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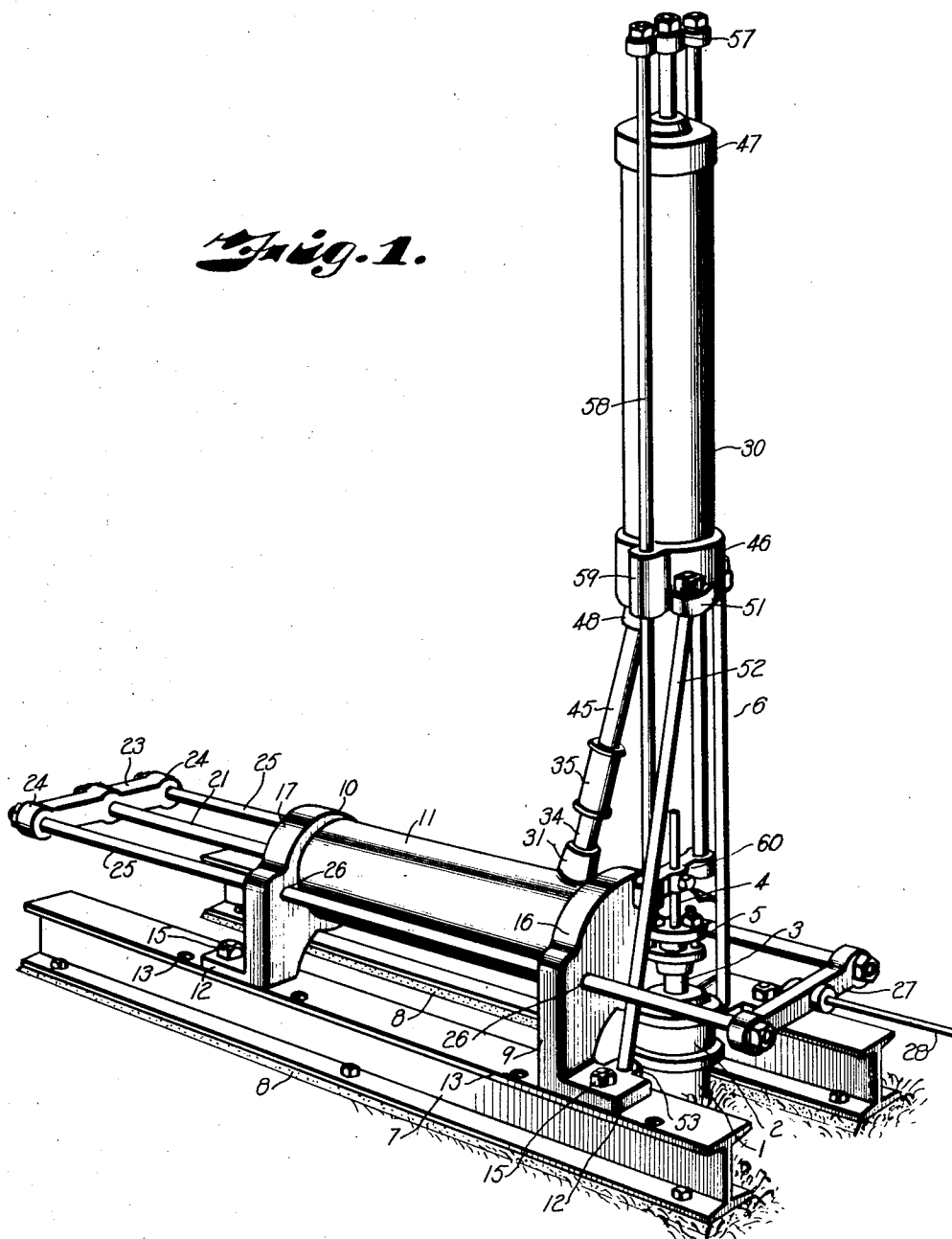
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HYDRAULIC PUMPING JACK

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2 Sheets-Sheet 1

Fig. 1.



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Fig. 3.



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HYDRAULIC PUMPING JACK

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My invention relates to pumping jacks and more particularly to devices of that character for use in pumping oil wells, and including hydraulic means for transmitting the reciprocatory motion of a horizontal pull rod to the vertical polish rod of a well pump; the principal object of the invention being to maintain a true vertical lift of the polish rod.

Further objects of the invention are to automatically control the flow of fluid in the hydraulic system and to interrupt the flow in the event of breakage of the pull rod, for preventing sudden descent and damage to the sucker rods and well pump.

In accomplishing these and other objects of the invention, I have provided improved details of structure, the preferred forms of which are illustrated in the accompanying drawings, wherein:

Fig. 1 is a perspective view of my improved pump jack applied to a well and connected with a pull rod in accordance with common practice.

Fig. 2 is a central vertical section through the pump jack showing the working parts in their relative position at the bottom of a pump stroke.

Fig. 3 is a central longitudinal section through the automatic control valve.

Referring in detail to the drawings:

1 designates well casing protruding from a well hole and capped by a casing head 2 supporting the well tubing 3. The tubing extends through the casing for supporting a pump at the bottom of the well (not shown), and a string of reciprocating sucker rods extending through the tubing is connected with the pump and fitted at its upper end with the polish rod 4 representing the usual pump-actuating apparatus sealingly engaged in a packing gland 5 on the tubing, and operably connected with my improved pumping jack 6 presently described.

The base for the pumping jack comprises a pair of I beams 7 mounted on anchor sills 8 and extending laterally from the well and in parallel spaced relation for accommodating the casing head 2 between their forward ends, and for the attachment of longitudinal-

ly spaced support plates 9 and 10 supporting a compressor cylinder 11.

The upper flanges of the beams are engaged by foot portions 12 on the support plates seated thereon, and are provided with series of spaced openings 13 with which apertures 14 in the foot portions may be selectively aligned to receive bolts 15 whereby the plates are secured on the beams.

The support plate 9 connecting the forward portions of the beams 7 is located slightly rearwardly from the casing head, and the support plate 10 is spaced rearwardly from the plate 9 by the cylinder 11 and serves to connect the rearward portions of the beams.

The support plates 9 and 10 are provided with semi-cylindrical head portions 16 and 17 respectively, having oppositely facing threaded annular recesses 18 at their inner sides engaged by threaded ends of the cylinder 11, the web portions of the heads, on bottoms of the recesses, serving as closure members for the open ends of the cylinder.

Protruding from the outer side of the head portion 17 on the plate 10 and in concentric relation therewith and with the recess is a boss 19 having an opening 20 in axial alignment with the cylinder 11 and a piston rod 21 is slidably engaged in the opening and fitted at its inner end with a piston head 22 which is reciprocable in the cylinder.

Secured to the outer end of the piston rod 21 is a connector bar 23 extending transversely over the beams 7 and provided with head portions 24 at its opposite ends attached to the rearward ends of slide bars 25.

The slide bars 25 extend forwardly from the connector bar 23 and in parallel spaced relation with the outer side walls of the cylinder 11, and are slidably engaged in openings 26 in wing-like portions of the support plates 9 and 10. The forward ends of the slide bars are fitted with a connector bar 27, and are extended outwardly from the support plate 9 sufficiently to provide a working clearance between the bar and the casing head when the bars are at the rearward limit of their movement.

Attached at a central position on the connector bar 27 is a pull rod 28 leading to a

source of power, (not shown), and representing actuating means whereby reciprocation may be imparted to the piston 22 for successively delivering a supply of liquid from a column 29 confined in the cylinder 11 into a receiving or expansion cylinder 30 hereafter described, adapted to cooperate with the cylinder 11 for actuating the pump.

Located on the upper side of the cylinder 11 and adjacent the support plate 9 is an upwardly protruding boss 31 having a threaded opening 32 communicating with the cylinder chamber 33 of the cylinder 11 and engaged by a nipple 34 extending upwardly and forwardly at an angle from true vertical and connected with the lower end of a control check valve 35.

The valve 35 includes a body member 36 provided with longitudinally spaced chambers 37 and 38 connected by a port 39 and a tapered seat 40 at the upper end of the port in the chamber 37 for cooperation with a valve member 41. The valve member is provided with a stem 42 extending downwardly through the port 39 into the chamber 38, and formed on the lower end of the stem is a collar 43 engaged by a compression coil spring 44 bearing against the lower end wall of the chamber 38, whereby the valve member is yieldingly retained in spaced relation with the seat 40 and the lower end of the pipe 45.

Fitted in the upper end of the check valve body 36 is a pipe 45 extending upwardly at a like angle with the nipple 34 and valve 35 to communicate with the receiving cylinder 30, said elements serving as a liquid conduit, and as a support brace for the vertically disposed cylinder 30.

The cylinder 30 is axially aligned with the polish rod 4 and fitted at its lower end with a coupling head 46 and at its upper end with a cover plate 47.

Depending angularly from the bottom of the coupling head 46 is a boss 48 provided with a threaded opening 49 receiving the upper end of the pipe 45, and establishing the connection between the pipe and the chamber 50 of the cylinder 30.

Extending sidewardly and oppositely from the forward portion of the coupling head 46 are a pair of lugs 51 attached to the upper ends of a pair of support legs 52 extending angularly downwardly from the lugs and secured to bosses or lateral flanges 53 projecting inwardly from the foot portions 12 of the support plate 9 for supporting the cylinder 30 in vertically spaced relation with the casing head 2.

Slidably mounted in the cylinder 30 is a piston 54 connected with a piston rod 55 extending upwardly through a guide opening 56 in the cover plate 47 and fitted at its upper end with a cross arm 57.

Secured to the outer ends of the cross arm 57 and extending downwardly therefrom in

spaced relation with opposite sides of the cylinder 30 are a pair of connecting rods 58 slidably engaged in guide bosses 59 on the coupling head 46, and a polish rod clamp 60 is secured to the lower ends of the rods, which are of sufficient length below the bosses to provide working clearance between the head 46 and the polish rod clamp.

In practicing my invention, the polish rod clamp 60 is secured on the polish rod 4 and the connector bar 27 is attached to the end of the pull rod 28 whereby motion and power may be transmitted to the pumping jack from a source of power (not shown). The cylinder 11 is filled with a liquid (preferably oil), and during the forward stroke of the piston 22, the liquid is forced from the chamber 33 through the nipple 34, valve 35 and pipe 45 into the lower end of the cylinder 30.

The liquid entering the chamber 50 of the cylinder 30 causes the piston 54 to be moved upwardly in the cylinder and the piston rod 55 through its connection with the connecting rods 58 causes upward movement of the polish rod 4 and sucker rods for actuating the pump at the bottom of the well.

When the forward movement of the pull rod 28 is completed, slack is imparted thereto by the power source, and the weight of the sucker rods supported by the piston 54 against the elevated head of liquid in the cylinder 30, causes the liquid to be forced downwardly through the pipe 45 and around the valve member 41, for return to the cylinder 11.

The liquid returning to the cylinder causes the piston 22 to be forced rearwardly, whereupon the slack in the pull rod is taken up preparatory for imparting the succeeding forward stroke to the piston.

Under normal pressure conditions of operation liquid moved by the piston 54 under influence of the weight of the sucker rods will pass the valve 41 without affecting the same and move through the port 39 into the chamber 38, and then to the cylinder 11.

In the event of breakage of the pull rod line 28, the sudden reversal of pressure from the cylinder 30 to the cylinder 11 results in abnormal pressure conditions and causes the valve 41 to be depressed against the tension of the compression spring 44 for closing the port 39 against the return flow of the liquid to the cylinder 11 thereby preventing sudden descent of the sucker rods and damage to the well pump.

What I claim and desire to secure by Letters Patent is:

1. In a device of the character described, in combination with apparatus including a pull rod and a polish rod, a support, a cylinder mounted horizontally on the support and having a port adjacent one end, a piston in the cylinder, a piston rod extending through the opposite end of the cylinder and connect-

ing the piston with the pull rod, a second cylinder mounted vertically above the support in spaced relation with the horizontal cylinder, an inclined conduit connecting said port with the lower end of the vertical cylinder, a valve in said conduit for controlling flow of liquid from one cylinder to the other, a piston in the vertical cylinder, a piston rod connected to said last-named piston and extending through the upper end of the vertical cylinder, and means for connecting said last-named piston to the polish rod.

2. In a device of the character described, in combination with apparatus including a pull rod and a polish rod, a support having head portions, a cylinder mounted horizontally between said head portions, and having a port adjacent one end, a piston in the cylinder, a piston rod extending through the opposite end of the cylinder, means connecting the piston rod with the pull rod including side rods extending through said head portions, a second cylinder, means including spaced legs for supporting the second cylinder vertically above said support, an inclined conduit connecting said port with the lower end of the vertical cylinder, a valve in said conduit for controlling flow of fluid from one cylinder to the other, a piston in the vertical cylinder, a piston rod connected to said last-named piston and extending through the upper end of the vertical cylinder, and means for connecting said last-named piston to the polish rod.

In testimony whereof I affix my signature.
VIRGIL L. DU BOIS.