

Aug. 18, 1942.

C. D. JOHNSON

2,293,259

DEVICE FOR PREVENTING CLOGGING OF DRILLING BITS

Filed March 25, 1941

2 Sheets-Sheet 1

Fig. 1.

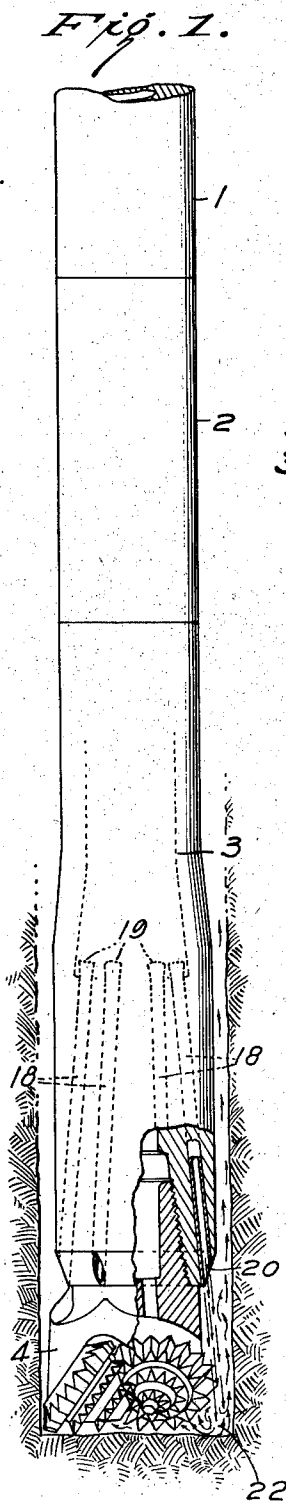


Fig. 2.

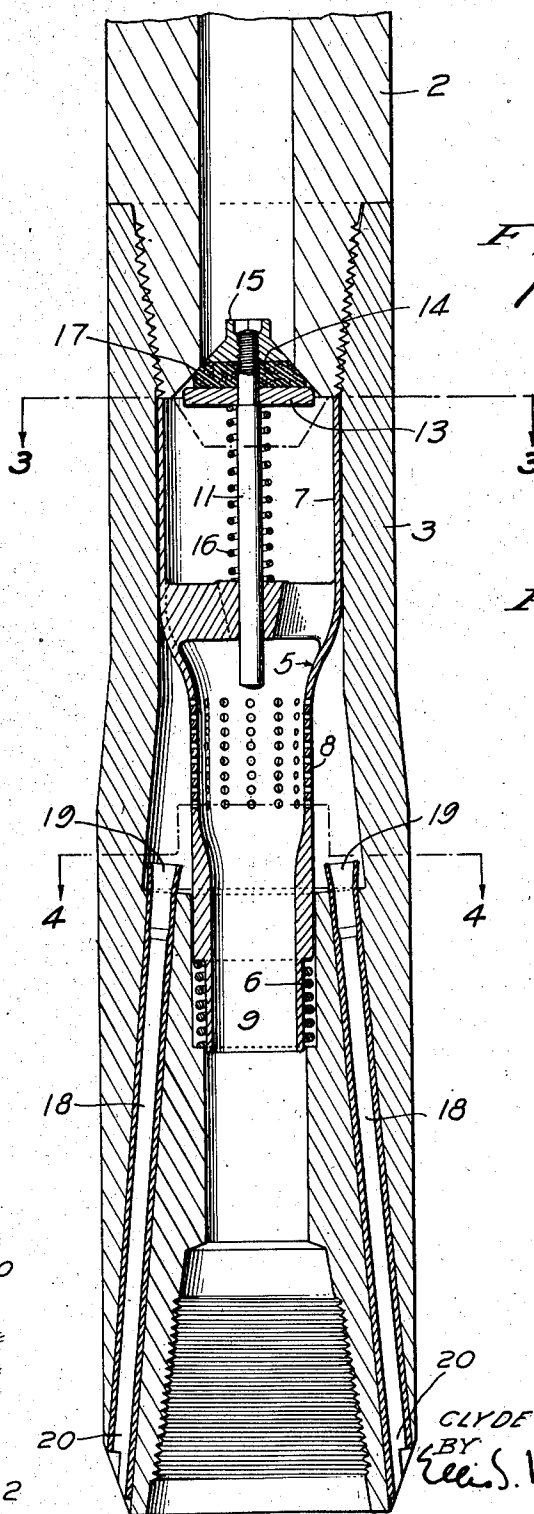
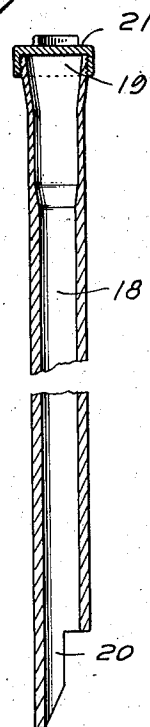


Fig. 3.



INVENTOR
CLYDE D. JOHNSON,
BY
Ellis S. Middleton
ATTORNEY.

Aug. 18, 1942.

C. D. JOHNSON

2,293,259

DEVICE FOR PREVENTING CLOGGING OF DRILLING BITS

Filed March 25, 1941

2 Sheets-Sheet 2

Fig. 3.

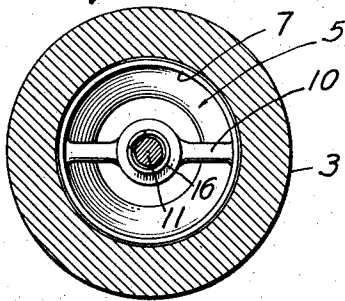


Fig. 7.

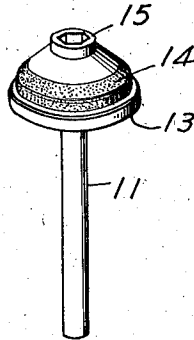


Fig. 4.

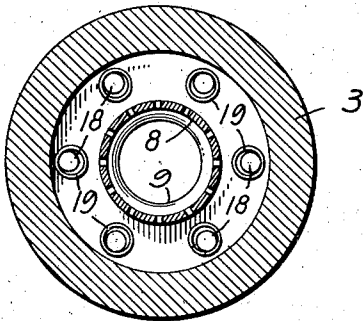


Fig. 6.

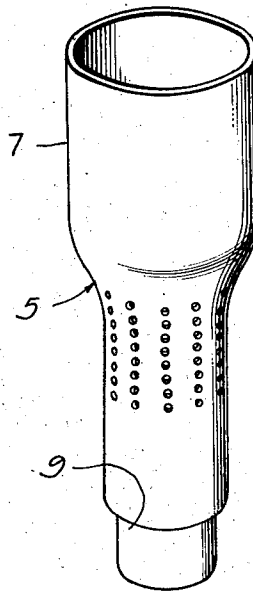
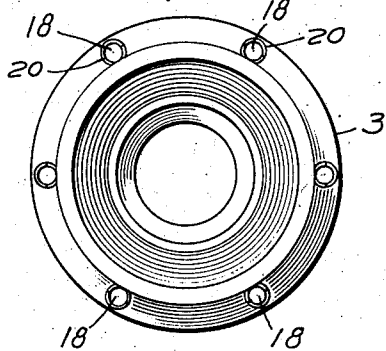


Fig. 5.



INVENTOR
CLYDE D. JOHNSON,
BY *Elin S. Middaletm*
ATTORNEY.

UNITED STATES PATENT OFFICE

2,293,259

DEVICE FOR PREVENTING CLOGGING OF
DRILLING BITS

Clyde D. Johnson, Parkersburg, W. Va., assignor
to Acme Fishing Tool Company, Parkersburg,
W. Va., a corporation of West Virginia

Application March 25, 1941, Serial No. 385,110

1 Claim. (Cl. 255—61)

The present invention relates to an apparatus for use with rotary well drilling tools.

In that art, a cleansing fluid is pumped axially through the drill stem or drill pipe and the rotary drill bit so as to remove detritus loosened by the bit, from the hole. It frequently happens in drilling that the teeth of the cutters on the bit proper become clogged with mud or the like so as to decrease the bit's cutting efficiency.

The principal object of the invention, therefore, is the provision of an attachment whereby multiple streams of cleansing fluid may be diverted from that passing downwardly through the drill pipe to the bit, the diverted streams passing downwardly and outwardly through the attachment, some of the diverted streams impinging upon the teeth of the cutters so as to prevent an accumulation of mud, rock or dirt at that point and others of the diverted streams impinging directly upon the bottom of the hole being drilled, immediately washing away and upwardly all loose cuttings. This prevents the bit from grinding the cuttings over and over with resultant clogging of the bit and greatly increased torque on the drill pipe, that sometimes causes twist-off.

The invention further contemplates a provision for preventing a flow of liquid with its contained detritus from arising through the axial bore in the bit when the fluid pumping operation is ceased, for instance during a drill withdrawal period, or when lowering the drill pipe in the hole after it has been withdrawn to put on a fresh bit or for other purposes.

The invention further contemplates the provision of a series of fluid conducting passageways in the drill attachment so that regardless of the stopping position of the bit when it is screwed into the bottom of the attachment, there will be one or more passageways arranged with relation to the bit teeth so that the latter will be washed by fluid ejected through the former, and others will direct streams of fluid at high velocity to impinge upon the bottom of the hole being drilled to wash away cuttings as they are loosened by the bit.

The invention further includes the novel combination, arrangement and construction of parts more fully hereinafter described and shown in the drawings, in which—

Fig. 1 is a side view partly in section of a combination involving the present invention;

Fig. 2 is a sectional view through a part of the drill string showing one embodiment of the invention;

Fig. 3 is a sectional plan view along the line 3—3 of Fig. 2;

Fig. 4 is a sectional view along line 4—4 of Fig. 2;

Fig. 5 is a plan view of the housing of the attachment with the interior parts removed;

Fig. 6 is a perspective view of the strainer mechanism;

Fig. 7 is a perspective view of the valve; and
Fig. 8 is a sectional elevation showing one form of fluid conducting tube and cap.

Referring now with particularity to the embodiment illustrated, a drill collar is shown at 1 to which a double pin sub 2 is attached in the usual manner. A body or housing 3 is attached to the sub 2 by the usual threads, the drill bit 4 being carried in the threaded bottom portion of the body 3.

The housing or body 3 is provided with an axial bore in which is located a strainer element 5 having a restricted lower portion 6, an enlarged upper portion 7 and an intermediate perforated portion 8.

A coil spring 9 located in a recess which surrounds restricted portion 6 of the strainer tends to push the entire strainer upwardly so that the top of the enlarged portion 7 engages against the bottom of the sub 2.

The enlarged portion 7 of the strainer is provided with a web 10 axially perforated to receive the valve stem 11.

The valve assembly includes a base plate 13, the rubber valve proper 14 and a cap nut 15, all held on the stem 11. A coil spring 16 encircles the valve stem and tends to push the rubber valve part 14 against the seat 17 surrounding the bore in the bottom of the sub.

The lower portion of the housing 3 is provided with recesses to receive a series of fluid conducting tubes 18 tapered as at 19 so as to limit their position within the housing. The lower end 20 of the fluid conducting tubes 18 are so arranged with relation to the cutters on the drill bit 4 that fluid ejected therethrough impinges upon the cutter teeth and/or upon the bottom of the hole as shown in Fig. 1 at 22.

In operation, when fluid is pumped through the bore of the drill string, it depresses the spiral spring 16, opens the valve and passes into the top of the strainer. From there it passes on each side of the web 10 completely through the strainer in an axial direction, and through the bore of the drill bit and performs its function in washing the detritus from the hole, returning to the surface where it is recycled.

During this passage, a part of the fluid is diverted through the perforations in the strainer and passes downwardly and outwardly through the fluid conducting tubes 18 to keep the cutter teeth clean and the cuttings washed from the bottom of the hole, as above mentioned.

It is to be noted that when for any reason the drill string is to be removed from a hole, the pumping of the washing fluid is stopped. As soon as this happens, the spring 18 closes the valve 14 tightly against the seat on the sub, thus effectively preventing the rise of fluid up through the center of the drill and housing. Consequently, there will be no accumulation of deposit in these parts in the interim of the non-pumping period. As soon as the pump is again started, the valve 14 opens and the cycle is repeated. When the drill string is withdrawn from the hole, the weight of the fluid in the drill pipe depresses the spring 18, opening valve 14 and permitting the fluid to drain out of the pipe as it is withdrawn. When the bit and drill pipe are run back in the hole, valve 14 being closed, prevents a rise of fluid through the drill and housing, thus avoiding accumulation of deposit in these parts and also helping to support some of the weight of the drill pipe. This relieves the strain on the cables and equipment.

There are occasions when it is not desirable to have all of the fluid conducting tubes in the series open, as shown particularly in Fig. 1 and Fig. 4. For instance, when it is desired to increase the pressure and velocity of the fluid, one or more of the fluid conducting tubes can be capped off by means of cap 21 as shown in Fig. 8. Thus any number of the tubes may be used as desired.

From the above, it will be apparent that a device has been provided which may be readily

attached to a drill string between the bit and either the drill collar or a sub, which will not only prevent back pressure, causing a rise of fluid through the drill, but will also permit diverting washing fluid against the teeth of the cutters so as to prevent their clogging with consequent loss of efficiency, and also divert washing fluid to the bottom of the hole at high velocity to remove cuttings as they are loosened by the bit.

The parts so provided are simple in construction, and readily assembled so that any one of them may be replaced quickly while the drill string is out of the hole.

While the invention has been shown and described with particular reference to specific embodiments, it is to be understood that it is not to be limited thereto but is to be construed broadly and restricted solely by the scope of the appended claim.

I claim:

In combination, a drill pipe, a rotary drill bit, a housing attached to the lower end of the drill pipe, said housing having fluid-conducting passageways therein to conduct a stream of washing fluid therethrough and to discharge the same onto the outer face of the drill bit, said housing having an axial bore through which washing fluid flows on the way to the drill bit and the fluid-conducting passageways, means to close said bore against back fluid pressure, a strainer element telescopically received within the axial bore in the housing, a spring pressing the strainer element upwardly against the drill pipe, said fluid-conducting passageways in the housing receiving fluid from the exit side of the strainer and means to close off one of the passageways not in line with the drill bit after the bit has been put in place.

CLYDE D. JOHNSON.