Jan. 8, 1924. 1,480,357

R. A. WILSON

UNDERREAMER BLADE CHECK

Filed Aug. 14, 1922

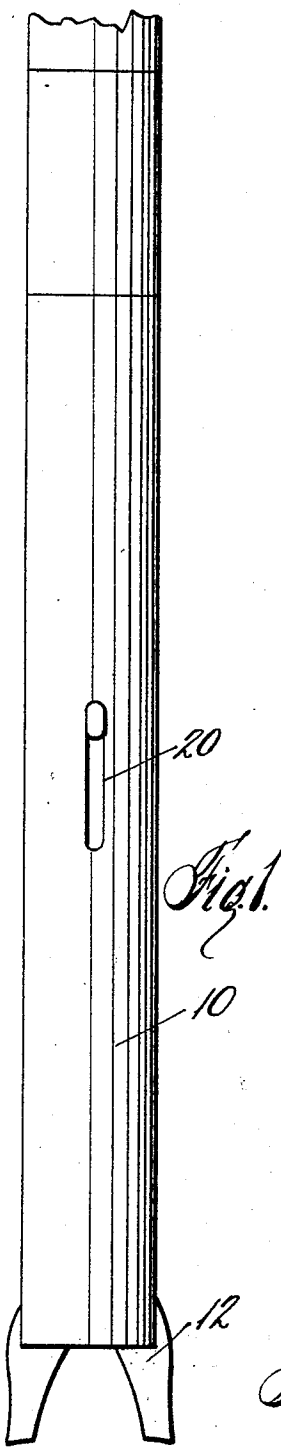


Fig. 1.

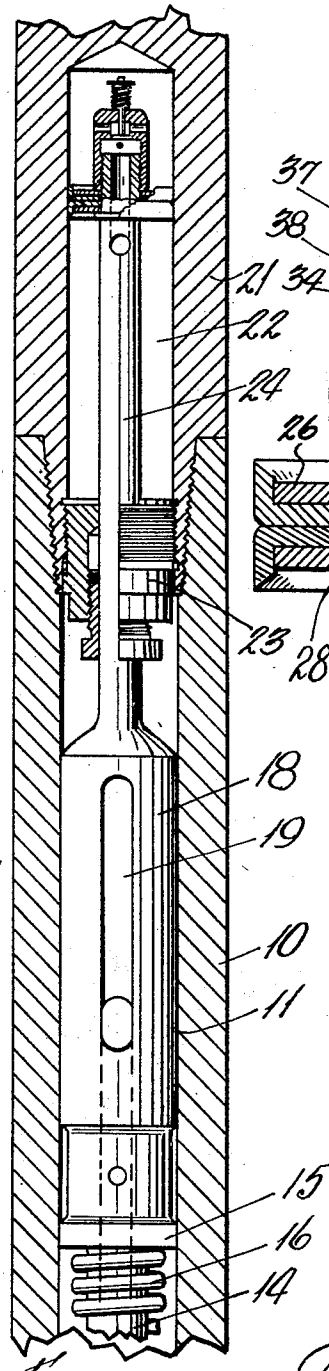


Fig. 2.

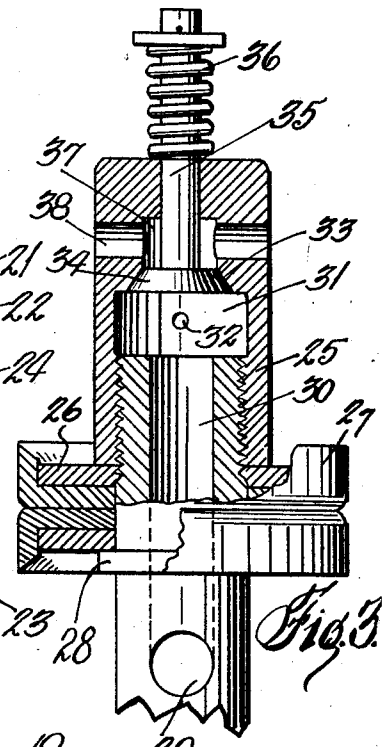


Fig. 3.

Inventor
R. A. Wilson.
By Jack Ashley
Attorney

Patented Jan. 8, 1924. 1,480,357

UNITED STATES PATENT OFFICE.

ROBERT A. WILSON, OF DALLAS, TEXAS.

UNDERREAMER BLADE CHECK.

Application filed August 14, 1922. Serial No. 581,649.

To all whom it may concern:

Be it known that I, ROBERT A. WILSON, a citizen of the United States, residing at Dallas, in the county of Dallas and State of Texas, have invented certain new and useful Improvements in Underreamer Blade Checks, of which the following is a specification.

This invention has relation to new and useful improvements in checking devices for underreamers.

In those types of underreamers where the blades are expanded by the action of a coiled spring under compression or by other means considerable unnecessary wear is occasioned upon the upward stroke or movement of the underreamer. This is particularly present in mud and other formations in which the blades have a tendency to stick. In such instances the blades will be held by the earth, while the body of the underreamer will move upwardly, thus compressing the spring until the tension of the said spring overcomes the retardation of the blades. When this occurs the blades will be suddenly released and will be drawn into their seats under the influence of the spring with considerable force, whereby an unnecessary shock and wearing impact results. Further this condition causes an unnecessary wear on all of the working parts.

The object of the invention is to overcome this objection by providing means for preventing a relatively quick or sudden movement of the body with relation to the blades when the underreamer is moved upwardly.

A further object is to provide means for permitting a comparatively quick expansion of the spring and extension of the blades when the underreamer is lowered to the bottom of the well, but offering such resistance as to prevent retardation of the blades upon an upward movement of the body of the underreamer, where such movement is during the reaming operation; however being arranged to permit a gradual retraction of the blades under a steady upward pull, when it is desired to remove the underreamer from the well.

A still further object of the invention is to provide means within the underreamer for resisting a quick or sudden movement of the body with relation to the blades and also for preventing a sudden compression of the spring which holds the blades expanded.

Another object is to cushion the expansion action of the blades so that when they are released the spring will not act with a shock.

A construction designed to carry out the invention together with other features will be hereinafter more particularly pointed out.

The invention will be more readily understood from a reading of the following specification and by reference to accompanying drawings, wherein:

Fig. 1 is an elevation of an underreamer constructed in accordance with my invention,

Fig. 2 is an enlarged fragmentary vertical sectional view of the same, and

Fig. 3 is an enlarged sectional detail of the check valve.

In the drawings the numeral 10 designates the body of an underreamer which body has a central bore 11. Blades 12 are adapted to seat in the lower end of the body when expanded. A mandrel 14 extending thru the bore of the body pivotally supports the blades at its lower end and has a collar 15 resting upon a spring 16 coiled around said mandrel. When the mandrel is moved downwardly relatively of the body the spring is compressed and the blades are retracted. The construction described is typical and the invention is not to be limited thereto.

At the upper end of the mandrel I provide a head 18 having a vertical diametrical slot 19 normally having its lower end in registration with the upper ends of slots 20 in the body 10. By inserting the usual wedge (not shown) in the slots and engaging the same with the bottom of the slot 19 the head and mandrel may be depressed to set the blades.

A tubular section 21 having a central bore or chamber 22 and of substantially the same mean diameter as the body, has its lower end screwed into the upper end of the body. A suitably constructed stuffing box 23 is screwed into the lower end of the section 21 and a plunger rod 24 passes thru the same into the chamber 22. The rod is integral with the upper end of the head and is moved thereby.

The upper end of the rod screws into a piston head 25. A piston comprising a pair of disks 26 between which a pair of flexible cups 27 are confined, is mounted on the rod

between a collar 28 and the lower end of the head. A port 29 in the rod below the piston communicates with an axial passage 30 extending to the upper end of the rod and opening into cavity 31 in the head. The chamber 22 contains a liquid, such as oil, and this sustains the piston and resists its downward movement. Radial ports 32 extend from the cavity and communicate with the chamber above the piston. Thus the downward movement of the piston is controlled by the passage of the liquid thru the ports 32, which being small will prevent a rapid passage and consequently check a sudden downward movement of the piston or quick relative upward movement of the body.

In the upper end of the cavity is formed an inverted valve seat 33 in which a valve 34 is received. The valve has a steam 35 passing thru the top of the head and is supported by a tension spring 36 which acts to seat the valve. Immediately above the valve a recess 37 is provided and radial ports 38 extend from the recess thru the head. The ports 38 have a much larger area than the ports 32 and when the valve is unseated, these ports 38 will permit a comparatively rapid passage of the liquid and thus not interfere with upward movement of the piston.

When the mandrel 14 is forced downwardly by the wedge the head 18 and rod will be moved downwardly thus carrying the piston to the bottom of the chamber. During this movement the liquid will pass thru the port 29, passage 30, cavity 31 and the ports 32 into the chamber 22 above the piston. The downward movement of the parts will be slow on account of the size of the ports 32. When the underreamer blades reach the bottom of the casing and pass below the same the spring 16 which has been compressed will be released and the blades 12 expanded. This will move the piston upwardly in the chamber 22. The liquid in the chamber above the piston will pass thru the ports 38 and recess 37 and unseat the valve 34 so that a free passage thru the passage 30 and port 29 is had and the piston permitted to move upwardly with substantially little resistance. However, sufficient resistance will be offered to cushion the expanding of the blades and prevent the usual impact due to the sudden release of the spring.

When the blades are fully expanded and seated the piston will be at the upper end of the chamber as is shown in Fig. 2 and a solid body of liquid will be below the piston offering resistance to its downward movement. When the body and section 21 are moved upwardly on the upward stroke of the underreamer the blades cannot stick or be retarded because the liquid below the piston prevents any movement of the body relatively of the blades and mandrel and also eliminates compression of the spring.

By this arrangement play of the blades and mandrel is obviated and the wear incidental to the usual relative movement during the underreaming operation is removed. This will not only prolong the life of the tool, but will increase its efficiency and tend to eliminate churning in the hole. It is obvious that a steady upward pull on the parts 10 and 21 will cause the liquid to flow thru the ports 32, when the blades are engaged with the bottom edge of the casing, thus the blades may be collapsed.

Various changes in the size and shape of the various parts as well as modifications and alterations may be made within the scope of the appended claims.

What I claim, is:

1. In an underreamer blade check, the combination with a body structure and a relatively moveable mandrel and cutting blades carried by the mandrel of means for checking a sudden relative upward movement of the body structure independently of the blades when the underreamer is moved thru its upward stroke.

2. In an underreamer blade check, the combination with a body structure, a relatively moveable mandrel, a spring sustaining said mandrel and cutting blades carried by the mandrel, of means for checking a sudden relative upward movement of the body structure independently of the blades when the underreamer is moved thru its upward stroke.

3. In an underreamer blade check, the combination with a body structure and spring supported blades moveable relatively of the body, of means for checking a sudden compression of the spring.

4. In an underreamer blade check, the combination with a body structure and spring supported blades movable relatively of the body, of means for checking a sudden compression of the spring and arranged to permit a quick expansion of the spring.

5. In an underreamer blade check, the combination with a body structure and a movable mandrel carrying expanding blades, of a check chamber in the body structure containing a body of liquid, and a piston mounted in the chamber connected with the mandrel and sustained by the liquid against a sudden relative upward movement of the body structure.

6. In an underreamer blade check, the combination with a body structure and a movable mandrel carrying expanding blades, of a check chamber in the body structure containing a body of liquid, and a piston mounted in the chamber connected with the mandrel and sustained by the liquid against a sudden relative upward movement

of the body structure, the piston having passages for permitting a restricted flow of the liquid for allowing a gradual upward movement of the body structure relatively of the mandrel and blades.

7. In an underreamer blade check, the combination with a body structure and a movable mandrel carrying expanding blades, of a check chamber in the body structure containing a body of liquid, and a piston mounted in the chamber connected with the mandrel and sustained by the liquid against a sudden relative upward movement of the body structure, the piston having passages for permitting a restricted flow of the liquid for allowing a gradual upward movement of the body structure relatively of the mandrel and blades, the piston also having means for permitting a quick upward movement relatively of the body structure for expanding the blades.

8. In an underreamer blade check, the combination with a body structure and a movable mandrel carrying blades, of a liquid containing chamber carried by the body structure, a head mounted on the mandrel, a plunger rod carried by the head and extending into the chamber, a piston mounted on the rod and having restricted passages for the flow of the liquid in one direction, and a self-closing valve permitting flow of the liquid in the opposite direction.

In testimony whereof I affix my signature.

ROBERT A. WILSON.