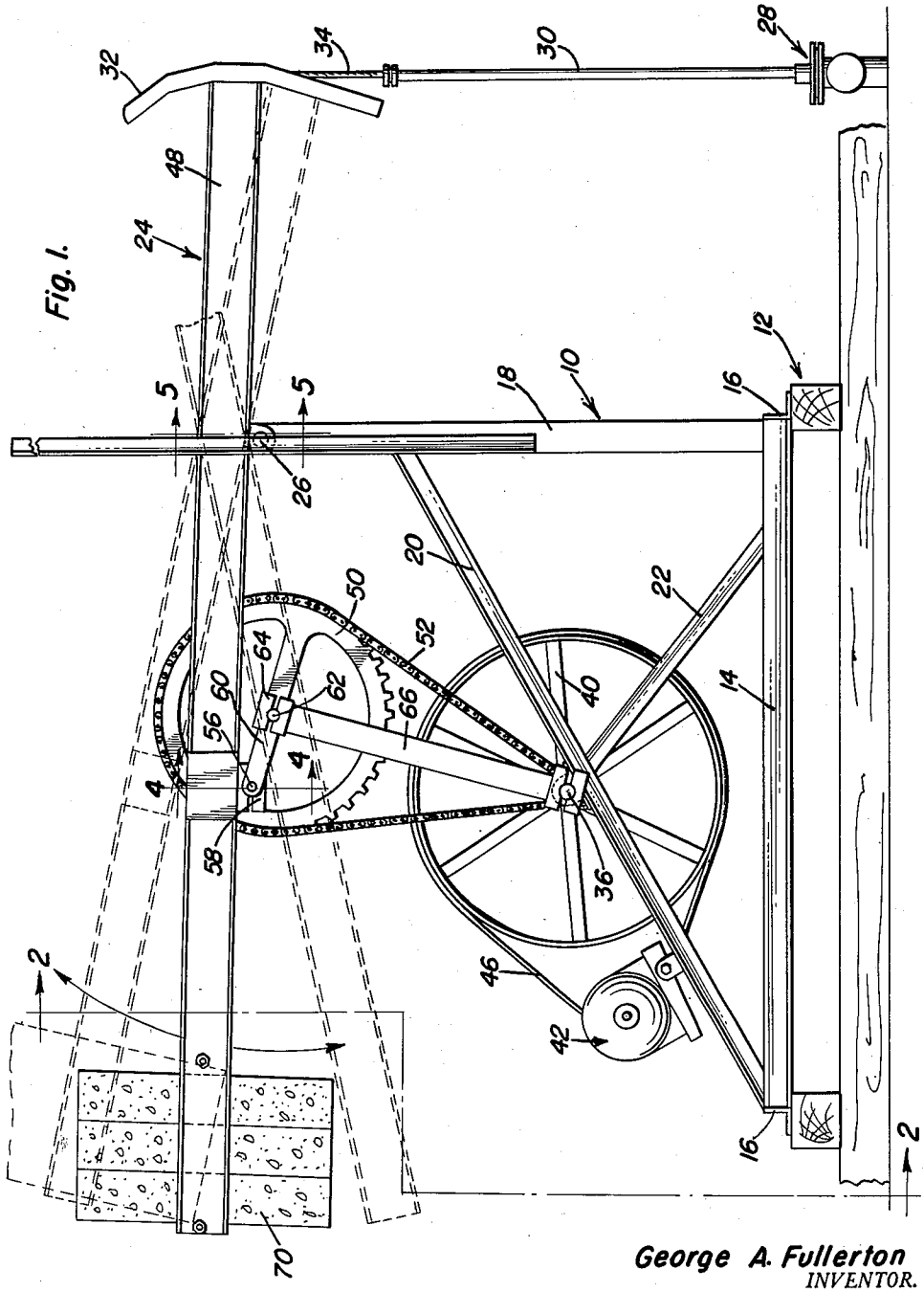
Dec. 18, 1951 G. A. FULLERTON 2,579,112

OIL WELL PUMPING MACHINE

Filed Feb. 6, 1950 2 SHEETS—SHEET 1

Fig. 1.



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Fig. 4.

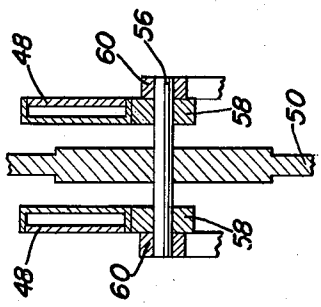


Fig. 5.

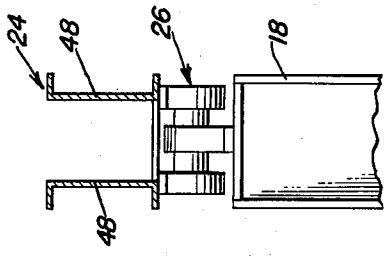


Fig. 3.

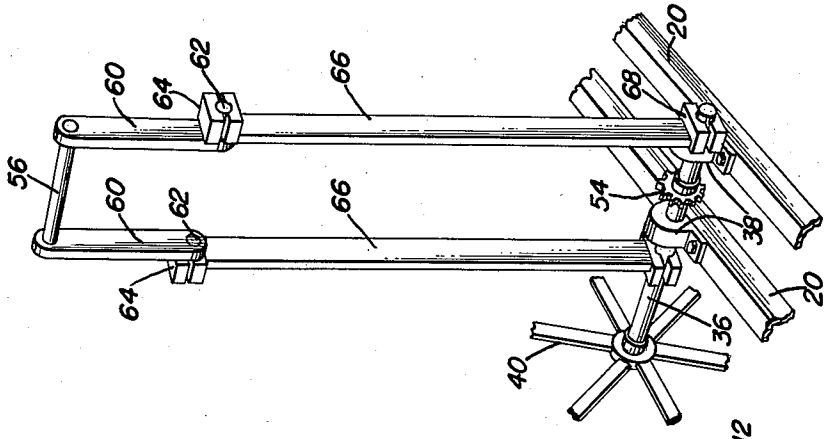
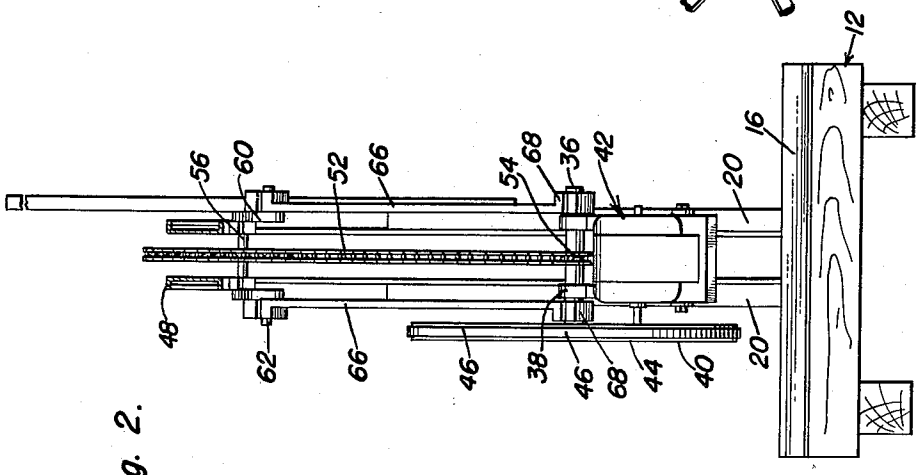


Fig. 2.



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UNITED STATES PATENT OFFICE

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OIL WELL PUMPING MACHINE

George A. Fullerton, Clarendon, Pa.

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6 Claims. (Cl. 74—41)

1

This invention pertains generally to pump jacks of the type disclosed in the patent to J. B. Hawley, Jr. et al. issued November 15, 1949, No. 2,488,124.

In the past, pump jacks of this type have included means for positively oscillating the walking beam in one direction only and have depended upon the weight of the pump rods and the material carried thereby for oscillating the walking beam in the reverse direction. Accordingly, the primary object of this invention is to provide a pump jack of this character which will positively oscillate the walking beam by imposing alternate opposed forces upon the walking beam, and which will be in no way dependent upon counterbalancing weights for positively accomplishing the necessary oscillation.

Another important object of this invention is to provide a device of this character in which the means for imparting oscillation to the walking beam will not become inoperative due to the pump rods becoming hung in the well casing or even breakage of the connection between the walking beam and the pump proper.

Another important object of this invention is to facilitate the operation of securing and/or taking up the connection between the walking beam and the pump rods in such a manner that other hoisting apparatus is entirely unnecessary.

A further important object of this invention is to provide a pump jack of this character that will be extremely reliable, well balanced and smooth in all phases of operation, which will not be a hazard to workers in the immediate vicinity, and which will be exceptionally low in manufacturing cost, yet durable and efficient for the purposes intended.

A meritorious feature of the present invention resides in the driven pulley being journaled to the walking beam by an eccentrically disposed shaft, which shaft rotates in unison with the driven pulley and has secured thereto arms, the outer ends of which in substantial coincidence with the medial axis of the driven pulley are pivotally connected to pitmans, which pitmans serve to retain the pulleys in spaced relationship and deliver the upward thrust to the walking beam through the agency of the arms and the transverse shaft.

Another important feature of the present invention resides in the driven pulley and the counterweight together with the flexible drive means working within the opening provided in the walking beam, while the arms and the pitmans are disposed to operate on opposite sides of the walking beam, the arrangement being such that there is a maximum space utilization with no possibility of interference between parts which are each easily accessible for lubrication, repair or replacement, while there is such symmetry between the working parts as to insure a nice balance of and smooth operation of the pump.

2

A final important feature to be specifically enumerated herein resides in the extreme simplicity of the pump jacks construction, which both insures low manufacturing cost and durability in its use.

These, together with various ancillary features and objects of the invention which will later become apparent as the following description proceeds, are attained by the present invention, a preferred embodiment of which has been illustrated by way of example only in the accompanying drawings, wherein:

Figure 1 is a side elevational view of the present invention, showing the same in operative position at a well head and various operating positions of the walking beam being shown in dotted outline;

Figure 2 is an end elevational view of the present invention, being taken partially in section upon the plane of the broken section line 2—2 of Figure 1;

Figure 3 is a fragmentary perspective view of the supporting and actuating means for the walking beam;

Figure 4 is a vertical sectional detail view taken upon the plane of the section line 4—4 of Figure 1; and

Figure 5 is another vertical sectional detail view, this view being taken upon the plane of the section line 5—5 of Figure 1.

Reference is now made more specifically to the accompanying drawings, wherein like numerals designate similar parts throughout the various views, and in which a frame is designated generally by the numeral 10. The frame 10, which in use will normally be seated upon and secured to a suitable foundation such as that of wood indicated at 12, includes a rectangular base formed of side members 14 and end members 16. The supporting frame 10 further includes an upright standard or post 18 secured to one of the end members 16. The post 18 is braced intermediate its ends by parallel rails 20, each of which have one end secured to the post 18 and the other end secured to the end member 16 other than that to which the post is secured. As clearly

shown in Figure 1, the rails 20 are braced intermediate their ends by inclined braces 22 connecting the rails 20 and the side members 14.

A walking beam, indicated generally at 24, is disposed upon the post 18 and suitably journaled for oscillation thereto as at 26 intermediate its ends. At 28 in Figure 1 there is indicated a well head, into which as in conventional mechanical lift pumps a pump rod 30 extends, which pump rod 30 upon vertical reciprocation will cause fluids to be pumped from the well head 28. In order to vertically reciprocate the pump rod 30 an arcuate member 32 is secured to one end of the walking beam 24, and a flexible cable 34 connects the upper end of the member 32 to the upper end of the pump rod 30, it being understood that the cable 34 is disposed in a longitudinally convexed and transversely concaved groove, not shown, in the arcuate member 32 that is tangent at all times during the oscillation of the walking beam 24 to the vertical projection of the pump rod 30. Thus it will be seen upon oscillation of the walking beam 24 the pump rod 30 will be reciprocated vertically in the well head 28.

Means is provided to oscillate the walking beam 24, which means include a shaft 36 journaled for rotation in bearings 38 carried by the rails 20, which shaft 36 extends laterally from the rails 20 and carries a large pulley or band wheel 40 by means of which the shaft 36 is rotated. A prime mover such as the electric motor indicated at 42 is mounted upon the rails 20 for rotating the wheel 40, and which electric motor is provided with a pulley 44 mounted upon the armature shaft thereof, and driving connection is had between the pulley 44 and the wheel 40 by means of the belt 46.

The walking beam 24 is preferably formed from spaced parallel members 48, that as will presently appear hereinafter it is only necessary that there be a vertical opening in the walking beam 24 opposite the pivot 26 from the arcuate member 32. A pulley or sprocket 50 is disposed for rotation in a vertical plane between the members 48, and which sprocket 50 is driven by means of a chain 52 entrained over a pulley or sprocket 54 fixedly attached to the shaft 36 intermediate the rails 20, so that the prime mover 42 will impart rotation to the sprocket 50.

In order to support the sprocket 50 and impart oscillation to the walking beam 24, a transverse shaft 56 fixedly extends through the sprocket 50 eccentrically of the center of the sprocket 50. As best shown in Figure 4, the shaft 56 projects laterally from opposite sides of the sprocket 50 through journal bearings 58 carried by the members 48 that are disposed on opposite sides of the sprocket 50, the shaft 56 being rotatably in the bearings 58. Disposed upon opposite sides of the bearings 58 and fixedly secured to the opposite extremities of the shaft 56 are a pair of arms 60 that extend therefrom in parallel relation to terminate substantially at the transverse medial axis of the sprocket 50 as clearly shown in Figure 1. It will be noted that since the shaft 56 is fixedly secured to both the sprocket 50 and the arms 60 that the other ends of the arms 60 remain in alignment with the transverse medial axis of the sprocket 50 during rotation of the latter.

The outer ends of the arms 60 are provided with oppositely extending pins 62 that are in alignment with the transverse medial axis of the sprocket 50, each of which pins 62 are rotatably received in bearing blocks 64 carried at the upper

ends of pitmans 66. The lower ends of the pitmans 66 are provided with bearing blocks 68 that rotatably receive the shaft 36 on opposite sides of the bearings 38. It will be noted that the pitmans 66 are disposed in parallel relationship and thus retained throughout the operation of the device by virtue of the shaft 36 and the arms 60 being rigidly secured in parallel relationship to the shaft 56. It will be noted that during the oscillation of the pitman 66 that the pins 62, which it will be recalled are constantly in alignment with the transverse medial axis of the sprocket 50, will remain equidistant from the shaft 36, this being for the purpose of keeping the chain 52 taut at all times over the sprockets 54 and 52 so as to insure positive drive therebetween.

As thus far described the operation of the pump jack will be readily understood. Operation of the prime mover 42 will at all times positively rotate the sprocket 50 through the belt 46, wheel 40, shaft 36, sprocket 54, and chain 52, since as hereinbefore noted, the sprockets 54 and 50 are maintained equidistant by the pitmans 66, arms 60, and the rigid connection between the shaft 56 and the sprocket 50 and between the shaft 56 and the arms 60. It will be obvious that rotation of the sprocket 50 will positively cause oscillation of the walking beam 24, since it will be noted that the shaft 56 is restricted by the bearings 58 to movement in an arc about the pivot 26 as a center, and in view of the further fact that the shaft 56 together with the pin 62 and shaft 36 define the apices of a triangle, two sides of which triangle correspond in length to the arm 60 and the pitman 66 and the angle between which sides is determined by the rotation of the sprocket 50 so as to vary the length between the shaft 56 and the shaft 36 to necessarily cause movement of the shaft 56 together with the bearings 56 alternately up and down about the arc about the pivot 26. Thus it will be seen that the walking beam 24 is positively actuated to oscillate in both its upward and downward movement.

Means is provided to counterbalance the weight carried by the cable 34 which includes a counterbalance weight 70 carried by the walking beam 24 at its end remote from the arcuate member 32, which counterbalance weight 70 will preferably be of such a mass as to balance the effect of the weight of the pump rods 30 and one-half of the difference in weight carried by the cable 34 on its upward and downward movements, so that alternate upward and downward forces are exerted on the walking beam 24 by the sprocket 50 for smooth relative continuous power requirements and operation of the machine.

It will be seen that the present invention affords a simple, trustworthy machine which will at all times positively control the position of the walking beam, which will permit efficacious attachment of the pump rods to the walking beam, and in which the flexible drive cannot become disengaged due to the pump rods breaking or becoming hung up.

From the foregoing, the construction and operation of the invention will be readily understood and further explanation is believed to be unnecessary. However, since numerous modifications and changes will readily occur to those skilled in the art after a consideration of the foregoing specification and accompanying drawings, it is not desired to limit the invention to the exact construction shown and described, but all suitable modifications and equivalents may

be resorted to, falling within the scope of the appended claims.

Having described the invention, what is claimed as new is:

1. In an oil well pumping machine, a supporting frame, an elongated beam oscillatably mounted on said supporting frame for movement in a vertical plane, a driving pulley carried by said frame, a driven pulley having an eccentrically disposed shaft fixed thereto and extending therefrom and which shaft is rotatably secured to said beam, flexible means operatively connecting said pulleys, an arm having one end fixed to the shaft and its other end terminating substantially at the axis of the driven pulley, and a pitman having one end pivoted to the frame adjacent said driving pulley and its other end pivoted to said other end of the arm.

2. In an oil well pumping machine, a supporting frame, an elongated beam oscillatably mounted on said supporting frame for movement in a vertical plane, a driving pulley carried by said frame, a driven pulley and flexible means operatively connecting the pulleys, means for positively oscillating the beam comprising said beam having an elongated, vertical opening therethrough, said driven pulley being disposed in said opening, a transverse shaft eccentrically disposed with respect to the driven pulley and secured thereto for rotation therewith, said shaft being rotatably secured to the beam on opposite sides of said beam, a pair of parallel arms on opposite sides of the driven pulley, one end of each of the arms being secured to the transverse shaft with the other end terminating substantially at the axis of the driven pulley, and a pair of pitmans each having one end pivoted to one of said other ends of said arms and also having the other end pivoted to the frame adjacent the center of said driving pulley.

3. An oil well jack comprising a frame including an upright standard, an elongated beam pivoted intermediate its ends to said standard for oscillation in a vertical plane, means carried by said beam remote from the pivotal connection between the beam and the standard for supporting pump rods, a driving pulley carried by said frame, said beam having an elongated vertical opening therethrough opposite the pivotal connection from the last mentioned means, a driven pulley in said opening for rotation in a vertical plane, flexible means operatively connecting the pulleys, means for rotating the driving pulley, means for positively oscillating the beam and for supporting the driven pulley comprising a transverse shaft eccentrically disposed with respect to the driven pulley and secured thereto for rotation therewith, said shaft being rotatably secured to the beam on opposite sides of said driven pulley, a pair of parallel arms on opposite sides of the beam, one end of each of the arms being secured to the transverse shaft for rotation therewith and with the other end terminating substantially at the axis of the driven pulley, a pair of pitmans each having one end pivoted to one of said other ends of the arms and also having the other end thereof pivoted to the frame adjacent the axis of the driving pulley, and means for counterbalancing the weight of pump rods carried by said first means.

4. In an oil well pumping machine, a supporting frame, an elongated walking beam oscillatably mounted on the frame for movement in a vertical plane, means for positively oscillating the walking beam comprising a driving sprocket and a driven sprocket, said driving sprocket being mounted for rotation on the frame, an elongated pitman having first and second ends, means adjacent the first end of the pitman for mounting the pitman for free oscillation about the axis of rotation of the driving sprocket, means carried by the pitman adjacent the second end thereof for mounting the driven sprocket for rotation about the central axis of the driven sprocket, means for mounting the driven sprocket for eccentric rotation on the walking beam, and an endless flexible driving element entrained over the sprockets.

5. In an oil well pumping machine, a first shaft and a driving sprocket mounted on the first shaft, a pitman having first and second ends, means pivotally securing the pitman to the first shaft adjacent the first end of the pitman, an arm of lesser length than the pitman and having first and second ends, means for pivotally securing the second end of the pitman to the first end of the arm for rotation of the arm at one side of the pitman about an axis parallel to the first shaft, a laterally projecting shaft fixedly secured to the arm adjacent the second end thereof, said second mentioned shaft extending away from the pitman in parallel relation to the first shaft, a driven sprocket eccentrically fixed on the second mentioned shaft with the axis thereof in alignment with the axis of the pivotal connection between the arm and the pitman, and a drive chain entrained over said sprockets.

6. In an oil well pumping machine, a first shaft and a driving sprocket mounted on the first shaft, a pitman having first and second ends, means pivotally securing the pitman to the first shaft adjacent the first end of the pitman, an arm of lesser length than the pitman and having first and second ends, means for pivotally securing the second end of the pitman to the first end of the arm for rotation of the arm at one side of the pitman about an axis parallel to the first shaft, a laterally projecting shaft fixedly secured to the arm adjacent the second end thereof, said second mentioned shaft extending away from the pitman in parallel relation to the first shaft, a driven sprocket eccentrically fixed on the second mentioned shaft with the axis thereof in alignment with the axis of the pivotal connection between the arm and the pitman, said driven sprocket being secured to the second mentioned shaft in spaced relation to the arm so that a walking beam may be pivoted to the second mentioned shaft intermediate the driven sprocket and the arm, and a drive chain entrained over said sprockets.

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