May 20, 1941. B. S. LIGHTFOOT 2,242,252

PUMPING UNIT AND POWER MACHINE

Filed Aug. 24, 1939 4 Sheets-Sheet 1

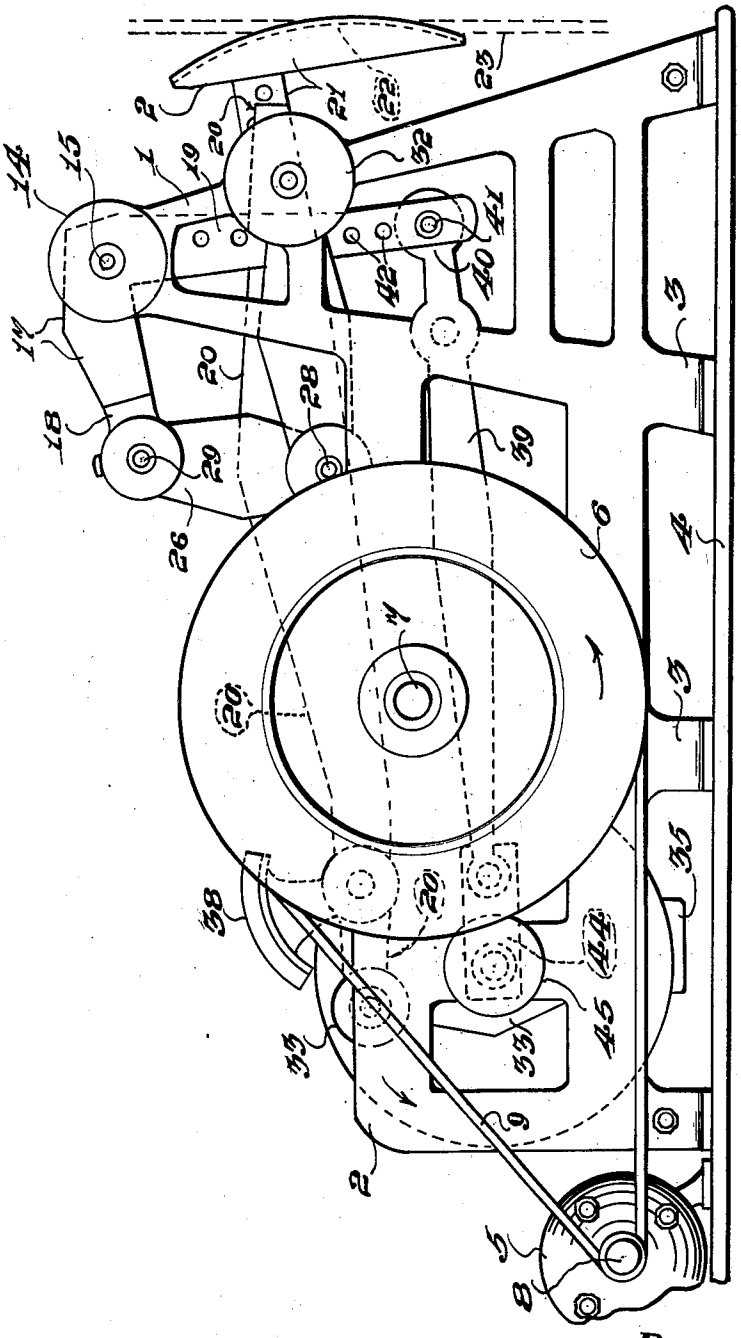


Fig. 1

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Filed Aug. 24, 1939 4 Sheets-Sheet 2

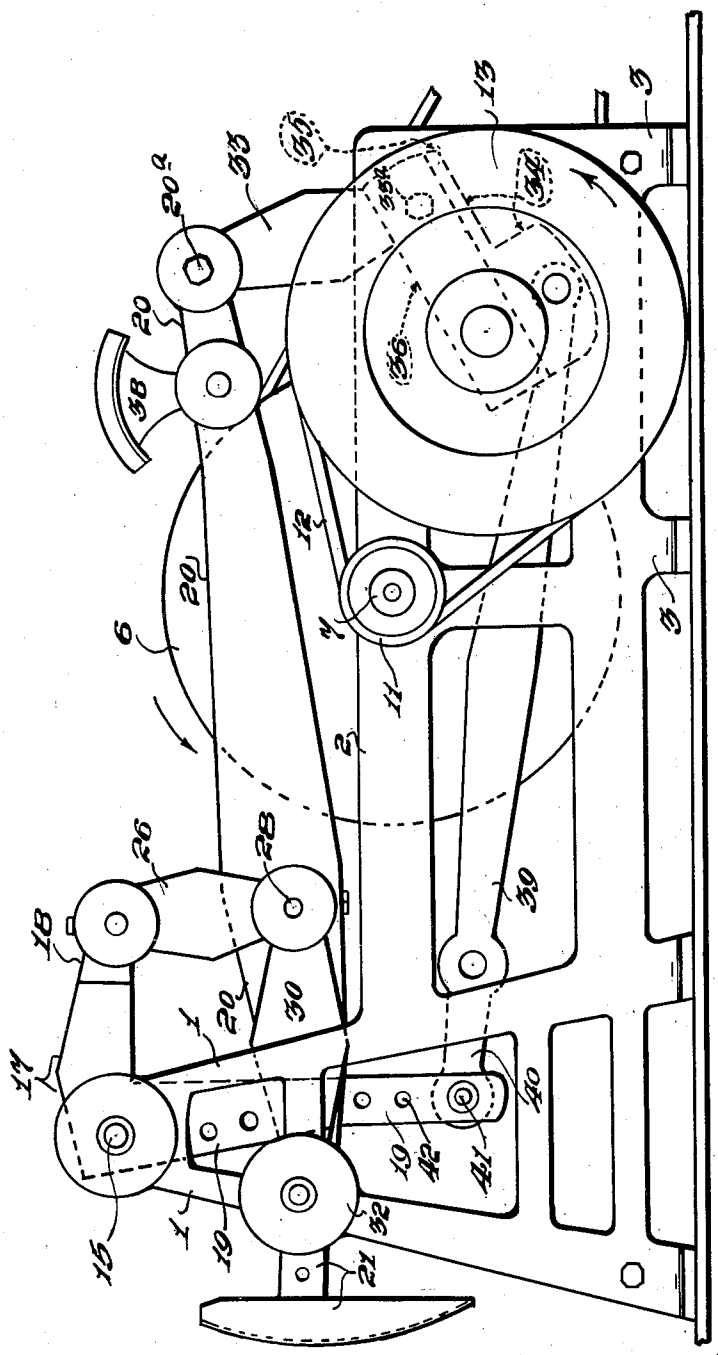


Fig. 2

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PUMPING UNIT AND POWER MACHINE

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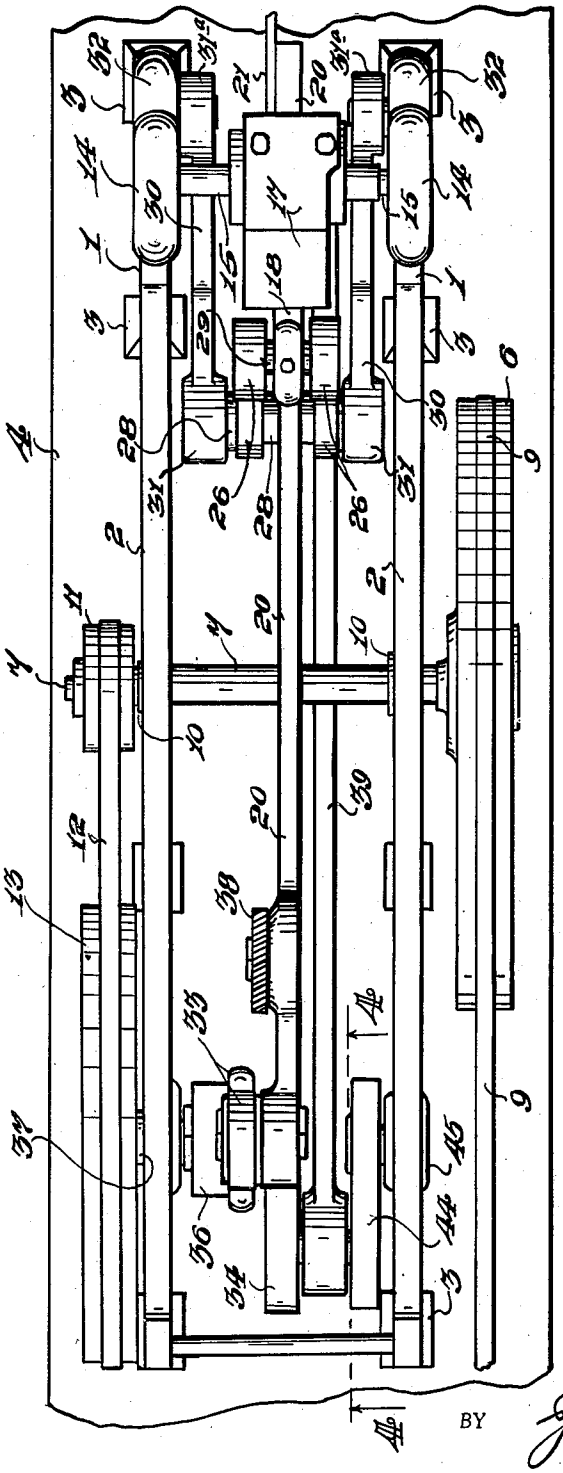


Fig. 3

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Filed Aug. 24, 1939 4 Sheets-Sheet 4

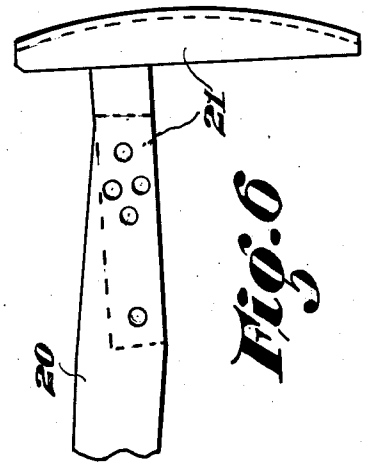


Fig. 6

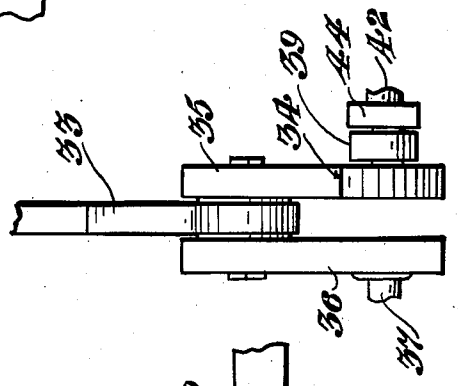


Fig. 5

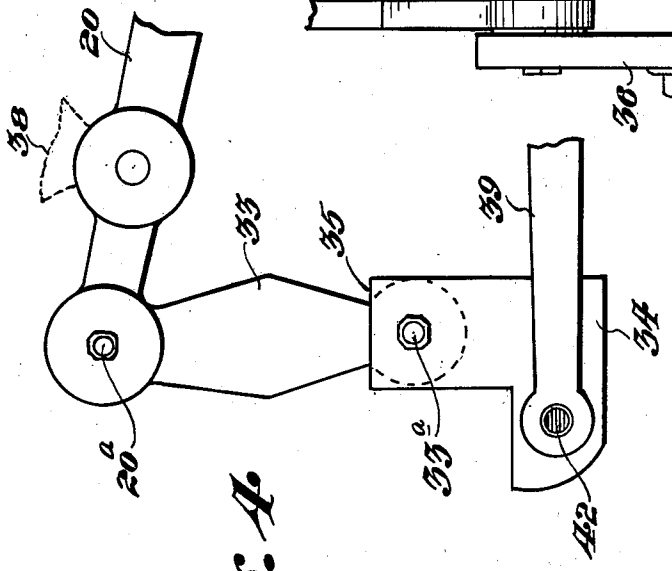


Fig. 4

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2,242,252

UNITED STATES PATENT OFFICE

2,242,252

PUMPING UNIT AND POWER MACHINE

Byron S. Lightfoot, Dallas, Tex., assignor of one-half to R. E. Harding, Raymondville, Tex.

Application August 24, 1939, Serial No. 291,642

2 Claims. (Cl. 74—41)

This invention relates to power machines for pumping wells or for performing work of a similar nature to which it may be applied.

An object of this invention is to provide a jack wherein the walking beam will be substantially balanced so as to permit the use of a smaller power source.

Another object of this invention is to provide a jack which includes means for conserving the power, the device including a walking beam connected to a power source and a linkage connected to the beam and the power source for utilizing the downward thrust at the working end of the beam to effect a balance at the driving end of the beam.

The machine is of few parts and its operation is without vibration, its movement being smooth, devoid of jerks or jars and of a flowing nature. It can be thus operated at a high rate of speed without danger of breakage.

The invention will be readily understood from a perusal of the following detailed description, taken in connection with the accompanying drawings:

Figure 1 is a side elevational view of the machine, partly broken away;

Figure 2 is a side elevational view of the machine the view being taken from the side opposite to that of Figure 1; the motor not shown;

Figure 3 is a top plan view of the machine taken on Figure 1 and partly broken away;

Figure 4 is a sectional detail view of Figure 3, the view being had on the line 4—4 of said figure;

Figure 5 is an edge view of Figure 4, taken from the left in the drawings; and

Figure 6 is a detail view of one end of the lifting lever and horse head.

In the construction and carrying out of the invention there is employed a suitable frame with a derrick-like portion 1 of suitable height, as illustrated in Figures 1 and 2. The frame includes sides 2 with legs 3, resting on any suitable support 4. Motive power is supplied preferably by a motor 5 or other means.

In Figure 1 and at approximately the center of the frame is mounted a pulley wheel 6 on a shaft 7 and connected to the shaft pulley 8 of the motor by a belt drive 9. The shaft 7 is made to rotate on bearings 10 in the sides of the frame as shown. The rotation of the pulley wheel 6 is imparted to the operating parts of the machine by means of a pulley 11 carried on the opposite end of the shaft 7, the belt drive 12 and a second pulley wheel 13 in connection with a crank shaft assembly which will be described hereinafter.

At the highest point of the derrick-like portion of the frame at 1 are bearing blocks 14 with bearings for supporting a shaft or king pin 15 and on this king pin or shaft is mounted an L-shaped element consisting of a central head or block 17 with an extension 18. Extending downwardly from the block 17 is a leg 19, the block, extension and leg 19, comprising a rocker arm and so termed throughout the specification.

As carried out in the construction of the machine, there is also provided a lifting beam 20 on one end of which is adjustably mounted an element 21, commonly known as a horse-head. The horse-head is curved in the familiar manner and likewise grooved as indicated at 22 to accommodate the reception of a cable indicated by the broken lines at 23, and leading to a well. This end of the lifting beam 20, however, may be connected to any object to which the machine may be used for utilization of its power.

The rocker arm is pivotally connected to the beam 20 by means of a pair of links 26, the links having circular bearing heads as shown for the pins 28 and 29. The pin 28 passes through the lifting beam 20 and is connected to the lower ends of the links 26, thus pivoting the links to the beam. The assembly of parts is completed at this point of the machine by the provision of a pair of guide links 30, the ends 31 of these links being pivotally connected to the pin 28 and their opposite ends 31—*a* pivoted to the circular bearing blocks 32.

The opposite end of the lifting beam 20 is pivotally connected by a pin 20—*a* to an element 33 which may be termed a connecting rod, whereby power from the motor acting through the pulley wheel 6, shaft 7, pulley 11 and the pulley wheel 13, in connection with the belt drives 9 and 12, actuates the lifting beam 20.

The crank shaft assembly comprises a member 34 of substantial L-shape, one end 35 of which is pivoted to one end of the link 33 by a pin 33—*a*, as shown by Figures 4 and 5, also Figure 2. A companion piece or link 36 is next provided, the piece or link 36 being pivoted to a stud shaft 37 on which the pulley wheel 13 is mounted.

Carried on the lifting beam 20 is a member 38 which is for the purpose of adding more weight by shifting the member laterally when required. However, the weight is not absolutely necessary to the operation of the machine.

A balancing link 39 has one end 40 pivotally connected by a pin 41 through any of the aper-

tures 42 in the leg 19 of the rocker arm according to the adjustment required and as will be clear from Figures 1 and 2. The opposite end of the balancing link 39 is pivoted by a pin 42 to the crank shaft assembly member 34, which member provides a balancing throw. Finally there is provided a link 44 which has one end pivoted to the balancing link 39 and its opposite end seated in a bearing 45 in one side 2 of the frame.

In the operation of the machine, when the load is applied on or to the lifting head 21, the connecting rod 33 moves downwardly, thus raising the load, and pressure is exerted on and at the pivot 28. The applied force then passes through the link 26 to the extension 18 of the rocker arm block 17 to the pivot or pin 15, down the leg 19 of the rocker arm to the pivot or pin 41, thence through the lever 39 to the crank shaft assembly member 34. At this point of the operation of the machine, the total pressure is being exerted along the lifting beam 20.

During the upward movement of the head 21 caused by the downstroke of the crank 34 the inner or driving end of the beam or lever 20 is being drawn downwardly by the link 33. At this time the secondary crank pin 42 will apply a driving force to the balancing lever 39 which will rock the bell-crank 17—19 to apply a similar downward thrust to the beam or lever 20 through the link 26.

As the head 21 moves downwardly the weight of the tools will tend to pull the inner or driving end of the beam upwardly. The positioning of the pivot 28 between the pivot 20^a and the beam fulcrum will permit transfer of the downward pull of the head 21 from the pivot 28 through the link 26, and bell crank 17—19 to the balancing lever 39. This will effect a closer balance between the movements of the beam 20 than is possible by the use of a counterweight, as the thrust of the lever 39 on the downstroke of the head 21 will be proportionate to the weight of the load.

While the invention discloses a practical working embodiment of the machine, it is to be understood that various alterations, changes and modifications may be made in keeping with the intent and motive thereof, and which would be within the scope and meaning of the appended claims.

What is claimed is:

1. A pumping jack comprising a frame, a crankshaft rotatably carried by the frame, said crankshaft including an auxiliary crank pin and a main crank pin, a walking beam rockably carried by said frame, a pitman connecting the inner end of said beam to said main crank pin, a lifting head carried by the outer end of said beam, a bell-crank rockably carried by said frame, means connecting one arm of said bell-crank to said beam at a point between the fulcrum of said beam and said pitman, and a balancing link connected at one end to the other arm of said bell-crank and connected at the opposite end to said auxiliary crank pin.

2. A pumping jack comprising a frame, a crankshaft rotatably carried by the frame, said crankshaft including an auxiliary crank pin and a main crank pin, a walking beam rockably carried by said frame, a pitman connecting the inner end of said beam to said main crank pin, a lifting head carried by the outer end of said beam, a bell-crank rockably carried by said frame, means connecting one arm of said bell crank to said beam at a point between the fulcrum of said beam and said pitman, a balancing link connected at one end to the other arm of said bell crank and connected at the opposite end to said auxiliary crank pin, and a drive wheel carried by said crank shaft.

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