April 7, 1925.

1,532,178

L. A. GODBOLD

LUBRICATOR

Filed July 25, 1921

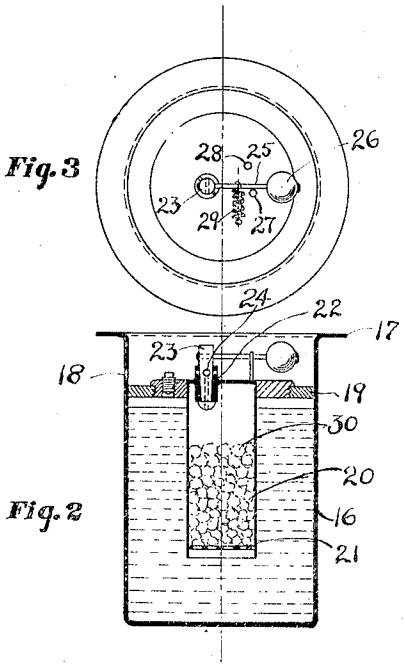


Fig. 3

Fig. 2

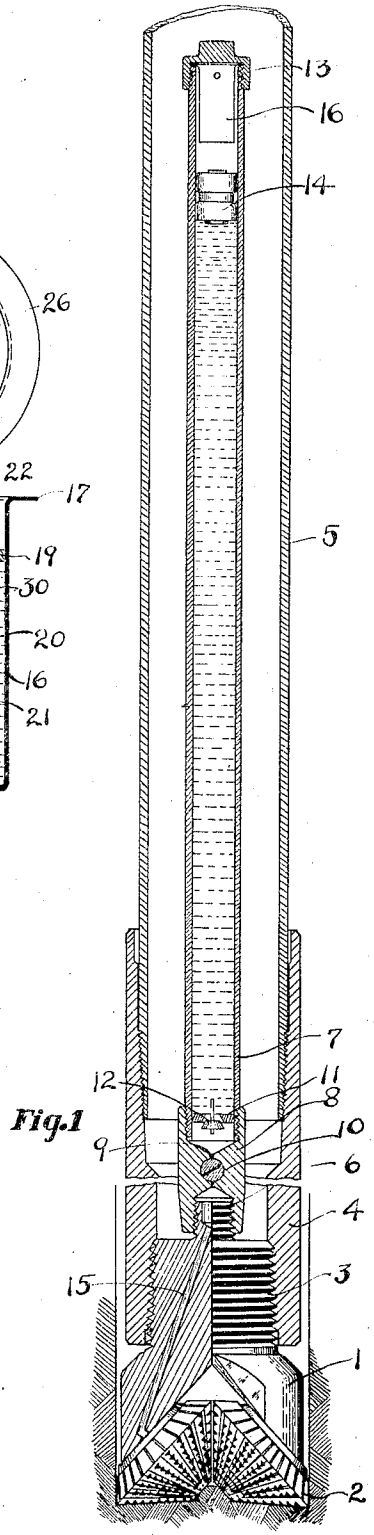


Fig. 1

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UNITED STATES PATENT OFFICE.

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LUBRICATOR.

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To all whom it may concern:

Be it known that I, LOUIS A. GODBOLD, a citizen of the United States, residing at Houston, Harris County, Texas, have invented a certain new and useful Improvement in Lubricators, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to an improvement in lubricators for roller earth boring drills. It has to do particularly with the means by which the lubricant is forced through the ducts of the bit to the bearings of the bit during the operation thereof.

The object of my invention is to provide a means for forcing the lubricant from its container to the bearings by gas pressure.

Another object is to regulate the rate of flow of the lubricant to the bearings according to the speed of rotation of the drill.

These and other objects and advantages will more clearly appear from the specification which follows. Referring to the drawings herewith, wherein like numerals of reference are applied to like parts in the several views; Fig. 1 is a central longitudinal section of a drill stem and drill with my improved lubricator attached thereto. Figs. 2 and 3 are central longitudinal sections and top plan views respectively of a preferred type of gas container or generator to be used with my device.

In the drilling of wells for oil, water, gas, sulphur, etc., it is customary to flush away the cuttings disintegrated by the action of the rotary cutters, and to carry the cuttings upwardly in suspension, by a stream of fluid pumped downwardly from the surface through the drill stem. The drill in operating, therefore, works under a head of fluid, containing mud and sand, which exerts a heavy hydrostatic pressure at the bottom of the hole where the drill operates. There is therefore a heavy backward pressure against the bearings, tending to carry the mud into the same and to thus cause wear.

To overcome this hydrostatic pressure and to force lubricant outwardly to the bearings against this head, I contemplate exerting a heavy gas pressure upon the top of the lubricant. Manifestly this gas pressure must be slightly greater than is the back pressure of the hydrostatic head of flushing water.

One embodiment of my invention, by means of which I accomplish this purpose, is shown in the drawings where I have shown a well known type of rock bit comprising a head 1 having cone-shaped roller cutters 2 at the forward end thereof. The upper threaded shank 3 of the bit is connected by means of the drill collar 4 to the drill-stem 5. A small upstanding nipple 6 on the upper end of the shank 3 is threaded for the attachment thereto of a coupling 8, through which a lubricator barrel 7 is coupled to the head.

The coupling 8 has a small oil passage 9 therethrough, said passage being formed with a rotatable valve 10 therein to control the flow of fluid therethrough. Adjacent the lower end of the lubricator barrel is a transverse plate 11, having an opening therein furnishing a seat for a downwardly opening automatic valve 12. Ducts 15 in the head of the bit carry lubricant from the lubricator to the bearings of the cutters 2.

The upper end of the barrel is threaded externally for the attachment of a cap 13. Below this cap and resting on the upper surface of the lubricant, I may employ a piston 14.

To exert a pressure on the piston, and thus force it downwardly upon the oil, I contemplate using the pressure of a gas. A container for gas under pressure is shown at 16 at the upper end of the lubricator barrel. It has an outwardly flaring marginal flange 17 at its upper end by means of which it may be clamped between the upper end of the barrel 7 and the cap 13. A small lateral opening 18 serves to allow passage of gas from the container to the space above the piston.

Within the container 16 and immediately below the opening 18 is a diaphragm 19 forming a closure for the upper end of the said container. The space below this diaphragm may be used as a receptacle for a gas under high pressure if desired but I contemplate generating gas therein during the progress of the drilling. This I accomplish by providing a small chamber 20 within the container, this chamber having a perforated bottom 21 therein slightly above the open lower end thereof. The upper end of

the chamber is closed but is provided with a valve chamber 22, having rotatable valve 23 therein. The valve 23 is perforated centrally to a point midway thereof and has a diametral passage 24 connecting with the central bore. This passage is adapted to register with an opening in the valve chamber when the valve is turned in the proper direction, thus allowing a passage of gas from the chamber to the space above, in the container 16.

The valve 23 is controlled in its operation by a governor comprising a laterally extending arm 25 having a ball 26 on the end thereof. The rotation of this arm about the pivot formed by the valve is limited by two upstanding pins 27 and 28. It is normally held in contact with the pin 27 by the action of a spiral tension spring 29. When held in that position the valve passage 24 is closed and no gas escapes.

The generation of gas in the chamber 20 may be accomplished by the use of calcium carbide or some similar compound shown at 30. The space without the chamber 20 is filled with water so that the tendency will be for the water to enter through the perforated plate 21 and to thus come into contact with the carbide and cause the generation of gas. If the valve is then closed, the pressure of the gas will become great enough to force the water back out of contact with the carbide so that no further gas will be generated.

When my device is used on a rotary drill of the type shown, the gas generated by the contact of water and carbide will have forced the water back until no further gas is being produced. The valve 23 will be in closed position due to spring 29. When the drill is rotated, however, the valve will be gradually opened. The rotation of the drill is in clockwise direction viewed from above. There will be a tendency of the weight of the governor to lag behind the drill as the drill rotates and this will force the lever arm 25 over toward the pin 28 against the action of spring 29. As the valve opens, allowing the escape of gas to the space in the lubricator above the piston, the pressure will gradually become great enough to force the piston slowly down upon the oil and feed it to the bearings against the pressure of the head of fluid in the hole. It will be noted that the valve will be opened widest when the rate of rotation of the drill is greatest, thus providing a greater amount of lubricant when it is most needed. The escape of gas from the chamber 20 will decrease the pressure there and allow water to enter and generate more gas and the gas will be continuously generated as long as it continues to escape. There might be a point reached where the pressure would be excessive within the lubricator, but when the pressure becomes too great it will again force the water back away from the carbide and thus cause the generator to cease to function, thereby relieving the increase of pressure for awhile.

Where stored gas under pressure is used, the whole container below the diaphragm 19 is stored with gas. The rotation of the drill will act to control the valve 23 and thus allow the feed of the gas to the lubricator in the manner described during the rotation of the drill stem. The size of the valve opening 24 will be regulated to allow the escape of gas at the rate required.

When the drill is being introduced into a hole, having a head of fluid therein, the upward pressure of the head of fluid will act to seat the valve 12 and prevent the forcing of mud to the lubricator barrel. When the rotation of the drill stem begins the gas will be admitted to the lubricator barrel and lubrication will begin. The advantage of this construction lies in the fact that the lubricant will be positively fed to the bearings when the drill is rotated. Until then there will be no loss of lubricant because there will be no pressure on the piston thereon. The faster the rotation, up to a certain limit, the faster will be the feed of lubricant due to the fact that the valve will be fully open and admitting gas rapidly to the lubricator. There will thus be no opportunity for impurities to get into the oil and clear lubricant is assured.

Having thus described my invention, the further advantages of which will now be clear, what I claim as new and desire to protect by Letters Patent is:

1. In a roller boring drill, the combination with a head having rotary cutters mounted on bearings thereon, of a lubricator barrel on said head, ducts therefrom constantly open to said bearings and means in said lubricator barrel to exert a gas pressure on the lubricant in said barrel to force it continuously through said ducts to said bearings.

2. In a roller boring drill, a drill head, cutters rotatable on bearings thereon, a lubricator on said head, ducts open from said lubricator to said bearings, a piston in said lubricator, a gas container above said piston enclosed in said lubricator and means to govern the discharge of gas from said container to the space above said piston.

3. In a roller boring drill, a drill head, cutters rotatable on bearings thereon, a lubricator barrel on said head adapted to feed lubricant to said bearings, a container above the lubricant in said barrel for fluid under pressure, said container having a valve controlled opening therefrom, and means actuated by the rotation of said drill to govern the operation of said valve.

4. In a roller boring drill, a drill head,

rotatable cutters mounted on bearings on said head, a lubricator barrel on said head, ducts therefrom to said bearings, a container in said barrel at the upper end thereof, means therein to generate gas and a governor controlling the passage of gas from said container to said lubricator barrel.

5. In a roller boring drill, a lubricator for the rollers thereon, comprising a lubricator barrel, a container for gas thereon, and means controlling the discharge of gas therefrom to said lubricator barrel adapted to operate only when said drill is rotating.

6. In a roller boring drill, a lubricator for the rollers thereon comprising a lubricator barrel, a container for gas thereon, a valve controlled passage from said container to said lubricator, and means to operate said valve actuated by the rotation of the drill.

7. In a roller boring drill, a drill head, cutter bearings, means to lubricate said bearings comprising a lubricator barrel, a gas container, a passage from said container to said lubricator barrel, a valve therein, a governor for said valve comprising a lever arm, a weight on said arm, and means to hold said arm and valve resiliently in closed position, said valve being adapted to open on the rotation of said drill.

In testimony whereof, I hereunto affix my signature, this the 2nd day of July, A. D. 1921.

LOUIS A. GODBOLD.