UNITED STATES PATENT OFFICE

2,257,080

DRILL PIPE CLEANER

Edgar J. Turner, Santa Paula, Calif., assignor to
The Texas Company, New York, N. Y., a corporation of Delaware

Application October 10, 1939, Serial No. 298,737

1 Claim. (Cl. 255—28)

This invention relates to cleaning devices and more particularly to a device for cleaning mud or other drilling fluid from the inside of a string of drill pipe while the latter is being withdrawn from a bore hole.

The principal object of the invention is the providing of a device by means of which, when once inserted in the upper end of the pipe string, will remove all of the mud therefrom effectively and without further attention. Another object is to provide means whereby further circulation of mud or other drilling fluid down through the pipe string may be effected without removing the cleaning device from the pipe.

In drilling bore holes by the rotary method, a fluid such as mud is circulated downwardly through the drill pipe string and out through the drill bit and upwardly to the surface through the annular space around the drill pipe. The mud fluid in returning to the surface carries upwardly the cuttings made by the drill bit. When it is desired for any reason such as for the changing of the drill bit, to withdraw or pull the string of drill pipe from the hole, the mud contained within the string of pipe becomes a serious problem. When each section or stand of pipe is unscrewed the mud contained in that section will spill and flow outwardly on the derrick floor and this obviously constitutes a definite hazard to the drilling crew by keeping the tools and derrick floor slippery. Furthermore, the drilling mud is often wasted and this constitutes a considerable loss, particularly when using chemically treated mud and in locations where it is difficult to obtain supplies of the mud.

One method which has been tried in an effort to prevent spilling and loss of the mud is to place a quantity of drilling fluid in the drill pipe, which fluid is heavier than the mud already in the hole and drill pipe. Because of the greater weight of this added fluid it will tend to force the mud contained in the pipe string downwardly so that there will be substantially no mud remaining in the pipe sections as they are unscrewed above the derrick floor. This method has several disadvantages among the more important of which are the high cost of the fluid weighting materials and the disturbing of the physical and chemical properties of the drilling fluid. This method also requires considerable additional time.

In accordance with the invention, the device or tool, which may be used in cleaning any string of flush joint drill pipe, is inserted in the upper end of the pipe as soon as the Kelly is removed on coming out of the hole. The tool engages the inner surface of the pipe and is of such weight that it will force the mud ahead, i. e., downwardly until it reaches some level below the derrick floor where the weight of the displaced fluid from the pipe string equals the weight of the tool itself. The tool will then remain at approximately this level below the floor of the derrick while the drill pipe is being pulled. It will eventually come to rest on the drill bit when all of the drill pipe has been removed. The tool is provided with means whereby it can be engaged and removed from the pipe in case this should be necessary and also has provision for permitting circulation downwardly through the pipe string without the necessity of removing the tool from the pipe. Thus, the use of the tool does not interfere in any manner with drilling operations and the drilling crew is enabled to keep the hole full of drilling fluid without the disadvantages and dangers of so-called "wet jobs." Furthermore, considerable time is saved in removing the drill pipe from the hole.

For a better understanding of the invention reference may be had to the accompanying drawing in which the single figure is a vertical sectional elevation showing the drill pipe and fluid in a bore hole and the cleaning tool within the pipe.

Referring to the drawing a string of drill pipe 10 having a drill bit 12 is shown in a bore hole 14. A quantity of drilling fluid or mud 16 is shown within the drill pipe and in the annular space surrounding the drill pipe.

The cleaning tool comprises a body member having a plurality of sections 18, 20, 22 and 24 secured together as by threaded connections. The sections of the tool may be formed of any suitable heavy material or metal such as iron.

The upper section 18 comprises a cylindrical portion having at its upper end a spear head 26 adapted to be engaged by a suitable over-shot on a wire line or cable in carrying the tool from the pipe. The cylindrical portion of the section 18 is provided with a shoulder 28 and around the cylindrical portion directly below this shoulder is mounted a swab rubber 30. This swab is of such size as to engage the inner surface of the pipe 18 as the tool moves through the pipe. The section 18 is provided with a vertical fluid passage 32 having one or more upwardly projecting branches 34.

The section 20 which is secured to the lower end of the section 18 is also provided with a
cylindrical passage 36 in alignment with the passage 32 and one or more branches 38 extend from the passage 36 outwardly through the body of section 34. A valve seat 40 is secured in the passage 36 and a ball valve 42 is biased by a compression spring 44 upwardly into engagement with the seat. The lower section 24 is provided with a nozzle-like projection 46 provided with a fluid passage 48 having one or more branches 50 extending outwardly. The section 22 may be of any desired length such as 8 or 10 feet and any desired number of these sections 22 may be connected together depending on the weight which it is desired to give the tool.

In operation, when it is desired to pull the string of drill pipe 10 from the hole the Kelly is first removed and the cleaning tool is then inserted in the open end of the uppermost section of pipe as shown in the drawings. The tool will slide downwardly in the pipe forcing the drilling fluid ahead of it until, as has been explained hereinbefore, a level is reached such that the weight of the drilling fluid forced downwardly and out of the drill pipe will equal the weight of the tool itself. The tool will naturally slide downwardly a distance depending on the weight of the tool and the nature and weight of the drilling fluid and the body member should be provided with a number of weight sections 22 sufficient to cause the tool to remain at a level below the derrick floor. The upper section of the pipe 10 can then be unthreaded and removed and as the pipe string is again raised the tool will tend to remain at its former level below the floor of the derrick and the second and remaining sections of the pipe can be disconnected and removed in this manner. The lower end of the tool will finally engage the drill bit 12 and when the latter is removed the tool can be withdrawn from the lower section of pipe. As has already been explained, the tool can also be pulled upwardly through the pipe.

If for any reason it is desired to circulate drilling fluid downwardly through the pipe 10 while the cleaning tool is in the pipe, this can be done without removing the tool since the fluid will pass through passages 34, 32 and 36, past the check valve 42 and outwardly through passages 38. In case the tool is resting upon the drill bit the circulating fluid can pass inwardly and downwardly through the passages 54 and 46 and thus out through the openings (not shown) in the bit 12.

It will thus be observed that a device has been provided capable of use with any internal flush drill pipe and which can be easily adapted to any type of drilling fluid or condition since additional bars or sections 22 can be added if necessary. The cost of maintenance of the tool is extremely low since the only wearing part is the swab rubber 38 which is inexpensive and can be easily replaced.

Obviously many modifications and variations of the invention as above set forth may be made without departing from the spirit and scope thereof, and therefore only such limitations should be imposed as are indicated by the appended claim.

I claim:

A device for cleaning the inside of a string of drill pipe having a drill bit on the lower end thereof, comprising a body member adapted to slide downwardly through said pipe, resilient means on said body member adapted to engage the inner surface of said pipe, said body member being provided with a longitudinal fluid passage, a valve seat in said passage, a valve in said passage below said seat, resilient spring means for forcing said valve upwardly toward said seat to close said passage, a nozzle shaped projection on the lower end of said body member adapted to engage said drill bit, and a second fluid passage extending from the outside of said body member downwardly through said projection, the arrangement being such that fluid circulated downwardly through said pipe will pass through said first mentioned passage past said valve, through said second passage and out through said projection.

EDGAR J. TURNER.