

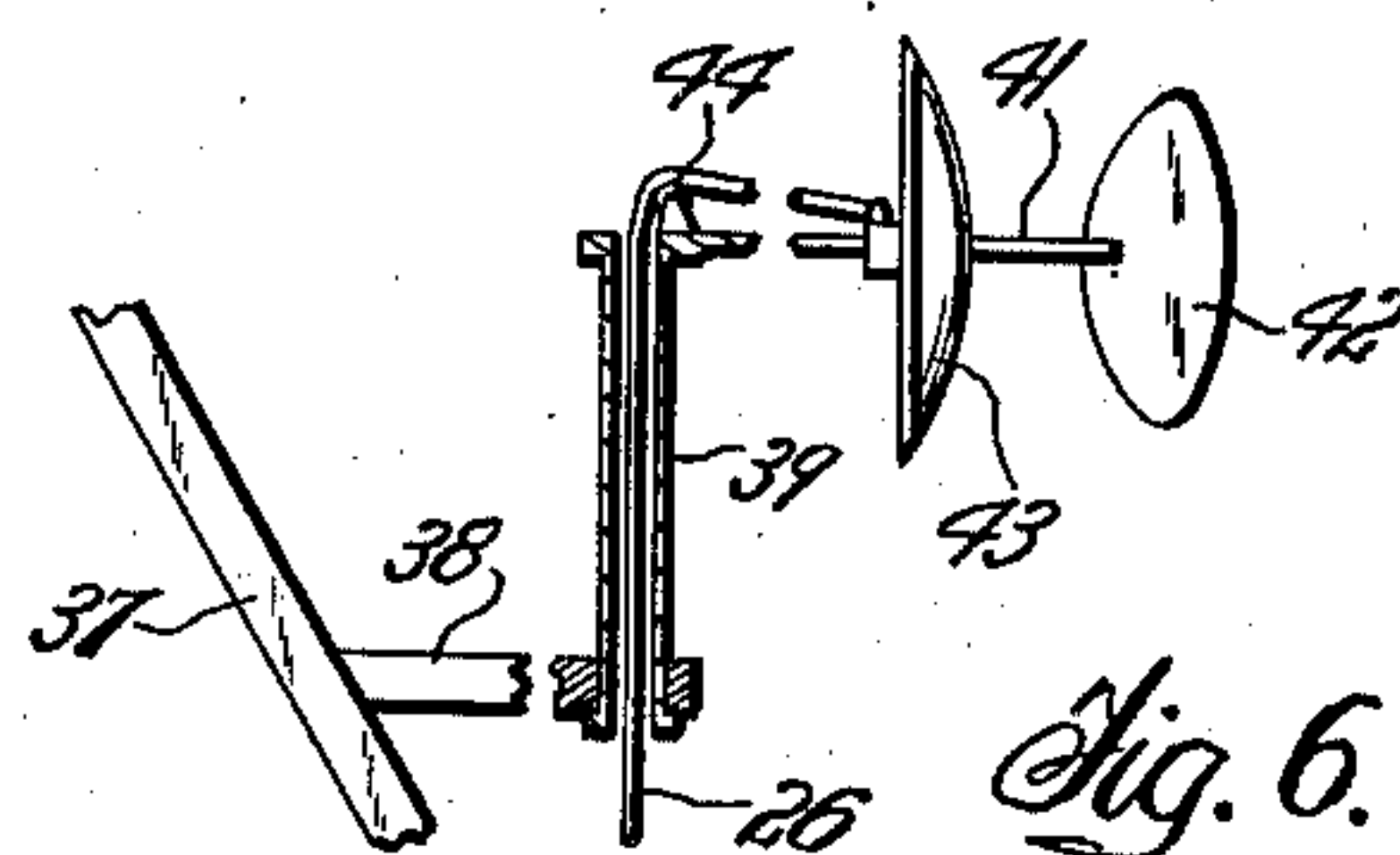
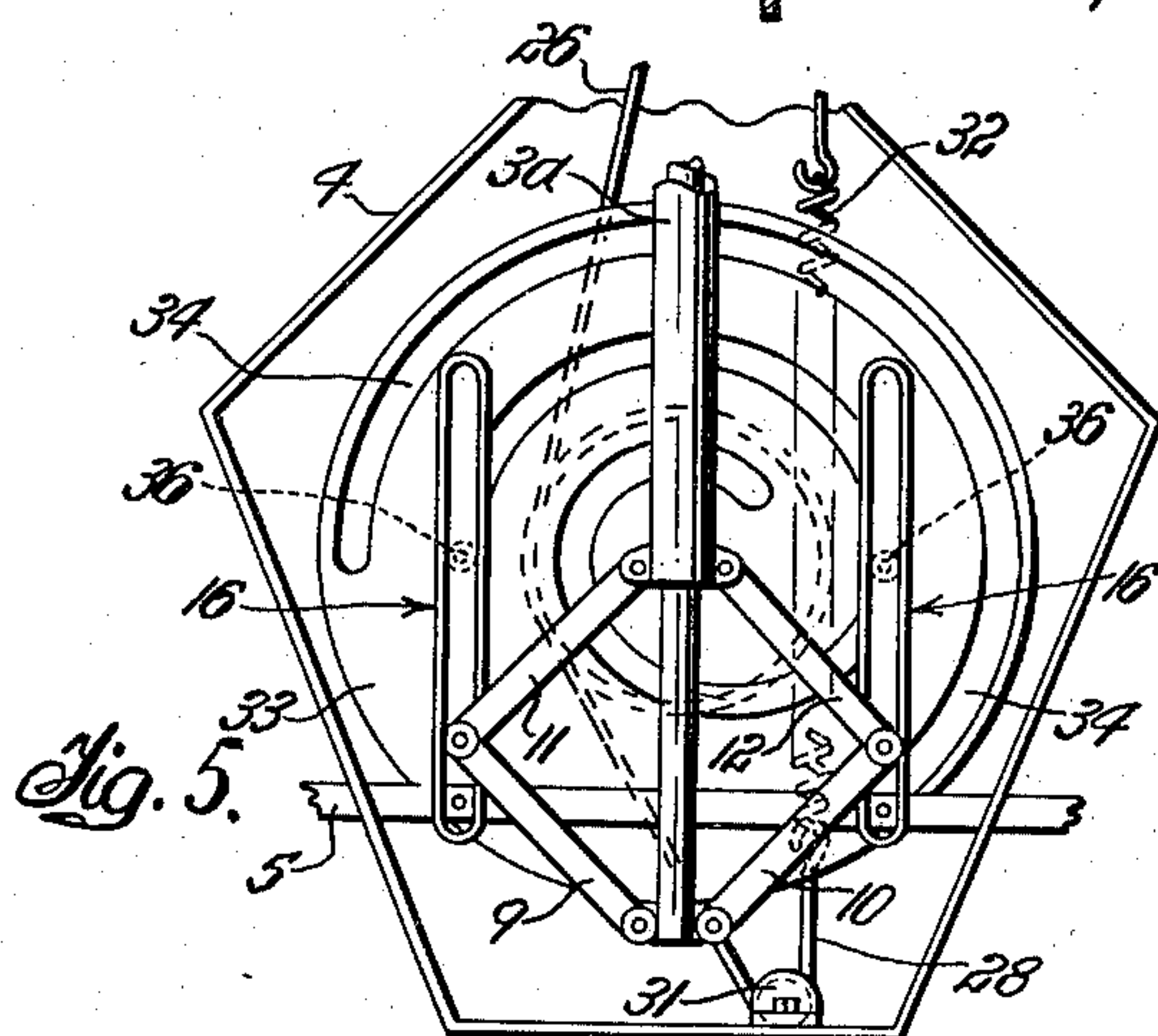
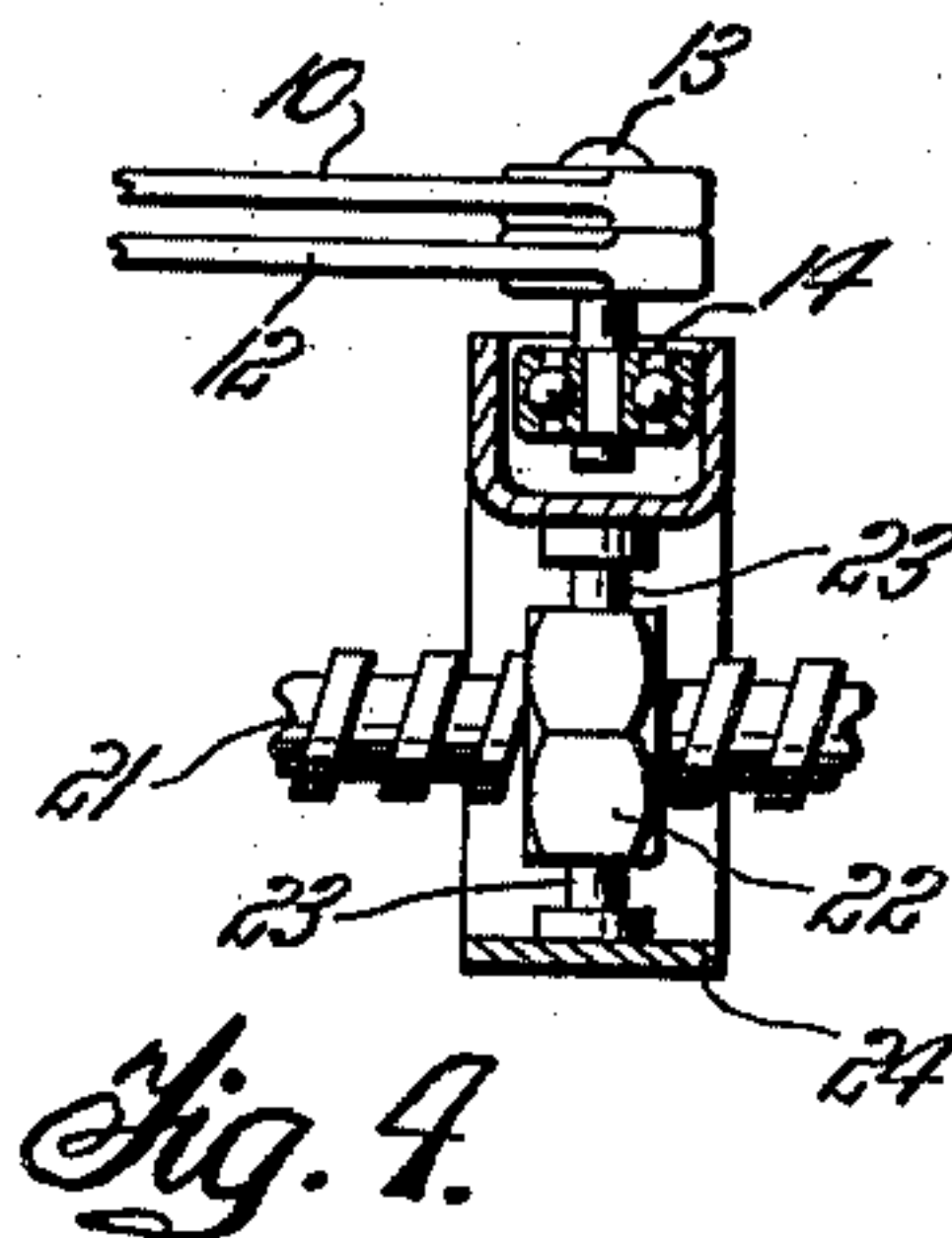
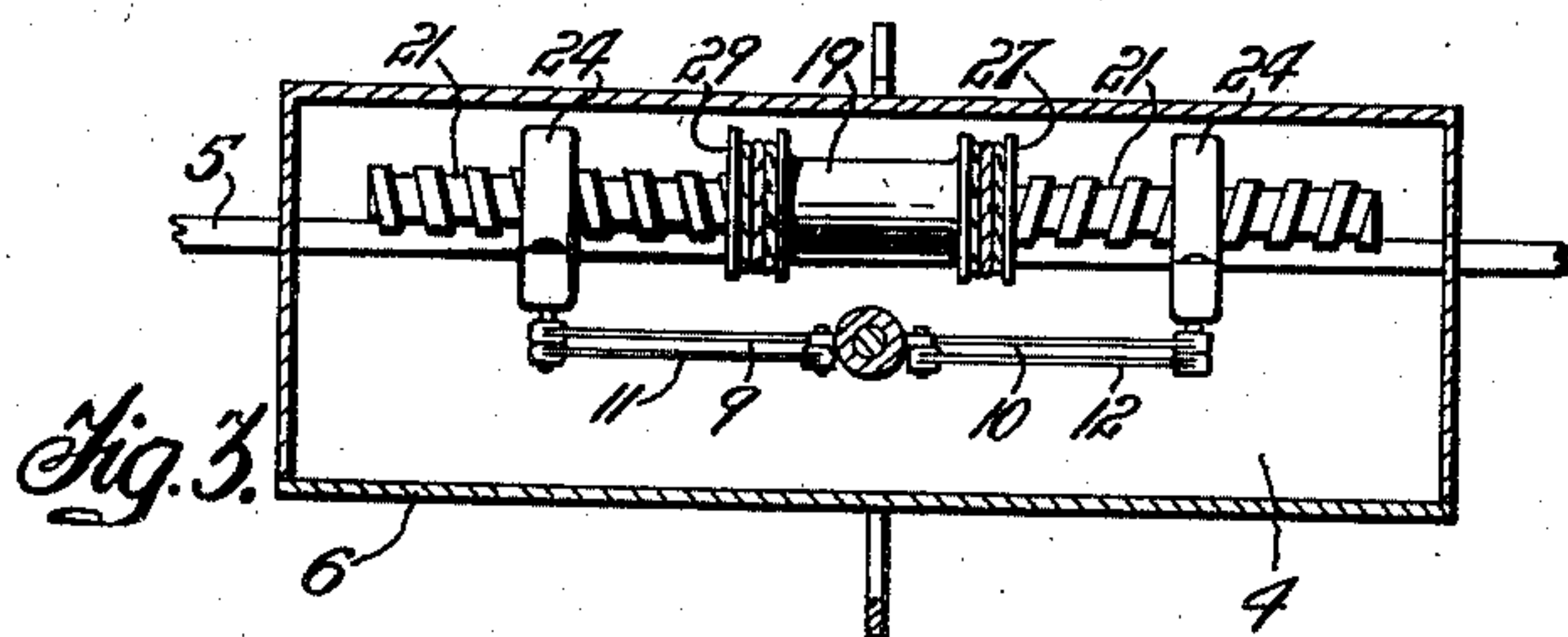
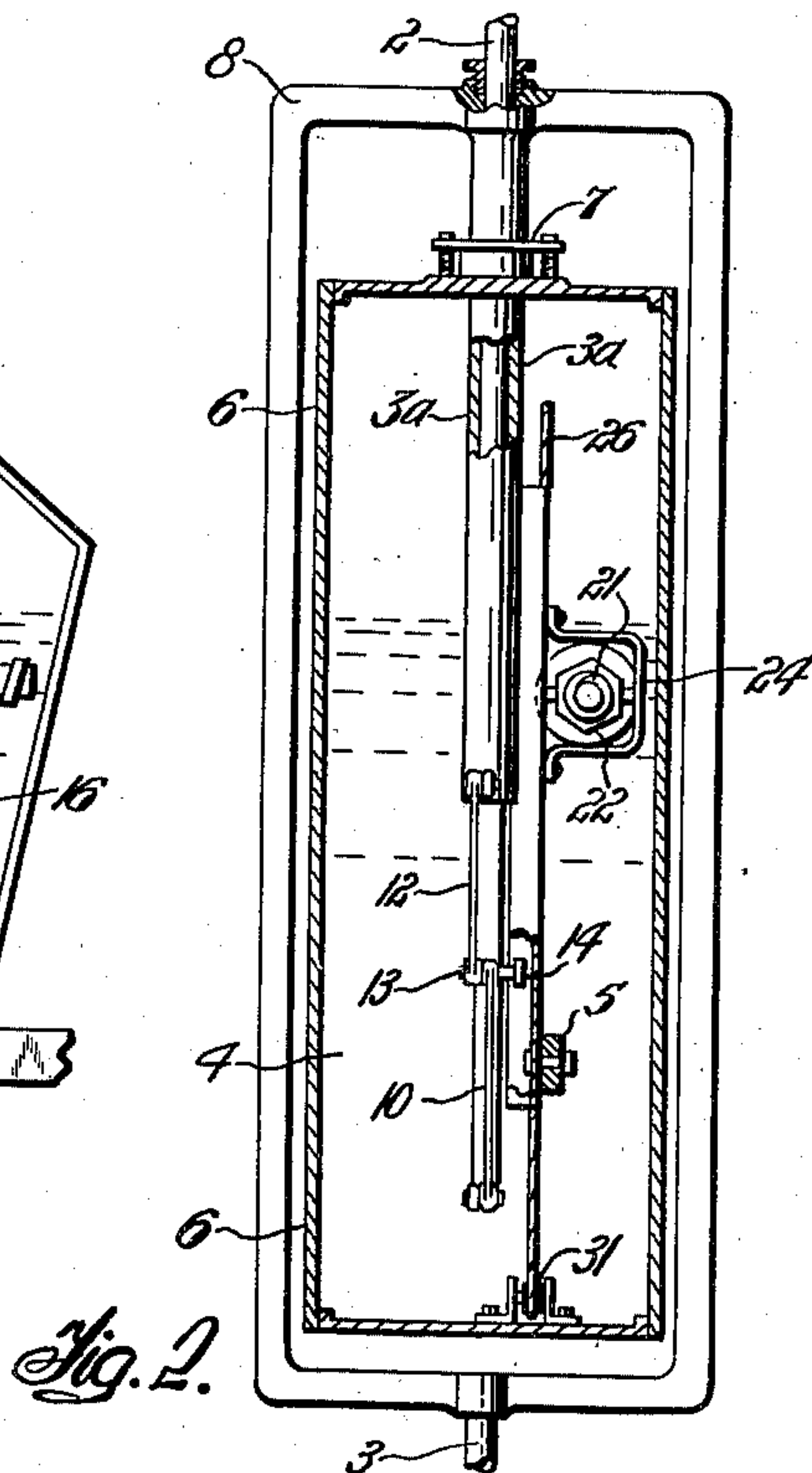
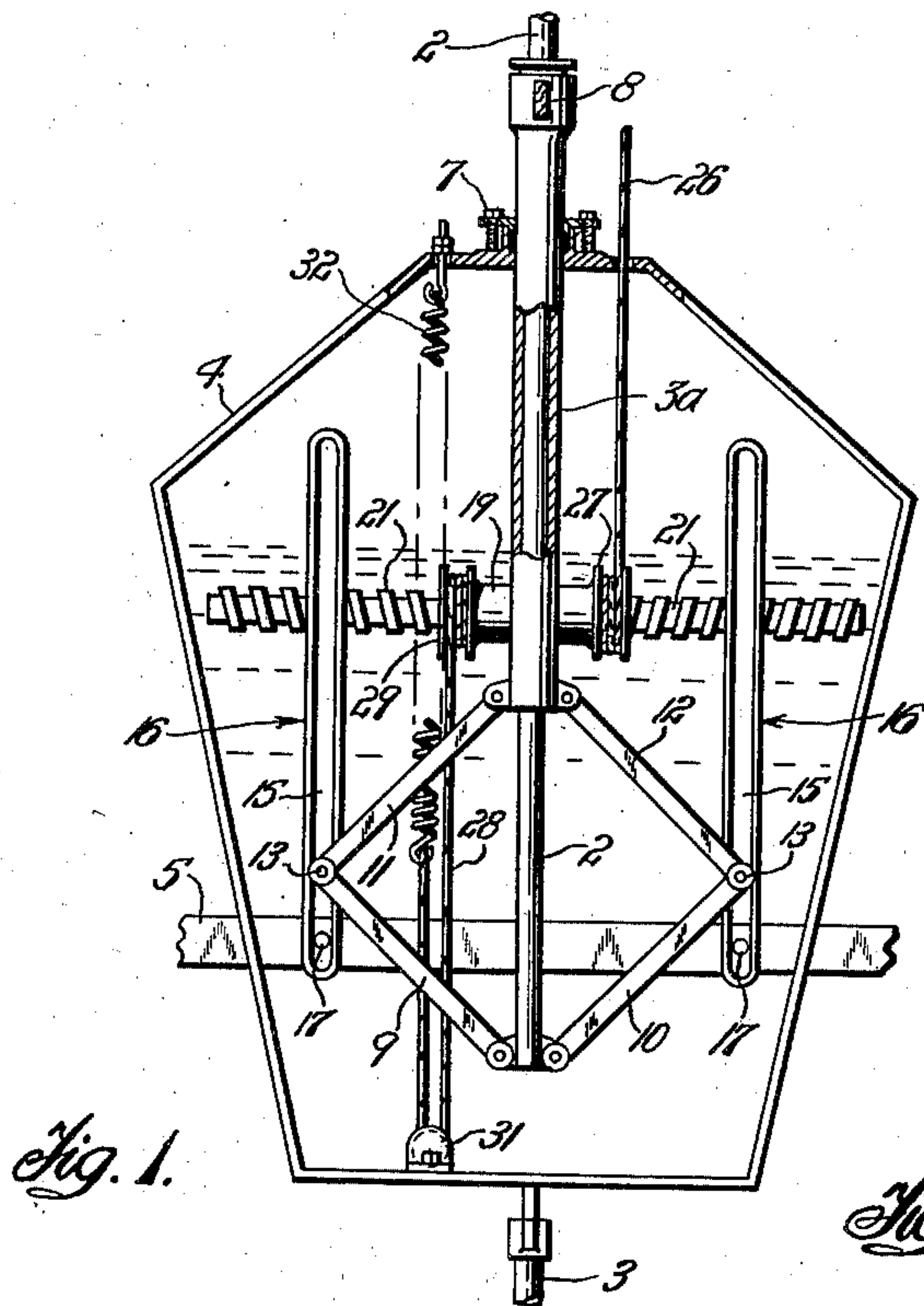
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2,123,374

APPARATUS FOR VARYING THE STROKE OF PUMP RODS AND THE LIKE

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## UNITED STATES PATENT OFFICE

2,123,374

APPARATUS FOR VARYING THE STROKE OF  
PUMP RODS AND THE LIKEErnest Francis Naismith McGauchie, Quarry Hill,  
Bendigo, Victoria, AustraliaApplication September 13, 1937, Serial No. 163,682  
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12 Claims. (Cl. 74—110)

This invention relates to apparatus for varying the stroke of pump rods or like reciprocating members, and is particularly concerned with, but not limited to, the pump rods of windmills.

5 In the specification of my prior application Serial No. 88,668 filed July 2, 1936, I have disclosed hydraulic or fluid operated means whereby the stroke of a pump rod or like reciprocating member may be variably increased as well as variably  
10 decreased beyond normal according to circumstances. The said specification also provides for the hydraulic or fluid operated means to be automatically controlled in accordance with variations in the power applied to the driving section  
15 of the pump rod or like reciprocating member, and points out that the apparatus functions in the manner of an automatic governor, and in addition to other advantages, prevents a windmill from "racing" by increasing the length of  
20 stroke of the pump rod without increasing the speed of the mill.

The present invention concerns a mechanical means, as distinct from an hydraulic or fluid operated means, that have been devised for varying the stroke of pump rod or like reciprocating  
25 members, and provides simple, inexpensive and efficient means for such purpose.

According to one embodiment of the present invention, the pump rod or like reciprocating  
30 member is divided into two sections, namely, a driving section and a driven section, and these two sections are connected respectively to a deformable parallelogram of links, while adjustable means are provided for deforming the parallelogram to thereby vary the length of stroke  
35 of the driven section in relation to that of the driving section.

In the case of applying the invention to windmills the adjustment of the parallelogram of  
40 links may be effected automatically in accordance with fluctuations in the velocity of the wind, whereby the pump will be operated at a stroke that will ensure the maximum amount of work being effected.

45 But in order that this invention may be better understood, reference will now be made to the accompanying drawing, which is to be taken as part of this specification and read herewith:—

50 Figure 1 is a part sectional front elevation showing a device in accordance with one embodiment of the invention, particularly applicable to the pump rods of windmills.

55 Figure 2 is a part sectional side elevation of Figure 1.

Figure 3 is a part sectional plan view of Figure 1.

Figure 4 is an enlarged detailed view showing portion of the adjusting means for the deformable parallelogram.

Figure 5 is a broken front view of a device according to a modification.

Figure 6 is a side elevation of a device for automatically controlling adjustment of the deformable parallelogram according to fluctuations in  
10 wind power.

In the drawing, the driving and driven sections of a windmill pump rod are indicated by the numerals 2 and 3 respectively. The driving section 2 may extend downwardly into a casing 4  
15 supported as by a cross bar 5 at some convenient position upon the mill tower, this casing accommodating certain parts hereinafter to be described and being, if so desired, charged with oil up to a suitable level, as indicated in Figures 1  
20 and 2. This casing may be normally closed by an oil-tight, dust-proof plate 6.

Preferably, the driven section of the pump rod, comprises a sleeve or tube 3a which freely encircles the driving section 2 within the casing 4,  
25 and extends through a gland or stuffing box 7 at the top of the casing. The upper part of this sleeve may be connected by a cross head or yoke 8, that extends outside the casing 4, to that portion  
30 of the driven section that extends downwardly to the pump.

According to the embodiments illustrated, the deformable parallelogram is furnished by four similar links 9, 10, 11 and 12, preferably of similar length, two of which, 9 and 10, are pivotally  
35 connected at their lower or inner ends to the lower end of the driving section of the pump rod. At their upper ends the two links 9 and 10 are pivotally connected to the two upper links 11 and 12 which in turn are pivoted at their upper or  
40 inner ends to the sleeve of the driven section of the pump rod.

Each of the pivot pins 13 that interconnect the upper and lower links may be extended, as indicated in Figure 4, and be fitted with a ball bearing or other anti-friction roller 14 adapted to  
45 track within a groove or channel 15 of an adjustable guide member 16, such for instance, as an arm of U-shape or like section which is pivoted as at 17 to the cross bar 5.

50 It will be evident that by adjusting the arms 16 about their pivots, the parallelogram of links will be deformed in such manner as to increase or reduce the stroke of the driven section of the pump rod in relation to the driving section.  
55



Various means may be provided for adjusting the pivoted arms 16. For example, according to Figures 1 to 4, the adjusting means includes a shaft or spindle 19 extending laterally of the arms 16 and having right and left hand screwed portions 21 that pass through the nut members 22 supported by swivel pins or trunnions 23 carried by the arms 16 and brackets 24 attached to the arms.

With the parts in the positions shown in Figure 1, wherein the arms 16 are parallel with the pump rod sections 2, 3, a 1:1 ratio will exist between the pump rod sections. If the arms 16 are moved outwardly about their pivots then the stroke of the driven section will be decreased. Conversely if the arms are moved inwardly the stroke of the driven section will be increased. It will therefore be evident that the stroke of the driven section depends upon the positions into which the arms 16 are adjusted, and also that infinite adjustment is obtainable by rotation of the spindle 19.

In order to rotate the spindle 19 to thereby adjust the arms 16 (and thus control the stroke of the driven section of the pump rod) according to fluctuations in wind power, a flexible line 26 leading from a wind-operated control device, as will be hereinafter referred to, may be attached to and coiled around a drum 27 on the screwed spindle 19. Another flexible line 28, (or a continuation of the first line) may extend from another drum 29 around a pulley 31 mounted within the casing 4 and be connected to a spring 32, or other device the function of which is to yieldingly maintain the mechanism in a minimum stroke position, i. e., a position in which the driven section will have a predetermined minimum stroke.

According to a modification illustrated in Figure 5, the screw spindle 19 and the associated nuts 22 may be replaced by a disc or like member 33 rotatably mounted within the casing 4 and having a spiral channel 34 engaged by ball bearing or other anti-friction rollers 36 carried by the arms 16, and co-operating with the channel at opposite sides of the centre of the disc. In this case, one or more flexible lines 26, 28, leading from the control device, as before referred to, may be provided to turn the disc and thus result in the arms being moved away from a minimum stroke position against the influence of a spring 32 or the like.

The aforesaid wind operated control device may take any suitable form, such for example, as described in my prior application Serial No. 88,668 filed 2nd July, 1936, with reference to Figures 6 and 7 or Figure 8 of the drawing thereof. Another suitable arrangement is indicated in Figure 6 of the accompanying drawing according to which the mill tower 37 has an outstanding arm or bracket 38 upon which a tube 39 is mounted with ability to swivel about a vertical axis. This tube carries at its upper end an arm or rod 41 provided with a tail or wind vane 42 the purpose of which is to keep a control vane 43 in the wind. This control vane is slidable lengthwise along rod 41. The aforesaid flexible line 26 may be attached to the control vane, pass around a guide pulley 44 and thence down the swivel tube 39 to the drum 27 on spindle 19 (Figures 1 to 4) or to the disc 33 (Figure 5) as the case may be.

Thus as the control vane 43 is forced outwardly by the wind along the rod 41 or returned by the spring 32, so the flexible line 26 transmits rotary motion to the spindle 19 or disc 33 thereby ad-

justing the pivoted arms 16 and setting the parallelogram of levers in a position to vary the stroke of the driven section of the pump rod.

Although it is preferred to employ a parallelogram of links as before mentioned it is within the purview of the invention to reduce the links to two. In such a case two links similar to those previously indicated by the numerals 9 and 11 (or alternatively 10 and 12) may be employed and operatively connected to the driving and driven sections of the pump rod, and an adjusting arm 16 as previously described. In order to absorb side thrusts the driving and driven sections of the pump rod may be provided at the side remote from the two links 9 and 11 with ball bearing or other rollers adapted to track along a vertical guide member. In such a case also the aforesaid spindle 19 will require only one screw portion to co-operate with the nut member of the single adjusting arm. This spindle would preferably be pivotally connected at its non-screwed end to the aforesaid vertical guide member.

Two links only, can also be used in the modification incorporating the rotary disc with the spiral channel as shown in Figure 5.

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

1. Apparatus for varying the stroke of pump rods or like reciprocating members having driving and driven sections, comprising a deformable parallelogram of links connected at or near two opposite corners to said driving and driven sections respectively, and adjustable means connected to said links for deforming said parallelogram whereby the length of the stroke of the driven section may be varied in relation to that of the driving section.

2. Apparatus for varying the stroke of wind-mill pump rods having driving and driven sections, comprising a deformable parallelogram of links, two of said links being pivotally connected at their lower ends to the lower end of the driving section and pivotally connected at their upper ends to the other two links, which are in turn pivoted at their upper ends to a sleeve, said sleeve freely encircling said driving section and being connected to the upper end of said driven section, and adjustable means connected to said links for deforming said parallelogram whereby the length of stroke of the driven section may be varied in relation to that of the driving section.

3. Apparatus according to claim 1 wherein said parallelogram of links is connected at or near its other two corners to adjusting members by movement of which the parallelogram is deformed.

4. Apparatus for varying the stroke of pump rods or like reciprocating members having driving and driven sections, comprising a deformable parallelogram of links connected at or near two opposite corners to said driving and driven sections respectively, and a pair of pivoted adjusting arms connected to said parallelogram or at adjacent the other two opposite corners thereof in such manner as to permit said corners of the parallelogram to slide along said arms, means being provided to adjust said arms about their pivots.

5. Apparatus according to claim 4 wherein said arms are provided with longitudinally extending grooves forming guideways for rollers that are mounted about pivotal axes of the respective opposite corners of the parallelogram.

6. Apparatus according to claim 4 in combina-



tion with screw and nut gear for adjusting said arms about their pivots.

5 7. Apparatus for varying the stroke of pump rods or like reciprocating members having driving and driven sections, comprising a deformable parallelogram of links connected at or near two opposite corners to said driving and driven sections respectively, a pair of adjusting arms connected to said parallelogram or at adjacent 10 the other two opposite corners thereof in such manner as to permit said corners of the parallelogram to slide along said arms, and screw and nut gear for adjusting said arms about their pivots comprising a rotary spindle extending laterally 15 of said arms and provided with right and left hand screw portions which extend respectively through nut members carried by the pivoted arms.

20 8. Apparatus according to claim 7 wherein each said nut member is mounted upon its arm with ability to swivel about an axis extending transversely of said screw spindle.

25 9. Apparatus for varying the stroke of pump rods or like reciprocating members having driving and driven sections, comprising a deformable parallelogram of links connected at or near two opposite corners to said driving and driven sections respectively, a pair of pivoted adjusting arms connected to said parallelogram or at ad-

5 adjacent other two opposite corners thereof in such manner as to permit said corners of the parallelogram to slide along said arms, and means for adjusting said arms about their pivots, comprising a rotary disc provided with a helical guide 5 co-operating at opposite sides of the centre of the disc with said arms whereby upon turning of the disc said arms are moved about their pivots.

10 10. Apparatus according to claim 9 wherein said guide takes the form of a helical channel and wherein each pivoted arm carries a roller adapted to track along said channel.

11. Apparatus for varying the stroke of pump rods or like reciprocating members having driving and driven sections, comprising two pivotally 15 interconnected links connected at opposite ends to said driving and driven sections respectively, and adjustable means operatively related to said links to vary their angular relationship whereby the length of stroke of the driven section may be 20 varied in relation to that of the driving section.

12. Apparatus according to claim 11, wherein said adjustable means comprises a pivoted arm and means pivotally and slidably connecting the 25 arms and links adjacent their point of interconnection, whereby to permit slidable movement of the links lengthwise along said arm.

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