R. E. LEONARD.

CONTROLLING MEANS FOR WELL DRILLING TOOL STRINGS.

APPLICATION FILED MAR. 4, 1919.

1,354,769. Patented Oct. 5, 1920.

Fig. 1

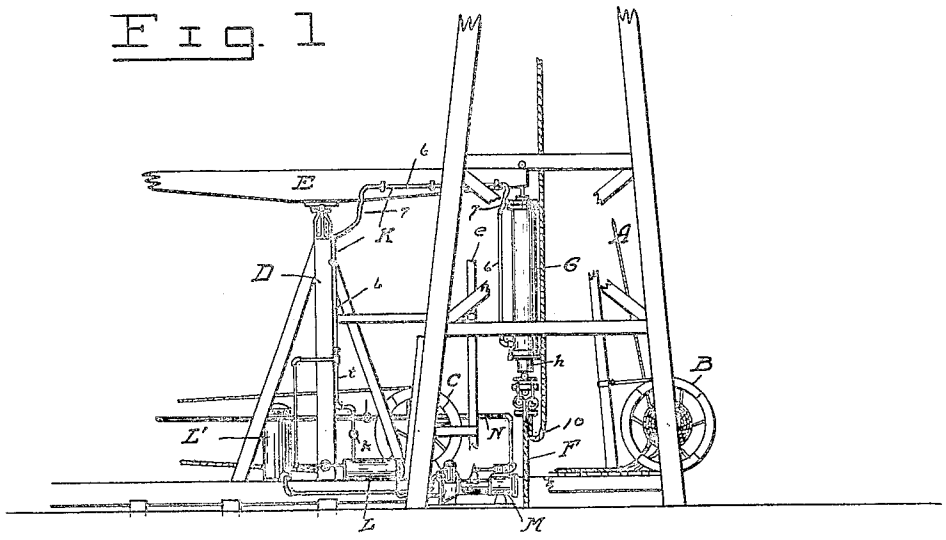
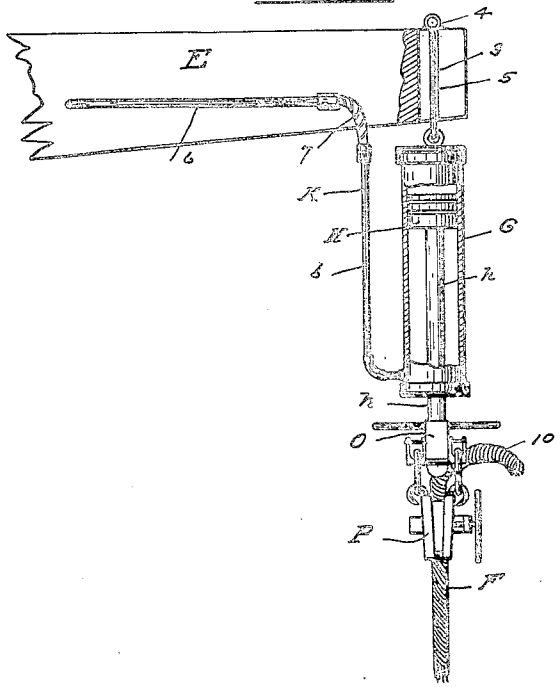


Fig. 2



Inventor,
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By

His Attorney.

UNITED STATES PATENT OFFICE.

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CONTROLLING MEANS FOR WELL-DRILLING-TOOL STRINGS.

1,354,769. Specification of Letters Patent. Patented Oct. 5, 1920.

Application filed March 4, 1919. Serial No. 280,533.

To all whom it may concern:

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

This invention relates to well drilling tool strings and it has for its object to provide a sensitively responsive means for accurately and conveniently controlling the feed and disposition within the hole of a string of oil well tools, including the cable, bits, jars, sinker bars and the like. Ordinarily what is known as a temper screw is used to provide a gradual feed for the string of tools as the hole is developed, such temper screw being connected with the string and with the walking beam whereby the string is vertically reciprocated in the drilling action. This temper screw requires constant attention and manual operation and involves inconvenience in its use. In accordance with the present invention I provide a piston and cylinder, one of which is connected with the walking beam and the other of which is adjustably connected with the string, and utilizes a pressure fluid, such as oil, for relative movement or permitting relative movement of the piston and cylinder. A suitable pump is provided to subject the fluid to the proper pressure and cause it to operate the piston relative to the cylinder, and a suitable control is provided for this pump, which control is preferably in juxtaposition to a control for the pressure fluid, so that the required relative movements of the piston and cylinder may be effected by an operator at a single suitable station or location in or adjacent to the derrick.

In accordance with the invention, the operator can effect the proper feed of the string of tools, or can materially raise or space them from the bottom of the hole, by simply manipulating two suitable controls, such as steam and oil pipe valves, and the relatively moving piston and cylinder are sensitively responsive to controlling impulses which may be accurately proportioned to the results to be obtained.

In accordance with the present invention it is not necessary for the operator to repeatedly visit the temper screw, directly over the hole, and interrupt his work for the purpose of suitably adjusting the string, but it is only required that he conveniently manipulate the controlling valves above mentioned, and in so doing practice will accustom him to nicely and delicately and accurately obtain the results desired.

With the above and other objects in view, the invention consists in the novel and useful provision, formation, location, association, relative arrangement and combination of parts, members and features, all as hereinafter described, shown in the drawing, and finally pointed out in claims.

In the drawing:

Figure 1 is a fragmentary side elevation of a well derrick and certain of the devices and instrumentalities employed in well drilling; and,

Fig. 2 is an enlarged fragmentary view of certain particular features thereof, illustrating more clearly the construction and action of particular features of the invention.

Corresponding parts in both figures are designated by the same reference characters.

Referring with particularity to the drawing, A designates a portion of a derrick such as erected at and over the mouth of a well hole to be developed; B designates the bull wheel used in handling the string in the well hole; C designates the calf wheel used in handling the casing in the well hole; D designates the samson post which supports the pivoted walking beam E, both disposed just outside of the derrick, with one end of the walking beam within the derrick; and *e* designates what is known as the headache post which acts as a step or rest for the working end of the walking beam; F designates the cable used to reciprocate the bit and other tools in the well hole, and the improved means for controlling the string of tools, including the cable, in accordance with the invention, comprises a cylinder G, a piston H movable therein and having its rod *h* which projects below the cylinder, a pressure fluid supply pipe K for supplying fluid to the lower end of the cylinder G from a pressure fluid reservoir L′, a pump M for putting the fluid in the reservoir L′ and pipe line K under pressure, a steam supply pipe N for the pump M, and controlling valves *k* and *n* for the pressure fluid line K and the steam line N respectively. Combined with the fluid pressure reservoir L′ is a fluid supply tank L into which air may be bled from

the cylinder G and from which air is sucked by the pump and forced into the reservoir L′, any suitable pump construction being adapted to be utilized for this purpose. It will be understood that the lowering of the string is occasioned by manipulating the controlling valve *k* so that the pipe line K is bled of its column of pressure fluid, back into the tank L, in which the pressure is less than that in the reservoir L′, being practically atmospheric pressure normally. The cylinder is preferably pivotally supported at the working end of the walking beam by a bracket 3 rising from the upper end of the cylinder and having materially directed bearings or gudgeons 4 resting upon the top of the walking beam, such bracket being free to swing within a slot 5 produced inwardly from the working end of the walking beam. The pipe or line K for the pressure fluid may include rigid pipe members 6, one of which may be secured at the side of the walking beam, and another of which may rise from the lower end of the cylinder G, still another portion of this line extending vertically in connection with the samson post D. Flexible pipe lengths 7 are provided at the ends of the rigid pipe length 6 upon the walking beam, whereby the movements of the walking beam may be accommodated together with a maintenance of the pipe line integrity. This pipe line extends from the reservoir L′ to the cylinder G, at the bottom thereof as stated.

The lower end of the piston rod *h* is connected by a swivel device O with a clamp P (such swivel device and clamp being of any standard or preferred construction), and the cable F is adjustably gripped by the clamp P, such cable being downwardly looped from the clamp, as at 10, and thence extending upwardly in the derrick. Thus the string may be fed downwardly in the hole until the loop 10 has been straightened out, whereupon a further feed of the cable is produced in the derrick, and a looped reserve supply provided.

In operating the device or mechanism or apparatus embodying the invention, the walking beam may continue to perform its function pertinent to drilling, which consists in vertically reciprocating the string of tools with the cable F and causing the bit to engage with and chip or break away or drill out the formation to which the drilling is being carried on in the development of the hole. The same is true of course of the use of such other tools as an underreamer which is substituted for the bit to cut away the annular shoulder beneath the casing and thus permit further lowering of the casing after a certain drilling operation has carried the lower extremity of the hole to a point beneath the casing. As the hole is developed the string must needs be lowered, step by step, and with the parts in the positions shown in the drawing, in order to lower the string a certain stage, it is only necessary to operate the pressure medium line valve *k* so as to release back from the pipe line K, into the tank L, a certain portion of the pressure medium in the line above such valve. This permits the piston H to descend proportionately, the column of pressure medium beneath it having been proportionately reduced, and the string thus descends correspondingly within the hole. In order to elevate the string, so as to take the tools from the bottom of the hole, the control valve *n* is operated to admit steam to the pump M and send pulsations of pressure medium to and through the reservoir L′ and through the line K, and introduce a further increment of pressure medium within the cylinder G, under pressure, thus upwardly actuating the piston H and raising the string.

Many changes and uses of the invention will occur to those skilled in the art, all with respect to the adjusting, positioning and controlling of the cable and its string of tools. Likewise, many changes and variations may be made from the foregoing description and disclosure of the drawing, in adapting the invention to varying conditions of services, all without departing from the true spirit of the invention.

Having thus disclosed my invention, I claim and desire to secure by Letters Patent:

1. The combination with a cable adapted to support and actuate well tools; of a relatively movable piston and cylinder one of which is connected with the cable, means being provided for supporting the other thereof; said last named means comprising a walking beam for vertically actuating the cable within the well hole; means being provided for controlling the supply of a fluid within the cylinder and whereby the position of the piston within the cylinder may be determined; said means comprising a supply means for the fluid, there being a pipe line between the supply means and the cylinder and which pipe line includes flexible portions extending to and from the walking beam.

2. The combination with a cable adapted to support and actuate well tools; of a relatively movable piston and cylinder one of which is connected with the cable, means being provided for supporting the other thereof; said last named means comprising a walking beam for vertically actuating the cable within the well hole; and means being provided for controlling the supply of a fluid within the cylinder and whereby the position of the piston within the cylinder may be determined; said means comprising a supply for the fluid, a flexible pipe line

extending between said pump and the cylinder.

3. The combination, in well drilling apparatus, with a samson post, pivotally supported walking beam, and with a string of tools; of a relatively movable piston and cylinder one of which is connected with the cable and the other of which is connected with the walking beam; and means for relatively moving the piston and cylinder comprising a pressure fluid supply means, and a pipe line extending from the pressure fluid supply means to the cylinder in part along the samson post and the walking beam; said pipe line having a flexible portion accommodating pivotal action of the walking beam on the samson post.

4. The combination, in well drilling apparatus, with a samson post, pivotally supported walking beam, and with a string of tools; of a relatively movable piston and cylinder one of which is connected with the cable and the other of which is connected with the walking beam; and means for relatively moving the piston and cylinder comprising a pressure fluid supply means, and a pipe line extending from the pressure fluid supply means to the cylinder in part along the samson post and the walking beam; said pipe line having a flexible portion accommodating pivotal action of the walking beam on the samson post; the piston spring being jointly pivotally supported on the walking beam, and said pipe line including a further flexible portion extending from the walking beam to the cylinder.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ROY E. LEONARD.

Witnesses:
RAYMOND IVES BLAKESLEE,
EDNA TURNER.