May 14, 1968 A. McLENDON, SR 3,382,939

BORING CYLINDER AND BIT

Filed Dec. 13, 1965

Fig. 1

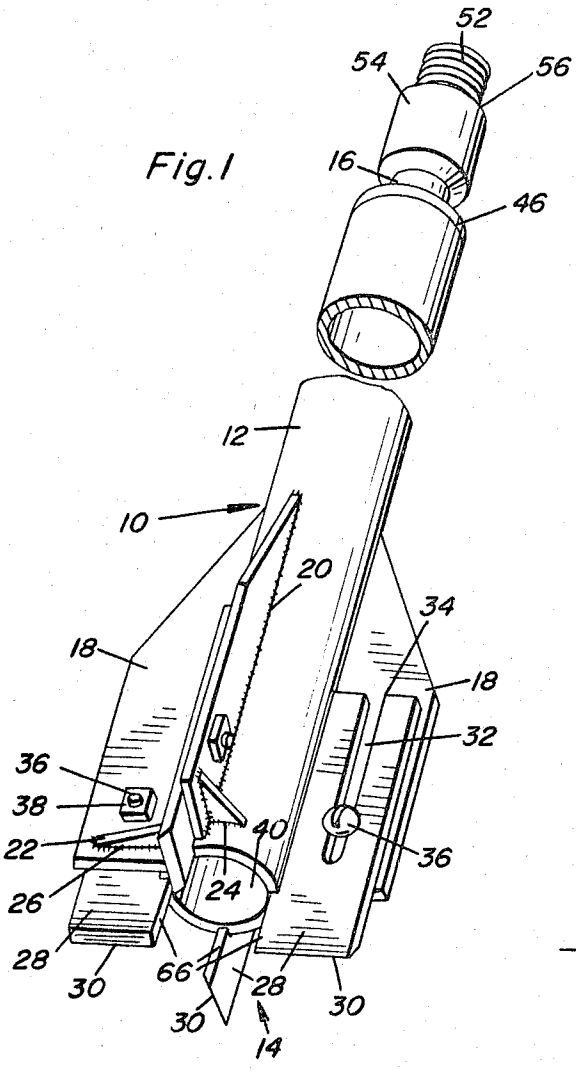


Fig. 2

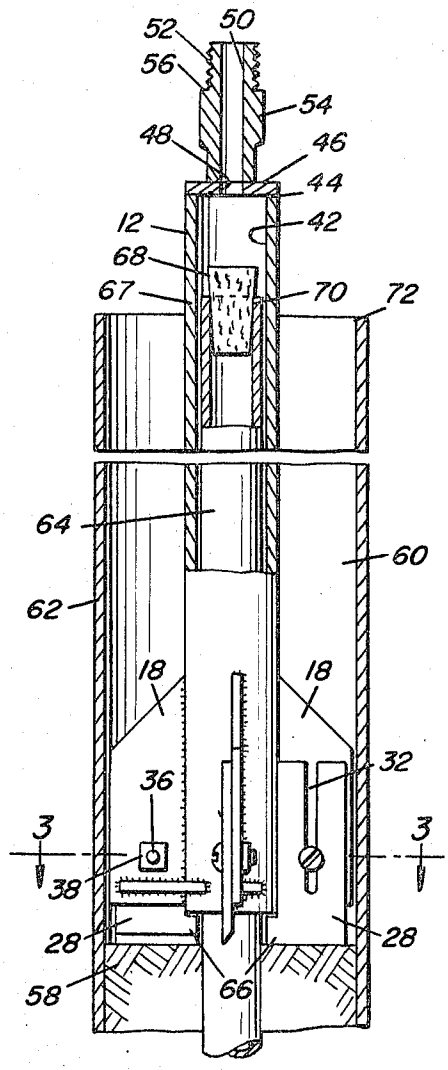
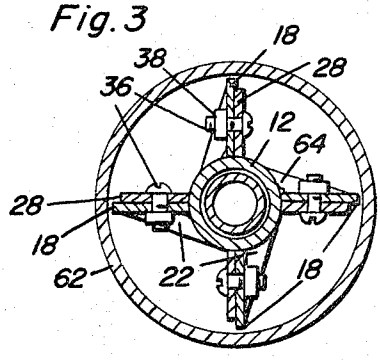


Fig. 3



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United States Patent Office 3,382,939 Patented May 14, 1968

3,382,939

BORING CYLINDER AND BIT

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Filed Dec. 13, 1965, Ser. No. 513,263
5 Claims. (Cl. 175—382)

ABSTRACT OF THE DISCLOSURE

A boring tool adapted to be power driven to salvage used, generally abandoned, sections of well casing with production pipe lodged therein, which casing sections have generally been removed from a well bore. The casing sections have generally become partially or wholly constricted by an incrustation occurring in the annulus between the casing and the pipe which is generally centrally positioned therein. The tool includes a body member sized so as to be rotatably and slidably engageable about the pipe and having a plurality of radially and longitudinally disposed cutter support members sized so as to closely fit within the casing thereby substantially bridging the annular space between the exterior of the pipe and interior of the casing. The cutter support members each carry an axially adjustable cutter member of genreally the same, but slightly lesser, width than the radius of the aforementioned annular space whereby the incrustation therein is effectively removed without undue cutting of the exterior of the pipe or interior of the casing. The tool is also provided with fluid inlet conduit means to permit utilization of a fluid to flush away cuttings being removed by the cutter members.

This invention relates generally to tools of the type used for cleaning well casings, and more particularly to boring cylinders and tool bits thereon for boring caked drilling mud out of the interior annular chamber of oil well casings.

Briefly, this invention is required to provide for the reuse of various oil well pipes such as oil well casings, inasmuch as drilling and logging pipes and casings used in oil wells for drilling or logging or various other underground operations wherein drilling mud may be used, usually become clogged with caked mud after a period of time. To provide for such instances, and to enable the casings to be reused, this invention provides a rotary type of boring cylinder with replaceable and adjustable tool bits thereon for boring out the caked mud by placing the casing in a horizontal position, as for example on the ground, rotating the boring cylinder while passing the cutting end thereof through the casing from one end thereof.

Accordingly, it is an object of the present invention to provide a tool for cleaning caked mud from various well casings.

It is another object of the present invention to provide a boring cylinder having a cutting head thereon and including a plurality of tool bits, the cylinder also including a fluid chamber therein whereby the caked drilling mud may be ground or broken up in the oil well casing and flushed therefrom, the fluid also acting to cool the cutting head of the boring cylinder.

It is another object of the present invention to provide a novel tool of the character described including a plurality of adjustable or removable tool bits for removing caked drilling mud from oil well casings including mud caked about the inner core pipe of the casing.

It is a further object of the present invention to provide a tool of the character described which is of simple construction while being extremely sturdy and quite easy to use.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

FIGURE 1 is a partial perspective view of the boring cylinder and tool bits comprising the present invention;

FIGURE 2 is a sectional view of the tool illustrated in FIGURE 1 shown drilling mud from a well casing in its intended manner, with parts taken in elevation; and

FIGURE 3 is a horizontal sectional view taken substantially on the plnae of the line 3—3 of FIGURE 2.

Referring now more specifically to the drawings, reference numeral **10** generally denotes the boring cylinder and tool bit comprising the present invention. The tool **10** comprises a hollow cylindrical body member **12** which is preferably from 10 to 30 feet in length, with diameters ranging from 10 to 20 inches, the most common diameters being that of 10, 12, 14, 16, 18 or 20 inches. Mounted on one end of the cylindrical body member **12** is a cutting head generally denoted by reference numeral **14**, and at the other end the hollow pipe **16**, which is provided for a purpose to be described more fully below.

The cutting head **14** comprising a plurality of radially extending backing plates **18**, spaced at 90° intervals on the outer periphery of the cylinder **12** and rigidly attached thereto as for example by the welds **20**. The four backing plates **18** are rigidly mounted on the cylinder **12** by the welds **20** and are further supported thereon by support brackets **22**, each bracket including an inner curved face or edge portion **24** which conforms to the curve of the outer surface of the cylinder **12** and each of which is rigidly mounted between the backing plate **18** and cylinder **12**, at right angles to each, by the welds **26**. Each backing plate **18** has a cutting blade **28** mounted thereon, the cutting blades **28** being preferably fabricated of high carbon steel, and each including a cutting edge **30** at the lowermost end thereof. Each of the blades **28** includes an elongated slot **32** therein open at the rear end of the blade **28**, in order to adjustably and removably mount the blades **28** on the backing plates **18** by means of the bolts **36** on which the nuts **38** are threadedly received. Thus, it will be observed in FIGURES 1 and 3 for example that the blades **28** are retained on the plates **18** by the bolts **36** and, if desired, may be shifted axially with respect to the longitudinal axis of the cylinder **12** on the backing plates **18** merely by loosening a nut **38** on the bolt **36**, sliding the blade **28** therealong and retightening the nut on the bolt. Further, it will be appreciated that the blades **28** may be readily removed in this manner in order to resharpen or replace the blades, while at the same time this mounting of the blades is quite rigid and sturdy.

The cylindrical body member **12** is hollow as stated above, and open at the bottom end **14**, as best illustrated in FIGURE 1, having the hollow cavity **42** therein. Mounted at the upper end **44** of the body member **12** in closing relationship therewith is a flat head **46** having an aperture **48** centrally located therein, the aperture having as its central axis the central longitudinal axis of the hollow cylindrical body member **12**. The hollow pipe **16** is mounted on the closing member **46** over the aperture **48** and coaxial therewith, the hollow pipe **16** including a fluid flow chamber **50** provided by the hollow cavity therein. Further, the inner diameter of the pipe **16** is substantially equal to the aperture **48**. The upper portion of the hollow pipe **16** is threaded as indicated by reference numeral **52**, and thereby is adapted to fit into the output connection of a power tool for rotation of the cylindrical body member **12**. The hollow pipe **16** also includes a thickened sleeve portion **54**, the top of which sleeve portion is indicated by reference numeral **56** and which provides a shoulder

or stop for limiting the axial distance which a power connecting member may be threaded on the threaded portion **62**. Further, the enlarged or thickened sleeve portion **54** provides additional strength or reinforcing for the hollow pipe **16**.

Referring now to FIGURE 2, it will be observed that the tool **10** is used to remove the caked and dried mud **58** which is normally built up in the annular area **60** between the outer shell of a casing **62** such as that normally used in well drilling or well logging, and the inner core pipe **64** which is normally supported centrally within the casing **62**. Thus, it will be observed in FIGURE 2 that the inner diameter of the cylindrical body member **12** is designed to be slightly larger than the outer diameter of the inner core pipe **64** thus providing an annular space or chamber **67** therebetween when the cylindrical body member **12** is moved downwardly over the core pipe **54**. It will be seen that the core pipe **64** at this time also acts as a guide for the tool in its downward movement in the annular chamber **60**. It will be appreciated, of course, that the tool **10** is rotated, as for example by a power tool (not illustrated) which is threaded on the threaded end **52** of the hollow pipe **16** in order to rotatingly drive the tool, at which time the cutting blades **28** of the cutting head **14** will be rotated, and as the tool **10** is moved longitudinally through the casing **62**, the mud **58** will be ground up or at least broken up. It will be appreciated further, that the position of the casing and tool illustrated in FIGURE 2 is for purposes of illustration only and that the casing **52** will normally be placed in a horizontal position, as for example on the ground, or on a horizontally disposed surface prior to the admittance of the tool **10** therein.

The blades **28** each includes an inner abutment portion **66**, which portions **66** extend radially inwardly to a point substantially equal to the inner diameter of the cylindrical body member **12**. The abutment portions **66** are provided for the purpose of removing the thin layer of mud **58** which normally will be found on the inner core pipe **54**. Of course, it will be appreciated from viewing FIGURES 1 and 2 in particular that the abutment portion **66** will necessarily be below the lower end **40** of the cylindrical body member **12**, and will extend inwardly into close adjacency with the core pipe **54**.

As stated above, the hollow pipe **16** has a fluid flow chamber **50** therein, the flat head **46** has the aperture **48** therein, and the body member **12** has the hollow cavity or chamber **42** therein, the body member **12** being opened at the lower end as illustrated at **40**. Further, when the tool **10** is moved downwardly in the casing **62**, the annular space or chamber **66** is left between the wall of the tool **12** and the inner core pipe **64**. A plug **68**, which may be of wood, rubber or any suitable material is placed on the open end **70** of the inner core pipe **64** in order to stop or close the inner core pipe, and while the tool **10** is being used, a suitable fluid is forced through the fluid flow chamber **50** into the hollow cavity or chamber **42**. The fluid will then flow downwardly through the annular chamber **66** outwardly of the open bottom end **40** of the body member **12**. This fluid will act to cool the cutting blades **28**, while at the same time will flush the broken up or ground up mud **58** back past the outer periphery of the body member **12** and out through the open end **72** of the casing **62**. It will therefore be appreciated that the tool **10** comprising the present invention provides means for removing matter such as the caked and dried drilling mud **58** from the annular space between the outer shell of a hollow cylindrical casing such as the casing **62** and the inner core pipe **64** therein, the tool being rotated and moved longitudinally through the casing over the inner core pipe, the tool having a plurality of cutting blades or tool bits supported thereon at the forward end thereof. While the tool is forced longitudinally through the casing fluid is forced downwardly through the tool and out of the

end thereof to cool the tool bit and force or wash and flush the ground-up mud from the casing in order to complete the cleaning operation.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the invention as claimed.

What is claimed as new is as follows:

1. A boring tool for removing matter from the annular space between the interior of a section of a casing and generally centrally disposed pipe lodged therein comprising, a hollow body member adapted to rotatably slide into the casing in rotatable, slidable relation to the pipe, a cutting head on one end of said body member, said cutting head being on the exterior of said body member, coupling means on the other end of said body member adapted to be connected to a power means for rotating said body member whereby said cutting head will break up or grind up said material, said cutting head including a plurality of radially and axially extending cutter backing plates fixedly mounted on the exterior wall of said body member, said backing plates terminating short of the end of said body member, a plurality of radially and longitudinally extending cutter members adjustably mounted on said backing plates for axial adjustment relative thereto, said cutter members extending forwardly of the end of said body member and being sharpened at the lower end thereof, said cutter members being of a radial dimension generally equal to the radius of the annulus between the interior of the casing and the interior of the body, the inner radial edge of said cutter members terminating short of the inner diameter of the body and the outer radial edge of said cutter members terminatng short of the outer radial edge of said cutter backing plates whreby undue cutting of the exterior of the pipe and interior of the casing is avoided during removal of matter from the annular space.

2. The combinaton of claim **1** including means for admitting fluid into said body member for flushing out cuttings and cooling the cutting head.

3. The combination of claim **1** wherein said cutter backing plates are generally equally spaced about the body member.

4. The combination of claim **1** wherein said cutter members each includes a radially inwardly extending portion at the lower end thereof, said inwardly extending portions extending into close relationship to said inner core pipe whereby rotation of said tool will cause said inwardly extending portion to remove the material from the exterior of said pipe.

5. The combination of claim **1** wherein said coupling means comprises a hollow pipe having one end thereof externally threaded to receive said power means, and a thickened sleeve portion on said pipe providing a shoulder adjacent the lower end of said threaded portion for limiting the downward movement of said power means thereon.

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