Sept. 16, 1924. 1,508,704

R. E. LEONARD

WELL DRILLING APPARATUS

Filed Feb. 2, 1921 2 Sheets-Sheet 1

Fig. 1.

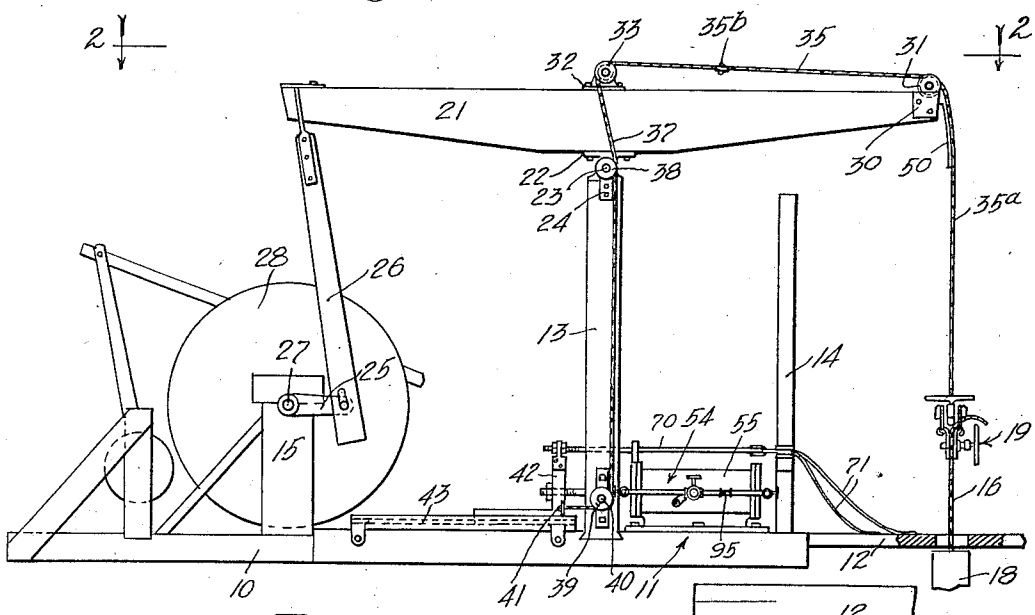
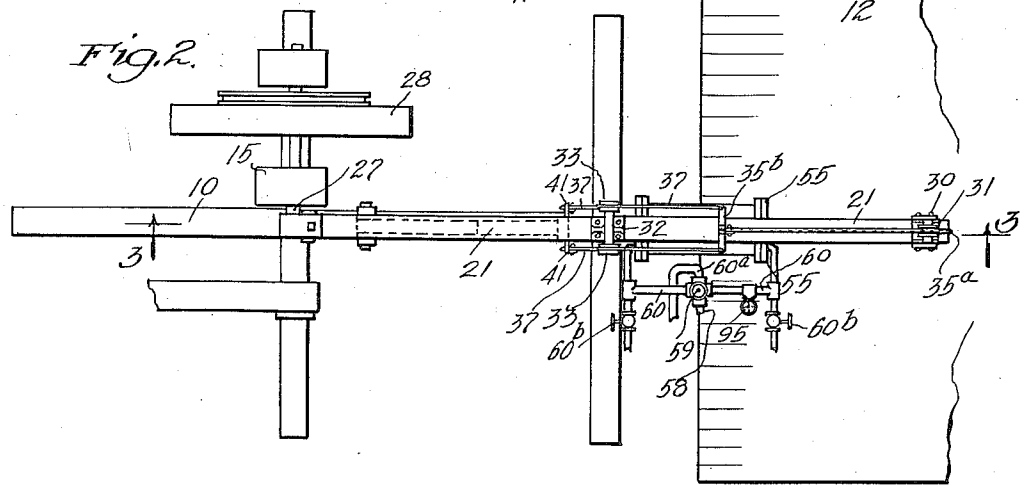


Fig. 2.



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Fig. 3.

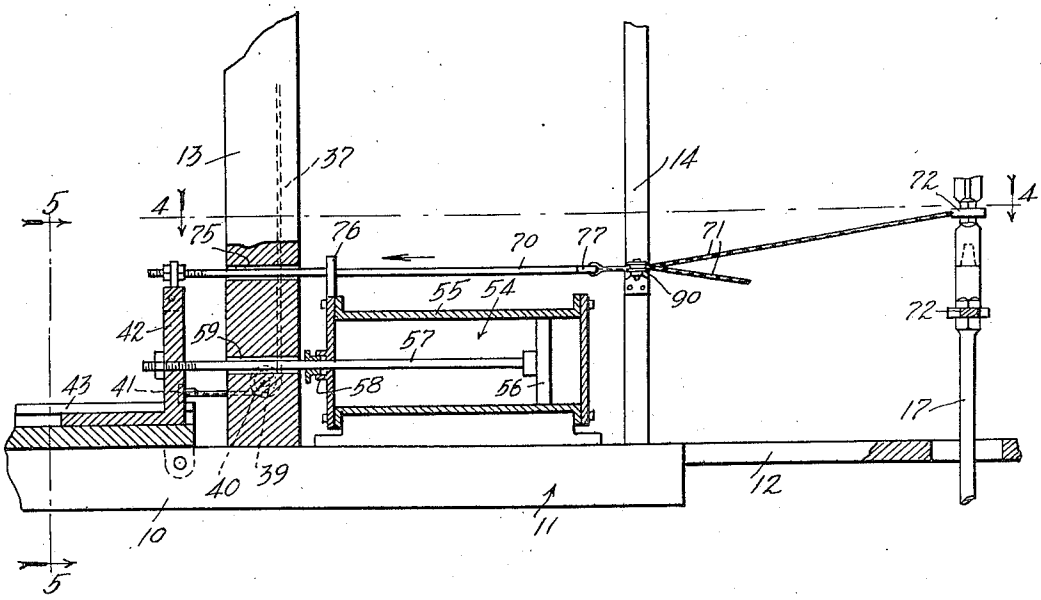


Fig. 4.

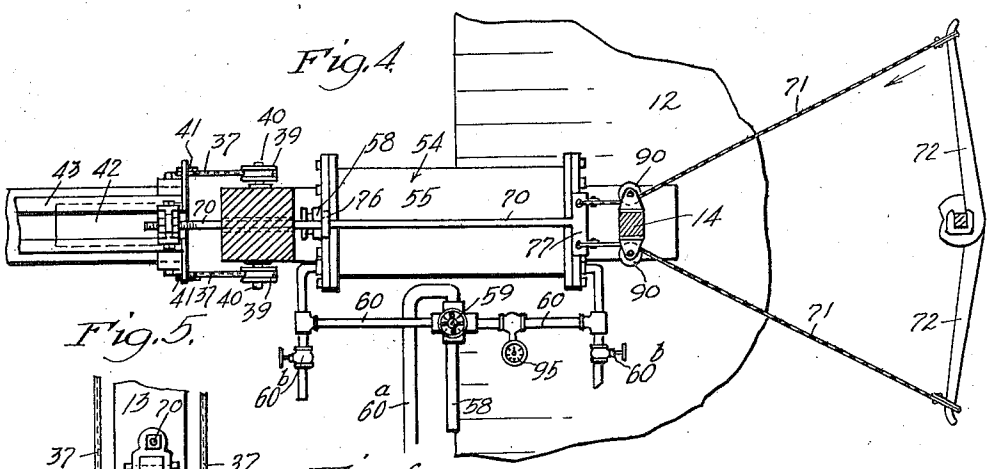


Fig. 5.

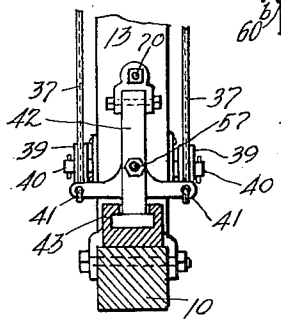
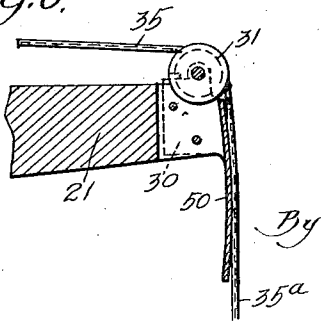


Fig. 6.



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Patented Sept. 16, 1924. 1,508,704

UNITED STATES PATENT OFFICE.

ROY E. LEONARD, OF LOS ANGELES, CALIFORNIA.

WELL-DRILLING APPARATUS.

Application filed February 2, 1921. Serial No. 441,953.

To all whom it may concern:

Be it known that I, ROY E. LEONARD, a citizen of the United States, residing in Los Angeles, county of Los Angeles, State of California, have invented new and useful Improvements in Well-Drilling Apparatus, of which the following is a specification.

This invention has to do with well drilling apparatus such as is used in drilling oil and water wells, and it is an object of the invention to provide improvements in apparatus of this character to simplify its construction and operation.

A noteworthy feature of the invention is the mechanism and arrangement by which the drilling line is supported or connected to the mechanism which operates or reciprocates it. The supporting mechanism is adjustable so that the drilling line can be supported at various heights and means is provided for adjusting of the supporting mechanism. With the arrangement provided by the invention the adjusting means is located at a convenient part of the apparatus and is always adjustable and easily operable regardless of whether or not the apparatus is in operation.

Another feature of the invention is the provision of fluid pressure means for adjusting or regulating the height of the drilling line embodying no fluid carrying parts, joints or connections subject to movement or liable to fail. The arrangement of said means allows it to be of heavy strong construction without making the apparatus cumbersome or ungainly.

Another particular feature of the invention is the provision of a drilling apparatus with fluid pressure means conveniently available for wrenching casings, tools, etc., and also capable of performing other functions. The invention provides fluid pressure means in the apparatus in such combination with the other parts of the apparatus as to be available for adjusting the drilling line, wrenching casings or drilling tools, etc., and for performing like operations.

The various objects and features of the invention will be best and more fully understood from the following detailed description of a typical form of the invention throughout which reference is had to the accompanying drawings, in which—

Fig. 1 is a side elevation of a portion of a typical well drilling apparatus embodying the present invention; Fig. 2 is a plan view of the same being a view taken as indicated by line 2—2 on Fig. 1; Fig. 3 is an enlarged detailed sectional view taken as indicated by line 3—3 on Fig. 2; Fig. 4 is a plan view of the parts shown in Fig. 3, being a view taken as indicated by line 4—4 on Fig. 3; Fig. 5 is an end view of the parts shown in Fig. 3 being a sectional view taken as indicated by line 5—5 on Fig. 3; and Fig. 6 is an enlarged detailed sectional view of the outer end portion of the walking beam.

In the drawings I show a portion of a typical well drilling apparatus embodying the present invention. Numeral 10 designates the main sill of the frame structure 11 which includes the derrick floor 12, the Samson post 13, the headache post 14, the jack post 15, etc. A walking beam 21 is carried on a saddle 22 having trunnions 23 journaled in side irons 24 which are mounted on the upper end of the Samson post 13. In the particular arrangement shown in the drawings the walking beam 21 is adapted to be operated from a crank 25 through a suitable connecting rod 26. The crank 25 is carried on shaft 27 driven through the band wheel 28. The structure and arrangement herein so far set forth is common to apparatus of this character and is merely typical of that in connection with which the present invention may be embodied.

In accordance with the present invention a bracket 30, carrying a pulley 31, is mounted on the outer end of the walking beam 21, that is the end of the walking beam opposite to that to which the connecting rod 26 is connected, and a bracket 32 carrying two pulleys 33 is mounted at the center of the walking beam 21. The pulleys 33 are on opposite sides of the beam 21 and are outward of the sides of the beam, as will be clearly seen from inspection of Fig. 2 of the drawings. A flexible member 35, preferably a flexible cable or chain has an outer part 35^a, carried in the pulley 31 so that its outer end hangs from the outer end of the walking beam 21 to carry a cable clamp 19. The inner end of the part 35^a is connected by a cross bar 35^b, to the two parts 37 of the flexible member which are carried in pulleys 33 and pass over pulleys 38 mounted on the extended ends of the trunnions 23. From the pulleys 38 the parts 37 extend downwardly substantially parallel to the Samson post 13 and pass around pulleys 39 carried by brackets 40 mounted on the sides

of the Samson post. After passing around the pulleys 39 the ends of the parts 37 connect at 41 to a cross head 42 slidably carried in guides 43 mounted on the main sill 10. I may state that it is not essential, as far as the present invention is concerned, that the member 35 be divided to have two parts 37 extending over two pulleys 33, two pulleys 38, two pulleys 39, and connecting to two parts of the cross head 42, as it is obvious how a single part might be arranged over single pulleys arranged similarly to those hereinabove set forth to perform substantially the same function. The principal object in dividing the members 35 into the two parts 37 is to balance or equally distribute the load or strains in the cross head 42 so that it will operate easily in the guides 43. The clamp 19, connected to the outer end of the part 35^a is adapted to carry the drilling line 16 which extends through the derrick floor 12 and into the casing 18 and carries at its lower end drilling tools 17.

With the arrangement and structure above described rotation of the shaft 27 through band wheel 28 will cause swinging or operation of the walking beam 21 through crank 25 and rod 26. The walking beam 21 in operating raises and drops the outer portion 35^a of the flexible member 35 and therefore the clamp 19 thus operating the drilling line 16. It will be obvious how movement of the cross head 42 in the guides 43 will cause movement of the parts 37 over pulleys 39, 38 and 33 causing movement of the outer portion 35^a of the flexible member 35 over pulley 41 thereby adjusting or varying the positioning of the clamp 19 relative to the outer end of the walking beam 21. By moving the cross head 42 the desired amount the clamp 19 can be adjusted to the desired position. With the cross head 42 located at a point removed from the walking beam and other moving parts it can be very easily and safely moved or adjusted when the apparatus is in operation. With the particular arrangement of pulleys shown in the drawings the operative length of the flexible member 35 varies only an infinitely small amount between the two extreme positions of the beam 21, and there is working or friction in only a very small portion of the member 35. The only portions of the member 35 which move or work during operation of the apparatus are those portions of the parts 37 extending around the pulleys 33 and 38 and that part of the outer part 35^a which extends around the pulley 31. All other parts of the member 35 move bodily as though they were rigid. If it is so desired a curved guide plate 50, curved concentrically with the trunnions 23, may be provided at the outer end of the walking beam 21 to guide the outer part 35^a of the member 35 so that it moves in a truly vertical line. When the guide plate 50 is employed there is a slight working in that portion of the member 35 which is carried on the guide plate.

In the preferred form of the invention the means for operating the cross head 42, and therefore the member 35, is fluid pressure means and comprises a cylinder and piston mechanism 54. A cylinder 55 is mounted on the main sill 10 preferably between the Samson post 13 and headache post 14. A piston 56 is adapted to reciprocate in the cylinder 55 and is connected to the cross head 42 by a suitable connecting rod 57 extending through a stuffing box 58 in one end of the cylinder and an opening 59 in the Samson post 13. Fluid under pressure is adapted to be admitted from the supply pipe 58 into the ends of the cylinder 55 through a distributing valve 59 and pipes 60. The valve 59 is operable to admit fluid from pipe 58 into either of the pipes 60 and simultaneously allow fluid to escape from the other pipe 60 through the exhaust pipe 60^a. Auxiliary escape valves 60^b may be provided to allow escape of fluid from the cylinder to adjust the positioning of the cross head and drilling line. In the preferred arrangement of the cross head and cylinder and piston mechanism the cross head is held out or away from the cylinder and piston mechanism when supporting the load of the drilling line, etc. The cross head is held out by fluid pressure in that end of the cylinder 55 which is completely enclosed and which has no stuffing box, or the like, in it. When drilling is started the cross head 42 is held in its extreme out position by fluid in said end of the cylinder 55 and as the drilling progresses and it is desired to lower the drilling line, or drilling tools, fluid is allowed to escape from the cylinder thus permitting the cross head to move inwardly. It is obvious how any desired amount of fluid may be allowed to escape from the cylinder thus lowering the drilling line and tools the desired amount. It is to be noted that the cylinder and piston mechanism, which adjusts or regulates the drilling line 16 through the connecting or flexible member 35, is located where it can be easily and conveniently operated at any time and where it can be of strong heavy construction without making it necessary to make other parts of the apparatus particularly strong and heavy. For instance, if the cylinder and piston mechanism were located on the walking beam 21, or were suspended at the end of the walking beam 21, as heretofore proposed, it would be necessary to provide a particularly heavy or strong walking beam and to provide exceptionally heavy or strong conduits to supply the necessary fluid pressure to the cylinder.

In fact, it has been found in practice difficult, and in fact practically impossible, to successfully communicate fluid pressure to a cylinder, or the like, located on or suspended from the walking beam. The fluid pressure connections and conduits used in connection with the cylinder and piston mechanism of the present apparatus may be of ordinary weight and construction.

With the cylinder and piston mechanism arranged, as shown in the drawings, between the Samson post and headache post it can be advantageously employed for wrenching tools, casings, and for performing similar duties. The means provided by the present invention for making the cylinder and piston mechanism available for performing these duties comprises, generally, a rod 70 connected to the cross head 42, and flexible members, 71, such as chains or cables, connected to the rod 70 and adapted to connect to wrenches 72, or the like. The rod 70 may be advantageously connected to the upper part of the cross head 42 wherefrom it may extend through an opening 75 in the Samson post and be carried in a guide 76 arranged at one end of the cylinder 55. A transverse head 77 may be provided on the outer end of the rod 70 to carry the flexible members 71. The flexible members 71 are preferably carried by pulleys 90 mounted at opposite sides of the post 14 and are adapted to connect to the outer end portions of the wrenches 72 which are arranged on drilling tools, casings, or the like. With this apparatus the cylinder and piston mechanism may be operated to effectively and properly wrench tools or casings. With wrenches 72 arranged on the parts to be wrenched, as shown in Figs. 3 and 4 of the drawings admission of fluid into the cylinder 55 to move the cross head 42 out, or away from the Samson post, will cause movement of the rod 70 in the direction indicated by the arrow in Fig. 3 and will thereby move the wrenches 72 in opposite directions, as indicated by the arrows in Fig. 4. With the members 71 arranged over the pulleys 90 the pull on the wrenches 72 will be practically uniform throughout the extent of their movement. By arranging a pressure gauge 95 in one of the fluid conducting parts, tools or casings may be wrenched up with the desired pressure, or to the proper tightness. When loosening the tools or casings it is not vitally important that any particular pressure be put on the wrenches but when tightening tools or casings it is important that they be wrenched tight enough and yet not too tight. With the apparatus of the present invention a joint may be wrenched to any predetermined tightness simply by regulating the pressure admitted into the cylinder.

By providing two flexible members 71 two wrenches 72 can be simultaneously operated in opposite directions, thus causing a given amount of movement of the cross head to move the wrenched parts twice as far as would be the case if only one flexible member was connected to a single wrench arranged on one of the parts while the other part is held stationary. Further by providing two flexible members the strains are distributed and balanced in the various parts.

It is to be understood that the present invention is not restricted to the use of two flexible members 71 as it is obvious how satisfactory results could be had with only one member 71 connected to a wrench arranged on one of the parts to be wrenched if the other part is held stationary.

In practice when tools or casing are being wrenched the parts being wrenched and also the wrenches, etc., may be supported or braced in any desired manner to hold or maintain them in their proper respective positions.

Having described a preferred form of my invention, I claim:

1. In well drilling apparatus, a drilling line, operating mechanism for the drilling line, a slidable cross head, a flexible member connecting the drilling line and cross head and arranged in connection with the operating mechanism so that the drilling line is operated by said operating mechanism, a stationary cylinder, a piston in the cylinder, and a connecting rod connected to the piston, arranged through one end of the cylinder, and connected to the cross head so that the drilling line is supported by fluid pressure in the other end of the cylinder.

2. In well drilling apparatus, a frame, an oscillating pivoted lever, a pulley at the outer end of the lever, a pulley at the pivoted portion of the lever, a drilling line, a cross head slidably mounted on the frame, a flexible member carried by the pulleys and having one end extending from the outer end of the lever and connected to the drilling line and having the other end extending from the pivotal portion of the lever and connected to the cross head, a cylinder mounted on the frame, a piston in the cylinder, and a connecting rod connected to the piston arranged through one end of the cylinder, and connected to the cross head so that the drilling line is supported by fluid pressure in the other end of the cylinder.

3. In well drilling apparatus which includes a drilling line and operating mechanism therefor, a stationarily mounted fluid pressure actuating mechanism positioned with respect to said operating mechanism and with the well so as to be operatively attachable to the drilling line for adjusting it and attachable to tools at the well for operating them.

4. In well drilling apparatus which includes a drilling line and operating mechanism therefor, a stationary cylinder and piston mechanism, said mechanism being positioned with respect to the operating mechanism and with the well so as to be operatively attachable to the drilling line and operating mechanism, so the drilling line is operated by the operating mechanism and is adjustably supported by the cylinder and piston mechanism, and so said cylinder and piston mechanism is attachable to tools at the well for operating them.

5. In a well drilling apparatus, mechanism for operating a wrench at the well including, a stationary fluid pressure-actuated cylinder and piston mechanism removed from the well, a flexible member adapted to be attached to the wrench to connect the wrench with the cylinder and piston mechanism, and means located between the cylinder and piston mechanism and the well for guiding the flexible member.

6. In a well drilling apparatus, mechanism for operating two wrenches at the well including, a stationary fluid pressure actuated cylinder and piston mechanism removed from the well, two flexible members adapted to be attached to the wrenches to connect the cylinder and piston mechanism with the wrenches, and guide pulleys for the flexible members located between the well and the cylinder and piston mechanism.

7. In well drilling apparatus mechanism for operating a wrench at the well including, a stationary cylinder and piston mechanism removed from the well, a rod extending through the piston through one end of the cylinder and away from the well, a flexible member connected with the rod and adapted to be attached to the wrench so that fluid pressure in the other end of the cylinder will move it to actuate the wrench, and means for guiding the flexible member.

8. In well drilling apparatus that includes a drilling line and operating mechanism therefor, said operating mechanism including a walking beam adapted to be reciprocated above the derrick floor and over the mouth of the well, a cylinder and piston mechanism stationarily and horizontally mounted near the derrick floor, flexible means connected to said cylinder and piston mechanism and thence extending to the walking beam where it is operatively connected to the drilling line whereby the drilling line is adjustably supported by said cylinder and piston mechanism; said cylinder and piston mechanism being so positioned with respect to the well that it is also operatively attachable to tools at the well for operating them.

9. In well drilling apparatus, a drilling line, operating mechanism for the drilling line, a slidable cross head, a flexible member connecting the drilling line with the cross head and arranged in connection with the operating mechanism so that the drilling line is operated by the operating mechanism, and stationarily mounted fluid pressure means for moving the cross head to adjust the position of the drilling line.

In witness that I claim the foregoing I have hereunto subscribed my name this 27th day of January, 1921.

ROY E. LEONARD.