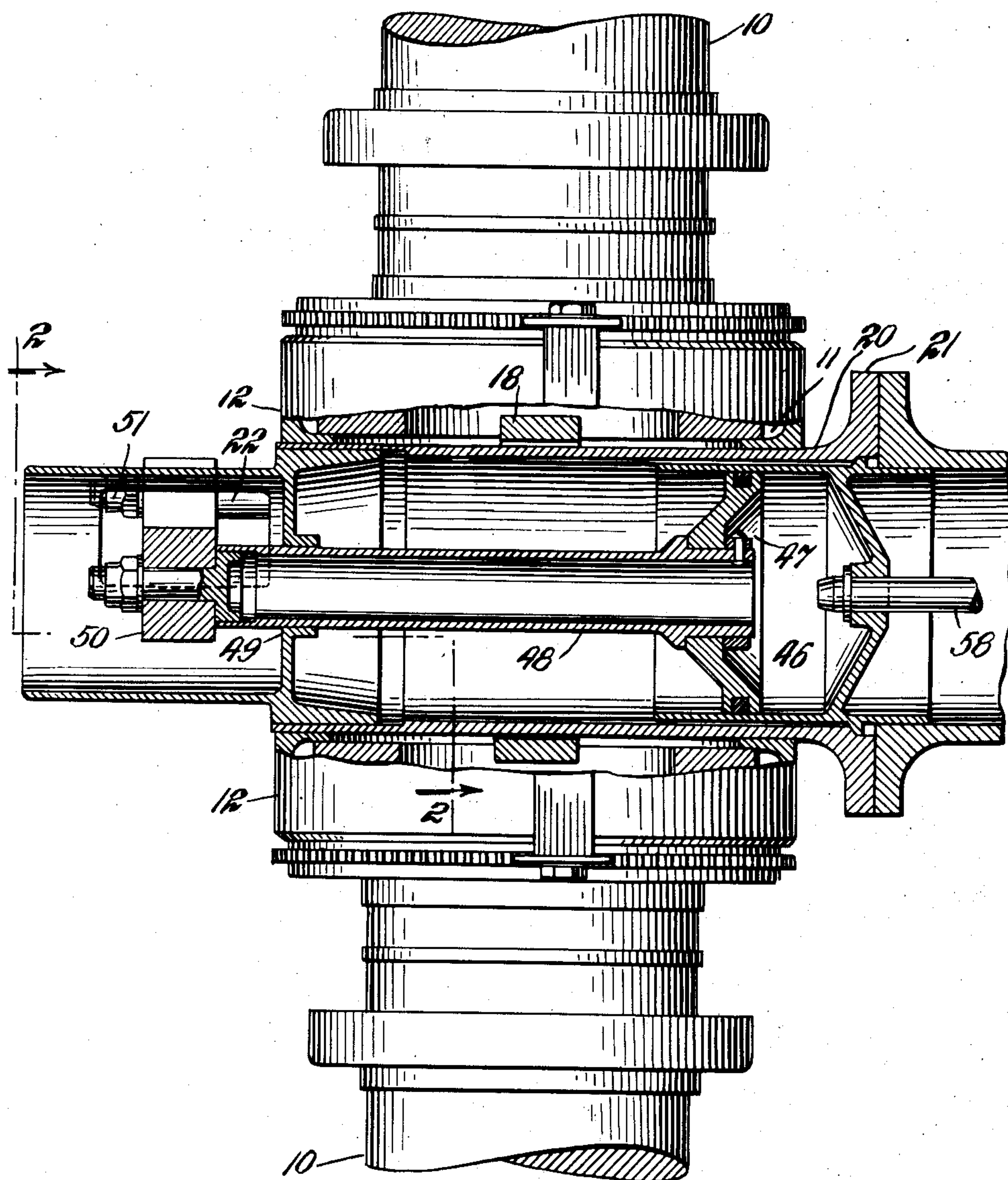
2,653,670

CONTROLLABLE PITCH PROPELLER

Original Filed June 2, 1948

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Fig. 1.



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Fig. 2.

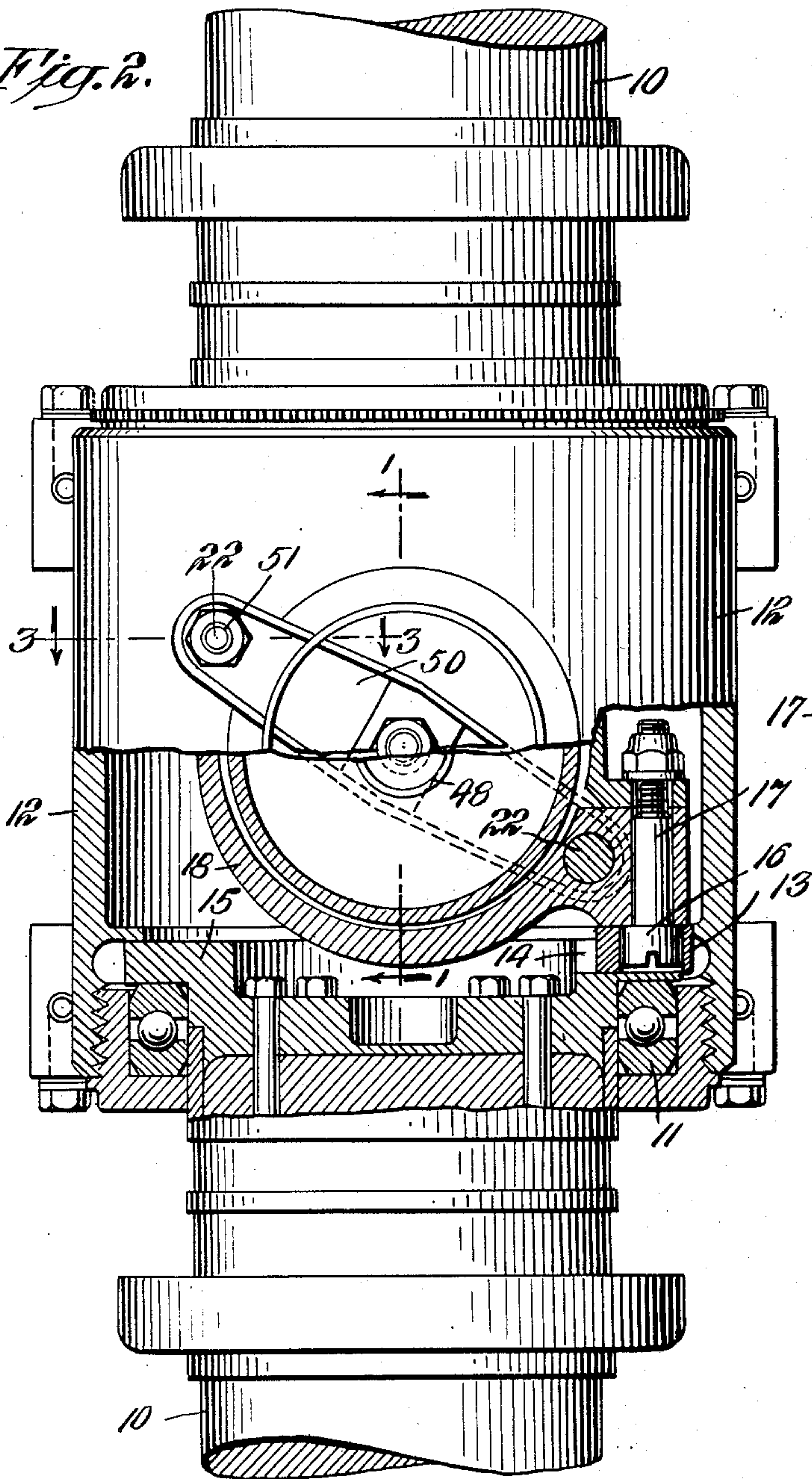
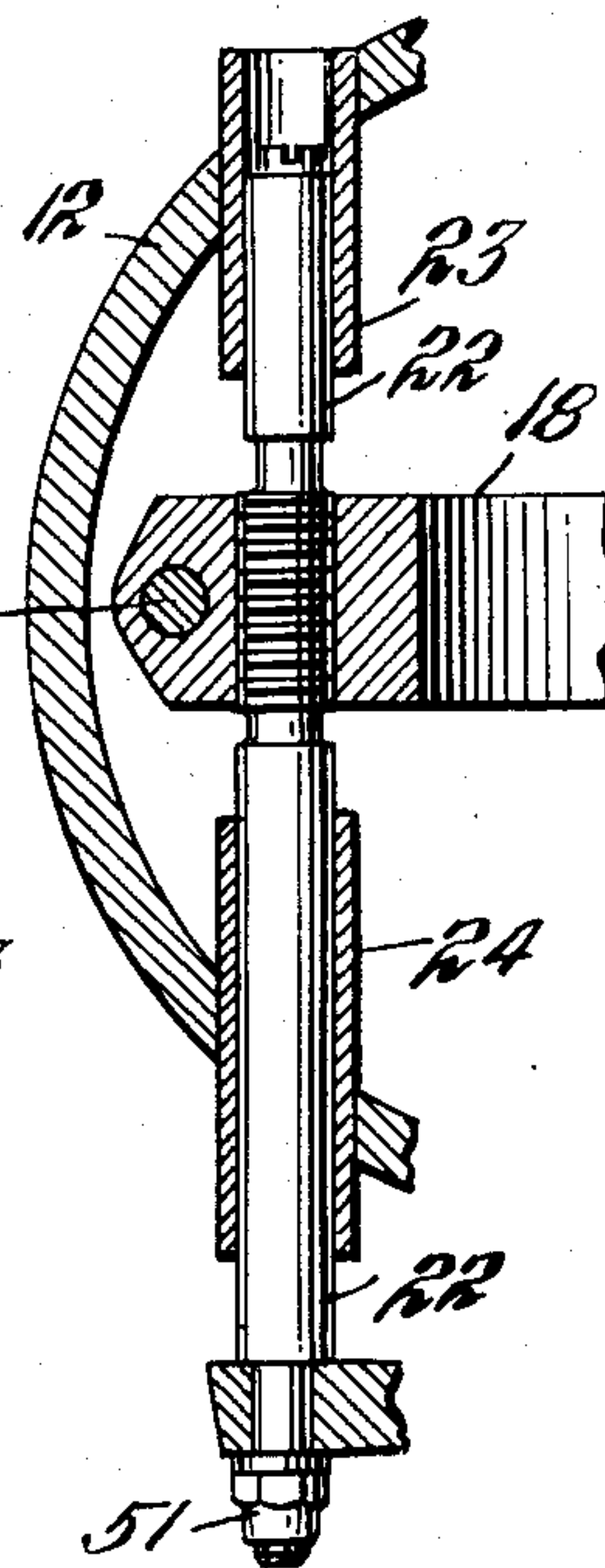


Fig. 3.



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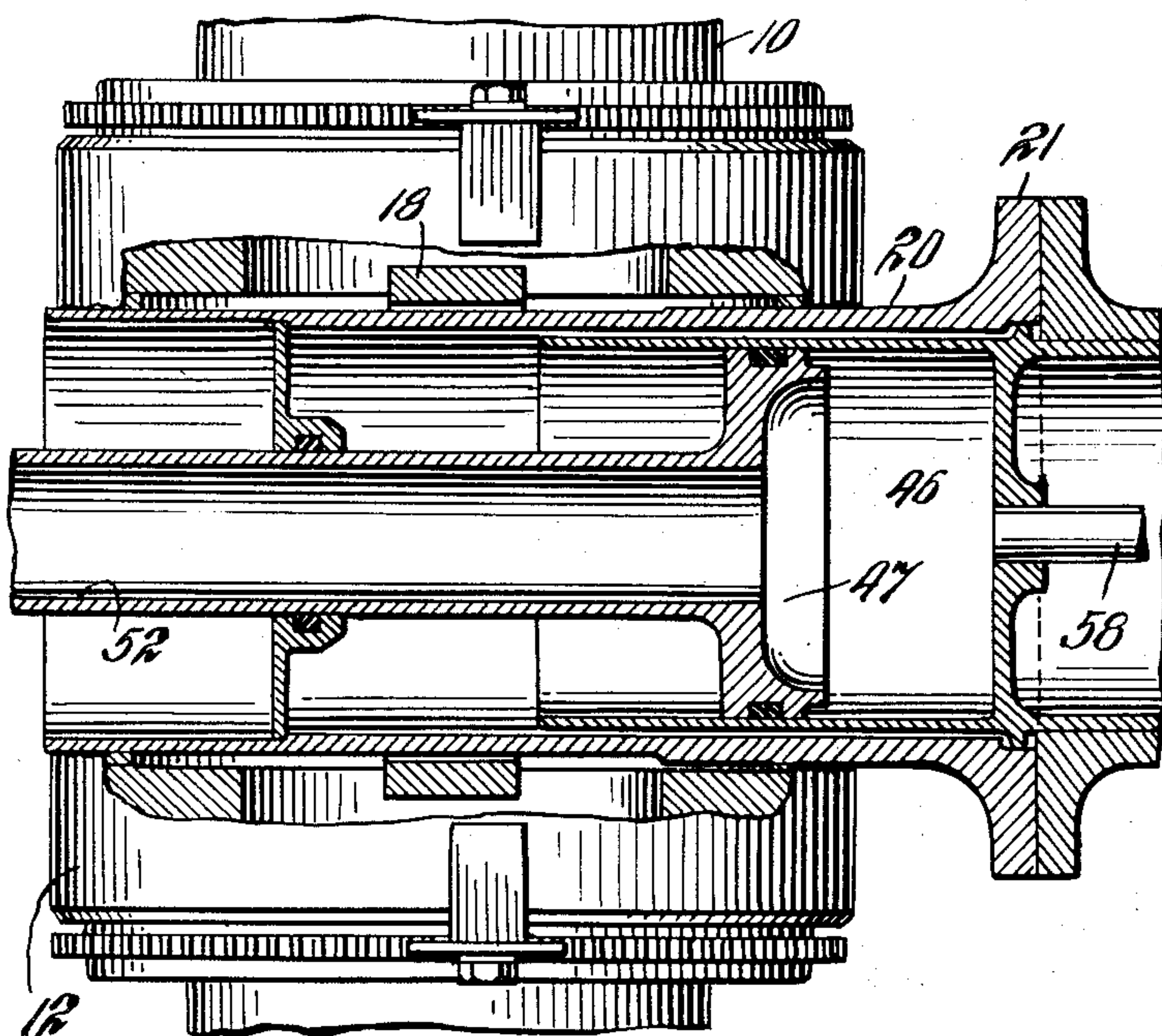


Fig. 4.

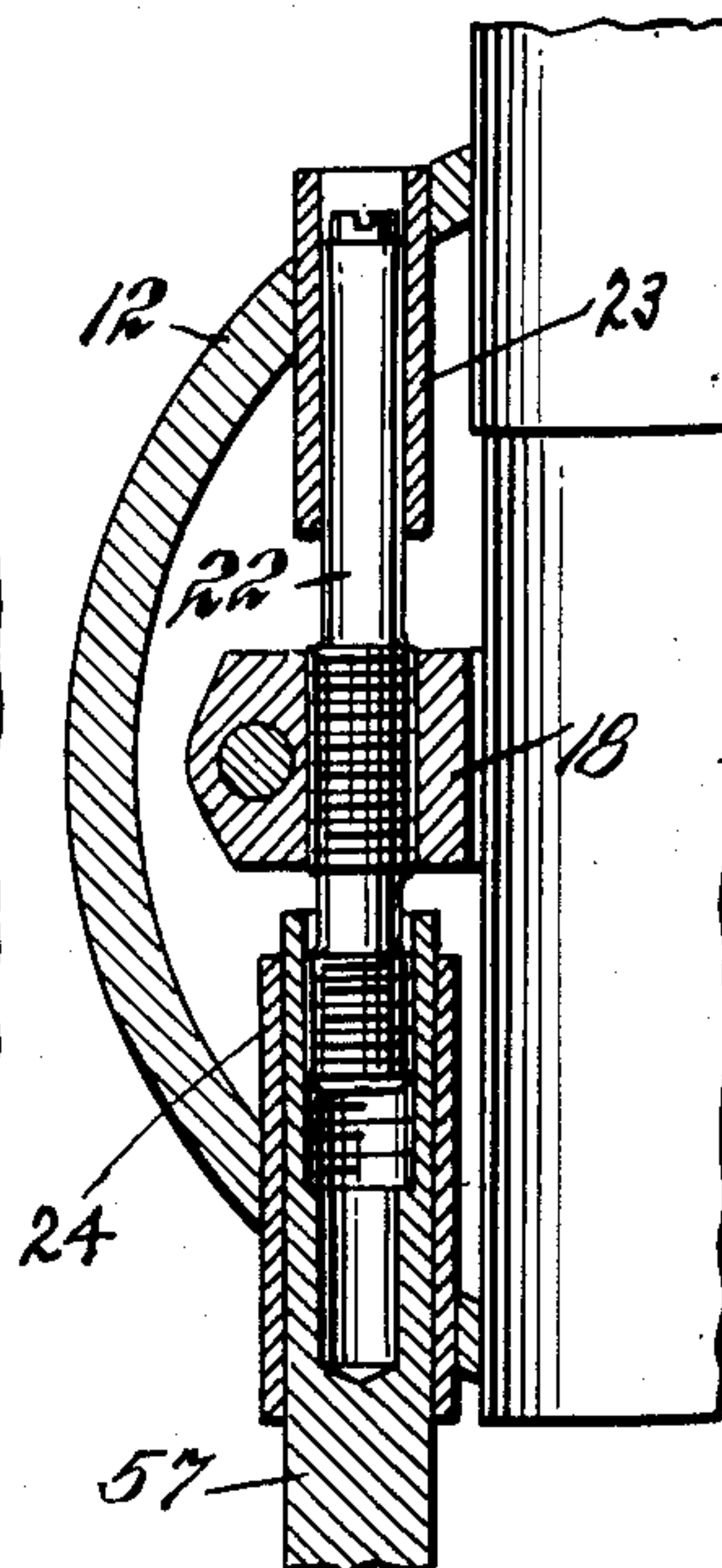
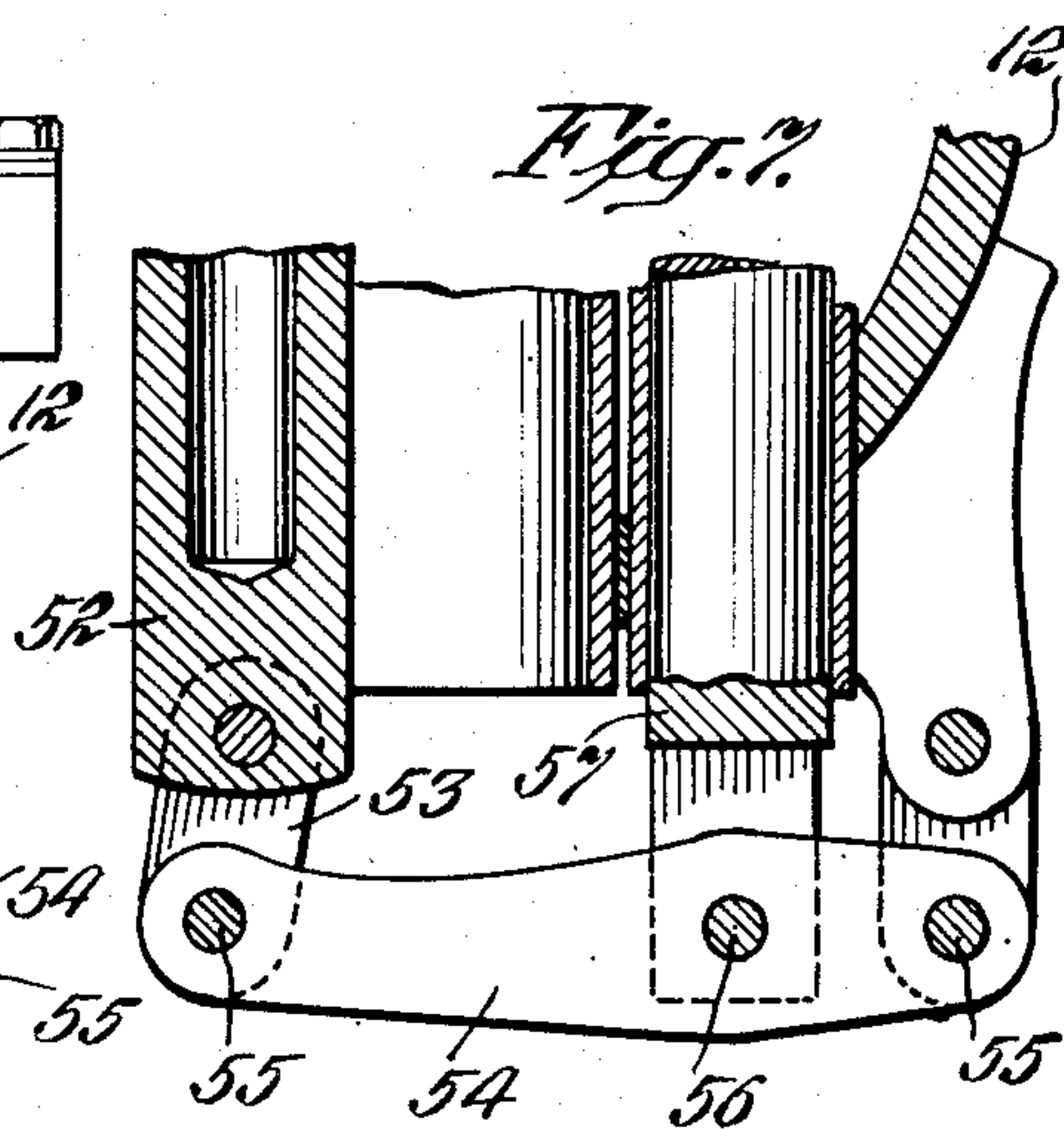
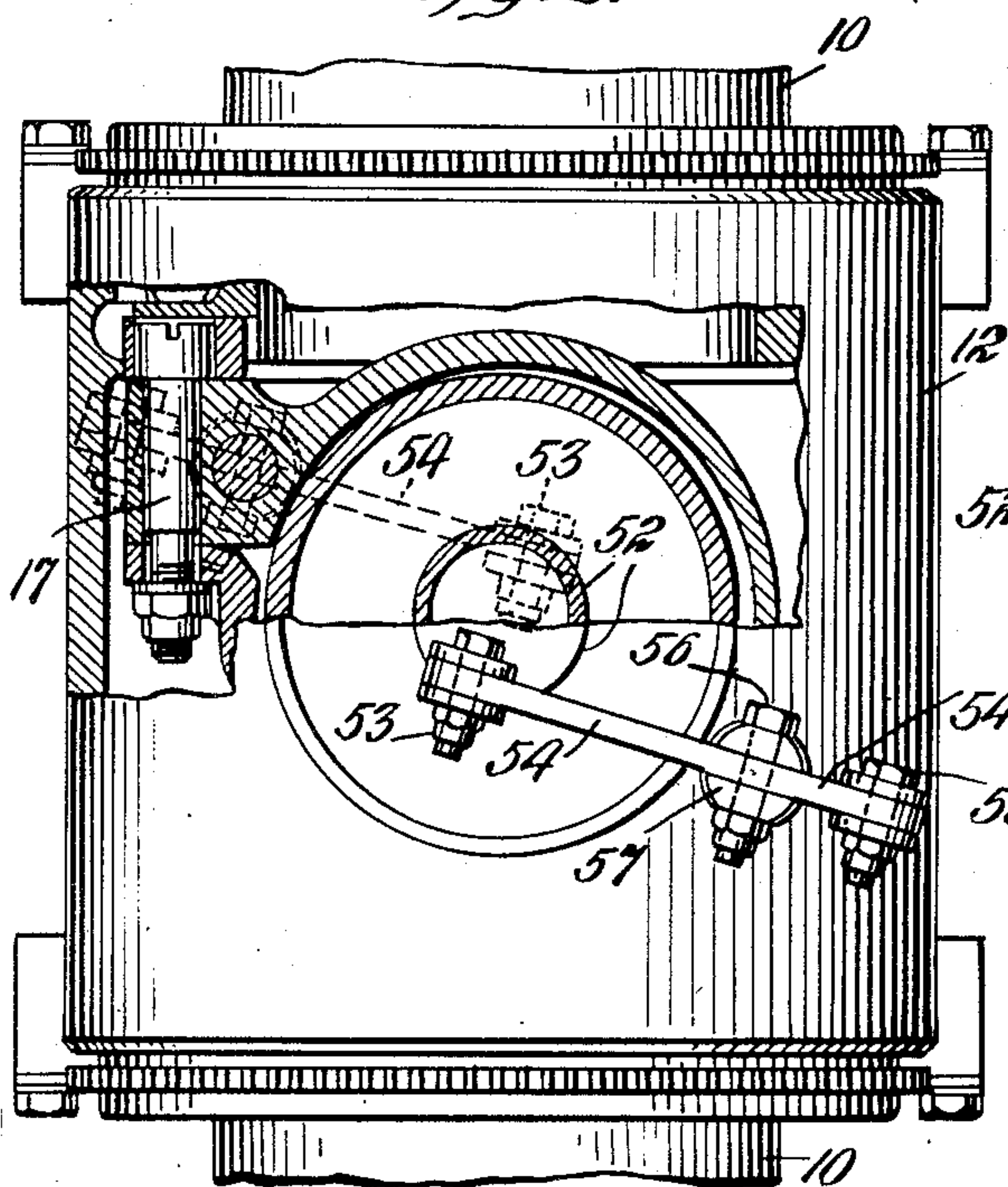


Fig. 6.

Fig. 5.



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CONTROLLABLE PITCH PROPELLER

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Original application June 2, 1948, Serial No.
30,637, now Patent No. 2,618,348, dated No-
vember 18, 1952. Divided and this application
September 19, 1951, Serial No. 247,264

1 Claim. (Cl. 170—160.32)

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The invention here disclosed is a controllable pitch propeller and a division of copending patent application Serial No. 30,637, filed June 2, 1948, now Patent No. 2,618,348 of November 18, 1952.

General objects of the present invention are to provide practical and efficient hydraulic mechanism for effecting the pitch changing adjustments of the propeller blades and to so construct this mechanism that it will be accommodated within the hub structure of the propeller.

Further, special objects of the invention are to provide the hydraulic pitch adjusting mechanism in a symmetrical, balanced form of construction which will cooperate fully in the proper functioning of the propeller and which while small in size for containment in the hub structure, will afford necessary power for pitch changing adjustments.

Other desirable results attained by the invention are set forth and will appear in the course of the following specification.

The drawings accompanying and forming part of the specification illustrate present preferred embodiments of the invention but structure and arrangement may be modified and changed as regards immediate illustration, all within the true intent and broad scope of the invention as hereinafter defined and claimed.

Fig. 1 in the drawings is a broken and substantially central longitudinal sectional view through the hub of the propeller as on approximately the plane of line 1—1 of Fig. 2;

Fig. 2 is a front and broken part transverse sectional view of the propeller sectioned portion appearing as on substantially the plane of line 2—2 of Fig. 1;

Fig. 3 is a broken horizontal sectional detail of the yoke and one of the slide rods carrying the same, with parts appearing as on substantially the plane of line 3—3 of Fig. 2;

Figs. 4 and 5 are broken longitudinal and transverse sectional views, respectively, of a modified form of the hydraulic operating mechanism;

Figs. 6 and 7 are broken sectional details of the leverage connections between the piston rod and thrust rods in this modified form of construction.

In the several views the blades 10 of the propeller are shown rotatably supported by bearings at 11 in the hub body 12 and as adjusted axially through the medium of slide blocks 13, Fig. 2, engaged in radial slots 14 in the inner ends of the propeller retainer rings 15.

The blocks 13 thus serve, in effect, as sliding

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crank pins for rotating the blades to various selected pitch angles. They are shown as pivotally engaged over the heads 16 of bolts 17 which fasten the ends of companion yoke segments 18 together about the central sleeve portion of the hub.

In the forms of the invention illustrated the propeller has a flanged mounting and the central drive sleeve 20 is therefore part of the mounting flange 21, Figs. 1 and 4.

The pitch changing yoke which directly actuates the blades, is supported between sliding bearings in the hub in the space immediately surrounding the central drive sleeve, closely adjoining the inner ends of the blades.

The sliding bearings mentioned are provided by rigidly connected parallel push rods. These rods are shown at 22, sliding at their opposite ends in inner and outer bearing sleeves 23, 24, in the hub 12, in parallel relation at diagonally opposite sides of the drive sleeve. This diagonal arrangement, as indicated in Fig. 2, brings the rods close to the inner ends of the blades and the thrust transmitting bolts 17 close to the rods.

The inner ends of the bearing sleeves 23, 24, are spaced far enough apart for full movement of the yoke supported on the rods between these bearings.

The thrust yoke 18 is a rigid ring, rigidly holding the slide rods in spaced relation and guided by these spaced parallel rods in accurately maintained alignment between closely adjacent bearings at opposite sides of the same. In this rigid relationship the parts are maintained in free sliding mounting, clear of binding or twisting effect and requiring but a minimum of effort to apply the pitch changing adjustments to the blades. The parts can be made to fit accurately and closely to avoid slip or lost motion which might lead to any difference in pitch between the blades.

The construction disclosed is particularly well suited to hydraulic operation for, as shown in Figs. 1 and 4, a hydraulic cylinder 46 may be mounted in the inner end of the hub sleeve, containing a piston 47 for connection with the push rods.

In Fig. 1 the hydraulic piston 47 is shown as having a tubular piston rod 48 guided through a bearing 49 at the front and carrying a transverse yoke 50 connected with forwardly extended end portions 51 of the push rods 22.

This construction provides a short stroke, powerful piston action having the same longitudinal movement as the thrust rods.

Where greater power may be required and a

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longer piston stroke is permissible, a construction like that shown in Figs. 4 to 7 may be employed.

In this modified form of the invention the forward end of the tubular piston rod 52 is shown pivotally connected at 53 with the longer arms of levers 54 fulcrumed at their outer ends to the hub body, as shown at 55, and pivotally connected at 56 with the extensions 57 on the forward ends of the slide rods 22.

In both the constructions shown the operating fluid, such as oil, may be admitted to and exhausted from the cylinder through a single transfer line such as indicated at 58 in Figs. 1 and 4. Centrifugal force creates a tendency for the blades to go into flat pitch, applying rearward pressure on the piston. Consequently there is no need for fluid or other applied pressure on the forward side of the piston. Normally fluid pressure for pitch control is under control of the propeller governor on the engine, increasing or decreasing in pressure, as needed, to maintain the desired pitch, and it is only necessary that this pressure fluid reach the piston through the one connection shown at 58.

The hydraulic operating mechanism disclosed is simple in construction, symmetrical and fully balanced and is such as can be wholly disposed within the central drive sleeve.

What is claimed is:

A controllable pitch propeller comprising a hub having an axially disposed drive sleeve extending therethrough from front to back, said drive sleeve having a mounting flange at the back and having a guide at the front end of the same, said drive sleeve having a cylinder forming section within the back portion of the same, a piston operable in said cylinder forming section, means for supplying and exhausting actuating fluid to and from said cylinder section in back of said piston, a piston rod extending

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forwardly from said piston through said guide at the front end of the sleeve, push rods within the hub at opposite sides of and parallel with said drive sleeve and with the piston rod operating within said drive sleeve, a thrust ring fixed on intermediate portions of said rods surrounding and freely operable longitudinally over said drive sleeve, propeller blades journaled in the hub with their inner ends closely adjoining said thrust ring, pitch changing connections from said thrust ring to the inner ends of said blades, bearings for said push rods supported in the hub at opposite sides of said thrust ring and longitudinally spaced to permit limited longitudinal pitch changing adjustment of said thrust ring, said spaced bearings being parallel with said drive sleeve and with the piston rod operating through said drive sleeve, and transverse operating connections extending from the forward end of the piston rod in the drive sleeve to the forward ends of said push rods at the opposite sides of the drive sleeve and whereby substantially all parts of the pitch changing mechanism are contained within the hub forward of the mounting flange and in generally parallel relationship with the drive sleeve.

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