June 23, 1953 C. B. REYNOLDS 2,642,942

DRILLING EQUIPMENT AND WELL PIPE CLEANER

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Fig. 1.

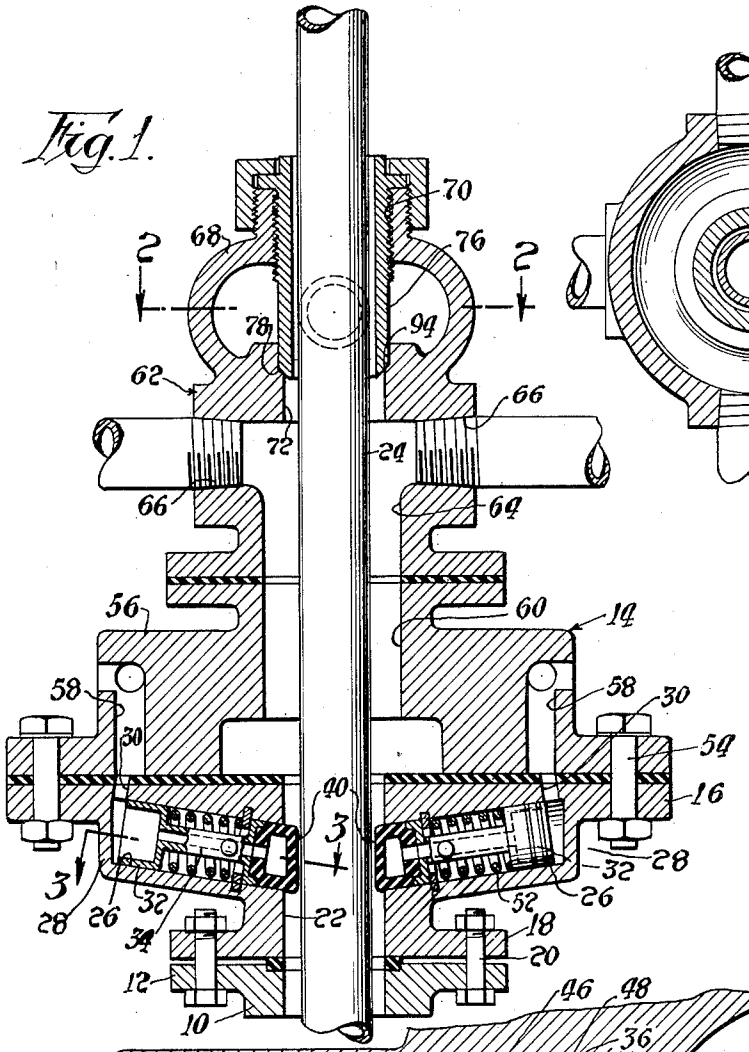


Fig. 2.

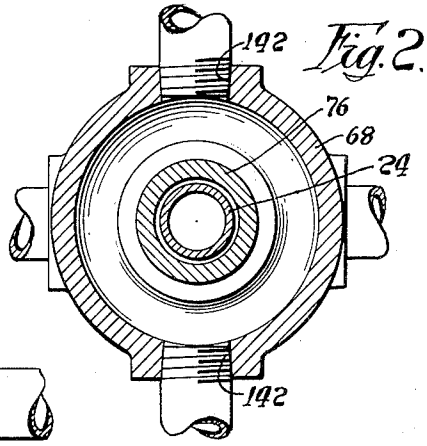
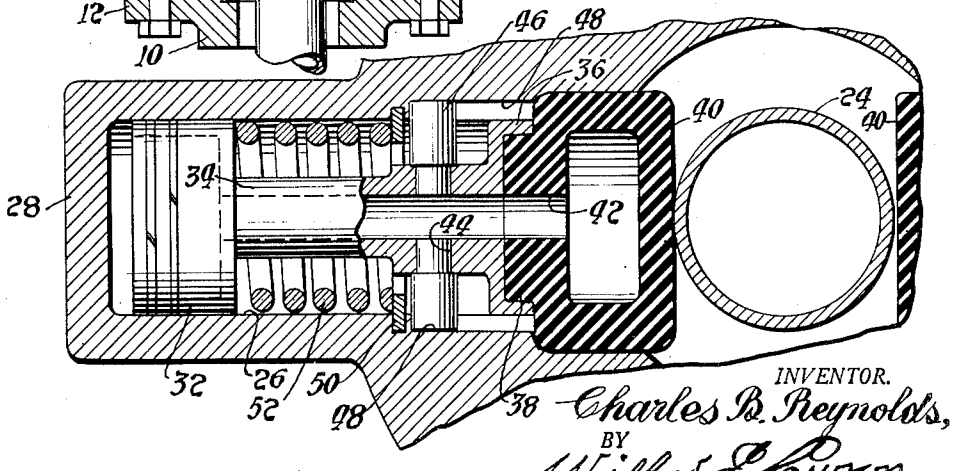


Fig. 3.



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Fig. 4.

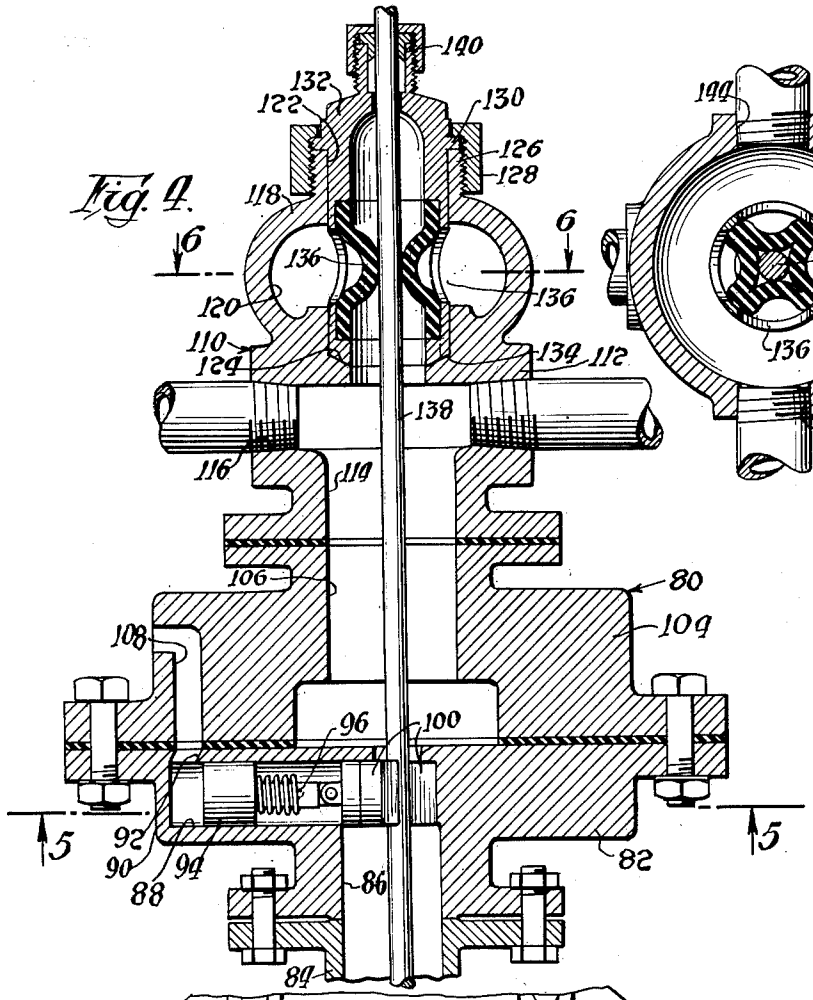
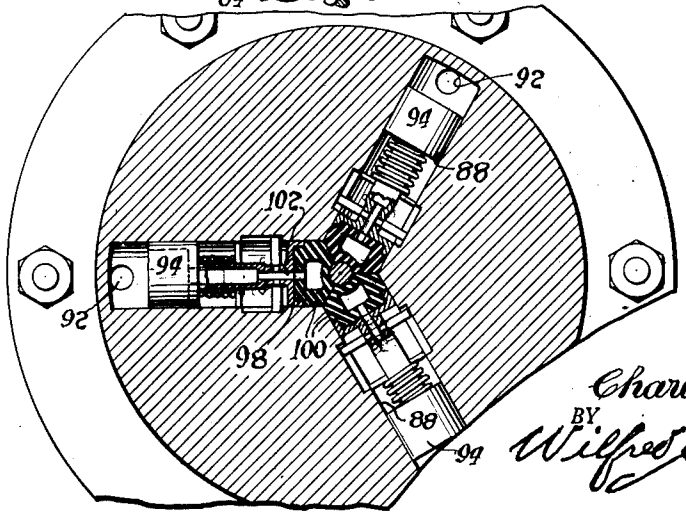


Fig. 6.

Fig. 5.



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DRILLING EQUIPMENT AND WELL PIPE CLEANER

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5 Claims. (Cl. 166—14)

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This invention relates to a cleaner for drilling equipment and well pipe as the latter is being extracted from a conventional well casing.

In the removal of drilling equipment, well pipe and the like from well casings, mud, debris, oils and the like adhere to the exposed surfaces of the well drilling equipment and pipe, and frequently valuable substances which might better remain in the well are withdrawn and lost. Also in certain instances undesirable matter may become hardened on the surface of the pipe or drilling equipment which must be removed before the drilling equipment or pipe is again used.

The primary object of this invention is to strip from the surface of drilling equipment or well pipe the matter which adheres thereto and to cause such matter to be deposited in the well during the extraction of the drilling equipment or pipe.

Another object is to remove from the surface of the drilling equipment or well pipe substances which may have adhered thereto and become hardened thereon so that the well pipe or drilling equipment will be in condition for subsequent use without further cleaning.

Still another object is to remove surface adhering matter from the well pipe or drilling equipment as the latter is being extracted from a well casing.

A further object is to automatically close the top of the well casing as the last piece of drilling equipment or pipe is withdrawn therefrom to prevent the escape of gas or liquid from the well.

The above and other objects may be attained by employing this invention which embodies among its features a head adapted to be attached to the upper end of a well casing and having a passage therethrough which aligns with the well casing and through which drilling equipment, pipe and the like is moved as it is extracted from the well casing, wipers carried by the head adjacent the well casing for stripping matter adhering to pipe, well drilling equipment or the like and depositing it in the well, means carried by the head above the wipers for directing a solvent against well drilling equipment, pipe or the like to dissolve matter which may have become encrusted thereon, and means for regulating the flow of solvent.

Other features include a second group of wipers carried by the head remote from the first group of wipers and associated with the solvent directing means to wipe from the pipe, drilling equipment or the like matter which has been dissolved by the solvent.

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In the drawings:

Figure 1 is a vertical sectional view through a well pipe cleaner embodying the features of this invention,

Figure 2 is a horizontal sectional view taken substantially along the line of 2—2 of Figure 1,

Figure 3 is a fragmentary enlarged sectional view taken substantially along the line 3—3 of Figure 1,

Figure 4 is a view similar to Figure 1 illustrating a modified form of drilling equipment and well pipe cleaner,

Figure 5 is a horizontal sectional view taken substantially along the line 5—5 of Figure 4, and

Figure 6 is a horizontal sectional view taken substantially along the line 6—6 of Figure 4.

Referring to the drawings in detail a well casing 10 is equipped at its upper end with a conventional attaching flange 12 to which this improved drilling equipment and well pipe cleaner is attached. The cleaner above referred to comprises a head designated generally 14 comprising a base member 16 carrying at its lower end an attaching flange 18 which is bolted to the flange 12 by conventional bolts 20. The base member 16 is provided with a vertical bore 22 which aligns axially with the well casing 10, and through which the well pipe, or drilling equipment 24 moves as it is extracted from the well casing. Formed into the base member 16 and opening into the passage 22 are radially disposed bores 26 which are closed at their outer ends by heads 28. Extending downwardly through the top of the base member 16 and communicating with the bores 26 are ports 30 the purpose of which will hereinafter appear. Mounted for sliding movement in each bore 26 is a hollow piston 32 which opens toward the head 28 of its respective bore and carries at its end remote from the head 28 a tubular piston rod 34 which opens into its respective piston. Formed at the end of each piston rod 34 remote from its respective piston 32 is a cup 36 into which is fitted a boss 38 carried by a hollow expansible wiper 40, the interior of which has communication with the interior of its respective tubular piston rod 34 through a passage 42 which extends through the boss 38. Formed in each piston rod 34 adjacent the cup 36 thereof are diametrically opposed openings 44 for the reception of trunnions 46 which project laterally from their respective piston rods and have their outer ends received in grooves 48 formed in diametrically opposed relation in the respective bores 26 so as to prevent the pistons and piston rods from turning in their respective

bores. As illustrated in Figure 3 these grooves 48, terminate substantially midway between opposite ends of their respective bores so as to serve as stops which will limit the distance that a piston can be retracted into its respective bore 26. Extending into each bore 26 adjacent the inner ends of the grooves 48 therein are stop lugs 50 against which one end of a compression coil spring 52 engages while its opposite end engages the piston 32 in its respective bore 36. These coil springs 52 serve to retract their respective pistons 32 and wipers 40 with relation to the bore 22 extending through the base member 16.

Secured to the base member 16 above the bores 26 and pistons 32 as by bolts 54 is a head member 56 which is provided with passages 58 which align with the ports 30 in the base member 16 to admit fluid into the bores 26 behind their respective pistons 32. The head member 56 is provided with an axial passage 60 which aligns with the passage 22 in the base member 16 and through which the drilling equipment, well pipe or the like 24 moves as it is extracted from the well casing. The bore 60 is of relatively large diameter to form a chamber in which is received matter dissolved from the surface of the well drilling equipment, well pipe or the like 24 and carried by the head member 56 adjacent its upper end is a cap member designated generally 62 which is provided adjacent its lower end with a bore 64 of a diameter substantially equal to the diameter of the bore 60 and which aligns therewith. The upper end of the enlarged bore 64 opens into radially disposed discharge ports 66 through which the fluid solvent used for dissolving hardened matter on the drilling equipment 24 may escape. Carried at the upper end of the cap member 62 is a dome 68 having an internally screw threaded axial opening 70 entering its upper end. Communication is established between the interior of the dome 68 and the passage 64 through a passage 72 of a diameter somewhat less than the diameter of the passage 64 and formed intermediate the ends of the passage 72 is a tapered seat 74 for cooperation with a valve member to be more fully hereinafter described. The valve member referred to comprises a tubular body 76 having external screw threads which engage the threads 70 of the dome 68 and a tapered seat 78 which is adapted to engage the seat 74 to prevent the escape of fluid from the interior of the dome into the passages 72, 64 and 60. It is obvious that by turning the valve member 76 relative to the dome 68, communication may be established between the interior of the dome and the passage 72 between the tapered end 78 of the valve member 76 and the seat 74 in the passage 72, hence by feeding steam or the like into the dome 68 it may be directed into the passages 72, 64 and 60 to dissolve any hardened matter which may adhere to drilling equipment or well pipe which is being extracted from the casing 10,

In the structure so far described only two wipers 40 are disclosed which in some instances will not satisfactorily effect adequate cleaning of the well drilling equipment or well pipe of debris which may adhere thereto. Accordingly in Figures 4 through 6 inclusive a cleaner of a modified form is disclosed.

In the cleaner disclosed in Figures 4 through 6 inclusive a head designated generally 80 comprises a base member 82 which is attached to a conventional well casing 84 in any suitable manner and is provided with an axial opening 86 which aligns with the casing 84. This base member 82 is also provided with radial bores 88 which open into the axial bore 86 and are closed at their ends remote from the axial bore 86 by heads 90. Like the base member previously described, the base member 82 is provided with ports 92 which open through the top thereof and communicate with the respective bores 88, and mounted in said bores for movement longitudinally thereof are hollow pistons 94 which correspond in all respects to the pistons 32 previously referred to. These pistons are equipped with tubular piston rods 96 which correspond to the piston rods 34, and carried at the ends of the piston rods 96 remote from the pistons 94 are cups 98 for the reception of bosses carried by hollow expansible wipers 100 which have communication with the tubular piston rods through passages 102. Like the head 14, a head member 104 is supported on the upper side of the base member 82 and is provided with a relatively large axial opening 106 which aligns with the opening 86 and through which drilling equipment or well pipe passes as it is extracted from the casing 84. Passages 108 are also formed in the head member 104 and communicates with the ports 92 for the admission of fluid into the bores 88, pistons 94, hollow piston rods 96 and the wipers 100.

Like the head 14 previously described, the head 80 is also equipped with a dome designated generally 110 which comprises a body portion 112 having an axial opening 114 extending therethrough which aligns with the axial opening 106 in the head member 80 and communicates at its upper end with radial discharge ports 116. The dome member 110 is also surmounted by a dome 118 which is hollow to form an annular passage 120 which surrounds an axial bore 122 which extends through the dome member said axial bore 122 is provided adjacent its lower end with an inclined seat 124 which communicates through the lower end of the dome member with the passage 114 therein. An upwardly extending externally screw threaded boss 126 is carried by the dome member 118 and threaded thereon is a cap 128 which has clamping engagement with a flange 130 carried by a valve member 132 which extends into the passage 122 and has a tapered lower end 134 for engagement with the seat 124. The valve member 132 is provided with circumferentially spaced radial openings 136 which open into the annular passage 120 of the dome member 118 and are covered by expansible wipers 136 which when subjected to fluid pressure confined within the annular passage 120 expand into the interior of the tubular valve member 132 and against well drilling equipment or pipe 138 which is moving upwardly through the valve member and the head 80 from the casing 84. A suitable packing gland 140 is carried by the upper end of the tubular valve member 132 to effect a seal with the well drilling equipment or pipe in order to prevent the escape of fluid therearound at the upper end of the head 80. Grease dissolving fluid such as steam is admitted into the dome member 68 of the dome 62 through suitable ports 142 and similar ports 144 open into the annular passage 120 of the dome 118 to admit steam or like solvent thereinto.

In use the head 14 is bolted to the flange 12 of a well casing 10 as illustrated in Figure 1 from which drilling equipment or pipe is to be extracted. As the extraction of the drilling equipment or pipe takes place, it will pass upwardly

through the passages 22, 60, 64, 72 and 70 in the head 14. The wipers 40 are normally held in retracted position under the influence of the springs 52 so that the drilling equipment or pipe may freely pass through the head 14. Upon introducing fluid under pressure through the passage 58, it will enter each port 30 and bore 26 between the head 28 and the piston 32, thus forcing the piston to move in its cylinder against the effort of the spring 52 therein. Simultaneously fluid will enter the wipers 40 through the respective piston rods so as to cause them to expand against the well pipe or well drilling equipment 24 so as to substantially completely encircle said well pipe or equipment. As a consequence as the pipe or equipment 24 is moved upwardly, any debris adhering to the surface thereof will be wiped therefrom and deposited in the well casing. Should there be hardened deposits on the pipe or well drilling equipment which cannot be removed by the wipers 40, the tubular sleeve 76 is rotated to move its tapered end 74 off of the seat 78 in order to establish communication between the interior of the dome 68 and the passage 72 so that upon admitting steam or like solvent through the port 142 it will be directed against the surface of the pipe or well drilling equipment to soften and dissolve the hardened matter which will fall downwardly through the passages 64 and 60 while the steam will escape through the ports 66.

Should it be desirable to wipe the drilling equipment or pipe subsequent to the application of solvent thereto, the head 80 disclosed in Figure 4 is employed and the pipe or drilling equipment 138 is engaged by the wipers 100 to remove the looser particles and liquids as it moves upwardly out of the well casing 84. By admitting steam to the annular passage 120 of the dome 118 through the ports 144, and lifting the valve member 132 off of its seat 134, it will be evident that the steam may be directed against the pipe or well drilling equipment 138 as it moves upwardly to dissolve hardened substances. Simultaneously with the introduction of steam pressure into the annular chamber 120, the steam passing through the openings 136 will impinge against the expansible wipers 136 to cause them to expand into contact with the pipe or well drilling equipment 138 and wipe the dissolved substances from the surface thereof. Hence by employing this device it is not only possible to remove the relatively loose substances that adhering to the surfaces of well drilling equipment or pipe, but also hardened substances may be dissolved and removed therefrom.

Obviously as the last piece of drilling equipment or pipe is withdrawn through the expansible wipers 40 or 100 according to the type of head employed, the fluid pressure within the wipers will automatically expand them against one another to form an effective seal at the top of the well casing, 10 or 84 as the case may be, which will prevent gas or liquid from escaping through the top of the well casing and being lost.

While in the foregoing there has been shown and described the preferred form of this invention, it is to be understood that minor changes in the details of construction, combination and arrangement of parts may be resorted to without departing from the spirit and scope of the invention as claimed.

I claim:

1. In a cleaner for drilling equipment, pipe or the like, a head adapted to be mounted on a well casing; said head having an opening extending therethrough which aligns with the well casing and through which drilling equipment, pipe or the like passes as it is withdrawn from the well casing; hollow expansible wipers carried by said head for movement radially toward or away from drilling equipment, pipe or the like that is being moved through said head; fluid actuated pistons carried by said head and connected to the wipers, means for applying fluid pressure to said pistons for advancing said wipers toward drilling equipment, pipe or the like moving through said head and for directing fluid into said wipers to cause them to expand; resilient means carried by said head and engaging said fluid actuated pistons for retracting said wipers relative to drilling equipment, pipe and the like passing through said head; and means carried by said fluid actuated pistons and engaging said head for limiting the retraction of the wipers and holding said wipers against rotation relative to the head.

2. In a cleaner for drilling equipment, pipe or the like, a head adapted to be mounted on a wall casing; said head having an opening extending therethrough which aligns with the well casing and through while drilling equipment, pipe or the like passes as it is withdrawn from the well casing; radially disposed pistons carried by said head for movement toward and away from drilling equipment, pipe or the like passing through said head; a hollow expansible wiper carried by each piston adjacent drilling equipment, pipe or the like passing through said head; resilient means connected with and urging retraction of said pistons relative to drilling equipment, pipe or the like passing through said head; means for directing fluid against said pistons to advance them against the resistance of the resilient means, and means for introducing fluid into the expansible wipers to cause them to expand.

3. In a cleaner for drilling equipment, pipe or the like, a head adapted to be mounted on a well casing; said head having an opening extending therethrough which aligns with the well casing and through which drilling equipment, pipe or the like passes as it is withdrawn from the well casing; radially disposed hollow pistons carried by said head for movement toward and away from drilling equipment, pipe or the like passing through said head, tubular piston rods carried by the pistons at the ends thereof adjacent drilling equipment, pipe or the like passing through said head, said piston rods opening into said pistons, hollow expansible wipers carried by the piston rods at the ends thereof remote from the pistons and opening into the rods; and means carried by the heads to direct fluid into the pistons and into the wipers to advance said wipers into contact with drilling equipment, pipe or the like passing through said head and to cause said wipers to expand and completely encircle such drilling equipment, pipe or the like.

4. In a cleaner for drilling equipment, pipe or the like, a head adapted to be mounted on a well casing; said head having an opening extending therethrough which aligns with the well casing and through which drilling equipment, pipe or the like passes at it is withdrawn from the well casing; radially disposed hollow pistons carried by said head for movement toward and away from drilling equipment, pipe or the like passing through said head, tubular piston rods carried by the pistons at the ends thereof adjacent drilling equipment, pipe or the like passing through said head, said piston rods opening

into said pistons, hollow expansible wipers carried by the piston rods at the ends thereof remote from the pistons and opening into the rods; and means carried by the heads to direct fluid into the pistons and into the wipers to advance said wipers into contact with drilling equipment, pipe or the like passing through said head and to cause said wipers to expand and completely encircle such drilling equipment, pipe or the like; springs encircling the piston rods and bearing on the pistons for retracting the pistons and the wipers.

5. In a cleaner for drilling equipment, pipe or the like a head adapted to be mounted on a well casing; said head having an opening extending therethrough which aligns with the well casing; a group of wipers carried by the head for engaging the surface of drilling equipment, pipe or the like passing through said head as it is being withdrawn from the well casing and removing dirt and debris clinging thereto, a group of expansible wipers carried by the head remote from the first group of wipers for engaging the drilling equipment, pipe or the like as it passes through said head; means for encircling the second group of wipers by a cleaning fluid for expanding the engaged wipers and thereby causing them to engage the drilling equipment, pipe or the like as it passes through the head; and means carried by the second group of wipers for directing such cleaning fluid against the drilling equipment, pipe or the like prior to being engaged by said second group of wipers.

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References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
257,127	Averill	Apr. 25, 1882
1,521,390	Reynolds	Dec. 30, 1924
1,709,949	Rasmussen et al.	Apr. 23, 1929
1,854,058	Otis	Apr. 12, 1932
2,047,520	Penick et al.	July 14, 1936
2,113,529	Hild	Apr. 5, 1938
2,174,366	Guiberson, 3d, et al.	Sept. 26, 1939