

H. R. HUGHES.
METHOD OF REGULATING THE LOAD ON ROTARY DRILLS.
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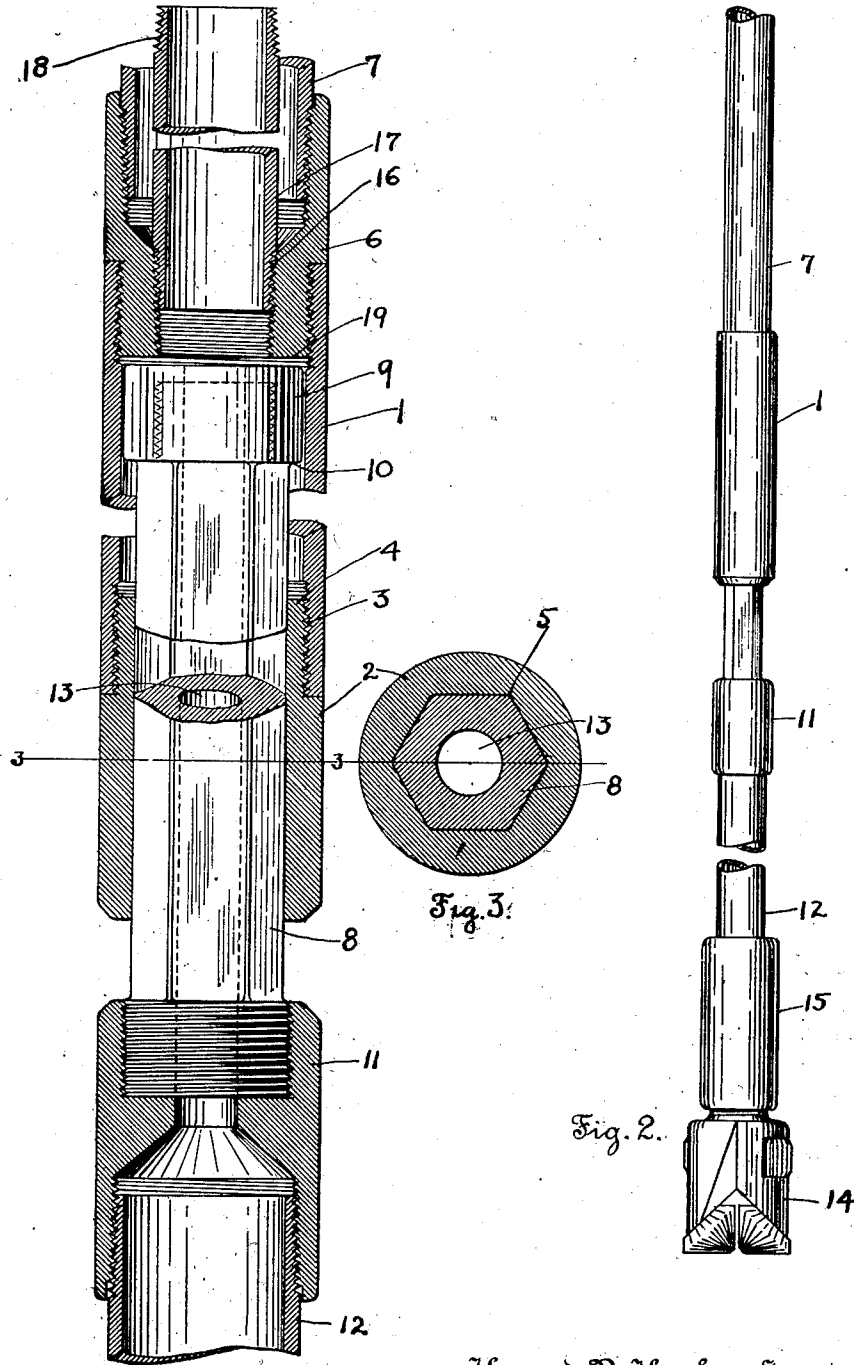


Fig. 1.

Fig. 2.

Fig. 3.

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UNITED STATES PATENT OFFICE.

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METHOD OF REGULATING THE LOAD ON ROTARY DRILLS.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, HOWARD R. HUGHES, a citizen of the United States, residing at Houston, Harris county, Texas, have invented a certain new and useful Improvement in Methods of Regulating the Load on Rotary Drills, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to load regulators to be used in rotary boring in earth or rock in the drilling of oil, water or gas wells.

In the drilling of deep wells in boring for oil, water or gas the wells sometimes are drilled to such a depth that the weight of the string of pipe above the rotary drill at the lower end thereof reaches in many cases an enormous load, and in fact when the well becomes relatively deep the whole weight of the drill stem and drill collar cannot be sustained by the drill itself without damage thereto. In some cases the driller will sustain a portion of the weight of the string of pipe by means of a cable in the derrick. It is very difficult and in fact almost impossible to regulate the weight upon the drill, so that it will not at times become excessive, to the damage of the drill bit.

One object of my invention is to place at a certain point in the string of drill stem a telescopic or sliding joint so that the weight of the pipe above the joint may be borne on the cable and the weight of the pipe below the joint sustained by the drill.

Another object of my invention is to so regulate the positioning of this joint and the operation of the drilling tools that a uniform predetermined weight will rest upon the drill at all times and to thus prevent the overloading of the bit. Further objects and advantages will appear in the specification which follows.

With particular reference to the drawing forming a part of the specification and wherein like parts are designated by like numerals of reference throughout the several views, Figure 1 is a central longitudinal section through the telescopic joint forming the substance of my invention; Fig. 2 is a side elevation of a string of pipe with a common type of rock bit thereon showing the use of my invention; Fig. 3 is a transverse section on the plane 3—3 of Fig. 1. In the practice of my invention it has been found by experiment that drills

should be loaded, for most efficient action in drilling, with a certain weight, said weight being variable according to the diameter of the bit being used. If this predetermined weight is sustained by the bit at all times, the bit will always operate at its greatest efficiency and there will be no danger of damage to the bit from the load sustained thereby. In my invention I contemplate calculating the weight of the drill stem which will produce the desired pressure upon the bit and to place a telescopic joint in the pipe at the upper end of the calculated length of pipe sufficient to produce the proper pressure upon the bit. I then sustain the weight of the drill stem above the joint by the cable. It is possible then to drill the well to any practicable depth and have the same uniform weight rest upon the drill.

In the drawing I have shown the type of joint which I contemplate using. This joint consists of a central length of pipe forming a housing 1 which is threaded interiorly at its upper end for attachment to a coupling member 6, by means of which it is secured to the drill stem 7. The lower end of the pipe 1 is also threaded interiorly for attachment to a sleeve 2, which is of greater thickness than the tube 1, and is provided with a central channel 5, polygonal in shape. In this embodiment I have shown the channel as hexagonal and adapted to slidably receive the shank 8 therein. The sleeve 2 is threaded at 3 to the section 1 and because of its greater thickness, an upper shoulder 4 is formed thereon. The sliding shank 8 which fits within the sleeve 2 extends upwardly therethrough within the sleeve 1 and adjacent the upper end thereof. On the upper end of the member 8 is threaded an enlarged head 9 which serves to prevent its removal from the sleeve 1 by contact of the lower shoulder 10 thereon with the upper shoulder 4 on the sleeve 2. The lower end of the sliding shank 8 is threaded within a coupling collar 11 by means of which it is secured to the lower section of the drill pipe 12. The sliding member 8 and the coupling members 6 and 11 are all provided with a longitudinal channel or bore 13 therein to provide a passage for flushing water with which to wash the cuttings away from the drill 14 attached by means of a drill collar 15 to the lower end of the drill stem 12.

The coupling collar 6 at the upper end of

the pipe 1 is, as previously stated, threaded onto the lower end of the drill stem 7. It is of greater thickness toward its lower end and is threaded interiorly at 16 so as to furnish a threaded attachment for a short length of smaller pipe 17 therein. This short length of pipe extends upwardly for a few feet within the drill stem 17 and is threaded at 18 at the upper end so as to furnish ready attachment for a fishing tool when necessary. This pipe 17, as will be apparent, has no use in the drilling operation and is only a precautionary measure in case the parts composing the sliding joint are broken off from the drill stem 7. If such accident occurs at the lower end of the pipe 7 the smaller pipe 17 will project upwardly above the break and present an attachment for a fishing tool or other similar grappling device which may be lowered downwardly into the well and be attached thereto.

In the operation of this invention, when the hole has been drilled to a sufficient depth, so that the addition of more pipe or drill stem thereto will increase the weight beyond the desired amount, the coupling member 11 will be threaded onto the upper end of the last piece of pipe and the sliding member 8 will then be threaded therein. The nut 9 at the upper end of the sliding member will be removed and the said sliding member will be inserted upwardly through the sleeve 2 within which it will fit snugly, but slidably. The nut or head 9 will then be secured on the upper end thereof, said nut being cylindrical in shape and adapted to fit closely within the housing 1 which is then fitted thereover and threaded at 3 upon the upper end of the said sleeve. The coupling member 6, with the length of pipe 17 therein, will be used to attach the upper end of the pipe 1 to the drill stem 7. The sliding member 8 and the housing 1 will be made of sufficient length so that a suitable amount of vertical play may be obtained so that the device may be successfully operated at great depths, the length being usually the same as one of the sections of drill stem being used.

When the drill stem, with the joint described, is operating beneath the ground the drill will be lowered so as to touch upon the bottom of the well. The upper length of pipe will be lowered until it begins to rest upon the upper end of the sliding member 8 of the joint. It will then be raised a short distance so that none of the weight of the upper section of the drill pipe will rest upon the joint. It will then be obvious that the rotation of the upper length of drill pipe will be communicated through the sleeve 2 to the slidable member 8 and from there to the lower length of drill stem and the drill will thus be rotated in the usual

manner. As the drill proceeds downwardly the sliding member 8 will be telescoped through the sleeve 2 until the shoulder 10 on the head 9 will contact with the upper shoulder upon the sleeve 2 and in that position the whole weight of the lower length of drill stem will begin to be sustained upon the cable, together with the upper length of drill stem above the joint. This increased weight will be noted by the driller and will be the signal to him indicating the necessity of lowering the drill stem and for the attachment of another section of pipe thereto. This operation may thus be repeated and, by proper regulation, no weight will be allowed to rest upon the drill except the weight of the string of pipe below the telescopic joint constituting my invention. This device is simple of construction and easily operated by the ordinary labor used about a drill derrick without danger of injury to the bit and will make it possible to always obtain the proper weight for the most efficient drilling. This is exceedingly important in the drilling operation as the bit will not be injured and furthermore the proper regulation of the weight upon the drill will greatly increase the speed of drilling. It will hence not only prolong the life of the drill itself but will greatly increase the efficient drilling action of the drill while operating.

Having thus described my invention, what I claim as new and desire to protect by Letters Patent is:

1. A method of regulating the load sustained by a rotary drill comprising the attachment to the drill of a sufficient length of drill stem to produce the proper load, attaching at the upper end of the said length of drill stem a telescopic joint, attaching a further length of drill stem to the upper portion of said joint, lowering the bit into the well until the drill rests upon the bottom of the hole, sustaining the load of pipe above the joint from the surface of the ground and lowering the upper length of pipe until the joint is in contracted position and sustaining the weight of the upper pipe from the surface during the drilling operation.

2. A method of regulating the load sustained by a rotary drill comprising attaching to the drill the desired weight of drill stem, sustaining any further length of drill stem from the surface, connecting the two lengths of drill stem by a telescopic joint, and adding lengths of pipe from time to time as necessary to allow the upper length of drill stem only to be sustained from the surface.

In testimony whereof, I hereunto affix my signature, this the 14th day of November, A. D. 1919.

HOWARD R. HUGHES.