April 9, 1940. J. LUNDGREN 2,196,774

PUMP JACK

Filed Dec. 15, 1938 2 Sheets-Sheet 1

Fig. 1.

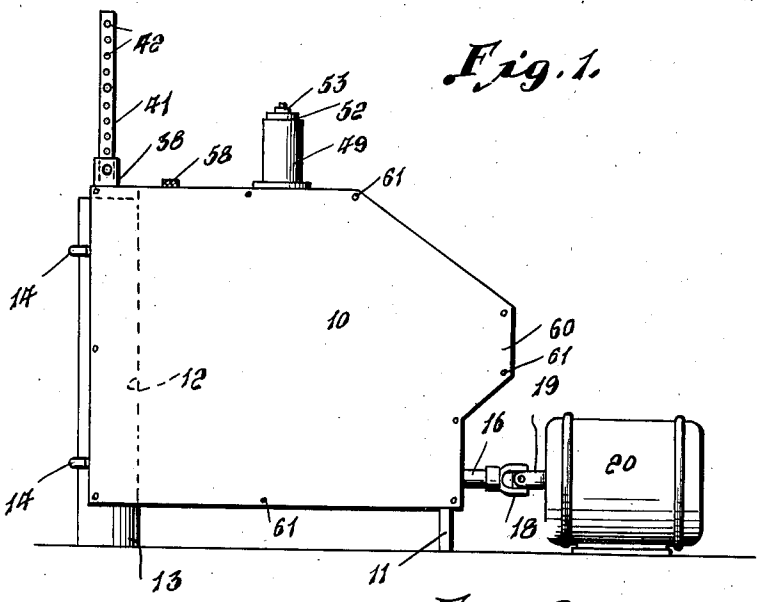

Fig. 2.

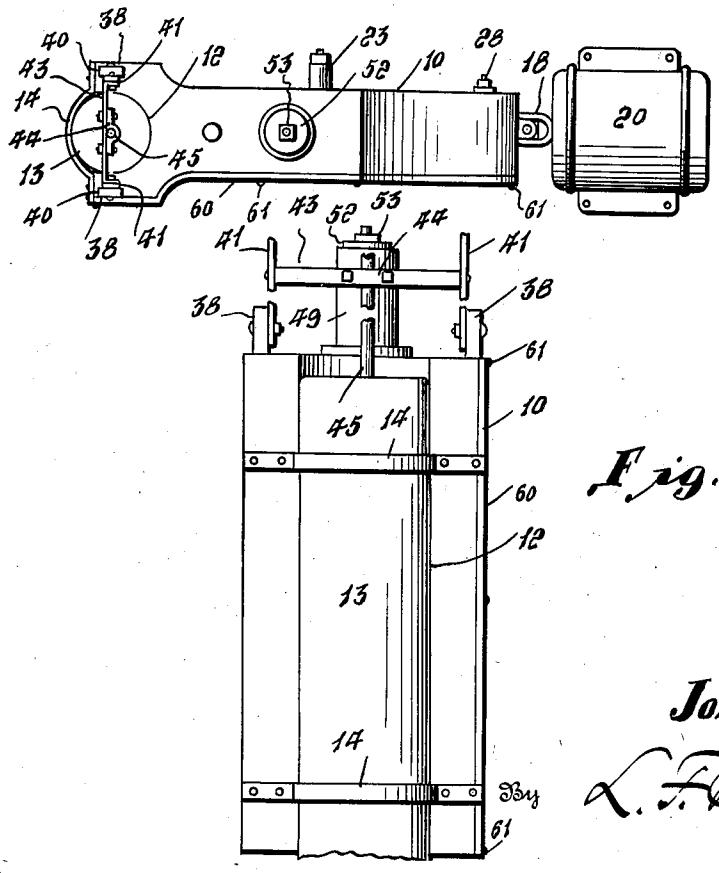

Fig. 3.

Inventor

John Lundgren

By L. F. Randolph

Attorney

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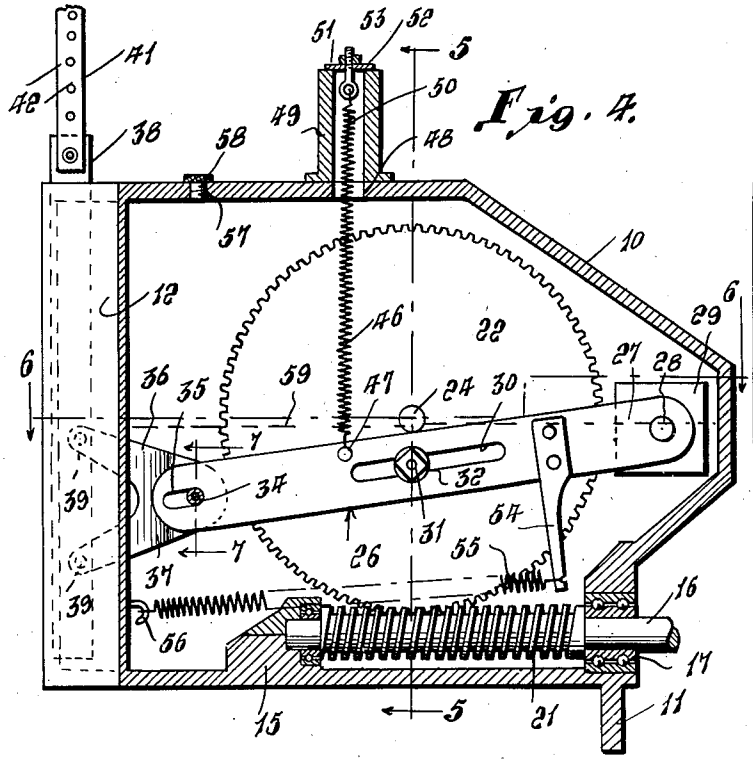


Fig. 4.

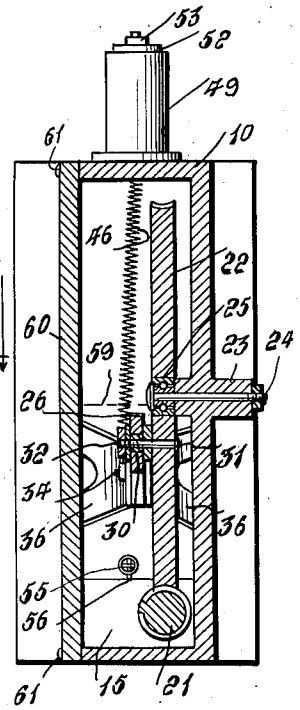


Fig. 5.

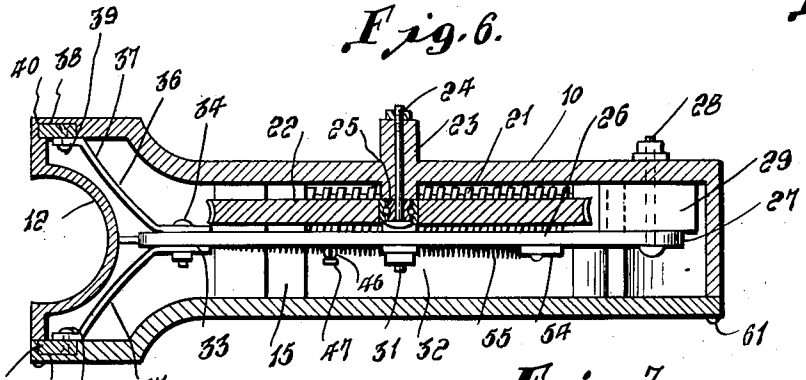
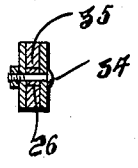


Fig. 6.

Fig. 7.



Inventor

John Lundgren

By X. T. Fauroth

Attorney

Patented Apr. 9, 1940

2,196,774

UNITED STATES PATENT OFFICE

2,196,774

PUMP JACK

John Lundgren, Askov, Minn.

Application December 15, 1938, Serial No. 245,977

6 Claims. (Cl. 74—45)

This invention relates to an improved pump jack adapted to be adjustably connected to a pump rod and capable of being driven by a relatively small high speed motor to impart a reciprocating motion to the pump rod.

More particularly it is an aim of this invention to provide a pump jack for reciprocating a pump rod, adapted to be driven by a relatively small electric or gasoline motor and provided with reduction gearing means including an eccentric for actuating a lever for imparting a reciprocating motion to the pump rod, said device forming an improved transmission for connecting the driven shaft of a high speed motor to a reciprocating pump rod.

More particularly, it is an object of this invention to provide a pump jack adapted to be driven by a light high speed motor for reciprocating a vertically disposed pump rod having means whereby the load on the motor will be maintained substantially uniform throughout the stroke of the rod so that the device may be actuated at an even uniform speed.

It is a further aim of the invention to provide a pump jack including an eccentrically actuated rocking lever adapted to reciprocate a pump rod and actuated by reduction gear means connected to the driven shaft of a high speed motor, and spring counterbalancing means connected to said lever for urging the lever upwardly and for resisting its downward movement to counterbalance the weight of the pump rod to thereby exert a uniform load on the motor.

Other objects and advantages of the invention will hereinafter become more fully apparent from the following description of the drawings, which illustrate a preferred embodiment thereof, and wherein:

Figure 1 is a side elevational view showing the pump jack connected to a motor and to a pump rod and pump casing,

Figure 2 is a top plan view of the same,

Figure 3 is an end view in elevation of the same,

Figure 4 is a longitudinal vertical sectional view partly in elevation of the pump jack,

Figure 5 is a vertical sectional view taken along the line 5—5 of Figure 4,

Figure 6 is a horizontal sectional view taken along the line 6—6 of Figure 4, and

Figure 7 is a sectional view taken along the line 7—7 of Figure 4.

Referring more particularly to the drawings, wherein like reference characters designate like or corresponding parts throughout the different views, 10 designates generally a casing or housing in which the pump jack mechanism of this invention is adapted to be enclosed, and which is provided at one end with the supporting leg or legs 11. The casing 10 at its opposite end is provided with a vertically disposed portion 12 which is semicircular in cross section and which is adapted to engage a portion of the upper end of a conventional pump casing 13 and to be secured thereto by means of the clamping brackets 14 so that the pump casing 13 co-acts with the leg 11 in supporting the casing 10.

A thrust bearing member 15 extends upwardly from the bottom of the casing 10 to journal one end of a shaft 16 which extends outwardly through the first mentioned end of the casing and which is journaled adjacent its opposite end by means of the anti-friction bearing 17. The last mentioned end of the shaft 16 is connected by means of the universal joint 18 to the driven shaft 19 of a motor, designated 20. The motor 20 has been shown as a conventional electric motor but a gasoline engine could be used instead or the shaft 19 could be driven from any other suitable source of power desired.

Mounted on and keyed to shaft 16 between the bearings 15 and 17, is a worm 21 the threads of which are adapted to mesh with a worm wheel 22 which is journaled in one side of the casing 10, as best seen in Figure 6, by means of the bearing 23, shaft 24 and the anti-friction bearing 25 carried by the worm wheel 22.

A lever, designated 26 is pivotally mounted at one of its ends 27 on a bolt 28 which is mounted in the same side of the casing 10 as the shaft 24 and which carries the spacing block 29 which holds the lever 26 spaced from the wheel 22 and between it and the opposite side of the casing 10. Lever 26 is pivotally mounted to swing through a vertical arc and is provided with an elongated slot 30, intermediate of its ends, to receive a threaded stud 31 which projects from the side of the wheel 22 and which is spaced from the axis of the wheel to form an eccentric. Stud 31 is provided with the nut and washer 32 for removably retaining the stud in engagement with the slot 30. It will thus be seen, that when the wheel 22 revolves stud 31 will slide relatively to slot 30 to cause the lever 26 to swing through a vertical arc.

The opposite end 33 of the lever 26 is disposed adjacent to the semi-circular portion 12 and has a fastening 34 extending therethrough and adapted to loosely engage the slots 35 which are formed longitudinally of the intermediate portion of the fork or V-shaped members 36.

The intermediate portions of the two corresponding V-shaped members 36 are disposed on opposite sides of the end 33 and have their corresponding forked ends 37 bowed outwardly to extend around the inner side of the portion 12, as best seen in Figure 6. The free ends of each of the fork shaped members 36 are bent to lie in a plane substantially parallel to the intermediate portions of said members and are adapted to be fixed to the slides 38 by means of the fastenings 39.

Slides 38 are reciprocally mounted in the guideways 40 formed in the sides of the casing 10 and on opposite sides of the portion 12. The guideways 40 open outwardly of the top of the casing 10 so that the slides 38, when in a fully retracted position, as seen in Figures 1 and 4, project above the top of the casing 10 to be secured to the lower ends of the bars 41 which extend upwardly therefrom and which are provided with the corresponding spaced openings 42 for adjustably positioning a brace 43, as seen in Figures 2 and 3, therebetween. Brace 43, which extends between the bars 41 and is mounted thereby, is disposed above and substantially across the center of the pump casing 13 and is provided, intermediate of its ends, with a clamping bracket 44 adapted to be clamped to a pump rod 45 which is disposed in the pump casing 13 for connecting rod 45 to the slides 38.

A contractile coil spring 46 is connected at one of its ends at 47 to the lever 26 adjacent the remote end of the slot 30, and has its opposite end extending upwardly through an opening 48 in the top of the casing 10. A cylinder 49 is mounted on the top of casing 10 and has its bore in alinement with opening 48 to receive the end 50 of the spring 46 which is connected to an eyebolt 51 which extends upwardly through a disk 52, mounted on the top of the cylinder 49. A nut 53 is connected to the threaded end of the eyebolt 51 to rest against the top of the disk 52 to form therewith an abutment for the end 50 of the spring 46, said nut 53 being adjustable to adjust the tension of spring 46.

An arm 54 is fixed at one of its ends to the lever 26 adjacent the end 27 and depends downwardly therefrom and is connected at its free end to one end of a contractile coil spring 55 the opposite end of which is connected to a hook 56 mounted in portion 12 of casing 10 to retain spring 55 under tension.

The top of the casing 10 is also preferably provided with an opening 57 adapted to be normally closed by a plug 58 by means of which casing 10 may be partially filled with oil, designated 59 or other suitable lubricant for lubricating the working parts disposed within the casing. The side 60 of casing 10, opposite to that to which worm wheel 22 and lever 26 are mounted, is preferably made removable so that access may be had to the interior of the casing for adjusting or replacing the movable parts contained therein, and is preferably held in place by means of the fastenings 61 and may be provided with sealing gaskets, not shown, or other suitable means to make the casing 10 liquid tight in its lower portion.

From the foregoing it will be seen that the motor 20 may be operated to drive shaft 19 which in turn drives shaft 16 and the worm 21 connected thereto. Worm 21 is adapted to be driven at a relatively high rate of speed to revolve the worm wheel 22 at a reduced speed. Worm wheel 22, as heretofore explained, actuates the lever 26 to swing it in a vertical arc by means of the stud and slot connection 31 and 30, respectively. The free end 33 of the lever is connected by means of the members 36 to the slides 38 so that slides 38 are vertically reciprocated by the swinging movement of lever 26 to reciprocate pump rod 45 in its usual way for pumping a liquid upwardly through pump casing 13 in the conventional manner. Lever 26 is loosely connected to the members 36 by means of the slots 35 so that its end 36 may slide relatively to the members 36 as it swings through its arc above and below the horizontal plane of its pivoted end 27. In order to prevent an uneven load on the motor 20 springs 46 and 55 are provided which combine to urge the lever 26 upwardly and which resist its downward movement to thereby counterbalance the weight of the pump rod 45 and the column of liquid being raised thereby so that an even load will be maintained on the motor 20 during the complete revolution of the worm wheel 22 to thereby prevent excess strain on the motor and an uneven operating speed. Furthermore, by providing the springs 46 and 55 it is possible to use a small low horse power high speed motor for performing the pumping operation. The spring 46 imparts an upward pull to the lever 26 while the spring 55 urges the arm 54 forwardly and upwardly of the end 27 of the lever to thereby cooperate with the spring 46 in raising the lever and functions particularly to urge the lever 26 upwardly when it is at the lowest point of its arc and when the stud 31 is directly beneath the axis of the gear wheel 22, at which point the spring 46 is substantially inoperable as it is pulling against a dead center position of the lever 26 so that the spring 55 bears the burden with the motor 20 of starting the lever 26 and the pump rod 45 on its upward movement.

Various modifications and changes in the construction and arrangement of the parts forming the invention are contemplated and may obviously be resorted to, and the right is therefore expressly reserved to make such variations and changes as do not depart from the spirit and scope of the invention as hereinafter defined by the appended claims.

I claim as my invention:

1. A pump jack comprising clamping means adapted to be adjustably connected to a pump rod, slides connected to said clamping means, guideways for said slides, a casing, a lever pivotally connected at one end to said casing, fork shaped members secured to said slides and pivotally and slidably connected to the free end of said lever, a worm wheel eccentrically connected to the intermediate portion of said lever, said worm wheel being journaled in said casing, and a worm in mesh with said worm wheel and keyed to a driven shaft journaled in said casing for actuating said lever for reciprocating said slides and the pump rod connected thereto.

2. A device as in claim 1, and a plurality of contractile coil springs connected to said lever and casing and disposed substantially at right angles to each other for urging said lever upwardly to counterbalance the weight of the pump rod.

3. A pump jack comprising a casing adapted to contain a lubricant, a driven shaft journaled in the bottom part of said casing, a worm keyed to said shaft, a worm wheel provided with a shaft journaled in one side of said casing, said worm wheel having an eccentrically disposed stud projecting from one side thereof, a lever pivotally connected at one end to said casing, said lever having a longitudinal slot intermediate of its

ends slidably connected to said stud, guideways formed in said casing, slides mounted in said guideways and provided with clamping means adapted to be adjustably connected to a pump rod, fork shaped members having their ends connected to said slides and their intermediate portions slidably and pivotally connected to the free end of said lever for reciprocating said slides when said lever is actuated by operation of the worm and worm wheel, and an adjustable contractile spring connected to said casing and to the lever, between the slot and its free end, for urging said lever upwardly to counterbalance the weight of the piston rod.

4. A device as in claim 3, an arm secured to and depending from said lever adjacent its pivoted end, and a contractile spring connected to the free end of said arm and to said casing, said last mentioned spring being disposed contiguously with the free end of said lever and substantially at right angles to said first mentioned spring to co-act therewith in lifting the lever.

5. A pump jack comprising a casing having a vertically disposed portion, semi-circular in cross section, at one end thereof adapted to engage the upper end of a pump casing, vertically disposed guideways formed in said casing at the sides of said semi-circular portion and opening outwardly of the top thereof, bars slidably mounted in said guideways and projecting upwardly from said casing, adjustable clamping means carried by said bars and adapted to adjustably engage a pump rod mounted in said pump casing, a lever pivotally mounted at one of its ends in the opposite end of said casing, means slidably and pivotally connecting said bars to the free end of said lever, and means eccentrically connected to the intermediate portion of said lever for actuating it to impart a reciprocating motion to said bars.

6. A device as in claim 5, and contractile coil springs disposed at right angles to each other and connected to said lever and casing for urging said lever upwardly to counterbalance the weight of the pump rod.

JOHN LUNDGREN.