Aug. 30, 1938. T. A. CREIGHTON 2,128,352

METHOD AND APPARATUS FOR RELEASING FLUID FROM DRILL PIPE

Filed Oct. 20, 1936 3 Sheets-Sheet 1

Fig.1.

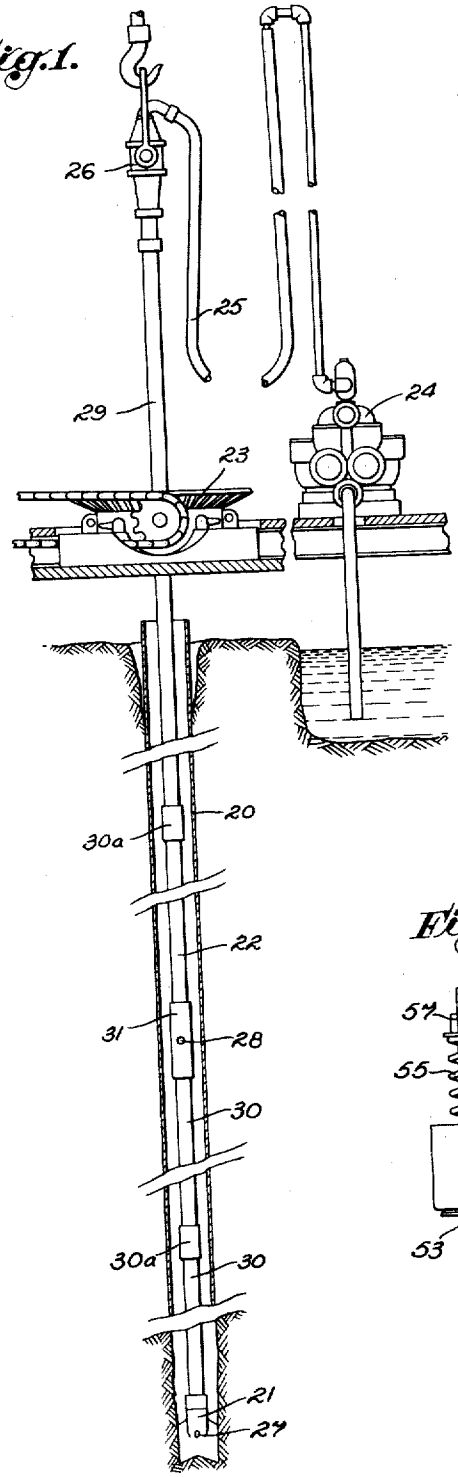


Fig.2.

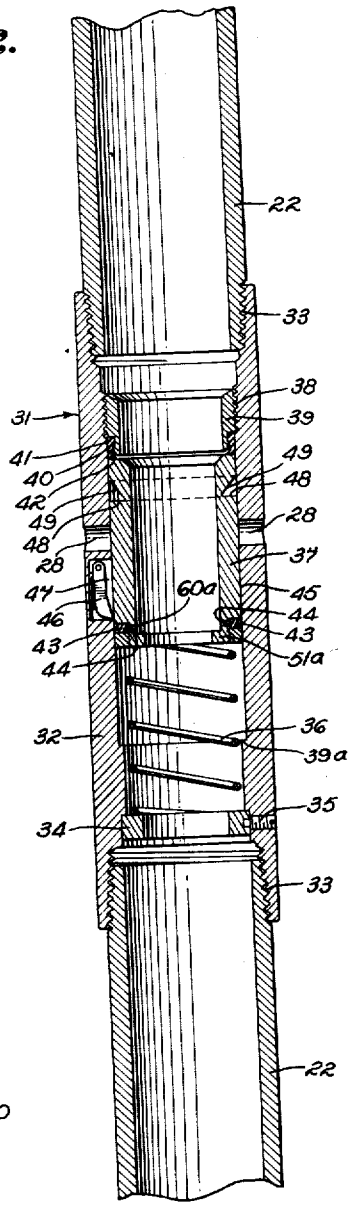
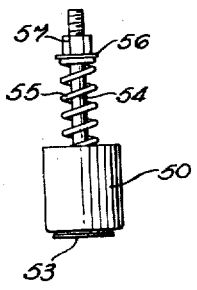


Fig.3.



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Aug. 30, 1938. T. A. CREIGHTON 2,128,352

METHOD AND APPARATUS FOR RELEASING FLUID FROM DRILL PIPE

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Fig.4.

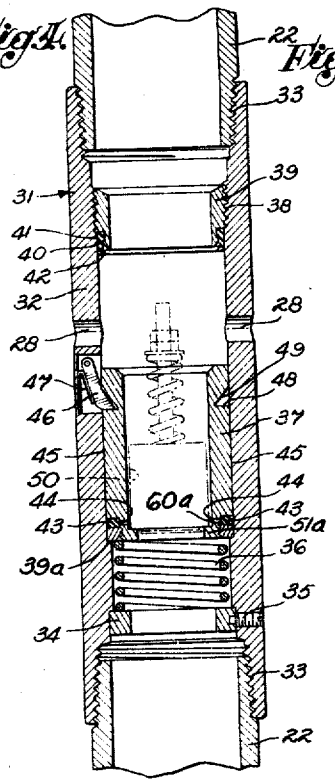


Fig.5.

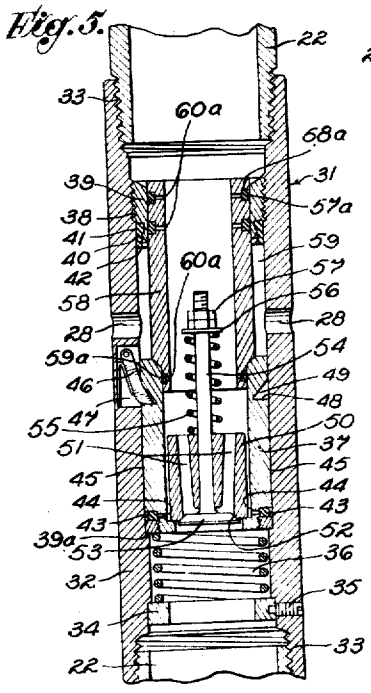


Fig.6.

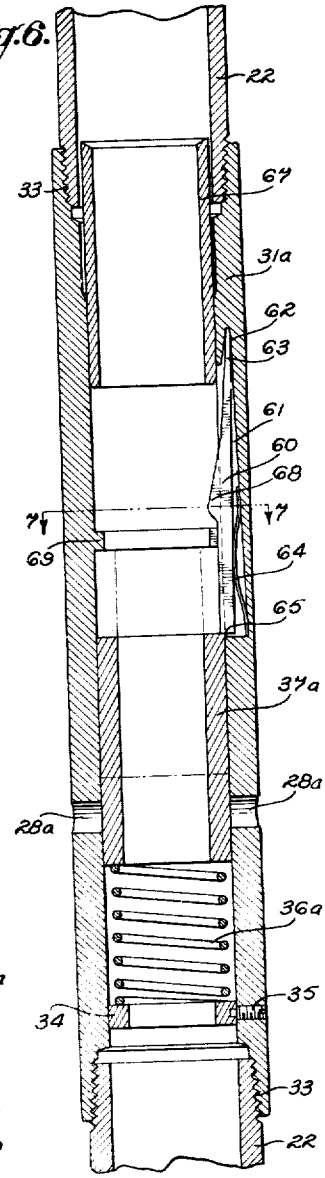


Fig.7.

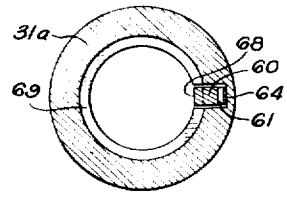
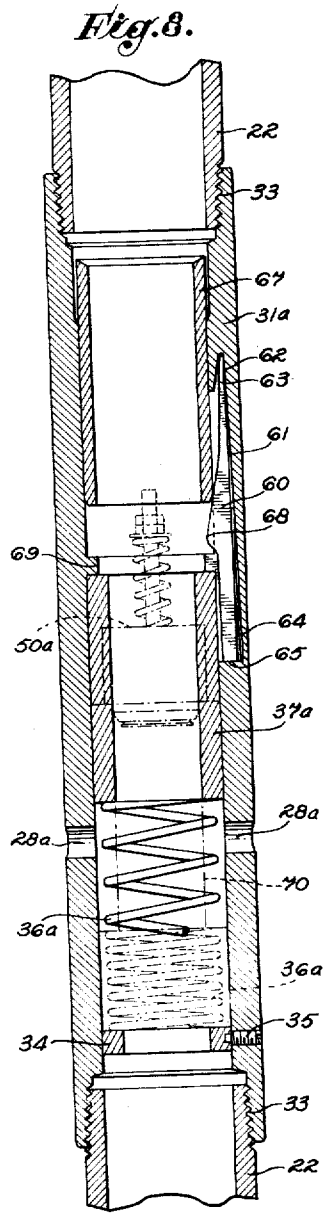


Fig.8.



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METHOD AND APPARATUS FOR RELEASING FLUID FROM DRILL PIPE

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Fig.9.

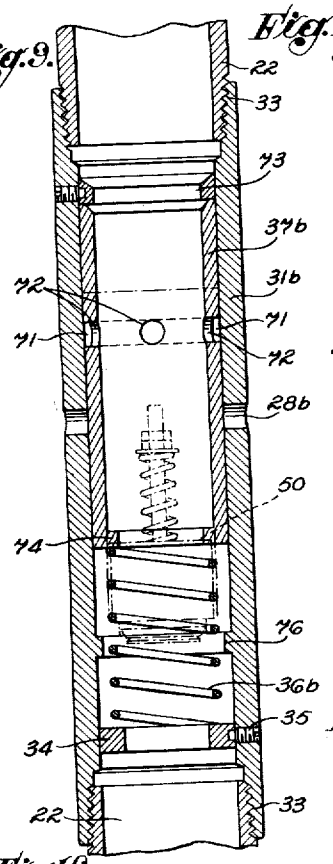


Fig.11.

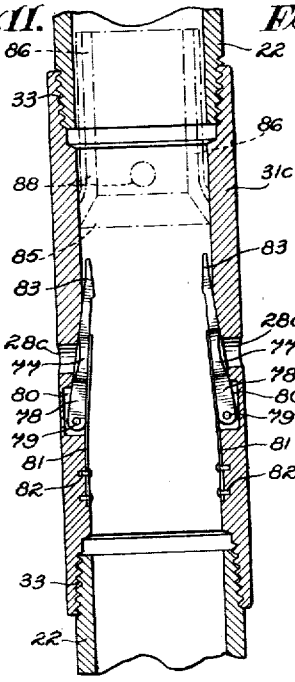


Fig.13.

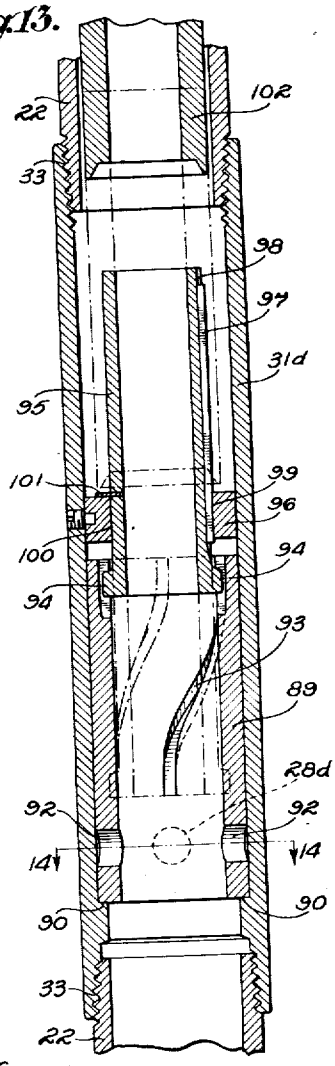


Fig.10.

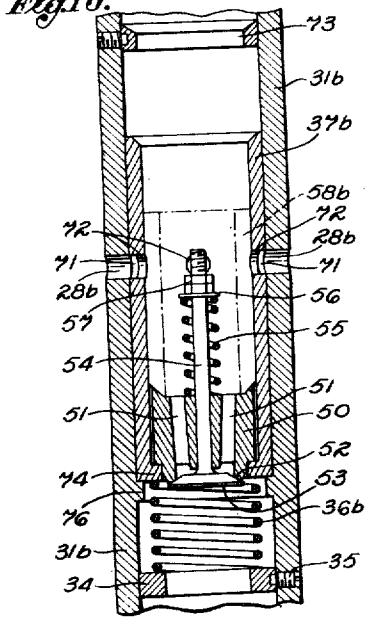


Fig.12.

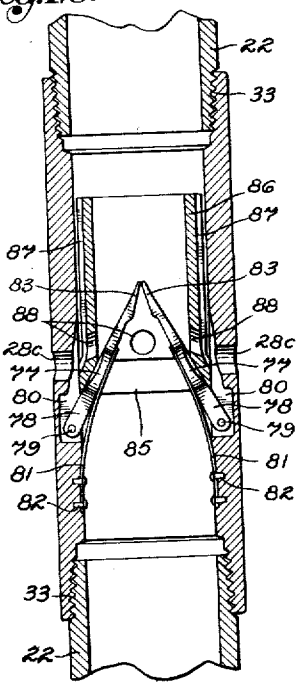
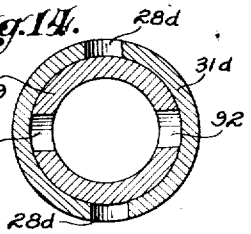


Fig.14.



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Patented Aug. 30, 1938

2,128,352

UNITED STATES PATENT OFFICE

2,128,352

METHOD AND APPARATUS FOR RELEASING FLUID FROM DRILL PIPE

Thomas A. Creighton, Lemoore, Calif.

Application October 20, 1936, Serial No. 106,558

10 Claims. (Cl. 255—28)

My invention relates to operations concerned with the drilling and maintenance of wells, and relates in particular to a method and apparatus whereby a fluid-like material is delivered into the well in the performance of a desired operation in such well.

The principal utility of the invention is now believed to be in conjunction with the drilling of wells by the rotary system wherein a tool is operated in the well by means of a string of drill pipe. During the drilling operation, a drilling fluid, ordinarily termed "mud", is forced downwardly through the string of drill pipe and is discharged from an opening in close proximity to the operation being performed in the well. Ordinarily the drilling tool has one or more discharge ports therein for directing the drilling fluid to desired points in the well. To produce the desired flow of the drilling fluid downwardly through the drill pipe and then out through the discharge opening or openings, it is customary to employ mud pumps which operate at a pressure up to 2000 pounds more or less per square inch. When this pressure is removed, as during the time a string of pipe is being pulled from the well, the drilling fluid moves downwardly so slowly in the drill pipe and out through the regular discharge passages as to interfere with the operation of pulling the drilling string. If a tool joint is unscrewed before the drilling fluid has drained from the section of drilling pipe above the joint, the drilling fluid will be spilled on the derrick floor, this resulting in an unsatisfactory and dangerous condition under which the pulling crew must work, and also resulting in a loss of drilling fluid which may be relatively valuable owing to the materials employed therein to give it desired characteristics.

It is an object of my present invention to provide a method and apparatus whereby an operation in a well is performed wherein the desired fluid is pumped during the carrying on of the operation out through a regular discharge opening, and then when it is desired to pull the string of pipe from the well, the motivating pressure for the fluid is released or removed, and the fluid is drained from the string of pipe by use of supplementary discharge or drainage openings disposed at desired points throughout the length of the string of pipe. For example, supplementary or auxiliary discharge openings may be opened at a point just above the normal discharge opening, and other supplementary openings may be opened at points somewhere between the lower and upper ends of the string of pipe, for example, in substantially the middle thereof.

It is a further object of the invention to provide a method and apparatus whereby supplementary fluid discharge or drainage openings in the string of pipe are opened by moving an actuating or effectuating member or device downwardly through the string of pipe from the upper end thereof.

It is a further object of the invention to provide a method and apparatus of the above character wherein the actuating or effectuating device is pumped down through the string of pipe as a piston moves by the downwardly moving fluid in the string of pipe, this piston-like member engaging and operating parts associated with the openings to remove closure members from the openings.

It is a further object of the invention to provide a method and apparatus of the above character wherein the piston-like member has longitudinal openings closed by a pressure-opened valve, making it possible to force fluid through the piston-like member should it be so desired.

It is a further object of the invention to provide a method and apparatus of the above character wherein the supplementary discharge or drainage openings are opened by a member passed down through the string of pipe and are subsequently closed by another member passed down through the string of pipe to a desired position of operation.

Further objects and advantages of the invention will be brought out in the following part of the specification.

Referring to the drawings, which are for illustrative purposes only,

Fig. 1 is a view of diagrammatic character showing a preferred practice of my invention.

Fig. 2 is an enlarged sectional view of a preferred form of my fluid releasing device with parts thereof in position to close supplementary openings in the side wall of the string of pipe.

Fig. 3 is an elevational view of an actuating means suitable for use in conjunction with the device disclosed in Fig. 2.

Fig. 4 is a sectional view similar to Fig. 2, showing the closure member moved into open relation to the discharge openings.

Fig. 5 is a sectional view similar to Fig. 4, showing therein a means for preventing further flow of fluid through the supplementary discharge openings.

Fig. 6 is a sectional view of another form of

fluid releasing device having a closure member latched in flow-obstructing position.

Fig. 7 is a cross section taken as indicated by the line 7—7 of Fig. 6.

Fig. 8 is a cross-sectional view similar to Fig. 6, showing the closure member in the position thereof assumed after the release of the latch.

Fig. 9 is a sectional view showing another form of fluid releasing means having a tubular closure member with a shoulder therein for receiving a piston-like actuating member.

Fig. 10 is a sectional view supplementing Fig. 9 to show the utility of this form of the flow releasing means.

Fig. 11 is a sectional view showing a flow releasing device having pivoted closure members for the supplementary discharge openings.

Fig. 12 is a sectional view similar to Fig. 11, showing the manner in which the pivoted closure members are swung into open relation by a sleeve which is passed downwardly through the string of pipe.

Fig. 13 is a sectional view showing another form of fluid releasing device having a rotary type of valve.

Fig. 14 is a cross section taken as indicated by the line 14—14 of Fig. 13.

In the form of the invention illustrated in Fig. 1, I show a well 20 in which an operation is being performed, such operation consisting in this instance in the deepening of the hole by use of a rotary bit 21 carried at the lower end of a string of drill pipe 22 which is turned by use of a rotary table 23 disposed at the upper end of the well 20. During the drilling operation drilling fluid is pumped by means of a mud pump 24 through a rotary hose 25 to a rotary swivel 26 which is connected to the upper end of the string of pipe 22. The drilling fluid is forced under relatively high pressure downwardly through the string of drill pipe 22 and is discharged in proximity to the drilling operation at the bottom of the well through a discharge opening 27 suitably formed in the rotary tool 21.

In accordance with my present method, the drilling fluid is forced under the pressure of the pump 24 downwardly through the string of pipe 22 and is discharged through the discharge opening 27 into the well, while at the same time the string of pipe is rotated to impart rotation to the rotary bit 21, the result being that as cuttings are removed from the bottom of the hole by the action of the bit, they are picked up by the flow of drilling fluid and carried upwardly along the exterior of the drill pipe 22 and within the well to the surface of the ground. This is of course standard procedure from which my invention deviates in the following manner. At the completion of the drilling operation, made necessary by the wearing out of the cutting element of the bit 21, the pump 24 is shut down, and preparations are made to pull the string of drill pipe 22 with its attached bit 21 from the hole. At this time a supplementary fluid discharge port 28 in the string of pipe 22 is opened, or a plurality of such supplementary ports are opened, so that the drilling fluid may drain from the drill pipe 22 at a faster rate of flow than will be permitted through the discharge opening 27 which is used during the drilling operation. As will be hereinafter set forth, the opening of the supplementary port or ports 28 is accomplished by moving an effectuating member or device downwardly through the string of drill pipe 22 from the upper end thereof, which may be done after removal of the Kelly bar 29.

The string of pipe 22 consists of joints of pipe 30 connected together by use of tool joints 30a. At a desired point in the string of pipe 22, a tubular member 31 is incorporated so as to form a part of the string of pipe 22 and provide a wall 32 in which one or more supplementary ports 28 are formed, as shown in Fig. 2. The tubular member 31 has threads 33 at the upper and lower ends thereof by which it may be connected into the string of pipe 22, and within the lower part of the member 31 a ring 34 is secured by means of screws 35 so as to form a shoulder on which a spring 36 may rest. The upper end of the spring 36 forces upwardly against the lower end of a valve closure member 37 made in the form of a sleeve adapted to slide within the tubular member 31 from a position in which it closes the openings 28, as shown in Fig. 2, to a position such as shown in Fig. 4 wherein it is in open relation to the openings or ports 28 so that fluid may pass through such openings 28 to the exterior of the string of pipe 22. Within the upper part of the tubular member 31 internal threads 38 are formed to receive an externally threaded ring member 39 forming a stop to limit the upward movement of the closure member 37, a stop for the downward movement of the closure member 37 being formed by a shoulder 39a in the wall 32.

Means are provided for sealing the ends of the closure member 37 when it is in raised position as shown in Fig. 2. To act as a seal for the upper end of the closure member 37, I provide a rubber ring 40 which is contained in a recess 41 formed between the lower part of the ring 39 and the wall 32 of the member 31. The lower edge 42 of the rubber ring 40 projects below the lower end face of the ring 39 so that the gasket formed by the rubber ring 40 will be engaged by the upper end of the sleeve 37 before the sleeve is stopped by engagement with the lower end of the ring 39. To seal around the lower end of the closure member 37, an annular sealing member 43 is held in a channel 44 in such position that it will have sealing engagement with the inner surface 45 of the tubular member 31.

Latch means are provided for holding the closure member 37 in open relation to the ports 28 when it has been moved into such relation by means which will be later described. This latch means is shown as a spring pressed pawl 46 pivoted in a recess 47 in the wall 32 below the horizontal plane defined by the ports 28. When the closure member 37 is moved downwardly from the position in which it is shown in Fig. 2 to the position in which it is shown in Fig. 4, the lower end of the pawl 46 will engage a shoulder 48 near the upper end of the closure member 37 formed by cutting an annular channel 49 in the outer surface of the closure member 37. In Fig. 3 I show a means for effectuating the opening of the ports at a desired time. In this practice of the invention the effectuating or actuating means consists of a member 50 of cylindrical form and of such diameter that it will pass downwardly through the string of pipe, but being of such diameter that it will not pass entirely through the closure member 37 but will engage a shoulder 51a therein preferably near the lower end of the member 37, the result being that the member 50 will engage the closure member 37 and move this closure member 37 downwardly from the position in which it is shown in Fig. 2 to its position in Fig. 4 wherein the upper end of the closure

member 37 will be positioned below the ports 28 and fluid may then flow from the interior of the string of pipe 22 to the exterior thereof. The member 50 comprises a plunger or piston which may be pumped downwardly through the interior of the string of pipe 22. When it engages the shoulder 51a of the closure member 37, its downward movement is then imparted to the closure member 37, with the result that the closure member 37 is moved into open relation to the ports 28.

The plunger member 50 is shown with several longitudinal ports 51 leading to a valve seat 52 adapted to be closed by a valve member 53 supported on the lower end of a valve stem 54 which projects upwardly through the member 50 and has a compression spring 55 around the upper portion thereof and in a position so as to force upwardly against a washer 56 which is held upon the upper end of the stem 54 by means of nuts 57. If, after the closure member 37 has been moved into open relation as shown in Fig. 4, it is desired to close the ports 28 and resume the pumping of fluid through the string of pipe to the discharge port 27 at the lower end thereof, a reclosing member 58, Fig. 5, may be dropped into the upper end of the string of pipe, whereupon it will gravitate through the interior thereof until it comes to rest against the upper end of the closure member 37. The member 58 comprises a sleeve the external diameter of which agrees closely to the internal diameter of the ring 39 and has sealing rings 57a held in grooves 58a in cooperating relation to the ring 39. The lower end of the member 58 is formed so as to cooperate with the upper end of the closure member 37 so as to form a liquid-tight seal, there being a sealing ring 59a for this purpose set in a groove in the lower portion of the member 58. When it is in the position in which it is shown in Fig. 5, the reclosing member 58 cooperates with the parts 39 and 50 to close the upper end of the space 59 which communicates with the ports 28, thereby preventing further discharge of fluid through the ports 28. The valve member 53 is so formed and supported that it will be opened by the downward pressure of fluid against the upper face thereof, with the result that after the reclosing member 58 is moved into operative position as shown in Fig. 5, fluid may be pumped downwardly through the plunger member 50. Openings 60a are provided through the walls of the members 37 and 58 behind the sealing rings 43, 57a and 59a through which fluid pressure may pass to force the rings positively out into sealing position.

In the practice of the invention described relative to Figs. 2 to 5 inclusive, the means for effectuating the control of the closure member 37 accomplishes its result by imparting a force to the closure member 37 to move the same into a position of open relation to the ports 28. In Figs. 6 to 8 inclusive I show a form of fluid releasing means in which the effectuating means does not engage the closure means. In this alternative form of a part of the invention I show a tubular member 31a adapted to be connected into the string of pipe in the manner described relative to the tubular member 31. In the lower portion of the tubular member 31a are ports 28a normally closed by a closure member 37a having the form of a sleeve. The sleeve is normally held downwardly against the upward force of a compression spring 36a by means of a latch 60 positioned in a vertically elongated recess 61 formed in the inner wall of the tubular member 31a. A pocket 62 formed at the upper end of the recess 61 receives the upper end 63 of the latch 60 and serves as a pivot means relative to which the latch 60 may swing. A leaf spring 64 disposed in the lower part of the recess 61 forces the lower part of the latch 60 leftwardly into such position that a shoulder 65 at the lower end thereof will engage the upper end of the closure member 37a, to hold the closure member 37a in a position of closed relation to the ports 28a. In this form of the invention the actuating means is in the form of a metal tube or sleeve 67 which is dropped through the string of pipe 22 so that it will engage a cam or projection 68 formed on the latch member 60, as shown in Fig. 8, forcing the latch member 60 in rightward direction and thereby carrying the shoulder 65 at the lower end thereof out of engagement with the upper end of the closure member 37a, whereupon the spring 36a may force the closure member 37a upwardly into engagement with a shoulder 69 formed within the tubular member 31a. When the closure member 37a is in the raised position in which it is shown in Fig. 8, the lower end thereof is above the ports 28a or in open relation to these supplementary fluid discharge ports, and will permit fluid to discharge freely therethrough from the interior of the string of pipe 22 to the exterior thereof.

Should it be desired to close the ports 28a after they have been opened as hereinbefore described, a plunger member 50a, such as indicated in dotted lines in Fig. 8, may be lowered into the string of pipe 22 and into engagement with the upper end of the closure member 37a. The downward force of fluid exerted against the plunger member 50a will cause the closure member 37a to move downwardly against the upward force of the spring 36a and into a position closing the ports 28a as indicated in dotted lines 70 in Fig. 8.

In Figs. 9 and 10 I show a form of fluid releasing means similar in general character to the fluid releasing means disclosed in Figs. 2 to 5 inclusive in that the sleevelike closure member 37b is supported in raised position by means of a compression spring 36b, and such closure member 37b is adapted to be moved into open relation by actual engagement thereof by a plunger or piston member which is pumped downwardly through the string of pipe. In this form of fluid releasing means the closure member 37b is contained within a tubular member 31b having ports 28b, and the closure member 37b has an external channel 71 communicating with the interior thereof through openings 72. When the closure member 37b is in raised position against an inserted stop ring 73, the channel 71 is in a position of disalignment relative to the ports 28b. An internal shoulder 74 is formed on the closure member 37b, preferably at the lower end thereof as shown, and the plunger or piston member 50 disclosed in Fig. 3 is adapted to pass through the greater portion of the closure member 37b and into engagement with the internal shoulder 74, whereupon downward pressure of fluid applied to the member 50 will be transmitted to the closure member 37b to move the same downwardly into engagement with a shoulder 76 in the lower part of the tubular member 31b, as shown in Fig. 10. When the closure member 37b is in this position, the channel 71 will be aligned with the ports 28b, and fluid from the interior of the string of pipe may then pass outwardly to the exterior through openings 72 and the ports 28b. In this form of the invention the reclosing member or sleeve 58b is formed of such size that it

will pass within the closure member 37b and come to rest on the plunger member 50 in a position to close the openings 72, as shown in Fig. 10 in dotted lines.

In Figs. 11 and 12 I show a form of fluid releasing means comprising a tubular member 31c adapted to be connected into a string of pipe 22 in the manner described relative to the sleeve 31 of Fig. 2. In this form of the invention ports 28c in the tubular member 31c are adapted to be normally closed by closure plates 77 supported upon levers 78, the lower ends of which are pivoted on pins 79 carried in recesses 80 which are formed in the inner wall portion of the tubular member 31c. Leaf springs 81, secured to the wall member 31c by means of rivets 82 as shown in Fig. 11, hold the levers 78 in such position within the tubular member 31c that the closure plates 77 will be maintained in closed relation to the ports 28c. Fingers or arms 83 project upwardly and inwardly within the tubular member 31c in such position that they may be readily engaged by an annular knife edge 85 formed at the lower end of an effectuating member 86 comprising a metal tube adapted to be dropped down through the interior of the string of pipe 22. In Fig. 11 the effectuating sleeve member 86 is shown in a position just prior to engagement with the fingers 83. As the member 86 moves downwardly from the position in which it is shown in dotted lines in Fig. 11 to its full line position in Fig. 12, it engages the fingers 83 and swings the levers 78 inwardly into the positions in which they are shown in Fig. 12. The closure plates 77 will be thereby swung into open relation to the ports 28c, and fluid from the interior of the string of pipe may pass downwardly through grooves 87 in the exterior of the sleeve member 86, or outwardly through radial openings 88 therein to the discharge openings 28c.

In Figs. 13 and 14 I show a form of fluid releasing device wherein the closure member comprises a rotary valve 89 disposed in a tubular member 31d in a position to rest on a shoulder 90 formed within the tubular member 31d near the lower end thereof. The tubular member 31d has a pair of radial ports 28d preferably in diametral alignment, and the closure member or valve member 89 has diametral openings 92 which are normally disposed at an angle of 90° to the ports 28d, as shown in Fig. 14.

As shown in Fig. 13, the valve member 89 is of tubular form, and in the inner wall surface thereof a number of spiral grooves 93 are formed. The upper ends of these grooves 93 are engaged by dogs or fingers 94 which project radially from the lower end of a cylindrical member 95 which is supported in an inserted ring 96. A spline 97 is carried in a longitudinal groove 98 in the cylindrical member 95, the lower end of the spline 97 engaging a keyway 99 formed in the bore 100 of the inserted ring 96 so that when the cylindrical member 95 is moved downwardly it cannot rotate. A shear pin 101 normally supports the cylindrical member 95 in raised position as shown in Fig. 13. In the upper part of Fig. 13 an effectuating means 102, in the form of a heavy metal sleeve, is shown in a position approaching the upper end of the cylindrical member 95. This member 102 is of such form that it may be dropped down through the interior of the string of pipe 22, and when it strikes the upper end of the cylindrical member 95 it drives the cylindrical member 95 downwardly, shearing the pin 101. As the cylindrical member 95 moves downwardly, the projections 94 traverse the spiral grooves 93 of the valve member 89, and since the cylindrical member 95 cannot rotate, the projections 94 in traversing the grooves 93 force the valve member 89 to rotate from the position in which it is shown in Figs. 13 and 14 through an angle of rotation of 90°, thereby bringing the openings 92 into alignment with the supplementary discharge ports 28d.

Although I have herein shown and described my invention in simple and practical form, it is recognized that certain parts or elements thereof are representative of other parts, elements, or mechanisms which may be used in substantially the same manner to accomplish substantially the same results; therefore, it is to be understood that the invention is not to be limited to the details disclosed herein but is to be accorded the full scope of the following claims.

I claim as my invention:

1. In a device of the character described, the combination of: a string of drill pipe having a discharge opening in the lower part thereof and a valve opening in the side wall thereof supplementing said discharge opening; a valve closure member in said string of pipe normally in a position to close said valve opening and to prevent escape of fluid from said pipe; and means movable into said pipe from an end thereof into operative relation to said valve closure member to move said valve closure member into open relation to said valve opening whereby fluid may flow through said valve opening to the exterior of said pipe.

2. In a device of the character described, the combination of: a string of pipe having a valve opening in the side wall thereof; a valve closure member in said string of pipe normally in a position to close said valve opening and to prevent escape of fluid from said pipe; means movable into said pipe from an end thereof into operative relation to said valve closure member to move said valve closure member into open relation to said valve opening whereby fluid may flow through said valve opening to the exterior of side pipe; and an additional means movable into said string of pipe into operative position relative to said valve opening and operating when in said position to prevent a flow of fluid through said valve opening.

3. In a device of the character described, the combination of: a string of drill pipe having a discharge opening in the lower part thereof and a valve opening in the side wall thereof supplementing said discharge opening; a valve closure member in said string of pipe normally in a position to close said valve opening and to prevent escape of fluid from said pipe; means movable into said pipe from an end thereof into operative relation to said valve closure member to move said valve closure member into open relation to said valve opening whereby fluid may flow through said valve opening to the exterior of said pipe; and an additional means movable into said string of pipe into operative position relative to said valve opening and operating when in said position to prevent a flow of fluid through said valve opening.

4. In a device of the character described, the combination of: a string of pipe having a valve opening in the side wall thereof; a sleeve in said string of pipe in a position to close said valve opening and being movable in said pipe so as to open said valve opening; a plug movable into said string of pipe from an end thereof into engage-

ment with said sleeve to move the same in said string of pipe so as to open said valve opening, said plug having a passage extending longitudinally therethrough; additional means movable in said pipe to close said valve opening after it has been opened; and a valve normally closing said passage and arranged to be opened by fluid pressure in said pipe subsequent to the closing of said valve opening.

5. In a device of the character described, the combination of: a string of drill pipe having a discharge opening in the lower part thereof and a valve opening in the side wall thereof supplementing said discharge opening; a valve closure member in said string of pipe normally in a position to close said valve opening and to prevent escape of fluid from said pipe; means movable into said pipe from an end thereof into operative relation to said valve closure member to move said valve closure member into open relation to said valve opening whereby fluid may flow through said valve opening to the exterior of said pipe; an additional means movable into said string of pipe into operative position relative to said valve opening and operating when in said position to prevent a flow of fluid through said valve opening; and holding means operative when said valve closure member has been moved into said open relation to maintain the same in said open relation.

6. In a device of the character described, the combination of: a string of drill pipe having a discharge opening in the lower part thereof and a valve opening in the side wall thereof supplementing said discharge opening; a valve closure member in said string of pipe normally in a position to close said valve opening and to prevent escape of fluid from said pipe; and means movable into said pipe to a position of operative relation to said closure member to effectuate the moving of said closure member into open position relative to said valve opening.

7. A method of rotary well drilling, comprising: rotating in a well a drilling string having a tool therein; discharging a fluid from said drilling string in operative proximity to said tool; opening an auxiliary port in said drilling string for the discharge of a fluid therefrom; and removing said drilling string from said well.

8. A method of rotary well drilling wherein a drilling fluid is discharged from a drill pipe into the hole being drilled, comprising: discharging said drilling fluid during the drilling operation from an opening in said drill pipe disposed near the bottom of the hole; and then effectuating the opening of a port in said drill pipe to discharge said fluid from another point in said drill pipe after completion of the drilling operation.

9. A method of rotary well drilling wherein a drilling fluid is discharged from a drilling string into the hole being drilled, there being a regular discharge opening for drilling fluid in said drilling string in operative relation to the drilling operation and a normally closed supplementary discharge port in said drilling string, comprising: discharging drilling fluid during the drilling operation through said regular discharge opening; and then opening said supplementary discharge port after completion of the drilling operation to produce a fast drainage of fluid from the drilling string.

10. A method of rotary well drilling wherein a drilling fluid is discharged from a drilling string into the hole being drilled, there being a regular discharge opening for drilling fluid in said drilling string in operative relation to the drilling operation and a normally closed supplementary discharge port in said drilling string, comprising: discharging drilling fluid during the drilling operation through said regular discharge opening; and then opening said supplementary discharge port after completion of the drilling operation to produce a fast drainage of fluid from the drilling string, said opening of said supplementary discharge port being effectuated by moving a member within said drilling string.

THOMAS A. CREIGHTON.

CERTIFICATE OF CORRECTION.

Patent No. 2,128,352. August 30, 1938.

THOMAS A. CREIGHTON.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 4, second column, line 45, claim 2, for the word "side" read said; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 25th day of October, A. D. 1938.

Henry Van Arsdale

(Seal)

Acting Commissioner of Patents.

ment with said sleeve to move the same in said string of pipe so as to open said valve opening, said plug having a passage extending longitudinally therethrough; additional means movable in said pipe to close said valve opening after it has been opened; and a valve normally closing said passage and arranged to be opened by fluid pressure in said pipe subsequent to the closing of said valve opening.

5. In a device of the character described, the combination of: a string of drill pipe having a discharge opening in the lower part thereof and a valve opening in the side wall thereof supplementing said discharge opening; a valve closure member in said string of pipe normally in a position to close said valve opening and to prevent escape of fluid from said pipe; means movable into said pipe from an end thereof into operative relation to said valve closure member to move said valve closure member into open relation to said valve opening whereby fluid may flow through said valve opening to the exterior of said pipe; an additional means movable into said string of pipe into operative position relative to said valve opening and operating when in said position to prevent a flow of fluid through said valve opening; and holding means operative when said valve closure member has been moved into said open relation to maintain the same in said open relation.

6. In a device of the character described, the combination of: a string of drill pipe having a discharge opening in the lower part thereof and a valve opening in the side wall thereof supplementing said discharge opening; a valve closure member in said string of pipe normally in a position to close said valve opening and to prevent escape of fluid from said pipe; and means movable into said pipe to a position of operative relation to said closure member to effectuate the moving of said closure member into open position relative to said valve opening.

7. A method of rotary well drilling, comprising: rotating in a well a drilling string having a tool therein; discharging a fluid from said drilling string in operative proximity to said tool; opening an auxiliary port in said drilling string for the discharge of a fluid therefrom; and removing said drilling string from said well.

8. A method of rotary well drilling wherein a drilling fluid is discharged from a drill pipe into the hole being drilled, comprising: discharging said drilling fluid during the drilling operation from an opening in said drill pipe disposed near the bottom of the hole; and then effectuating the opening of a port in said drill pipe to discharge said fluid from another point in said drill pipe after completion of the drilling operation.

9. A method of rotary well drilling wherein a drilling fluid is discharged from a drilling string into the hole being drilled, there being a regular discharge opening for drilling fluid in said drilling string in operative relation to the drilling operation and a normally closed supplementary discharge port in said drilling string, comprising: discharging drilling fluid during the drilling operation through said regular discharge opening; and then opening said supplementary discharge port after completion of the drilling operation to produce a fast drainage of fluid from the drilling string.

10. A method of rotary well drilling wherein a drilling fluid is discharged from a drilling string into the hole being drilled, there being a regular discharge opening for drilling fluid in said drilling string in operative relation to the drilling operation and a normally closed supplementary discharge port in said drilling string, comprising: discharging drilling fluid during the drilling operation through said regular discharge opening; and then opening said supplementary discharge port after completion of the drilling operation to produce a fast drainage of fluid from the drilling string, said opening of said supplementary discharge port being effectuated by moving a member within said drilling string.

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