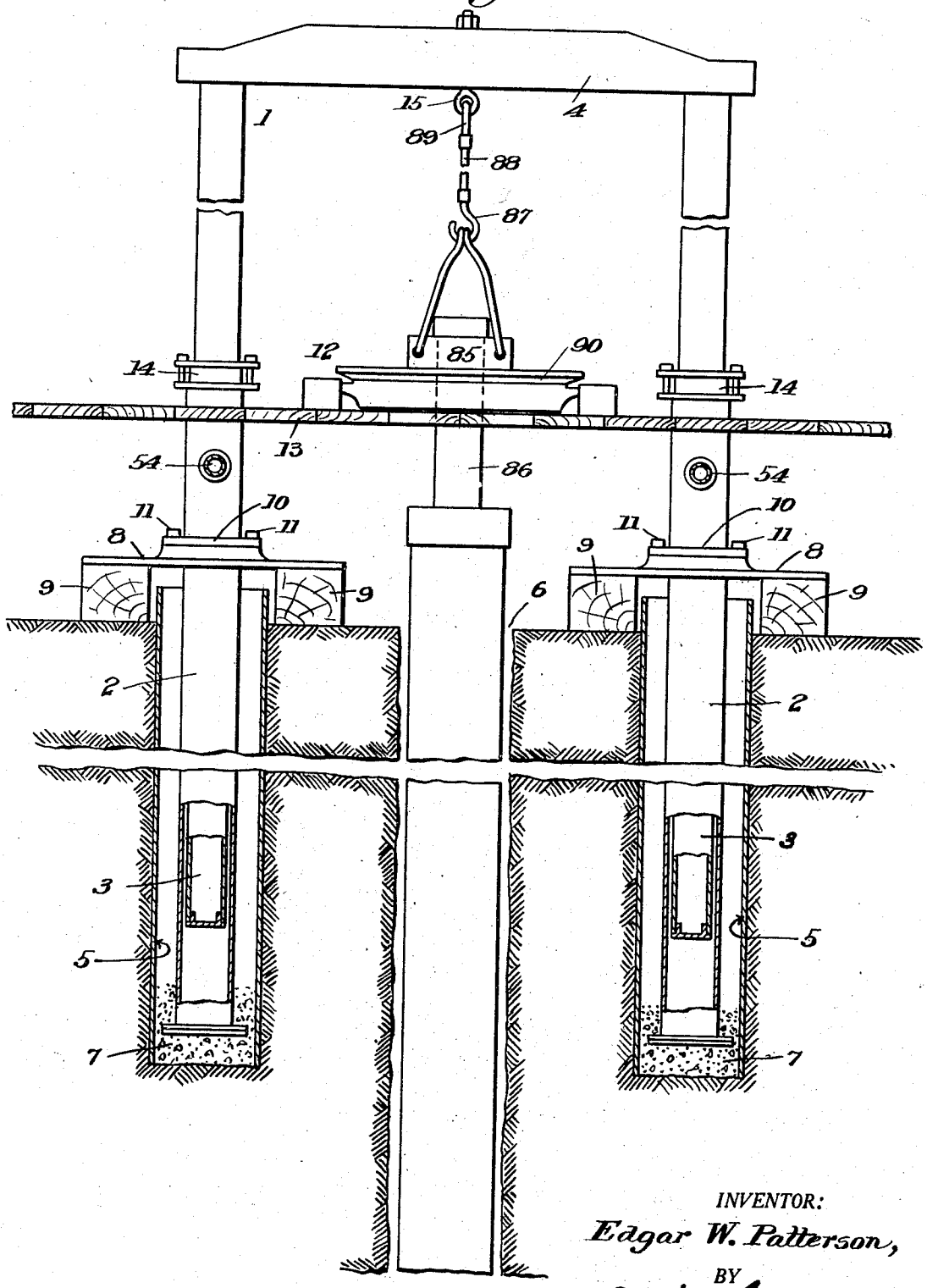
July 15, 1924. 1,501,464

E. W. PATTERSON

HYDRAULIC APPARATUS FOR HANDLING WELL TUBING

Filed April 9, 1923 2 Sheets-Sheet 1

Fig. 1.



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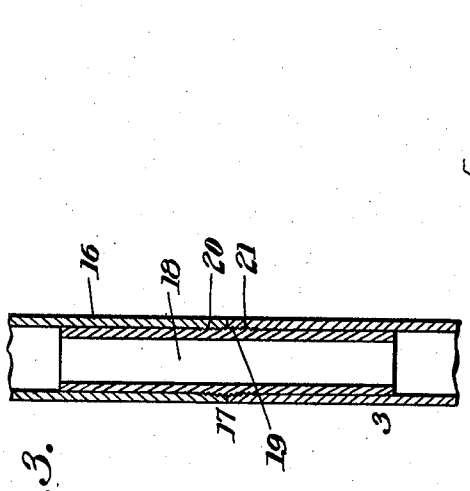


Fig. 3.

Fig. 2.

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UNITED STATES PATENT OFFICE.

EDGAR W. PATTERSON, OF NORWALK, CALIFORNIA.

HYDRAULIC APPARATUS FOR HANDLING WELL TUBING.

Application filed April 9, 1923. Serial No. 630,849.

To all whom it may concern:

Be it known that I, EDGAR W. PATTERSON, a citizen of the United States, residing at Norwalk, in the county of Los Angeles and State of California, have invented new and useful Improvements in Hydraulic Apparatus for Handling Well Tubing, of which the following is a specification.

My invention relates to an elevating apparatus and the main object thereof is to provide a hydraulic apparatus particularly useful for raising and lowering drill pipe or casing in what is known as the rotary method of oil well drilling.

The hydraulic jack has been proven in years past to be one of the most powerful and safe elevating apparatuses known, and it is principally for this reason that I utilize such jack in my new elevating apparatus as herein disclosed.

Other objects and advantages will appear hereinafter, and while I show herewith and will describe a preferred form of construction, I desire to be understood that I do not limit my invention to such preferred form, but that various changes and adaptations may be made therein without departing from the spirit of my invention as hereinafter claimed.

Referring to the accompanying drawings:

Fig. 1 is a vertical, longitudinal section of an oil well and the hydraulic jack of my invention associated with said oil well.

Fig. 2 is a plan view of the pumping and pressure plant of my elevating apparatus.

Fig. 3 is a longitudinal section of one of the piston joints.

In the drawings 1 designates in its entirety a hydraulic jack, which includes a pair of vertical cylinders 2—2, a pair of vertical pistons 3—3 mounted to reciprocate vertically in said cylinders respectively, and 4 a horizontal cross bar connected at its ends respectively to the upper ends of said pistons.

The cylinders 2—2 are mounted within vertical casings 5—5, which are sunk in the earth at diametrically opposite sides of a well 6 and equi-distant from the center of said well, said cylinders being embedded in concrete foundations 7—7 within said casings 5—5.

Plates 8—8 are mounted on beams 9—9, two of which beams rest upon the surface of the earth at opposite sides of the upper end of each casing 5, through which plates extend the cylinders 2—2 respectively, there being annular flanges 10—10 on said cylinders which rest respectively upon said plates 8—8 and are bolted thereto by bolts 11—11, whereby the cylinders are properly positioned and mounted within the casings 5—5.

A derrick 12 is mounted above the well, through the floor 13 of which derrick extends the cylinders 2—2 and pistons 3—3, there being stuffing boxes 14—14 on the upper ends of said cylinders just above said floor.

An eye 15 is secured in the cross bar 4 on the under side of said bar and midway between the ends thereof coincident with the center of the well 6.

The pistons 3 are constructed of pipe sections 16 joined together by joints 17 which comprise a tubular element 18 formed with an external thread 19 midway of its ends, half of which is engaged by an internal thread 20 on one pipe section 16, while the other half thereof is engaged by an internal thread 21 in the end of the adjoining section 16.

The pumping and pressure plant of my elevator as shown in Fig. 2 includes an oil storage tank 25, a pump 26, pressure tanks 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41 and 42, pressure gauges 43 and 44, and pipe connections presently to be described.

An oil inlet pipe 45 leads from the tank 25 to the pump inlet 46 and an oil outlet pipe 47 leads from the pump outlet 48 into said tank. A check valve 49 and an adjustable automatic pressure relief valve 50 are interposed in the pipe 47, said check valve being located near the pump outlet 48 and said relief valve being located between said check valve and the tank 25.

A pipe 51 leads from the pipe 47 at a point 52 between the check valve 49 and relief valve 50 and connects at 53 to a pipe 54, the ends of which connect to the upper part of the jack cylinders 2—2. A pipe 55 connects to pipe 51 at point 52 and to one end of pressure cylinders 27 to 42 inclusive by means of pipe connections 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70 and 71 respectively.

A pipe 72 leads from the pipe 55 at a point 73 and connects at a point 74 to the pipe 51 between the points 52 and 53. A discharge pipe 75 leads from the pipe 51 at

point 74 into the storage tank 25. A valve 76 is interposed in the pipe 51 between the points 52 and 74.

Valves 77 and 78 are respectively interposed in the pipes 72 and 75 opposite the valve 76. A valve 79 is interposed in the pipe 55 between the connections 67 and 68 for isolating the tanks 39 to 42 inclusive from the tanks 27 to 38 inclusive. A pipe 80 leads from the pipe 51 at a point between valve 76 and point 52 to the pressure gauge 43. A pipe 81 leads from the pipe 72 at a point between the valve 77 and point 73.

The operation of my invention is as follows: Assuming there are ten 80-ft. stands of drill pipe in the well 6 to be drawn out and a new bit put on and run in again. 1st operation—pulling pipe out of well. The jack 1 being in its lowermost position an elevator clamp 85 is placed around the upper end of the well casing 86 and said elevator clamp connected to a hook 87 on the lower end of a cable 88 connected at its upper end to a hook 89, which engages the eye 15 in the beam 4. Valve 79 is opened, leaving all sixteen pressure tanks 27 to 42 inclusive open to main high pressure line 51.

The pump 26 is put in operation and pressure in said pressure tanks and lines is run up to the desired working pressure, which will be indicated on both gauges 43 and 44. Valve 76 is opened, releasing pressure into hydraulic jack 1 to raise the same and well casing 86. This raising continues for a lift of about 80 ft. until the upper pipe joint comes above the surface of the derrick rotary table 90.

Valve 76 is then closed and the jack and said raised pipe are held by the pressure in said raised position. Said raised stand of pipe is then disconnected from the lower remaining length of pipe and swung to one side and secured in the derrick and the elevator clamp 85 is disconnected from the upper end of said stand.

Valve 78 is now opened, allowing oil to escape from jack 1 freely into storage tank 25 through pipes 54 and 75, which will cause said jack to descend. When jack reaches its lowermost position, valve 78 is closed, elevator clamp 85 is attached to the upper end of the next uppermost casing stand. Valve 76 is again opened, causing jack and casing to again be raised by the pressure from the pump until said pipe joint is above the rotary table 90, which pipe is disconnected and stood up in the derrick with the first pipe.

The above described operations are continued until all of the casing is drawn from the well and stood up in the derrick.

During all of said operations pump 26 is in operation, maintaining pressure in tanks 27 to 42 inclusive. In case pressure should for any reason go above the desired head, automatic valve 50 will open to release oil to storage tank 25 throughout outlet pipe 47.

2nd operation—lowering drill pipe back into well.

It will be understood that each 80 ft. stand of drill pipe weighs approximately 2000 lbs. or one ton. Therefore the load being lowered into well increases with every stand of pipe put in well.

Then in place of releasing the pressure, created in the jack by the load, into the open storage tank 25, it will be stored in the pressure tanks 27 to 38 inclusive, under sufficient of its own pressure to again raise the unloaded jack back to its uppermost position.

Valve 79 is closed, separating tanks 27 to 38 inclusive from tanks 39 to 42 inclusive, the latter tanks retaining their high pressure for use in case of emergency. Now valve 77 is opened, releasing pressure into jacks, causing same to rise to the upper position. Then said valve 77 is closed, holding jack in said raised position. Then the elevator clamp 85 is attached to the upper end of the first 80 ft. stand of drill pipe and said pipe is then ready to be lowered back into the well. Then by opening valves 78 and 77 and allowing the excess pressure from tanks 27 to 38 inclusive to escape to storage tank 25, until pressure gauge 43 indicates a pressure low enough so that when valve 78 is closed, the weight of the drill pipe suspended by the jack will create a sufficient pressure within the jack to allow the jack to back down against said pressure as indicated by said gauge. Then when the jack is at its lowermost position again, the valve 77 is closed, holding jack in said position, while elevator clamp 85 is disengaged from the drill pipe. Then valve 77 is again opened, releasing pressure which was stored in tanks 27 to 38 by the down trip of jack with the load, which will be sufficient to again raise the unloaded jack to its upper position, and said operations repeated. Said pressure being at all times derived from a head of compressed air in pressure tanks. My elevator may be operated either by oil or water or other suitable liquid.

In case of an emergency if it is desired to raise the casing partly in the well, the valves 77 and 78 may be closed and the valve 76 may be opened to utilize the high pressure in the tanks 39 to 42 inclusive for such purpose.

Having described my invention, I claim:

1. In an apparatus of the character disclosed, a hydraulic jack, a fluid pumping and storage plant connected to said jack for pumping fluid to a proper pressure for raising said jack to raise a well casing and for storing said compressed fluid and utilizing the same for lowering said casing in its well.

2. In an apparatus as disclosed, a hy-

draulic jack, a fluid pumping and storage plant connected to said jack, for pumping fluid to a proper pressure for raising said jack and a well casing connected thereto, for storing said fluid pressure, for utilizing part of said stored fluid pressure, for lowering said casing and for utilizing all of said fluid pressure for raising said casing.

3. In an apparatus as disclosed, a hydraulic jack, a pumping and storage plant connected to said jack, means for utilizing the fluid pressure while being pumped for raising said jack, means for shutting off the pump of said plant and allowing the fluid pressure in the jack to escape so that said jack will descend, means for utilizing the stored pressure of said plant, to allow the jack to descend with a load, means for enabling said jack to store pressure as it descends with said load, and means for utilizing said latter stored pressure for raising the jack without a load.

4. In an apparatus as disclosed, a hydraulic jack, a pumping and storage plant connected to said jack, means for utilizing the fluid pressure while being pumped for raising said jack, means for shutting off the pump of said plant and allowing the fluid pressure in the jack to escape so that said jack will descend, means for utilizing the stored pressure of said plant, to allow the jack to descend with a load, means for enabling said jack to store pressure as it descends with said load, and means for utilizing said latter stored pressure for raising the jack without a load, and means for utilizing all of the pressure stored by said pump and said jack under load for lifting said load.

EDGAR W. PATTERSON.