Oct. 11, 1927. 1,644,913

L. P. BURGESS ET AL

ROTATOR

Filed Jan. 19, 1924 3 Sheets-Sheet 1

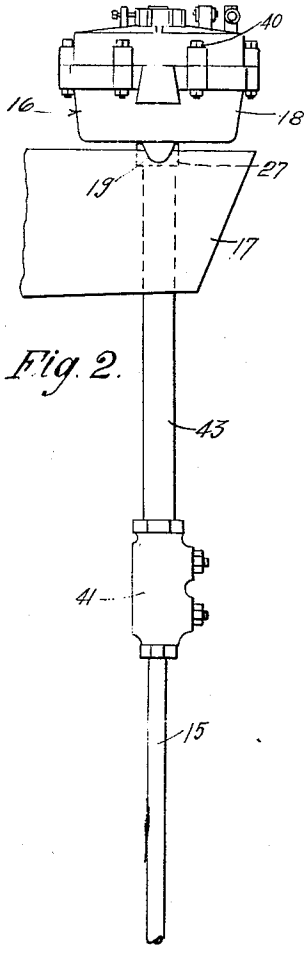
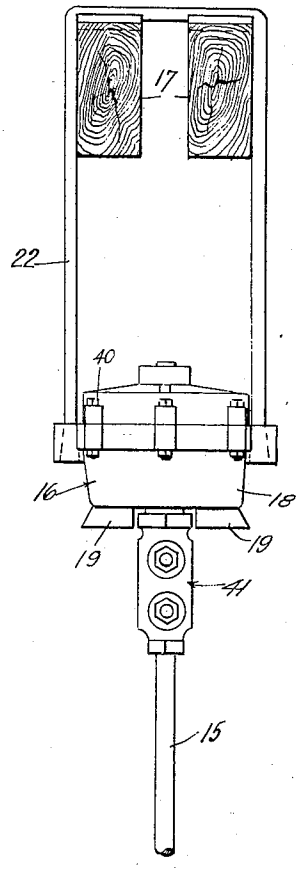


Fig. 2.

Fig. 3.



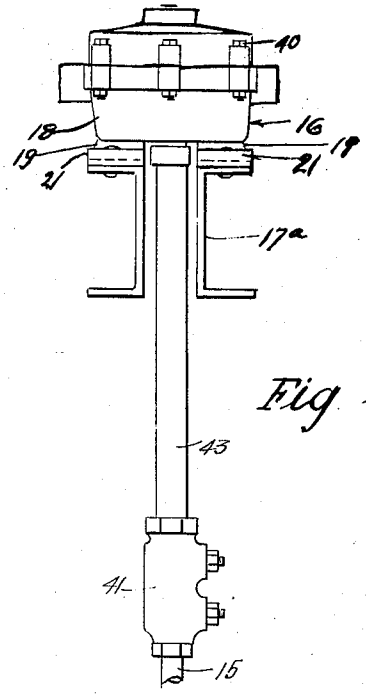


Fig. 4.

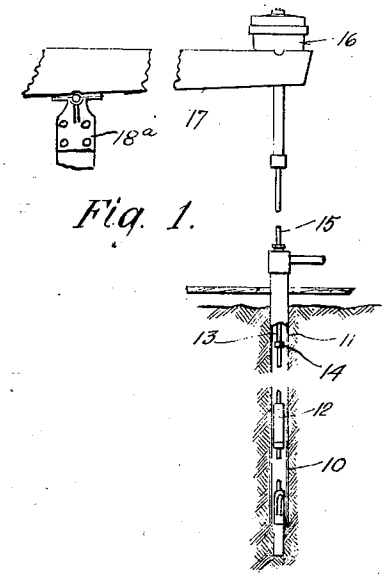


Fig. 1.

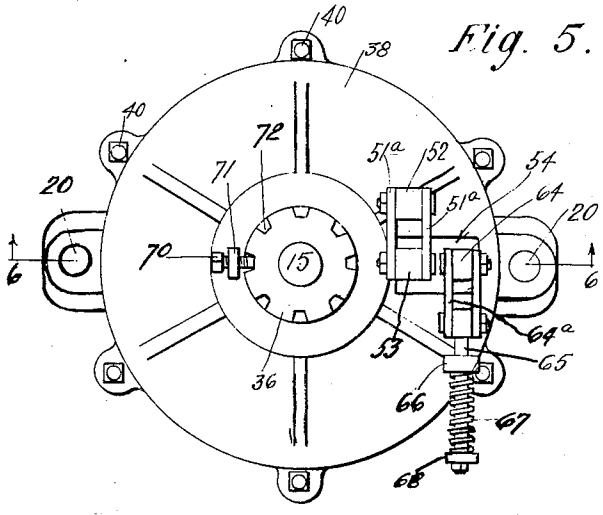


Fig. 5.

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ROTATOR

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Fig. 6.

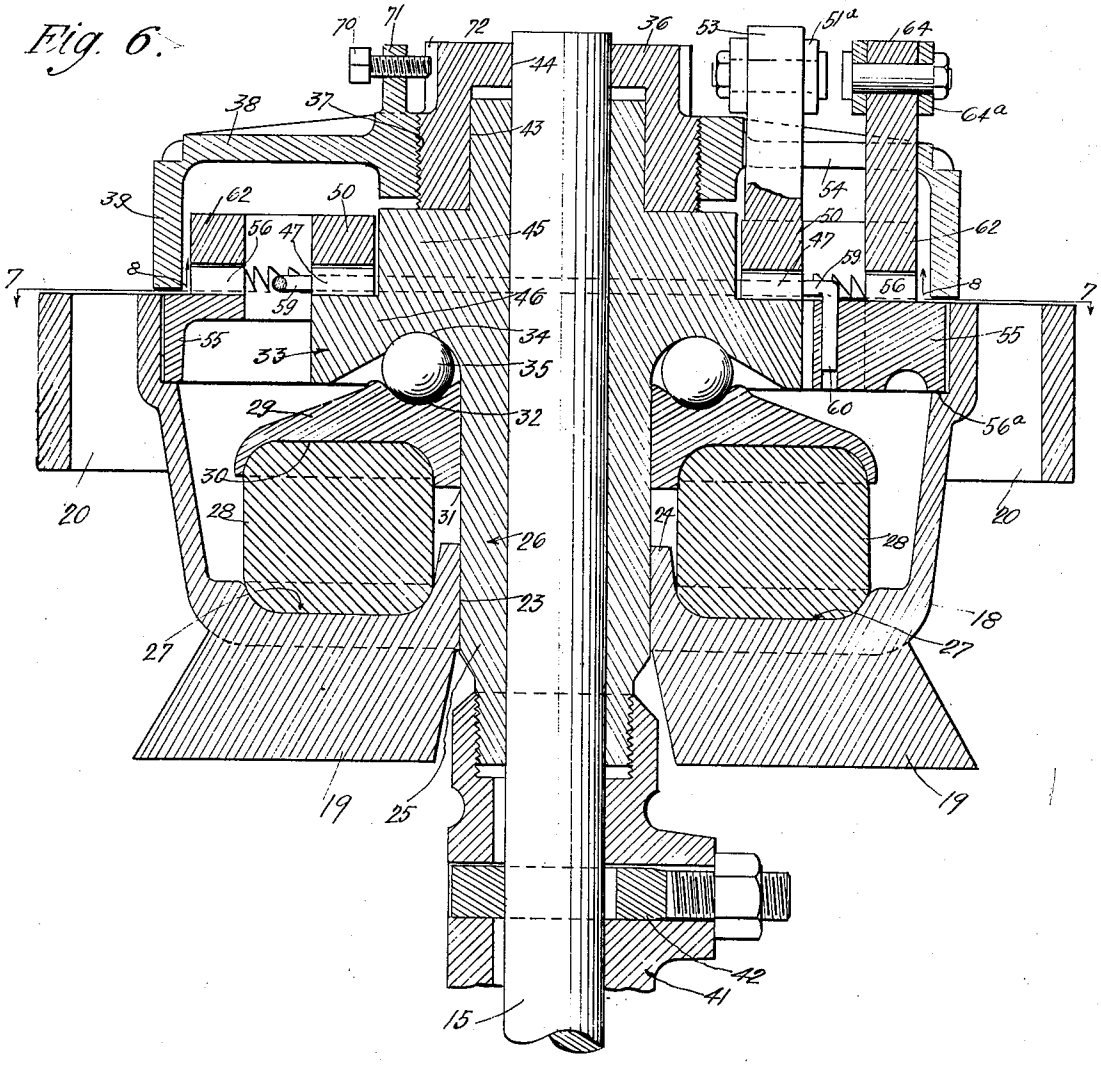


Fig. 10.

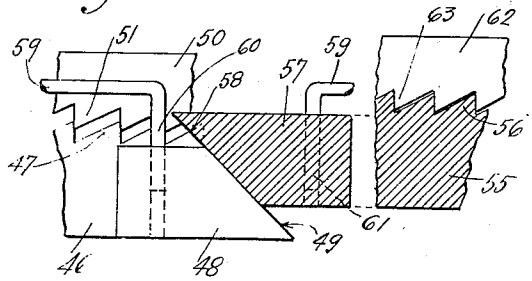
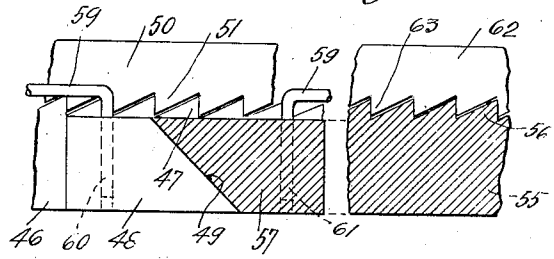


Fig. 9.



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ROTATOR

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Fig. 7.

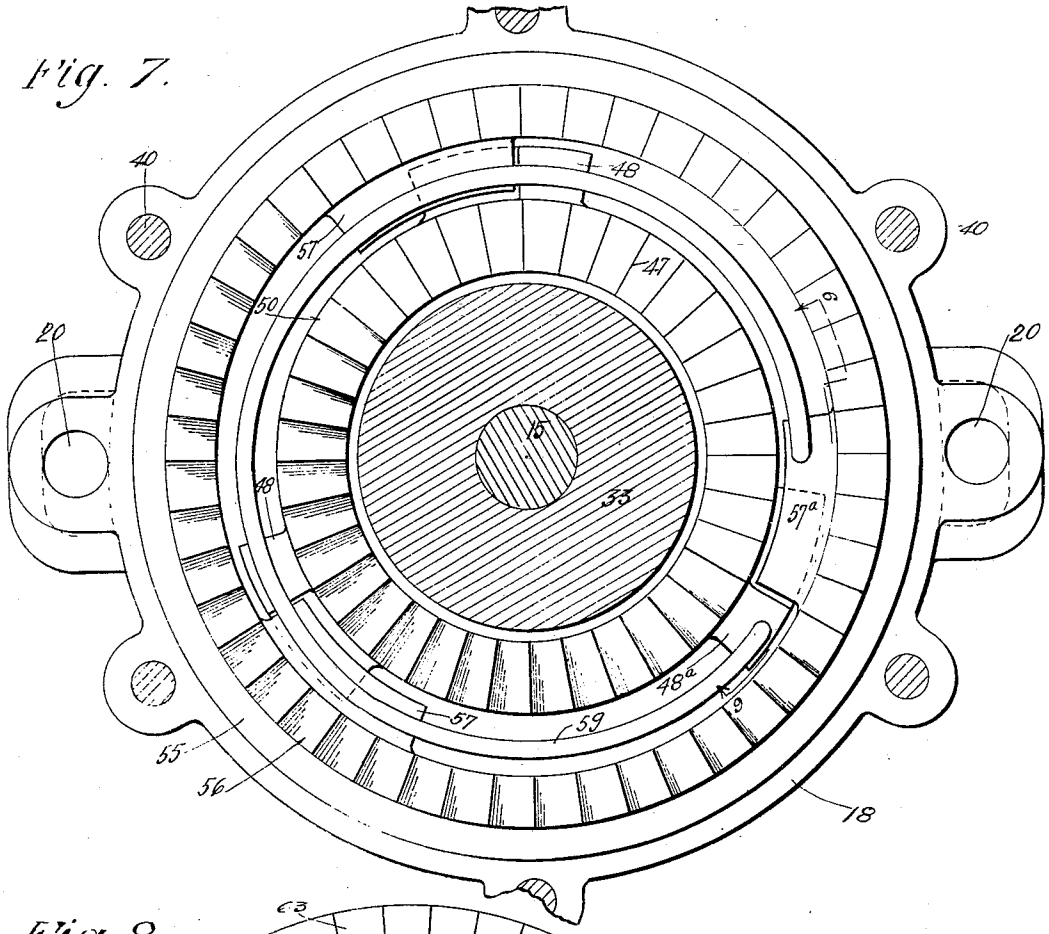
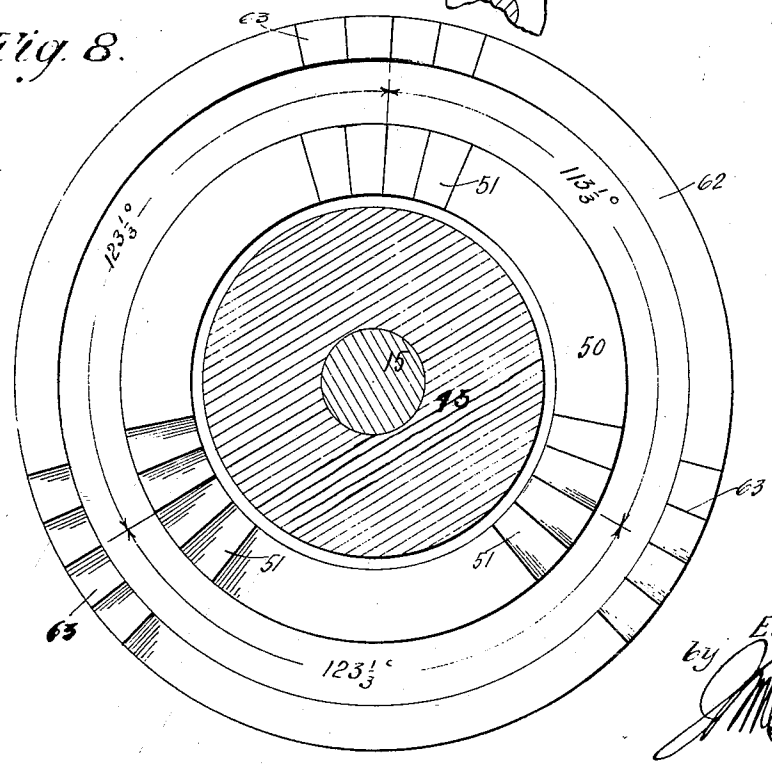


Fig. 8.



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Patented Oct. 11, 1927. 1,644,913

UNITED STATES PATENT OFFICE.

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ROTATOR.

Application filed January 19, 1924. Serial No. 687,279.

This invention has to do generally with rotators and more particularly with rotators used in connection with mechanisms where the reciprocating motion of a given member is to be accompanied by a partial rotation thereof.

As will be fully explained in the body of the specification, in our device the rotation of such a member is accomplished by the differential loading of the member during its reciprocation; or in consequence of its inertia when subjected to sudden, positive acceleration or to a change in its direction of longitudinal movement.

The device may be used in many and various situations, and while it may be applied with advantage to either a vertically or horizontally reciprocating member, it has certain distinctive features which render it particularly well adapted to rotate the vertically reciprocating rods and plungers of deep well pumps. For the purpose of more definitely describing the invention and pointing out the novel features and advantages of a physical embodiment thereof, we have illustrated and will describe the invention as applied to this latter use, but the drawings and description are to be considered merely as illustrative of and not restrictive on the invention.

It is well recognized by those skilled in the art that pump plungers and sucker rods, which extend from said plungers to the reciprocating mechanism above, should be rotated periodically. Hence there is no need of here setting forth a full discussion of why such movement is desired, except to briefly state that it assures equal distribution of wear on pump plungers and working barrels, eliminates the danger of the plunger and barrel from becoming scored by foreign matter, prevents sucker rods from becoming unscrewed, reduces the likelihood of the pump "sanding up," and gives both plunger and sucker rod, where the latter pass through the upper stuffing box, the characteristics of "self-cleaning" devices by preventing the accumulation of foreign matter thereon. It will be seen that by reason of these accomplishments an efficient rotating mechanism has great economic value in that it greatly reduces the cost of upkeep, the labor and expense of repair, and the loss of production which is attendant upon such repair.

As far as we are aware, all prior rotators depend upon the variable angularity between walking beams and sucker rods for accomplishing the rotation of said rods, the rotary movement being transmitted to the rods through ratchet and pawl systems. As distinguished from such a method, we provide means whereby the rods have relative longitudinal movement with respect to walking beams, and it is by this relative movement that we accomplish the desired rod rotation.

Briefly described, the device comprises a rotor clamped to the polish rod and rotatably supported on top an intermediate resilient member carried on or suspended from the beam, and it is through the flexure of this member (caused by differential loading or the inertia of the rods) that the relative longitudinal movement between rod and beam is accomplished. Through a novel arrangement of cams on the rotor and rotor supporting member, this longitudinal movement imparts rotary movement to the rods. The angular extent of rotation is controlled by changing the stroke of longitudinal movement, which, in turn, may be accomplished by varying the resiliency of the intermediate member or by adjustment which varies the extent of said member's flexure.

The longitudinal movement of the rods in one direction is caused by the inertia of the plunger and rods or the imposition of added weight thereon (occurring at the start of the upstroke) at which time the resilient member is compressed; while the movement in the opposite direction is caused by expansion of the resilient member as the rods are relieved from this added weight or after their starting inertia is overcome (occurring, in main, at the end of the up stroke).

However, the actual rotation of the rod occurs only during the expansion of the resilient member, such expansion taking place, in main, when the added load is released from the rods, a feature of great advantage since it reduces the wear and strains on the rotator, as well as reducing the tortional stresses and strains on the rods and plunger. Since the load is at a minimum during periods of rod rotation, little or no

lubrication is required at points where relative rotary movement occurs. The resilient member also acts as a shock absorber when the plunger changes motion at the start of its up stroke.

The rotator, as a whole, rests on or is suspended from the walking beam, but is not rigid therewith, so in the event the plunger becomes "sanded in" and resists further reciprocation, the beam may continue in its reciprocation without causing damage to the rotator, rods or plungers, for the rotator remains suspended on top the polish rod, and will be clear of the beam except when the latter is at the upper limit of its stroke.

Should the resistance of the plunger to rotary movement exceed a predetermined value, we provide means whereby the reciprocation of the rods may continue without a coincident rotation thereof, lost motion then occurring between certain cam elements of the device.

The weight of the rotator as directed on the rods is sufficient to aid in thrusting them through their down stroke, thus eliminating the necessity of an "adjuster board," although the rotator weight is not sufficient to cause excess pressure on the rods when pumping low gravity oils.

While the device is not complicated in construction, it is certain and positive of operation, and may be installed with ease. It is entirely self contained and has no operating connection to the beam or other part of the reciprocating mechanism which requires loosening or detachment when the rods are pulled from the well.

Other features of novelty and objects of the invention will be set forth in the following detailed description, in which

Figure 1 is a diagrammatic view, in fragmentary and contracted elevation, of an oil well pump with our device attached thereto.

Fig. 2 shows our rotator mounted directly on the end of a walking beam.

Fig. 3 shows our rotator suspended from a walking beam by cables, the beam being shown in end elevation.

Fig. 4 shows the rotator mounted on the end of a "jack" which is adapted to be operated by "cribs" or other connections from a pumping well.

Fig. 5 is a top plan view of our rotator.

Fig. 6 is an enlarged vertical section on line 6—6 of Figure 5.

Fig. 7 is a horizontal section on line 7—7 of Fig. 6.

Fig. 8 is a section on line 8—8 of Figure 6, as viewed from below.

Fig. 9 is a fragmentary view partially in section, as viewed from the line 9—9 of Figure 7; and

Fig. 10 is a view similar to Figure 9 but showing certain of the parts in changed relative position.

In Figure 1 is shown a pump barrel 10 at the lower end of tubing 11, the pump plunger 12 in barrel 10 being adapted to be reciprocated through the medium of sucker rods 13 which are coupled by threaded joints 14. The uppermost rod 15, commonly known as a "polish rod", has connection through rotator 16 with the reciprocating member 17 which, in Figures 1 and 2, comprises a walking beam, and in Figure 4 comprises a "jack" 17^a. Beam 17 is fulcrumed on Samson post 18^a, and is reciprocated through any of the well known crank means (not shown), while jack 17^a is adapted to be reciprocated by any suitable connection (not shown) with a pumping well.

In order that rotator 15 may be capable of attachment to the walking beam in a variety of manners or to beams of varying design, supporting member 18, which is of the general configuration of a bowl, has diametrically opposed rockers 19 on its lower face, and diametrically opposed eyes 20 on its outer periphery. Thus the rotator may be mounted on beams 17 or 17^a so rockers 19 cradle in channeled bed plates 21, or may be suspended by stirrups or cables 22 which depend from the beams, the ends of the cable passing through eyes 20 and there secured, for instance, by being "leaded in". The flexible nature of either of these types of connection accommodates the relative angular movement between beam and rotator during periods of pump operation.

Member 18 has a central opening 23 defined by a marginal, annular flange 24, which flange provides bearing for the tubular spindle 25 of rotor 26. The inner, bottom face of member 18 is cupped at 27 to receive and position a resilient member 28, which, in the present instance, is a rubber ring, though springs may be substituted for the ring without departing from the scope of certain of our claims.

Resting on ring 26 is a load washer 29, cupped at 30 to receive the ring and having a central aperture 31 through which spindle 25 extends and has bearing. The upper face of washer 29 has a ball race 32, while the lower face of the annular rotor head 33 has a complementary ball race 34; balls 35 completing the ball bearing between head 33 and washer 29. Rotor 26 is held from separative movement with respect to washer 29 by adjustment nut 36 which is threaded into the central aperture 37 of cap 38, the annular flanges 39 of the latter being adapted to rest on the upwardly extending flanges of the bowl or supporting member 18. Bolts 40 (Figures 2 and 5) hold the cap and bowl in assembly.

Rotor 26 is positively connected to polish rod 15, the connection being of any suitable type. For instance, the lower end of spindle 25 is threaded into clamp or grip 41 (see

Figures 3 and 6) which, in turn, is rigidly clamped to rod 15 by any of the well known means such as wedge plug 42. In certain installations, especially where the rod extends through the forked end of a walking beam, a sleeve 43 about the rod may connect the clamp and rotor (see Figures 2 and 4). The same effect may be gained by pinning the rotor to the polish rod, although the clamp method of attachment is preferable in that it does not mutilate the rod and does provide a range of adjustment.

It will be seen from a consideration of the above assembly that the forces set up by the weight of the rod are transmitted to the walking beam through rotor 26, washer 29, ring 28, and supporting member 18. When the rotator is in operative condition, ring 28 is, of course, in a state of partial compression.

Now the addition of weight to the rod, such as occurs when the plunger starts its up stroke and takes on a load of oil, causes the further compression of ring 28, or, in effect, the supporting member initially moves upwardly more rapidly than does the rod and its attached rotor. Thus relative longitudinal movement between supporting member and rotor and hence between beam and rod, is set up. When the rods are relieved of their additional load, as occurs at the end of the up, or delivery stroke, ring 28 flexes, due to its inherent resilient qualities, and moves rotor 33 and hence rod 15 upwardly with respect to the supporting member, thus completing a reciprocation of the rod with respect to the beam. It is this relative longitudinal movement between rod and beam which we utilize to secure the periodic rotation of rod 15.

Before going further into the rotating mechanism, we wish to call attention to the fact that relative longitudinal movement between rods and beam may also be set up by reason of the rod's inertia, either when the direction of rod movement is reversed at the end of a stroke or when the rod is suddenly accelerated during the up-stroke. Furthermore, ring 28 serves as a shock absorber when the direction of rod movement is reversed at the end of the down stroke.

Rotor spindle 25 is continued above head 33 and has bearing in bore 43 of adjustment nut 36, while the upper extremity of rod 15 is adapted to slide through the restricted bore 34 of said nut. Head 33, the top of which is adapted to coact with nut 36 for stroke adjustment purposes, comprises an upper and lower annulus 45 and 46, respectively. The upper face of annulus 46 is provided with serrations or teeth 47 and its peripheral face is provided with a plurality of cam lugs 48 having cam inclines 49. About annulus 45 is a rotor stop ring 50 having toothed segments 51 adapted to engage teeth 47. A particular and preferred arrangement of segments 51 will be discussed later. Stop ring 50 is capable of vertical movement within cap 38 but is held from rotary movement by link 51^a which connects cap stud 52 and ring stud 53, the latter projecting upwardly through the cap aperture 54.

Concentric with and in the horizontal plane of annulus 46 but spaced apart therefrom, is a follower ring or cam member 55 which rides on the annular shoulder 56^a of member 18. Flanges 39 of cap 38 overhang ring 55 and prevent separative longitudinal movement between member 18 and ring 55. Ring 55 has teeth 56 on its upper face, and is provided with internal cam lugs 57, the latter having inclined cam faces 58 complementary to and adapted to coact with cam faces 49 of rotor cams 48. A "horse-shoe" spring 59 has depending extremities 60 and 61 which extend through suitable receiving apertures in one of the rotor cam lugs 48^a and one of the follower cam lugs 57, respectively. Spring 59 has an inherent closing tendency, so it continuously exerts a yieldable effort to draw the follower cams into engagement with the rotor cams. Thus, as the rotor is moved in a manner to be presently described, spring 59 yieldably draws the follower after it, and maintains the complementary cams in engagement.

A follower stop or ring 62 has toothed segments 63 which rest on and coact with the follower teeth 56. A stud 64 extends upwardly from follower stop 62 and through cap aperture 54, it being joined by link 64^a to pin 65, this pin being slidably mounted in cap stud 66. A spring 67 on pin 65 between stud 66 and nut 68, forms a yieldable connection between ring 62 and cap 38 and normally prevents relative rotation therebetween, although it allows limited rotation under certain circumstances, as will be later set forth.

For the sake of brevity, we will confine the following description of the operation of the rotator to the instance where relative longitudinal movement between beam and rods is set up by the differential loading of the rods during their reciprocation. During the down stroke of the pump, all parts of the mechanism are approximately in the relative position illustrated in the various figures of the drawings, excepting Figure 10.

When the additional load is placed on the rods as the pump starts its up stroke, ring 28 is further compressed and relative longitudinal movement between rotor 26 and supporting member 18 is set up. For the purpose of better pointing out the action of the device, we may assume that the movement of rotor 26 is downward with respect to member 18 during the period of such relative movement. As the rotor descends, rotor stop

ring 50 moves with it, or at least descends sufficiently to maintain teeth 51 and 47 in partial mesh so counter-clockwise movement (as viewed in Figure 7) or "backing up" of the rotor is prevented. At the same time (that is, during one stage of relative longitudinal movement between rotor and supporting member) follower spring 59 causes follower ring 55 to move in a clockwise direction so it assumes the position of Figure 10, cams 48 and 57 being held continuously in sliding engagement, and the follower stop ring 62 ratcheting over follower teeth 56, said ring alternately rising and dropping during such ratcheting. The parts remain in the position of Figure 10 until the load on the rods is reduced by the delivery of oil (disregarding, in this illustrative example, the matter of acceleration or change of motion of the rod) whereupon ring 28 flexes and raises the rods and rotor with respect to the supporting member. Since the interengagement of teeth 63 and 56 normally prevent the counter-clockwise rotation or "backing up" of follower ring 55, rotor 26 is revolved in a clockwise direction (as viewed in Figure 7) by the coaction of cams 48 with cams 57, spring 59 yielding to allow the relative rotary movement between the rotor and follower, it being evident that this rotation due to cam coaction occurs during another stage of relative longitudinal movement between rotor and supporting member. During such rotation, rotor stop ring 50 ratchets over rotor teeth 27, and subsequently holds the rotor against counter-clockwise movement, said ring alternately rising and dropping the period of rotation.

Since the rotation of rotor 26 and polish rod 15 is in a clockwise direction as viewed from the top thereof, the threaded joints between sucker rods are tightened as a consequence, an obvious advantage.

Should the force necessary to rotate the rods and plunger exceed a certain amount, as determined by the tension and adjustment of spring 67 through manipulation of nut 68 (Figure 5), cams 57 (and hence rings 55 and 62) are "backed up" by rotor cams 48, springs 59 and 67 yielding to allow this movement. Damage to the rotator and rods is thereby avoided, though the rods and rotor may still continue in their reciprocation. Should reciprocation of the plunger and rods be resisted to a dangerous degree, the rods and rotor remain stationary while the beam reciprocates idly. In such an event, where the rotator is mounted as in Figures 2 and 4, the beam reciprocates idly beneath the rotator, while in the installation of Figure 3, the beam reciprocates idly above the rotator, the rotator being spaced below the beam a sufficient distance to allow such idle reciprocation without interference.

By adjustment of nut 36, the extent of longitudinal movement of the rotor with respect to the supporting member may be regulated, for such adjustment fixes the allowable extent of flexure of ring 28. By thus regulating the length of stroke, the angular extent of rod rotation during each reciprocation thereof, may be varied and regulated. Nut 36 is held in adjusted position by set screw 70 threaded through cap bracket 71 and adapted to engage notches 72 on the periphery of the nut.

By reason of the fact that rod rotation occurs only during periods when the load on and resistance of the rods to reciprocating are diminishing or at a minimum, wear and strain on the rotator, rods and plunger is reduced to a minimum, and there is little or no need of providing lubrication between the rotor and load washer.

In Figure 8 we have illustrated a preferred method of arranging the locking segments on stop rings 50 and 62. Since both rings are of similar construction, but one need be described in detail. The teeth in the various segments of a single ring are of equal pitch, but the groups of teeth are so spaced that the angular distance between pitch radii extended to similar points in the several segments is other than an even multiple of the circular pitch of said teeth. To cite an example, and assuming that the segments of a given ring are of equal angular extent, the angular distance between pitch radii drawn to the centers of the segments are unequal. Thus, in Figure 8, the circular pitch of the teeth being 10°, we have shown the segments as being spaced apart 123⅓°, 123⅓° and 113⅓°. Only one segment is in operative engagement with the ratchet teeth of its companion rotating member at any one time.

By this relative arrangement of segments, or rather of teeth in the several segments, an operative engagement between rotating members and their respective locking rings may be obtained with less relative rotation than would be possible if all the segment teeth were spaced in the manner usual to gear segments. Thus we secure the advantageous effects of a relatively small pitch ratchet wheel, as far as the extent of relative movement necessary to obtain proper interengagement is concerned, and yet have the advantage of the sizeable, strong teeth of a relatively large pitch ratchet wheel.

It will be noted that the rotator is entirely self-contained and may be installed and placed in operative condition with very little labor. The elimination of operating links, rods, etc., between rotator and beam is a feature of great value, for it obviates the necessity of loosening or detaching any such member when the rods are pulled from the tubing, as well as eliminating the danger incident to the exposure of working parts.

We have not attempted to discuss exhaustively all the advantageous results obtained by the use of our device, but we believe we have set forth a sufficient number of points to clearly indicate the superior quality of our rotator. While we have shown and described a preferred embodiment of the invention, we do not wish to be limited thereto except for such limitations as a fair interpretation of the appended claims may import.

We claim:

1. In combination, a reciprocating mechanism, a member adapted to be reciprocated, means operatively connecting the mechanism and member whereby said member is reciprocated by operation of the mechanism, said connective means including two parts adapted to have relative rotative and longitudinal movement, a resilient member between the parts and adapted to yield and thereby allow relative longitudinal movement of the parts in given directions and subsequently, by virtue of its resiliency, to move the parts relatively and in opposite directions; and a drive connection between said parts and operable by virtue of their relative longitudinal movement to cause rotation of the parts in given relative directions, only.

2. In combination, a reciprocating mechanism, a member adapted to be reciprocated, means operatively connecting the mechanism and member whereby said member is reciprocated by operation of the mechanism, said connective means including two parts adapted to have relative rotative and longitudinal movement, a resilient member between the parts and adapted to yield and thereby allow relative longitudinal movement of the parts in given directions and subsequently, by virtue of its resiliency, move the parts relatively and in opposite directions; and a yieldable drive connection between said parts and operable by virtue of their relative longitudinal movement to cause rotation of the parts in given relative directions, only, said yieldable connection being adapted to yield and allow relative longitudinal movement of the parts without accompanying relative rotation thereof, when the force necessary to cause such rotation exceeds a predetermined amount.

3. In combination, a reciprocating mechanism, a member adapted to be reciprocated, means operatively connecting the mechanism and member whereby said member is reciprocated by operation of the mechanism, said connective means including two parts adapted to have relative rotative and longitudinal movement, a resilient member between the parts and adapted to yield and thereby allow relative longitudinal movement of the parts in given directions and subsequently, by virtue of its resiliency, to move the parts relatively and in opposite directions; means adapted to hold the parts against relative rotation in given directions, and a drive connection between said parts and operable by virtue of their relative longitudinal movement to cause relative rotation of the parts in opposite directions.

4. In combination, a walking beam, means for oscillating the walking beam, a supporting member on the beam, a polish rod, means connecting said member and rod in a manner whereby they are capable of rotation in given relative directions, only, and whereby oscillation of the beam reciprocates the rod, the resistance of the rod to reciprocation being variable; said connecting means including a resilient element adapted to yield, when resistance of the rod increases, and thereby allow relative vertical movement of the member and rod in given directions, the element being further adapted to move the member and rod relatively and in opposite directions when the resistance of the rod subsequently decreases, and means operatively connecting said member and rod and operable by virtue of said relative movement to cause rotation of said rod with respect to said member.

5. In combination, a walking beam, means for oscillating the walking beam, a supporting member on the beam, a polish rod, means connecting said member and rod in a manner whereby they are capable of rotation in given relative directions, only, and whereby oscillation of the beam reciprocates the rod, the resistance of the rod to reciprocation being variable; said connecting means including a resilient element adapted to yield, when resistance of the rod increases, and thereby allow relative vertical movement of the member and rod in given directions, the element being further adapted to move the member and rod relatively and in opposite directions when the resistance of the rod subsequently decreases; adjustable means for regulating the allowable extent of relative longitudinal movement between the member and rod, and means operatively connecting said member and rod and operable by virtue of said relative movement to cause rotation of said rod with respect to said member.

6. In combination, a reciprocating mechanism, a member adapted to be reciprocated, means operatively connecting the mechanism and member whereby said member is reciprocated by operation of the mechanism, said connective means including two parts adapted to have relative rotative and longitudinal movement, a resilient member between the parts and adapted to yield and thereby allow relative longitudinal movement of the parts in given directions and subsequently, by virtue of its resiliency to move the parts relatively and in opposite directions; and a yieldable and adjustable

drive connection between said parts and operable by virtue of their relative longitudinal movement to cause rotation of the parts in given relative directions, only.

7. In a device of the character described, a supporting member, a resilient member supported by the supporting member, a rotor supported on the resilient member and movable both rotatably and logitudinally with respect to the supporting member, said resilient member yieldably resisting longitudinal movement of the rotor in one direction, a cam on the rotor, and a cam supported by the supporting member, one of said cams having a face extending angularly with respect to the axis of rotation of the rotor, said cams being so relatively arranged that the other cams engages said angular face during longitudinal movement of the rotor in the other direction and thereby sets up rotation of the rotor with respect to the supporting member.

8. In a device of the character described, a supporting member, a resilient member supported by the supporting member, a rotor supported on the resilient member and movable both rotatably and longitudinally with respect to the supporting member, a stop member holding the rotor against rotation in one direction with respect to the supporting member, said resilient member yieldably resisting longitudinal movement of the rotor in one direction, a cam on the rotor, and a cam supported by the supporting member, one of said cams having a face extending angularly with respect to the axis of rotation of the rotor, said cams being so relatively arranged that the other cam engages said angular face during longitudinal movement of the rotor in the other direction and thereby sets up rotation of the rotor in the opposite direction with respect to the supporting member.

9. In a device of the character described, a supporting member, a resilient member supported by the supporting member, a rotor supported on the resilient member and movable both rotatably and longitudinally with respect to the supporting member, a stop member supported by the supporting member and holding the rotor against rotation in one direction with respect to the supporting member, said resilient member yieldably resisting longitudinal movement of the rotor in one direction, a cam on the rotor, and a cam supported by the supporting member, one of said cams having a face extending angularly with respect to the axis of rotation of the rotor, said cams being so relatively arranged that the other cam engages said angular face during longitudinal movement of the rotor in the other direction and thereby sets up rotation of the rotor in the opposite direction with respect to the supporting member.

10. In a device of the character described, a supporting member, a resilient member supported by the supporting member, a rotor supported on the resilient member and movable both rotatably and longitudinally with respect to the supporting member, a follower for the rotor and supported normally for rotation in one direction only, with respect to the supporting member, a cam on the follower, one of said cams having a face extending angularly with respect to the axis of rotation of the rotor, said cams being so relatively arranged that the other cam engages said angular face during longitudinal movement of the rotor in the other direction and thereby sets up rotation of the rotor in one direction with respect to the supporting member, and means holding the rotor against rotation in the other direction.

11. In a device of the character described, a supporting member, a resilient member supported by the supporting member, a rotor supported on the resilient member and movable both rotatably and longitudinally with respect to the supporting member, said resilient member yieldably resisting longitudinal movement of the rotor in one direction, a cam on the rotor, a follower for the rotor and supported for rotation with respect to the supporting member, yieldable means adapted to hold the follower against rotation in one direction, a cam on the follower, one of said cams having a face extending angularly with respect to the axis of rotation of the rotor, said cams being so relatively arranged that the other cam engages said angular face during longitudinal movement of the rotor in the other direction and thereby sets up rotation of the rotor in one direction with respect to the supporting member, and means holding the rotor against rotation in the other direction.

12. In a device of the character described, a supporting member, a resilient member supported by the supporting member, a rotor supported on the resilient member and movable both rotatably and longitudinally with respect to the supporting member, said resilient member yieldably resisting longitudinal movement of the rotor in one direction, a cam on the rotor, a follower for the rotor and supported for rotation with respect to the supporting member, yieldable means adapted to hold the follower against rotation in one direction, a connection between the rotor and follower whereby rotation of the rotor in one direction sets up rotation of the follower in said one direction, a cam on the follower, one of said cams having a face extending angularly with respect to the axis of rotation of the rotor, said cams being so relatively arranged that the other cam engages said angular face during longitudinal movement of the rotor in the other direc-

tion and thereby sets up rotation of the rotor in one direction with respect to the supporting member, and means holding the rotor against rotation in the other direction.

13. In a device of the character described, a rotor having arcuately arranged ratchet teeth, a coaxial member having a plurality of toothed segments adapted independently to cooperate with the ratchet teeth, the circular pitch of the ratchet and segment teeth being equal and the angular distance between radii extended to similar points of teeth in any two segments being other than an even multiple of the circular pitch of said teeth, the rotor and member being relatively rotatable to bring the segments successively into operative engagement with the ratchet teeth, and means for rotating the rotor.

14. In a device of the character described, a supporting member, a resilient element supported by said member, a rotor yieldably supported on the resilient element, said rotor including a head, peripheral cams on the head, a rotatable follower ring supported on the supporting member, cams on the inner peripheral face of the ring engaging the rotor cams, means for holding the follower ring against rotation in one direction, and rotor-driven means adapted to rotate said ring in the opposite direction when the resilient member yields beneath the rotor.

15. In a device of the character described, a supporting member, a resilient element supported by said member, a rotor yieldably supported on the resilient element, adjustable means compressing the resilient element between the rotor and supporting member, said rotor including a head, peripheral cams on the head, a rotatable follower ring supported on the supporting member, cams on the inner peripheral face of the ring engaging the rotor cams, means holding the follower ring against rotation in one direction, and rotor-driven means adapted to rotate said ring in the opposite direction when the resilient member yields beneath the rotor.

16. In a device of the character described, a supporting member, a resilient element, supported by said member, a rotor yieldably supported on the resilient element, said rotor including a head, peripheral cams on the head, ratchet teeth on top the head, a rotor-stop member carried by the supporting member and having ratchet engagement with said teeth, a rotatable follower ring supported on the supporting member, cams on the inner peripheral face of the ring and engaging the rotor cams, means holding the follower ring against rotation in one direction, and rotor-driven means adapted to rotate said ring in the opposite direction when the resilient member yields beneath the rotor; the rotor-stop member being adapted to hold said rotor against rotation in said one direction.

17. In a device of the character described, a supporting member, an annular resilient element supported by said member, a wear washer on top the resilient element, ball bearings on top the wear washer, and a rotor rotatably supported by said bearings, and means for connecting said rotor to a polish rod.

18. In a device of the character described, a bowl-shaped supporting member having a central aperture in its bottom wall, a ring-shaped resilient element in the bowl, and a rotor above and supported by the resilient member, said rotor including a spindle extending downwardly through the apertures of the ring and bottom wall and having rotational bearing in said bottom wall.

19. In a device of the character described, a bowl-shaped supporting member having a central aperture in its bottom wall, a ring-shaped resilient element in the bowl, a rotor above and supported by the resilient member, said rotor including a spindle extending downwardly through the apertures of the ring and bottom wall, and a rod grip on the spindle below said bottom wall.

20. In a device of the character described, a bowl-shaped supporting member having a central aperture in its bottom wall, a ring-shaped resilient element in the bowl, a rotor above and supported by the resilient member, said rotor including a tubular spindle extending downwardly through the apertures of the ring and bottom wall, said spindle being adapted to take a polish rod in the bore thereof, and a rod grip on the spindle below said bottom wall.

In witness that we claim the foregoing, we have hereunto subscribed our names this 27 day of December, 1923.

LYSLE P. BURGESS.
EDWARD E. STEVENSON.