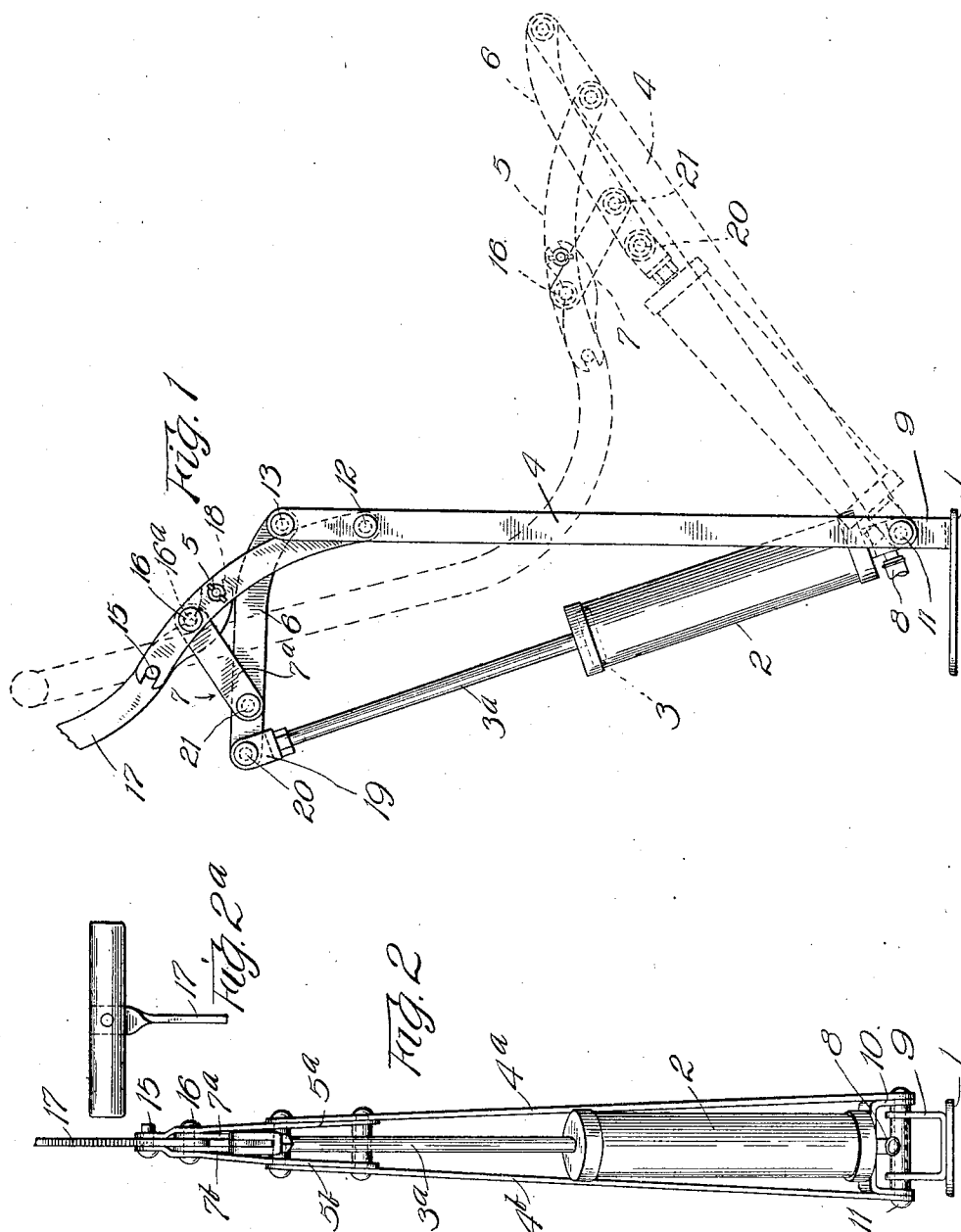


PUMP.

APPLICATION FILED FEB. 14, 1920.

**1,362,004.**

Patented Dec. 14, 1920.



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# UNITED STATES PATENT OFFICE.

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## PUMP.

1,362,004.

Specification of Letters Patent.

Patented Dec. 14, 1920.

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*To all whom it may concern:*

Be it known that I, LAWRENCE H. JENSEN, a citizen of the United States, residing at St. Charles, in the county of Kane and State of Illinois, have invented certain new and useful Improvements in Pumps, of which the following is a specification.

The invention relates to pumps of the type particularly adapted for use in inflating pneumatic tires, air storage tanks, and the like; and the general object thereof is to provide a high-power pump which may be constructed at a minimum cost.

A more specific aim of the invention is to provide an operating mechanism for a pump, which is of an advantageous character in that the power applied to the operating handle is transmitted to the piston rod with a maximum degree of efficiency; in that the movement of the piston is accelerated when the state of compression within the pump cylinder is the lowest, while the effective force exerted upon the piston gradually increases as the pressure builds up in the cylinder; and finally in that in the operation of the parts, friction is reduced to a minimum.

In the accompanying drawings, I have illustrated a preferred embodiment of my invention, but it is to be understood that in the interpretation of the appended claims they are not to be limited to the precise construction or arrangement set forth, except as may be necessitated by the state of the prior art.

In the drawings, Figure 1 is a side elevation of my improved pump with a portion of the operating handle broken away, the position of the parts when the piston has reached the end of its stroke being shown in broken lines. Fig. 2 is an edge elevation of the pump with the operating handle broken away and shown in Fig. 2<sup>a</sup>.

The device comprises essentially a foot or base plate 1, a pump cylinder 2, pivotally mounted upon the base plate and having a piston 3 therein with a rod 3<sup>a</sup>. 4 designates a support also pivotally mounted upon the base plate 1 and providing a fulcrum for an operating arm 5 and a lever 6, the latter being connected at its opposite end to the piston rod 3<sup>a</sup>. The operating arm 5 has a mov-

able connection with the lever 6 which herein consists of a link 7.

The base 1, and pump cylinder 2, with the piston 3 and rod 3<sup>a</sup> may be of any usual or preferred construction, forming *per se* no part of the present invention, the cylinder 2 being provided with the usual outlet 8. The base plate has an upstanding portion 9 upon the upper end of which, on a pivot 11, is mounted a bracket 10 carrying the pump cylinder 2.

The support 4 is pivotally mounted relative to the base 1 and preferably co-axially with the pump cylinder 2 upon the pivot pin 11. Preferably it comprises a pair of bars 4<sup>a</sup> and 4<sup>b</sup> formed of a length substantially greater than the pump cylinder. The bars are spaced apart as shown in Fig. 2 so as to form a rigid swinging bracket or arm, being connected near their free ends by pivot pins 12 and 13 and mounted at their lower ends at opposite sides of the bracket 10 upon the pivot pin 11.

The pivot pin 12 also serves as a pivotal support for the operating arm 5, being for this purpose positioned a short distance from the free end of the support 4. Similarly, the pivot pin 13 provides a pivotal support or fulcrum for the lever 6 at the free end of the support 4. The arm 5 may be bifurcated in form as shown in Fig. 2, and comprises a pair of arms 5<sup>a</sup> and 5<sup>b</sup> spaced apart sufficiently to fit neatly between the bars 4<sup>a</sup> and 4<sup>b</sup> at their pivotal connection therewith, and connected at their opposite ends by means of a pair of pins 15 and 16 with sufficient space therebetween to receive the lower end of an operating handle 17. The pin 15 may be made rigid with the handle so as to engage in notches 15<sup>a</sup> and 15<sup>b</sup> in the upper ends of the arms 5<sup>a</sup> and 5<sup>b</sup>, and the lower end of the handle is preferably curved so as to clear the pin 16, being notched at its free end to receive a pin 18 carried by the arms 5<sup>a</sup> and 5<sup>b</sup>. The pin 18 may be in the form of a screw having a wing nut adapted to lock the handle in position with reference to the arm 5. To avoid an extreme curvature of the lower end of the handle it may be notched as at 16<sup>a</sup> to receive the pin 16.

The lever 6 is in the form of a single bar, being spaced midway between the upper

ends of the bars 4<sup>a</sup> and 4<sup>b</sup> upon the pivot pin 13 and suitably connected with the upper end of the piston rod 3<sup>a</sup> by means of a member 19 and a pivot 20.

5 The link 7 is connected near one end of the arm 5, being pivotally mounted on the pin 16, and at its other end is pivotally connected by means of a pivot 21 with the lever 6. Preferably the link is made of two arms  
10 7<sup>a</sup> and 7<sup>b</sup> arranged one on each side of the lever 6 and entered at the opposite ends between the arms 5<sup>a</sup> and 5<sup>b</sup> of the operating arm 5. The parts are so proportioned and arranged that as the arm 5 is swung down-  
15 wardly by means of the handle 17, the pivot 16 moves with relation to the pins 21 and 20 so as to increase the effective length of the power arm of the operating arm 5 and hence act with increasing force upon the  
20 lever 6 as the piston approaches the end of its stroke. It will be observed that the lever 6 and piston rod 3<sup>a</sup> form in effect a toggle, the parts of which are moved substantially into alinement as shown in dotted lines in  
25 Fig. 1 at the end of the piston stroke.

It will be seen by reference to Fig. 1 that the link 7 is adapted to transmit to the lever 6, the force applied to the operating handle with a maximum degree of efficiency. By  
30 eliminating all relatively sliding connections sometimes employed, not only is friction reduced to a minimum so that the durability of the operating mechanism is materially increased, but the cost of construction is also substantially reduced.

I claim as my invention:

1. In a pump having a cylinder with a piston and a piston rod operatively associated therewith, the combination of a pivotally mounted support, an arm pivotally connected with said support at a point spaced from its free end, a lever pivotally connecting the free end of said support with the free end of said rod, and a link connecting  
45 said arm with said lever and adapted to transmit force applied to the arm to the piston rod through the medium of the lever, to a gradually increasing degree as the piston approaches the end of its stroke.

50 2. In a pump having a cylinder and a piston rod, the combination of a support, a base upon which said support and said cylinder are mounted for relative swinging movement, means connecting said support with said rod including a lever, an arm pivotally mounted on the support at a point spaced from its free end, a link connecting  
55 said arm to said lever, and means for swinging said arm, said lever and the piston constituting a toggle the parts of which are adapted to be moved into substantial alinement by the operation of said arm.

3. In a pump having a cylinder and a piston rod, the combination of a base sup-

porting the cylinder of the pump and hav- 65 ing a support also mounted on the base so as to be swingable with reference to the pump cylinder and its piston rod, said support being of a length substantially greater than the pump cylinder, a lever connecting 70 the free end of said support with said rod, an operating arm fulcrumed on said support, and means pivotally but non-slidably connecting said lever and said arm and operable in the movement of the arm to move 75 said lever and the piston rod substantially into alinement.

4. In a pump having a piston rod, the combination of a support, a lever pivotally connected directly to the support and to the piston rod, and means including a second lever pivotally connected with the first lever so as to move relative thereto toward and from the upper end of the piston rod whereby to exert a gradually increasing leverage 85 upon the piston rod as the latter approaches the end of its stroke.

5. In a pump having a cylinder and a piston rod, the combination of a pivotal support or fulcrum, a pivotal connection between the support and the rod consisting solely of a lever, and an operating arm pivoted to said support and having a movable connection with said lever permitting movement of the operating arm toward and away from the upper end of the piston rod whereby the effective leverage exerted by the arm upon the piston rod increases as the compression in the cylinder rises.

6. In a pump having a cylinder and a piston rod, the combination of a support upon which the cylinder is pivotally mounted, a second support pivotally mounted upon the first support and of a length substantially greater than the length of the cylinder, a lever connecting the free end of the second support with the free end of the piston rod, an arm pivotally connected with the second support at a point removed from the connection of the lever therewith, means for swinging the arm, and means operatively connecting said arm with said lever whereby the effective force transmitted by the lever from the arm to the piston rod increases gradually as the rod approaches the end of its stroke.

7. In a pump having a cylinder with a piston and a piston rod, the combination of a member of a length substantially equal to the combined length of the cylinder and piston rod, means for supporting the cylinder and member for relative swinging movement, a member pivotally connecting the free end of the first mentioned member with said rod and forming with said rod in effect a toggle, and means pivotally connected to the first mentioned member and operatively connected with the second member for movement 125

relative to the latter toward and from the upper end of the piston rod whereby to move the parts constituting the toggle substantially into alinement.

5 8. In a pump having a rod to be reciprocated the combination of a support, a lever pivoted directly to said support and also to the rod, and a second lever also pivoted

to the support and operatively connected with the first lever so as to be movable bodily toward and from the point of connection of the first lever with the rod in the operation of the pump.

10 In testimony whereof I have hereunto set my hand.

LAWRENCE H. JENSEN.