Sept. 6, 1927. 1,641,296

F. L. SCOTT

LOAD INDICATOR

Filed May 3, 1926 2 Sheets-Sheet 1

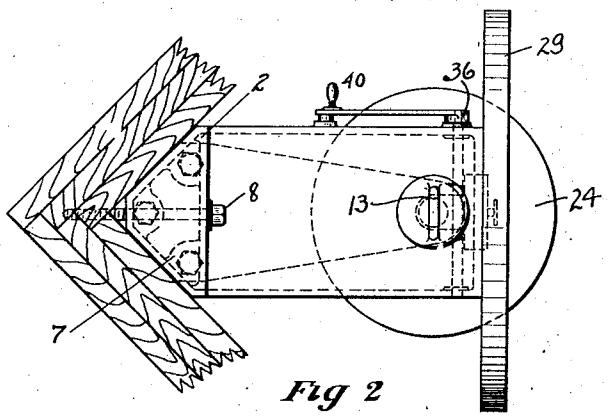


Fig 2

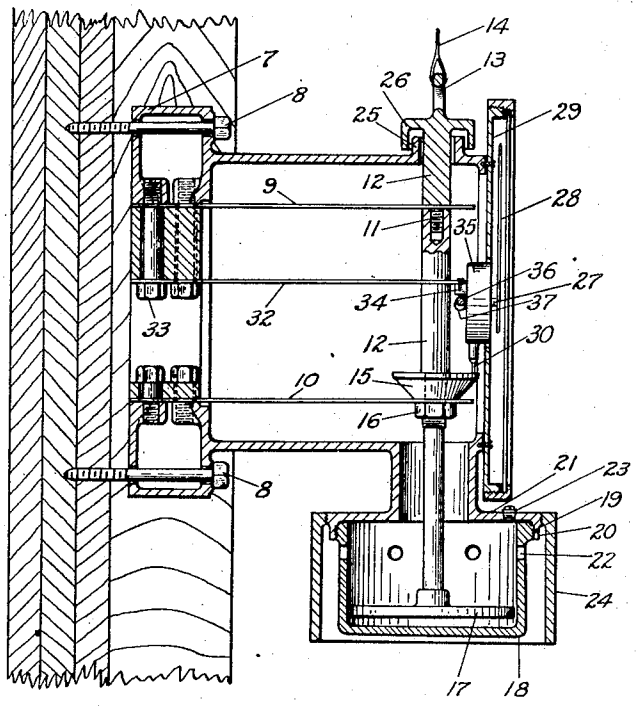


Fig 1

Floyd L. Scott. Inventor

By Jesse R. Stone

His Attorney

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F. L. SCOTT

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Filed May 3, 1926 2 Sheets-Sheet 2

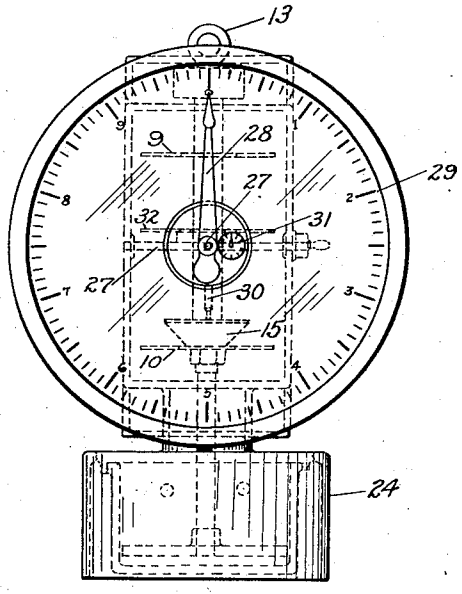


Fig 3

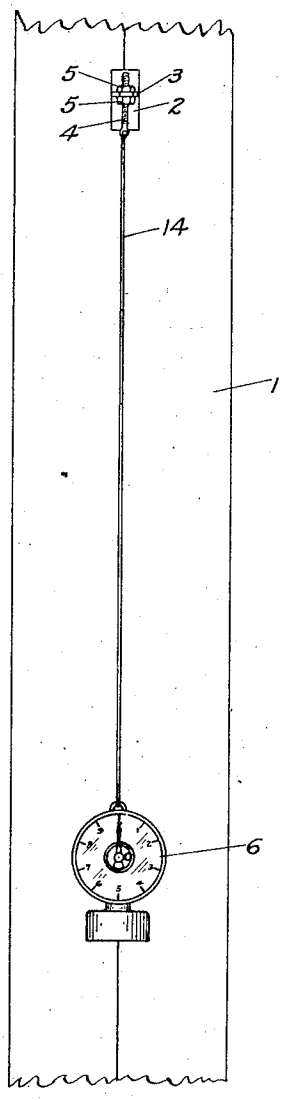


Fig 4

Floyd L. Scott. Inventor

By Jesse R. Stone

Attorney

Patented Sept. 6, 1927. 1,641,296

UNITED STATES PATENT OFFICE.

FLOYD L. SCOTT, OF HOUSTON, TEXAS, ASSIGNOR TO HUGHES TOOL COMPANY, OF HOUSTON, TEXAS, A CORPORATION OF TEXAS.

LOAD INDICATOR.

Application filed May 3, 1926. Serial No. 106,574.

My invention relates to a means to measure the changes in the amount of load placed upon a structure. It is particularly designed for use in well drilling operations to indicate the load allowed to bear upon the drill at the bottom of the well.

It is an object of my invention to use a portion of the load supporting derrick employed in drilling to show, by its compression under the load, the relative changes in the weight supported by the said derrick.

In drilling with the rotary drill, and especially with a rotary drill of the roller type, it is particularly desirable to place upon the bit during this drilling operation a certain predetermined load which shall not be excessive. Drills now ordinarily employed will work with maximum efficiency when the load resting upon the tools is not too great. The weight of the drill stem by means of which the drill is operated is at ordinary depths too great, and it becomes necessary to support a large part of the weight upon the cable suspended at the upper end of the derrick.

I have found that one of the best indications of the load supported by the derrick is found in the degree of compression upon the frame of the derrick itself under the weight. I therefore contemplate securing an indicating means between two points upon the side of the derrick and to note the compression of the derrick under the load by an indicating dial at one of the selected points.

Referring to the drawing herewith wherein a preferred embodiment of my invention is disclosed, Fig. 1 is a vertical longitudinal section through a portion of the derrick frame and through the housing of the indicating device, Fig. 2 is a top plan view of the indicating device, Fig. 3 is a front elevation thereof, and Fig. 4 is a front elevation of the indicating device showing the same connected by means of a wire to an upper bracket on the derrick frame. Like numerals of reference are employed to designate like parts in all the views.

Referring to Fig. 4, I have shown one leg of the derrick 1, which is preferably made up of a plurality of planks of the desired width nailed together at one edge as shown in Fig. 2 so as to make a substantial upright support. A derrick leg thus formed provides an inner right angular recess in which to support the indicating device. At a point spaced upwardly from the floor of the derrick I place a bracket 2 which fits with the angle of the derrick leg and is secured to the planks forming the same by screws or otherwise to form a rigid connection therewith. The bracket has a forwardly extending arm 3 with an opening therein to receive a screw which may be adjusted vertically in said opening by means of adjusting nuts 5, 5 on each side of said arm.

Spaced downwardly from the upper bracket upon the derrick leg and at a point close enough to the derrick platform to be easily inspected by the drilling operator, I place an indicating device shown at 6. The construction of the indicator is shown best in Fig. 1. It is formed of a bracket 7 formed to fit within the angle of the derrick leg and secured thereto at the upper and lower ends by means of lag screws 8. Upon this bracket are secured upper and lower spring arms 9 and 10 respectively. These arms, as shown in dotted lines in Fig. 2, are wider at their inner ends adjacent the derrick leg and are tapered outwardly, and have the outer end recessed slightly to fit about a push rod. The upper spring arm 9 has a central opening therethrough to receive a threaded end 11 of the upper section of the push rod 12. Said upper section of the push rod is provided with an eyelet 13 to receive a wire 14 by means of which the said push rod is connected with the adjusting screw 4 of the upper bracket. The lower spring 10 receives the lower end of the push rod 12 and is fitted between a bearing member 15 and a lock nut 16. The push rod is extended downwardly below the spring arm 10 and is provided at its lower end with a disc or plunger 17 adapted to work within a cup or cylinder 18 thus forming a dash pot. The cylinder 18 is threaded at its upper end at 19 for engagement with a downwardly extending annular flange 20 upon the housing 21. A plurality of openings 22 are formed adjacent the upper end of the cup to provide for the overflow of oil or other fluid used in connection with the dash pot arrangement. A threaded plug 23 closes an opening in the upper end of the dash pot housing to allow the refilling of the dash pot with oil or other liquid when necessary. A skirt 24 is ex-

tended downwardly around the dash pot to protect the same from dust or mud which might injure its effectiveness.

The two spring arms 9 and 10 and the push rod arrangement are surrounded by the housing 21 which is extended outwardly from the bracket 2. The said housing conforms in shape to the working apparatus inside thereof, and is intended to act partly as a support and partly to protect the working parts of the weight indicator. On the upper face of the housing adjacent the push rod the wall of the housing is extended upwardly at 25, and the push rod working through the opening adjacent thereto has thereon a cap or flange 26 which fits around the flange upon the housing thus serving to protect the interior of the housing from mud or dirt.

Secured to the forward face of the housing adjacent the push rod is the dial of the indicating apparatus. This dial has a central, rotatable shaft or pin 27 thereon upon which is fixed a hand or pointer 28. Immediately back of the said pointer is a graduated scale 29 of the usual form used with weight indicating devices. The shaft 27 upon which the pointer is fixed has thereon a small gear meshing with a rack upon a shaft 30. This construction is common in indicating devices and is not shown in detail. The lower end of the shaft 30 projects through the housing of the indicator, and bears against the upper face of the bearing member 15 upon the push rod as shown particularly in Fig. 1. The shaft is held resiliently downward against the bearing member by any ordinary construction not shown. Adjacent the shaft 27 on the face of the dial is a small pointer 31 working on a smaller dial face, and acting to indicate the number of revolutions of the larger hand upon the dial 29.

In order to set the hand or pointer 28 at zero upon the dial it is necessary to provide an adjusting mechanism which consists of a central spring arm 32 secured by screws 33 to the housing, approximately midway between the two spring arms 9 and 10. The said arm has a notch in the outer end straddling the push rod, and has secured at its forward end a bar 34 secured to the rear side of the housing 35 of the indicating mechanism. Below the bar 34 is a transverse shaft 36 journalled at its ends in the housing 21 and having thereon an eccentric portion 37 acting as a cam, the rotation of which will raise or lower the bar 34 and with it the housing 35. A handle 40 on said shaft serves to rotate it. This will serve to adjust the pointer 28 in an obvious manner.

In the operation of my device the indicator is secured at the proper elevation upon the leg of the derrick, and the bracket 2 is secured in properly spaced relation at a point approximately vertically above the indicator, and the tension upon the connecting rod or wire 14 is adjusted by means of the nuts 5, 5. By thus adjusting the tension upon wire 14, the pointer may be brought approximately to zero upon the dial. Further adjusting for accuracy may be made through the cam 37 raising or lowering the housing relative to the bearing member 15 upon which the shaft 30 rests. The connecting rod or wire 14 is preferably made of a metal having approximately the same coefficient of expansion under heat as has the wooden frame of the derrick, thus avoiding any deterimental effect upon the accurate operation of the device through the unequal expansion of the frame relative to the connecting rod. I have found that an alloy of nickel and iron will have the correct coefficient of expansion.

When the load is placed upon the derrick by hoisting the drill stem and bit off the bottom of the well, the hand 28 of the indicator may be reset to stand at zero. The drill is then lowered upon the bottom of the hole until the correct amount of weight rests thereon. This is determined by the driller largely from experience, and it may be that on the installation employed by him the pointer will stand at 3 upon the dial. If this is taken as the point upon the dial where the hands should be allowed to stand, it will be easy for the driller thereafter to retain the proper weight upon the drill to maintain the pointer at this figure. A greater or less weight upon the drill will cause the pointer to move from the correct place upon the dial.

The dash pot employed by the push rod will largely overcome the tendency of the push rod to vibrate rapidly from the effects of the drill. The ordinary roller drill as operating in rock will have a strong vibration, tending to keep the hand of the pointer constantly varying from the point where it would ordinarily come at rest, and the use of the dash pot largely overcomes this incidental vibration upon the indicator.

By supporting the push rod 12 in the manner shown upon the ends of spring arms 9 and 10, the push rod is allowed to vary according to the weight upon the derrick with approximate freedom. There is no hinge support such as would ordinarily tend to affect the free operation of the push rod, and the tendency of the supporting arms is to hold the push rod in the position at which it is set. The complete installation is light and compact in form, and may be easily and quickly installed upon any derrick of ordinary construction. It employs but a short length of the derrick (from twenty to thirty feet thereof), and the compression caused by the load upon the derrick leg is found to be sufficient to indicate with great accuracy

the variations in the load sustained by the derrick.

It is not desired in this indicating device to show the exact weight in pounds resting on the drill. It is simply intended to show variations in the load resting on the drill, and it will be necessary for the driller to note the point indicated upon the dial when the desired weight rests upon the drill, and to maintain thereafter the pointer at this mark. If the load increases due to the addition of further lengths of pipe or drill stem, the pointer may be quickly set to zero as previously described by turning the hand to the zero point while the entire load is supported upon the derrick. If the load is then allowed to rest upon the drill until the hand reaches the desired point upon the dial, the load will be easily maintained at the required amount. If it previously indicated 3 upon the dial, if it is brought to that point each time, it will show the desired load upon the drill.

Having thus described my invention, the further objects and advantages of which will be apparent to one skilled in the art, what I claim as new and desire to protect by Letters Patent, is:

1. A load indicator for well drilling operations, comprising a load supporting derrick leg, an indicating device secured rigidly at a desired point on said derrick leg, a bracket secured on said leg at a point spaced from said indicating device, a push rod, means for resiliently supporting said rod on said device, a tension wire connecting said push rod and said bracket and a pointer actuated by said push rod to show variations in the load acting to compress said derrick leg.

2. A load indicator for well drilling comprising a load supporting derrick leg, a bracket secured rigidly thereto, an indicator secured rigidly to said leg at a point spaced from said bracket, a dial on said indicator, a pointer on said dial, a push rod, means for resiliently supporting said rod on said leg adjacent said indicator, an operating shaft for said pointer bearing on said push rod and a tension wire connecting said push rod and said bracket.

3. A load indicator for well drilling comprising a derrick leg, a bracket thereon, an indicator housing on said leg spaced vertically from said bracket, a rotating pointer on said indicator, an operating shaft for said pointer, a push rod, means for resiliently supporting said rod in said housing and bearing against said shaft, a tension wire between said push rod and bracket, and means to dampen the movement of said rod.

4. A load indicator for well drilling rigs comprising a derrick frame, an indicator support on said frame, a push rod slidable vertically in said support, a pointer operating shaft movable through means of said push rod, resilient supporting means for said rod, a bracket on said frame spaced vertically from said indicator, and a taut wire connecting said push rod and said bracket for the purpose described.

5. A load indicator for well drilling rigs comprising a derrick frame, an indicator support secured rigidly thereto, an indicating dial, a pointer, a shaft in said indicator support adapted to move said pointer relative to the dial, a push rod slidable vertically in said housing and bearing on said shaft, resilient plates supporting said push rod; a bracket spaced vertically from said support, and means connecting said push rod and bracket whereby compression of said frame will move said push rod and said shaft.

6. In a load indicator for well drilling rigs, a derrick leg, a weight indicating scale supported rigidly on said leg, an attaching means spaced vertically from said scale on said leg, and a rigid connecting means between the said scale and said attaching means, whereby compression of said derrick leg will actuate said weight indicating scale.

In testimony whereof, I hereunto affix my signature, this the 28th day of April, A. D. 1926.

FLOYD L. SCOTT.