March 15, 1927. 1,620,795

L. J. BLACK

PUMP JACK

Filed Aug. 24, 1926 3 Sheets-Sheet 1

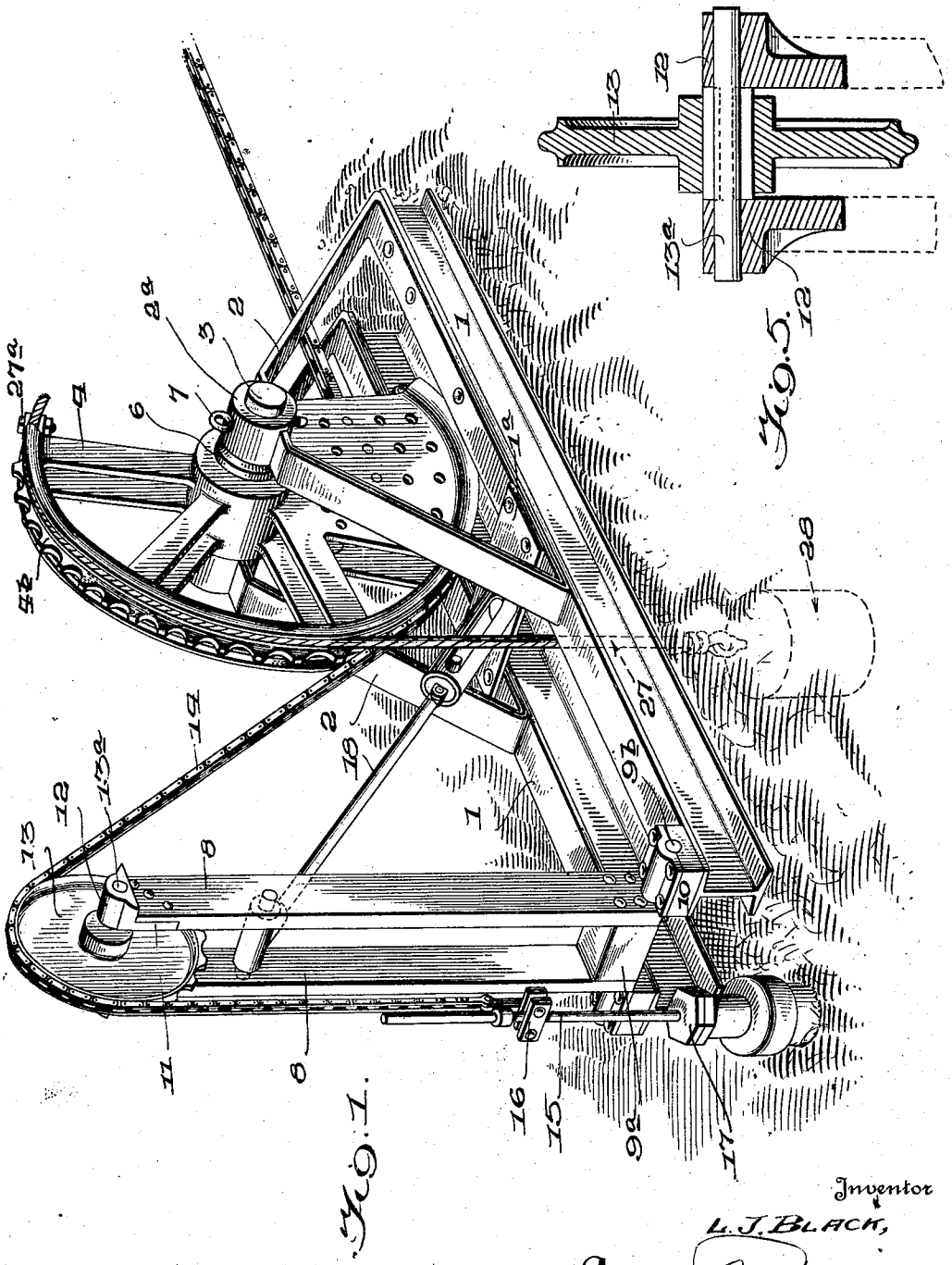


Fig. 1.

Fig. 5.

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Filed Aug. 24, 1926 3 Sheets-Sheet 2

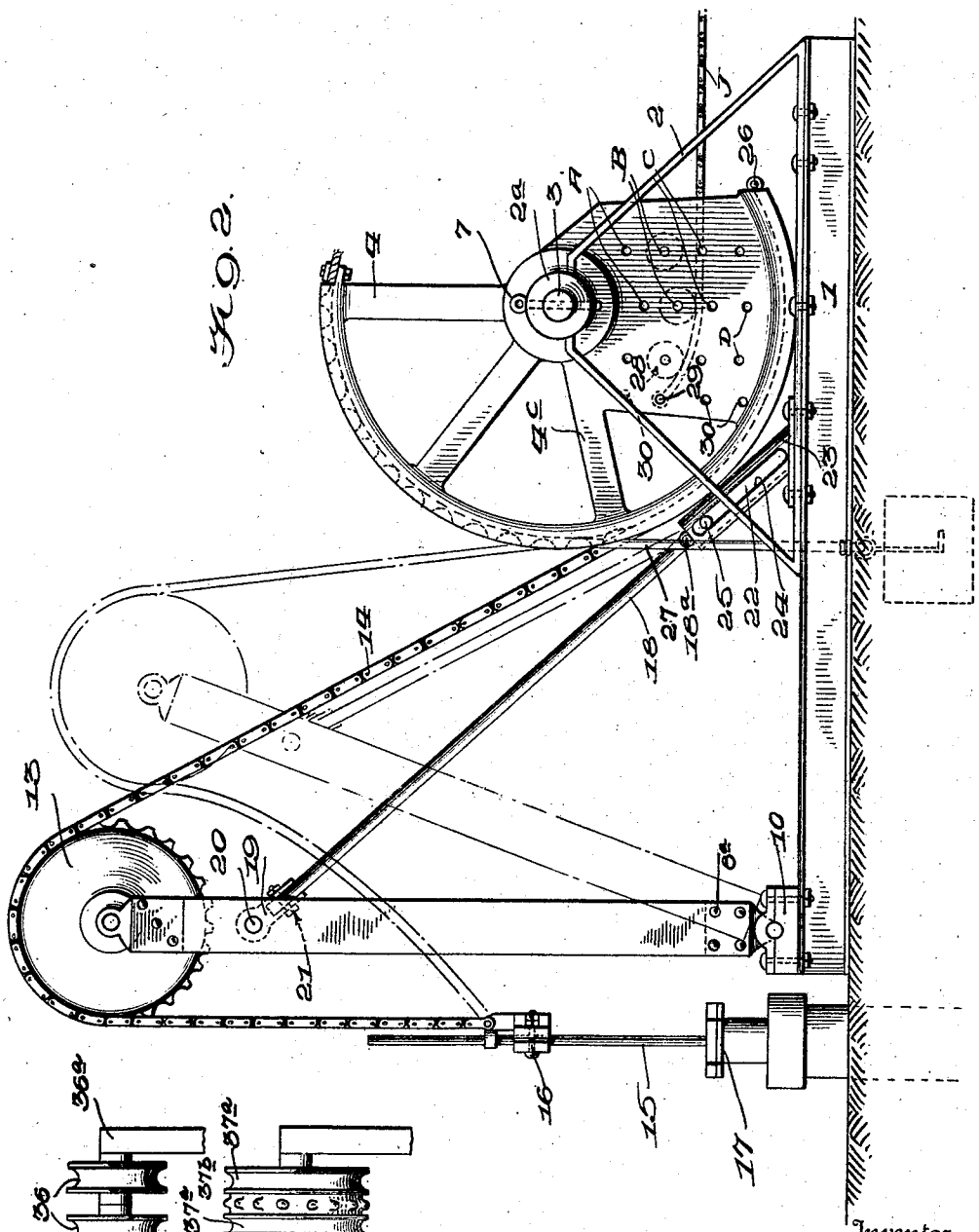


Fig. 7. Fig. 8.

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March 15, 1927. L. J. BLACK 1,620,795

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Filed Aug. 24, 1926 3 Sheets-Sheet 3

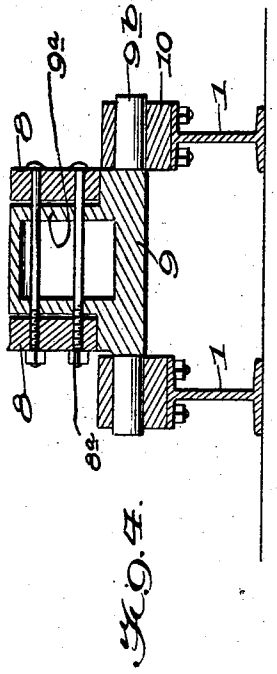


Fig. 4.

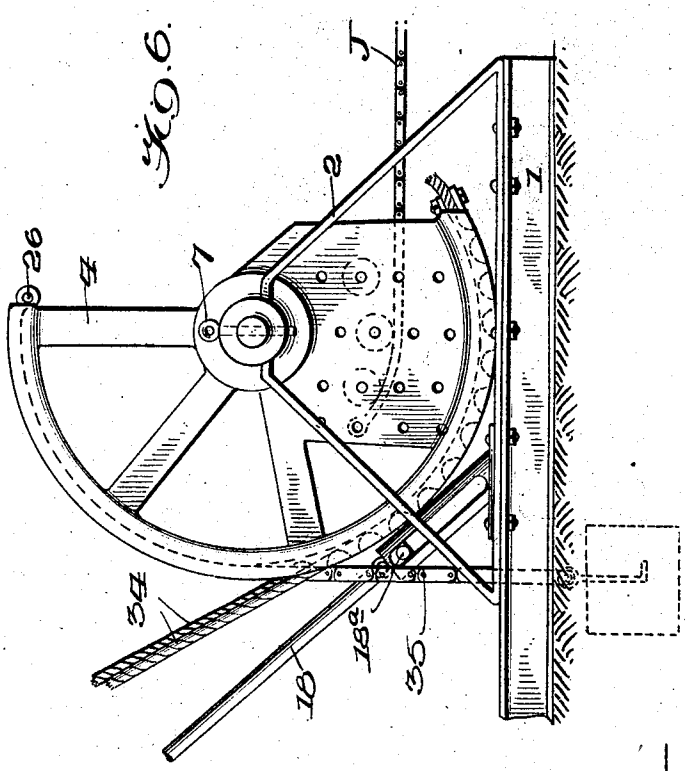


Fig. 6.

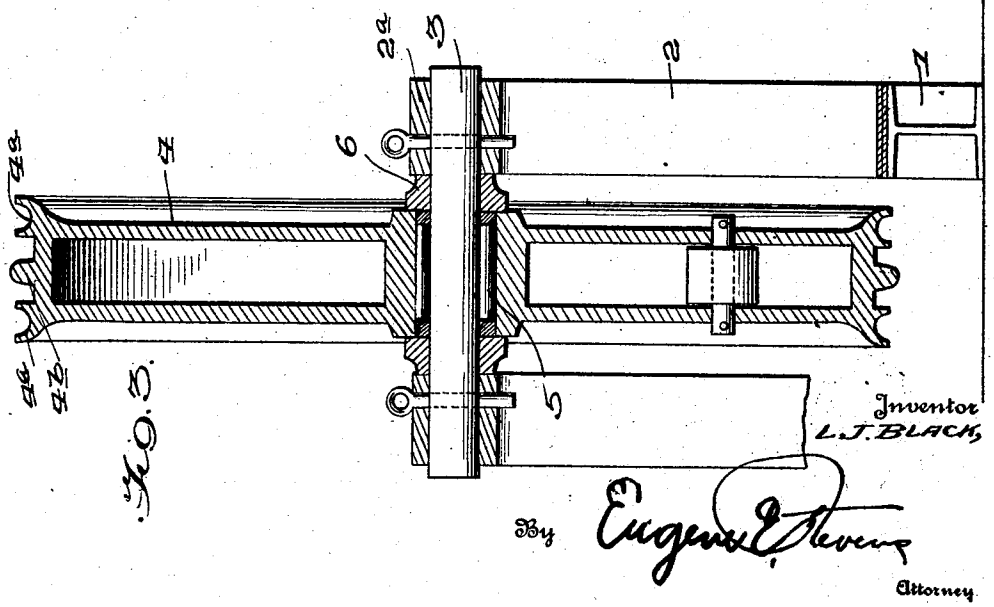


Fig. 5.

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UNITED STATES PATENT OFFICE.

LEE J. BLACK, OF BEAUMONT, TEXAS.

PUMP JACK.

Application filed August 24, 1926. Serial No. 131,251.

My invention relates to improvements in pumping machinery and particularly to the so called pump jacks for operating the polished rods used in connection with oil well pumping apparatus.

The principal objects of the invention may be briefly summarized as follows:

First, it aims to provide a pump jack structure wherein the idle pulley or sheave supporting mast is designed to be swung backwardly to entirely clear the casing head of the well so as to permit the free use of the derrick and hoisting tackle when it is necessary to pull rods or tubing from the well.

Secondly, to furnish a device of this character wherein a single or duplicate connection may be employed for engagement to and manipulation of the polished rod, the same being either chains or cables or the like, and which may be employed with a pump jack of the type including a counterweight.

Thirdly, the provision of a novel and improved power wheel having means whereby its operating cable or jack line may be attached in such fashion as to produce a smooth uniform pull on the wheel throughout its stroke,—this jack line attaching means being adjustable whereby the length of stroke of the power wheel and pump may be varied with respect to the length of stroke of the crank or cam which operates the jack line.

Other objects and advantages of the invention will be mentioned or will be readily apparent as the description proceeds.

The various features of novelty which characterize my pump jack are pointed out with particularity in the claims annexed to and forming a part of this specification. However, for a better understanding of the improvements and their advantages, reference should be had to the accompanying drawings and descriptive matter depicting what I now regard as a preferred embodiment of the invention. It is to be understood of course, that the disclosure herein is in no wise limitative and that I am entitled to make such changes and modifications in the apparatus shown as fairly fall within the spirit and scope of the invention as claimed.

In the drawings:

Figure 1 is a perspective view of the invention in operative position and illustrating a sprocket chain as the operating connection between the power wheel and the polished rod;

Figure 2 is a side elevation;

Figure 3 is a cross sectional view through the power wheel and its bearing support;

Figure 4 is a cross sectional detail of the foot casting for swingingly connecting the mast to the supporting frame.

Figure 5 is a cross section through the mast carried sprocket sheave shown in Figure 1;

Figure 6 is a side elevation of the power wheel illustrating the use of duplicate cable connections for engaging the polished rod; and

Figures 6 and 7 illustrate two forms of mast sheaves which may be employed when the duplicate cable arrangement of Figure 6 is used.

Referring specifically to the drawings, wherein like reference characters designate the same parts throughout the several views, the apparatus comprises a frame including a pair of spaced I-beams 1 connected in any desired way such as by cross members 1^a.

At one end of the frame are provided V-shaped supporting standards 2 with transverse sockets 2^a at their apices for the reception of the shaft 3 of the segmental power wheel 4. An anti-friction roller bearing 5 is provided for wheel 4 as shown in Fig. 3, set collars 6 engaging the hub ends of the wheel 4 to hold it against end play. Fig. 1 clearly illustrates that shaft 3 is held stationary in sockets 2^a by cotter pins 7 which extend transversely through each socket and the shaft 3.

At the other end of the frame is mounted the sheave or pulley supporting mast comprising spaced uprights 8 the lower ends of which are bolted as at 8^a to the sides of the medial boss 9^a of the foot casting 9 whose pintles 9^b are secured in bearing boxes 10 mounted upon the frame. It is seen that the mast is swingingly mounted on the frame, this construction enabling it to be swung clear of the well hole when it is desired to pull tubing or rods as will be more fully explained hereinafter.

At their upper ends the mast sections 8 carry cap castings 11, the same being formed with bearings 12 to receive the pintles 13^a of the sprocket pulley 13. The chain 14 which is driven in the well known reciprocatory fashion by power wheel 4 is trained

over this pulley 13 and has its end connected to the polished rod 15 as indicated at 16, the polished rod 15 working through the casing head 17 of the well in the usual manner.

The mast is held in vertical position by means of an adjustable brace in the form of a rod 18 whose T head 19 at one end is pivotally supported on a short shaft 20 carried by the uprights 8. The T head 19 is socketed to receive the rod 18 and a detachable connection is established by means of a bolt or pin 21 insertable through alined holes in the socket and rod as indicated in Fig. 2. The other end of the rod 18 is pivoted as at 18^a to a plunger element 22 working in the forwardly slanting or obliquely disposed socketed casting 23 which is bolted to one of the cross members 1^a.

The socket casting 23 is slotted as indicated at 24 to receive a pin 25 projecting laterally from the plunger 22. The end of the pin 25 is adapted to engage in recesses within the socket whereby to hold the mast in its operative or inoperative position. It is understood that the rod 18 is designed to slide into the socket casting 23 as indicated in dotted lines in Figure 2.

The very important advantage of my construction, just described, is that it enables the mast to be swung entirely clear of the casing head 17 so as to permit the rods or tubing to be pulled without hindrance by means of a derrick and tackle as mentioned in the introductory part of this specification. With pump jacks of the type commonly used it is necessary to dismantle or take down the mast in order to get it out of the way when it is desired to pull tubing. The only other alternative is to move the apparatus away from the casing head and this is a rather tedious task.

Referring again to the power wheel 4 it is noted that its periphery is formed at either side with a circumferential groove 4^a while between these grooves is a sprocket toothed segment 4^b coextensive with the periphery of the wheel. The polished rod operating chain 14 previously mentioned is trained over the sprocket teeth 4^b and the end of this chain is secured to a cross pin 26 carried by the wheel, as shown in Fig. 2.

Figure 1 illustrates that one of the grooves 4^a is designed to receive a cable 27 which is fastened to the wheel as at 27^a and has its free end suspending a counterweight 28 which works in a hole in the ground between the two I-beams 1. The function of the counterweight is to partially compensate for the weight of the rods in the well so as to relieve the wheel 4 of a certain amount of strain and lessen the force requisite to lift the rods. However, it is of course to be understood that the weight of the rods in the well will be sufficiently in excess of the weight of the counterweight 28 to lift the same on the return or drop of the rods in the normal well known operation of the device.

Referring to Fig. 3 it is observed that the wheel 4 is hollow, that is it comprises spaced supporting webs 4^c for the rim or felly. These webs 4^c are each provided with four series of diametrically opposite holes A, B, C and D. There are three holes in each series and each hole thereof is the same distance from the center of the wheel. The series of holes A, B and C are designed to receive the pintles of rollers 28. The jack line J is connected to the wheel 4 by means of a pin 28 selectively engageable in any one of the diametrically opposite holes 30 of the web sections 4^c there being a pair of these holes in proximity to each series of holes A, B, C and D.

It is evident that by the use of the rollers 28 positioned in any one of the series of apertures or holes A, B, C and D that the pull on the wheel 4 will be uniform throughout its stroke by reason of the fact that the holes of each series are equidistant from the center of the wheel 4. This is an important feature because in the structures now used the pull of the jack line is uneven. By way of explanation it is pointed out that when a jack line is connected to a power wheel solely at one point and without auxiliary support for the line the point of connection is very close to the center of the wheel at the commencement of the stroke. This results in a decided thrust against the shaft of the power wheel, it being understood that the line of pull of the jack line is so as to speak in a straight line. Likewise the speed of rotation of the power wheel is going to vary during the stroke according to the distance the jack line attachment is from the axis of the wheel during the various stages of the stroke.

The adjustable rollers 28 further permit the stroke of the power wheel 4 to be varied relative to the stroke of the cam or crank (not shown) which operates the jack line J. The stroke of this cam or crank for operating the jack line is of course uniform and is usually anywhere from 20 to 24 inches. Assuming that the rollers 28 are located in the series of holes A, the pumping stroke or extent of travel of the periphery of the wheel 4 would be nearly twice the length of the stroke of the jack line J and its cam or crank. When the rollers 28 are located in the holes B the relative length of the pumping stroke and extent of travel of the rim of wheel 4 will be somewhat less than when the rollers were located in the holes A. In other words, the jack line stroke being constant, the peripheral movement of the wheel 4 will decrease as the rollers 28 and point of jack line attachment are moved closer to the periphery. It is of course understood that the

connection between the sucker or polished rod 15 assures that its stroke will be same as the stroke of power wheel 4. It is very important to be able to change the pump stroke as the desirable length of stroke will vary according to the depth of the well and other circumstances.

When pumping particularly deep wells it is often desirable to support the polished rod by means of a double cable or double flexible connection. In my apparatus this is possible without changing the wheel 4 or materially altering the structural arrangement of the device. Two cables are connected in the grooves 42 as clearly shown in Fig. 6 while the chain 14 of Fig. 2 becomes the chain 35 of Fig. 6 and supports the weight 35ª. The cables are trained over duplicate sheaves 36 (Fig. 7) on a common shaft received in bearings 12, the sheaves 36 replacing the sprocket pulley 13 of Fig. 1. It may be desirable to employ a pulley 37 (Fig. 8) in lieu of either pulley 13 or duplicate pulleys 36. This pulley 37 is formed like the power wheel 4 having marginal cable grooves 37ª and an intermediate sprocket toothed section 37ᵇ. This pulley could be used with either a chain or duplicate cable connection between power wheel 4 and polished rod 15.

Having thus described the invention, what is claimed is:

1. A pump jack comprising a frame, a power wheel journaled upon said frame, a mast swingingly mounted upon said frame and having a pulley journaled thereon and positionable over the well casing head, a flexible polished rod operating connection trained over said pulley and driven by said power wheel, an adjustable brace for said mast whereby the mast may be swung from its operative position to a point clear of the casing head, said power wheel including spaced rim supporting web sections, a reciprocatory jack line for operating said power wheel, and variably positionable means carried between said web sections for connecting said line to the wheel at various points with respect to its axis.

2. A pump jack comprising a frame, a power wheel journaled upon said frame, a mast swingingly mounted upon said frame and having a pulley journaled thereon and positionable over the well casing head, a flexible polished rod operating connection trained over said pulley and driven by said power wheel, an adjustable brace for said mast whereby the mast may be swung from its operative position to a point clear of the casing head, said power wheel including spaced rim supporting web sections, a reciprocatory jack line for operating said power wheel, and variably positionable means carried between said web sections for supporting said line during its working stroke and maintaining the same a uniform distance from the axis of the wheel throughout said stroke.

3. A pump jack comprising a frame, a power wheel journaled upon said frame, a mast swingingly mounted upon said frame and having a pulley journaled thereon and positionable over the well casing head, a flexible polished rod operating connection trained over said pulley and driven by said power wheel, an adjustable brace for said mast whereby the mast may be swung from its operative position to a point clear of the casing head, said power wheel including spaced rim supporting web sections, a reciprocatory jack line for operating said power wheel, supporting rollers for said line disposed between said web sections and arranged in arcual series equidistant from the axis of the wheel, and said rollers being variably positionable with respect to the axis of the wheel whereby the stroke of the wheel may be varied with respect to the stroke of the jack line.

4. A pump jack comprising a frame, a power wheel journaled upon said frame, a mast swingingly mounted upon said frame and having a pulley journaled thereon and positionable over the well casing head, a flexible polished rod operating connection trained over said pulley and driven by said power wheel, an adjustable brace for said mast whereby the mast may be swung from its operative position to a point clear of the casing head, said power wheel including spaced rim supporting web sections, a reciprocatory jack line for operating said power wheel, variably positionable means carried between said web sections for supporting said line during its working stroke and maintaining the same a uniform distance from the axis of the wheel throughout said stroke, the periphery of said power wheel having attaching and guiding means for said aforementioned connection, a counterweight carried by said wheel, a flexible connection for supporting said counterweight, said wheel periphery having guide means for an auxiliary connection to be attached to the polished rod.

5. In a pump jack, a power wheel comprising spaced web sections, the web sections having several radially spaced and diametrically opposite series of transverse apertures, the apertures of each series being on the same radii, rollers positionable between said webs and having their pintles selectively engageable in the respective series of apertures, a reciprocatory jack line for oscillating said power wheel and adapted to work over said rollers in any of the several settings thereof, and said power wheel having means for connection with said jack line at points adjacent the ends of each of said series of apertures.

6. In a pump jack, a power wheel com-

prising spaced web sections defining a substantial recess between the hub of the wheel and its rim, a reciprocatory jack line for operating said wheel, antifriction elements over which said jack line works, and means for selectively mounting said antifriction elements between said webs in arcual series at radially spaced points.

7. In a pump jack, a power wheel comprising spaced web sections defining a substantial recess between the hub of the wheel and its rim, a reciprocatory jack line for operating the wheel, means positionable between said webs for supporting said jack line equidistant from the center of the wheel throughout its working stroke, and means for variably positioning said jack line supporting means with respect to the center of the wheel.

8. In a pump jack, a power wheel comprising spaced web sections defining a substantial recess between the hub of the wheel and its rim, a reciprocatory jack line for operating the wheel, and means positionable between said webs for supporting said jack line equidistant from the center of the wheel throughout its working stroke.

9. In a pump jack, a power wheel, a reciprocatory jack line for operating the same, anti-friction means for supporting said line the same distance from the center of the wheel throughout its working stroke, and said wheel having means whereby said line supporting means may be variably positioned with respect to the axis of the wheel.

10. In a pump jack, a power wheel comprising spaced web sections defining a substantial recess between the hub of the wheel and its rim, said web sections having means whereby a jack line may be attached thereto in different positions with respect to the axis of the wheel, variably positionable means associated with and between said web sections for supporting a jack line equidistant from the axis of the wheel throughout its movement, and the rim of said wheel extending entirely across the space between said web sections to thereby provide a relatively broad periphery, and guide means formed upon the periphery of said rim for a plurality of flexible connections, said guide means including a series of sprocket teeth and a pair of grooves.

In testimony whereof I affix my signature.

LEE J. BLACK.