Sept. 22, 1931. H. E. RUTHERFORD 1,824,235

CONVERTIBLE BAILER BOTTOM

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Fig. 1

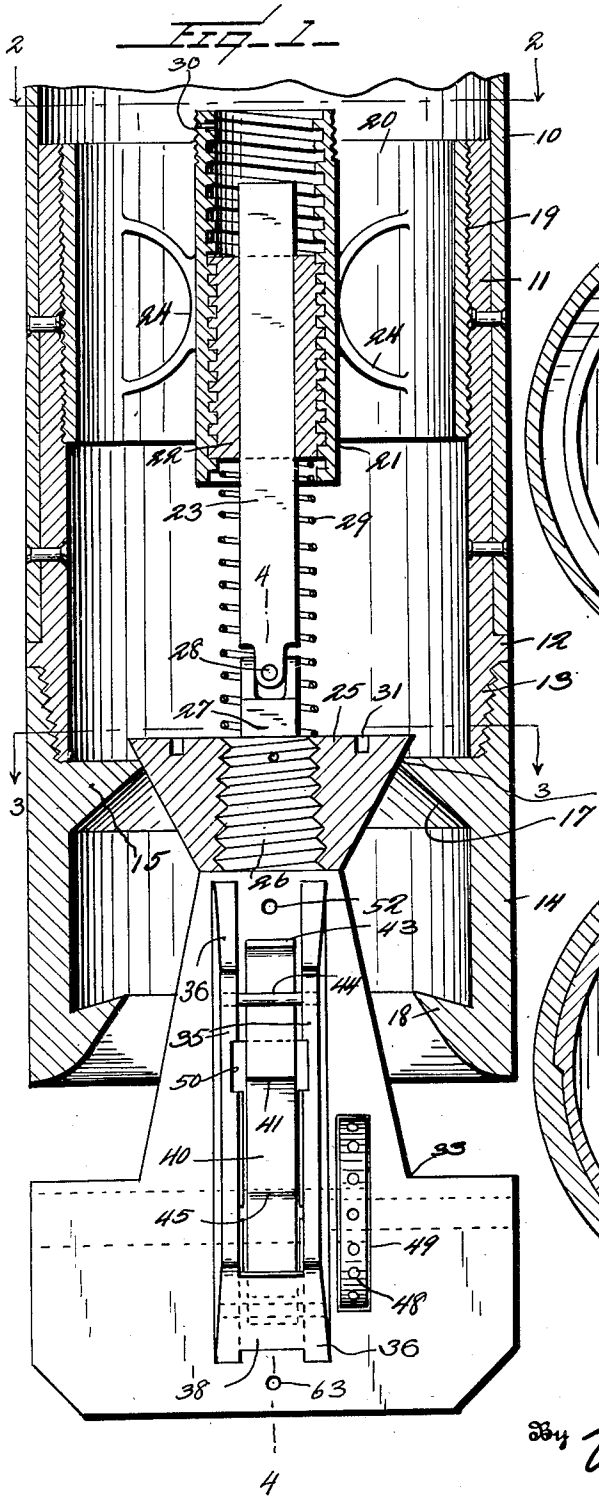


Fig. 2

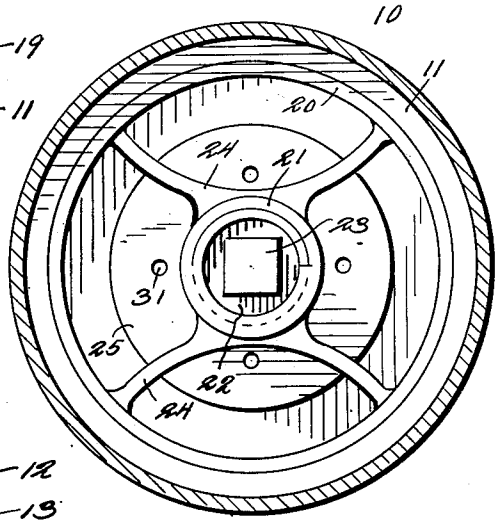
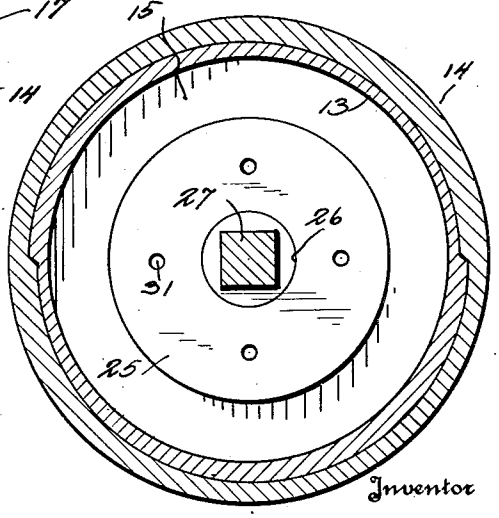


Fig. 3



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CONVERTIBLE BAILER BOTTOM

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Fig. 4.

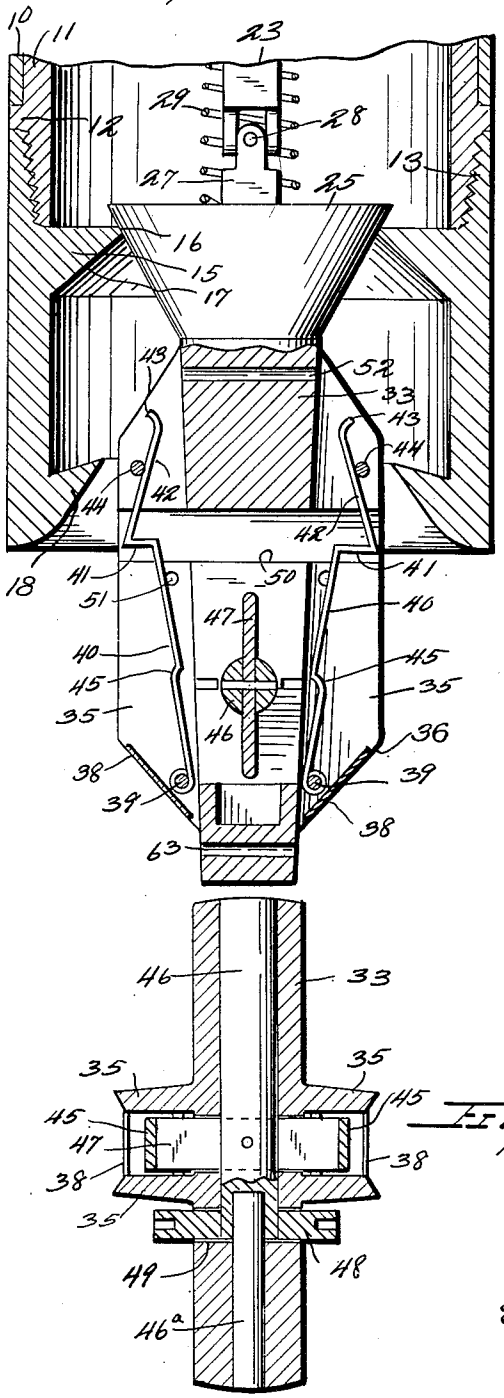


Fig. 5.

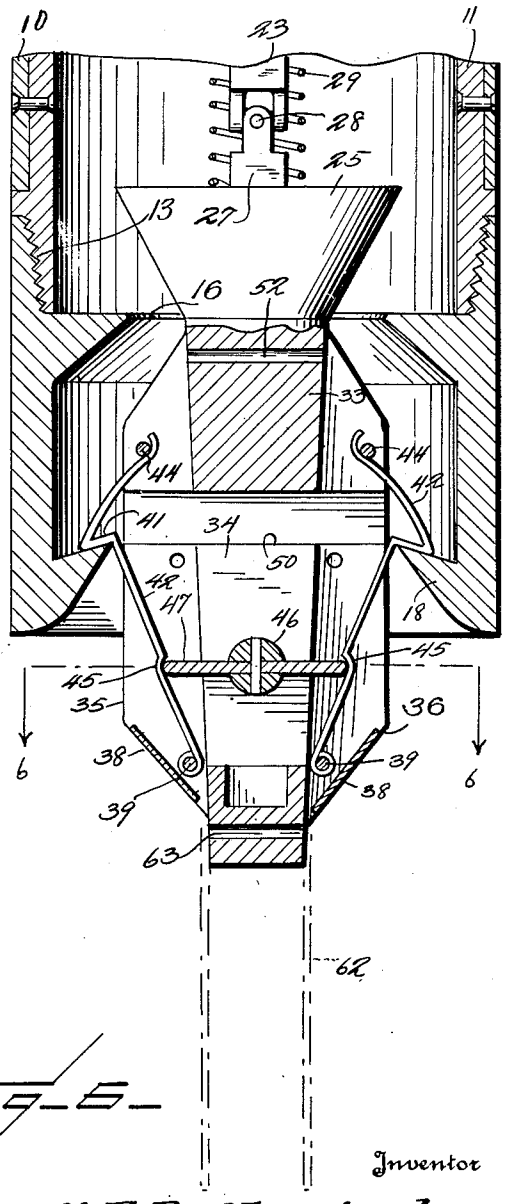


Fig. 6.

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Fig. 7.

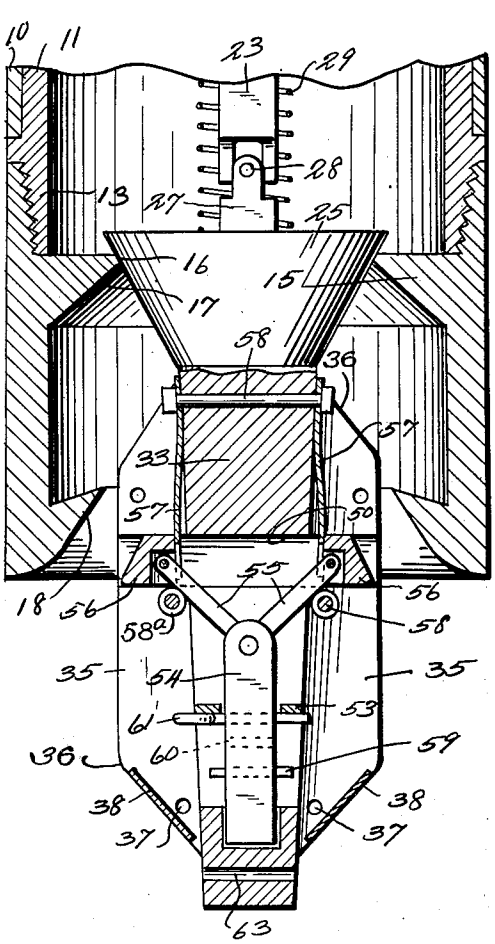


Fig. 8.

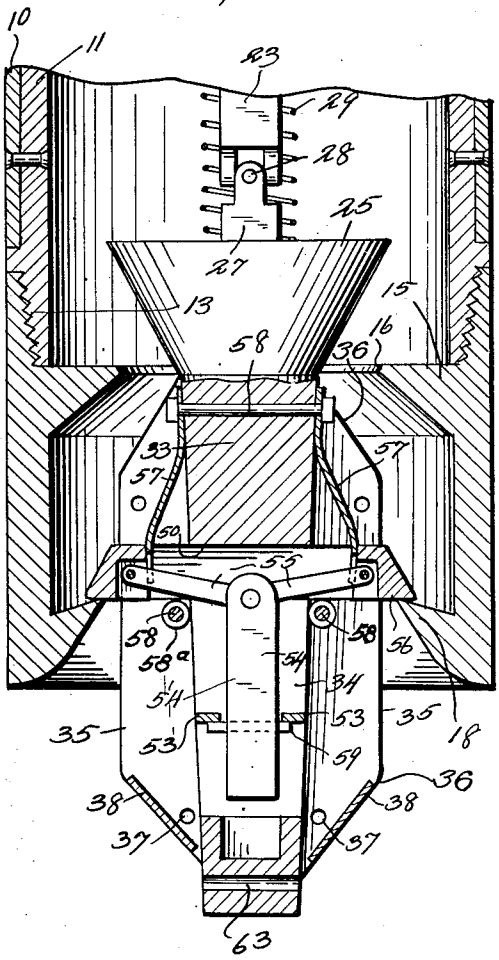
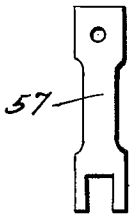


Fig. 9.



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UNITED STATES PATENT OFFICE

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CONVERTIBLE BAILER BOTTOM

Application filed December 11, 1930. Serial No. 501,640.

This invention relates to bailers such as are used in wells and particularly to a bailer bottom. Bailers are ordinarily formed as a relatively long bucket or body having an upwardly opening valve at the bottom, the valve being provided with a dart extending below the bottom of the bailer so that when the bailer is lowered, in carrying water to the bottom of the well, as is oftentimes necessary, the valve will remain closed until the dart strikes the bottom of the well when it will open and permit the discharge of water. These bailers may also be used for taking water out of the well when desired, by lowering the bailer into the well, the valve opening when it strikes the bottom of the well, allowing the inlet of water to the bailer and the valve closing when the bailer is lifted.

The object of my present invention is to provide a combination bailer which provides for three separate uses of the bailer, namely to prevent the lifting up of the valve under high well pressure before the bailer has reached the bottom of the hole, providing for immediate release of the valve when the bailer has reached the bottom of the hole and for holding the valve open until the contents of the bailer has been discharged and the bailer again drawn to the surface, and providing for a use of the valve in the manner of an ordinary valve such as is commonly found in bailers.

A further object is to provide a bailer bottom of this character which requires but a few seconds to change to adapt the bailer bottom to either of the exigencies above noted.

Other objects will appear in the course of the following description.

My invention is illustrated in the accompanying drawings, wherein Figure 1 is a vertical section through a bailer bottom constructed in accordance with my invention, the dart being shown in elevation;

Figure 2 is a section on the line 2—2 of Figure 1;

Figure 3 is a section on the line 3—3 of Figure 1;

Figure 4 is a longitudinal fragmentary sectional view at right angles to the section shown in Figure 1 and showing the dart and valve lowered;

Figure 5 is a like view to Figure 4 and showing the dart and valve raised and with the springs thrown into operative position;

Figure 6 is a section on the line 6—6 of Figure 5;

Figures 7 and 8 are fragmentary sections of the lower end of a bailer bottom showing a modified form of valve holding means, the valve in Figure 7 being shown as lowered and the valve in Figure 8 as raised and locked in its raised position;

Figure 9 is an elevation of one of the springs shown in Figures 7 and 8.

Referring to Figures 1 to 5, 10 designates the body portion of a bailer which may extend up at any desired distance. Riveted to this body 10 and extending slightly below it is a sleeve 11 formed to provide a shoulder 12 against which the lower edge of the body 10 rests and below this shoulder, this sleeve is tapered and screw-threaded as at 13. Engaging these screw-threads 13 is the lower section 14 of the bailer. This is formed adjacent its upper end with an inwardly extending wall 15 defining a valve seat 16. The under face of this wall extends upward and inward as at 17 so that the valve seat is relatively narrow so as to prevent the collection of dirt upon this valve seat which would tend to hold the valve in an open position.

At the lower end of the section 14, there is an inwardly and upwardly extending flange or shoe 18, the under face of which is beveled or rounded upward and inward, the internal diameter of this flange being slightly larger than the internal diameter of the seat 16.

The upper end of the sleeve 11 is interiorly screw-threaded at 19 and having screw-threaded engagement with this sleeve is a relatively long collar 20. Disposed centrally in this collar is a tubular inwardly screw-threaded member 21, the threads of which are preferaby square cut, though I do not wish to be limited to this. Having screw-threaded engagement with the member 21

is the cylindrical guide 22 having a square bore through which passes the shank 23 of the valve stem. Extending from the screw-threaded member 21 to the sleeve 20 are the outwardly extending spider arms 24. These are riveted, bolted, welded or otherwise attached to the sleeve 20 and to the member 21 and support this member in concentric relation to the sleeve. It will be obvious now that by rotating the stem 23, the screw-threaded guide block 22 will be shifted upward or downward within the member 21 for a purpose now to be stated.

Normally resting upon the seat 16 is a downwardly tapering valve 25 having the general form of the frustum of an inverted cone. This valve is interiorly screw-threaded to engage the tapered screw-threaded portion 26 of a stem section 27. This stem section 27 has a universal joint connection at 28 with the stem section 23. A coiled compression spring 29 is disposed between the under face of the member 22 and the upper face of the valve and, therefore, acts to urge the valve downward. The valve can, however, move upward against the action of this spring, the stem section 23 moving upward through the many-sided bore of the guide 22. By rotating the two sections 23 and 27, therefore, with the valve, in one direction or the other, the spring may be tensioned to any desired degree. This does not act to shift the valve, but rotation of the stem 23 causes the upward or downward movement of the guide 22. Means may be provided at the upper and lower ends of the member 21 as at 30 for limiting this upward and downward movement of the guide so that it will not pass out of the member 21. The upper face of the valve is provided with wrench openings 31 whereby the valve may be unscrewed from the portion 26.

Below the portion 26, the stem is formed to provide the usual dart, designated generally 33. This is slotted midway of its length as at 34. Formed with the dart as by casting, welding, or otherwise attaching thereto are the outwardly projecting pairs of wings 35. There are two of these wings 35 on each side of the dart. The upper and lower ends of these wings are beveled as at 36 and the lower ends of the wings are connected by the webs 38.

These webs at their lower ends are provided with apertures 37 (see Figures 7 and 8) for the reception of transverse pins 39 shown in Figures 4 and 5. With these pins in Figures 4 and 5, springs 40 are pivotally engaged. These springs 40 adjacent their upper ends are bent sharply outward as at 41 to form locking dogs and then the upper ends of the springs extend upward and inward as at 41, the upper extremities of the springs being outwardly bent as at 43. To limit the outward movement of the springs, I provide pins 44 removably disposed through these wings 35. Midway between the beads embracing the pins 39 and the shoulders or dogs 41, each of these springs is outwardly deflected at 45. Pivotally mounted in the slot 34 is a manually actuatable shaft 46 having the two oppositely projecting arms 47. When the shaft is turned so that the arms extend upward parallel to the axis of the dart or stem, the springs 40 are untensioned and are free to move inward or outward except insofar as they are limited by the pins 44, but when these arms 47 are turned to the position shown in Figure 5, the arms will bear against the springs urging them outward and placing them under tension as shown in Figure 5, that is, when this shaft 46 is rotated with the parts of the bailer bottom in the position shown in Figure 4, the action of the arms 47 is to force the middle portions of the springs outward but the dog-like portions of the springs 41 cannot move upward any further than illustrated in Figure 4 on account of the pins 44. When, however, the dart and valve are moved upward within the bailer bottom to the position shown in Figure 5, then the dog portions 41 of the springs will engage over the flange or shoe 18 and lock the valve in its raised position.

The curved or deflected portions 45 of the springs act to engage the arms 47 and hold these arms against accidental movement, as shown clearly in Figure 5.

For the purpose of rotating the shaft 46, I mount upon the shaft the wheel 48 as shown particularly well in Figure 1, which wheel is provided in its periphery with a plurality of openings whereby a wrench or pin may be inserted in the wheel to rotate it, this wheel being disposed in a slot 49 formed in the body of the dart. In order to put this wheel in place, the shaft 46 is formed in two sections, the section which is designated 46 and the section 46a which extends through one end of the dart and into the recess in the end of the section 46. Any other means of mounting the wheel 48 may be used and any other means may be used whereby this shaft section 46 may be rotated. It will be seen that the wheel 48 does not extend out beyond the wings 35, but is entirely protected by said wings. This is clear from Figure 6.

It will be noted from Figures 4 and 5 that intersecting the slot 34 there is a many-sided bore or slot 50 and also that just below this slot the wings 35 are provided with openings 51. It will also be noted from Figures 4 and 5 that at the upper end of the dart 33, there is a transverse bolt opening 52. These openings 51 and 52 and the slot 50 are out of use when the bailer is equipped with the particular form of springs

shown in Figures 4 and 5 at 47. In Figures 7 and 8 I show an alternative means for locking the valve in its raised position. In this form, the slot 34 is intersected by a strip or web 53 formed with a central opening. This strip or web may be inserted in the slots shown in Figure 4.

Disposed through this central opening is a vertically movable latch 54 having at its upper end two pivoted arms 55 disposed in divergent relation to each other and at their upper ends extending into recesses and pivoted to dogs 56, the upper faces of which dogs are beveled downward and outward and the lower faces being flat. Bearing against these dogs and urging them outward are the springs 57. These springs at their upper ends are held in place by a bolt 58 passing through the aperture 52 shown in Figures 4 and 5. In the apertures 51 are disposed bolts 58 which carry rollers 58*a* against which these arms 55 bear. The sliding latch 54 is formed with a stop pin 59 limiting its upward movement and with a plurality of apertures 60 into which a cotter pin 61 may be inserted. With this construction, when the lower end of the dart strikes the bottom of the well, the dart is moved upward and, assuming that the cotter pin 61 is removed then when the dogs 56 pass the upper edge of the flange 18, the dogs will be projected outward over this flange as shown in Figure 8, locking the valve in its raised position. If, however, the cotter pin 61 is in place, then this valve is freely movable up and down in the same manner that the ordinary valve of a bailer is freely movable up and down toward and from its seat. It will be seen that both in Figures 4 and 5 and 7 and 8 I have shown means whereby the locking dogs may be locked from projection so as to leave the valve free to move up and down or whereby the locked dogs are released so that they are projected as soon as they reach the valve 18 and lock the valve in its raised position. It will be seen that the locking dogs when they are retracted are entirely within the wings 35 and it will further be noted that these wings act to center the valve within the flange 18 and restrict the lateral movement of the valve therein.

In Figure 5, I illustrate how a "dump" may be applied to the lower end of the dart. This "dump" consists of a tube 62 which may be riveted, bolted or otherwise attached to the lower end of the dart 33, the lower end of the dart being formed with a transverse opening 63 for this purpose. When this extension 62 is attached to the lower end of the dart, it is obvious that the dart will open when the bailer has reached a predetermined distance from the bottom of the well and that the distance at which this dart will open will depend entirely upon the length of the extension 62.

When this device is used as a regular bailer and under normal circumstances, there is no necessity of holding the valve 25 down yieldingly against its seat and hence there is no necessity for placing any tension upon the spring 29. Under these circumstances, the member 22 is shifted up within the member 21 so that no tension is brought upon the spring and so that the valve 25 is capable of opening in the usual manner. Where this bailer is used, as for instance, to carry water into the well and discharge it at the bottom thereof and where there is high pressure within the well, the valve, if there were no tension on the spring 29, would be lifted from its seat on the way to the bottom, resulting in saturating the walls of the well, provided the well was an open hole or without a casing. This would tend to so wet the earth wall of the well that it would be liable to cave in and at the same time the proper amount of water would not be applied at the bottom of the well for the next drilling operation without making several unsuccessful runs to the bottom. Under these circumstances, the spring 29 is tensioned to any degree required by simply rotating the dart until the requisite tension has been applied to the spring and this spring then holds the valve 25 to its seat.

By reason of the short surface of the valve seat 16, the chances of cuttings collecting on the seat and holding the valve open are more or less eliminated. If the valve should be held open by the cuttings, part or all of the slush contained within the bailer and en route from the bottom of the hole, would be lost. Furthermore by having the valve seat 16 very narrow, it affords a wider opening permitting more slush or fluid to pass through the valve seat in less time when the valve is open which is a great advantage particularly while dumping cement. By providing a threaded connection 13 between the bottom 14 and the upper portion of the bailer, all the working parts may be removed by disconnecting at this point. This joint should be a perfect screw connection as all working shocks and jars are transmitted to this point. While I have shown a screw-threaded joint at the point 13, I do not wish to be limited to this as the bailer may be made with no joint at this point.

The wings 35 on each side of the dart, which wings have approximately the width of the internal diameter of the flange 18, prevent the dart from swinging from a vertical position, thus assuring a liquid-tight seat without the aid of the valve tensioning spring 29 under normal conditions where there is no high well pressure. Furthermore, these wings afford a quick action in

dumping in the slush box when bailing sandy formations, or when sand has settled or packed on top of the valve, requiring several bumps on the bottom of the slush box to open the valve. These wings, furthermore, prevent the dart from striking the wall by keeping it within the vertical line of the bailer tube while descending to the bottom with water for the next drilling operation. Where the dart is liable to strike the wall of the tube or well and be dislodged, the position of the valve is changed, thus allowing leakage of liquid which wets the walls of the well and is liable to cause a cave-in. Furthermore these wings fuly protect the latch assembly from damage under the most severe conditions.

This bailer is particularly adapted for running cement into the hole as on reaching the bottom of the well, the dart will strike the bottom which raises the valve and the latches then hold the valve open and allow the cement to fully flush out. It will thus be seen that my bailer is adapted to be used in the ordinary bailing operation with the spring 29 relaxed. It is adapted to be used in bailing operations, where the pressure within the well would normally open the valve, by placing a tension upon the springs and it is adapted to be used under any circumstances where it is desirable that the valve 25 shall be latched in a raised position when once it has been lifted. The flexible connection formed by the universal joint 28 is particularly important as if the valve were connected by a rigid connection 23 and if upon reaching the bottom of the hole, the dart or valve tongue struck a boulder or some other irregular object and slid off the edge of it, the valve tongue or dart would be forced by the impact a bit to one side or out of a perfect vertical position. This would tend to deform the valve stem 23 and the valve stem guide and the tension spring and put a severe strain upon the member 21. With the universal joint 28, however, this dart may be forced laterally to one side or the other without in any way affecting the action of the valve and without placing any strain upon the stem section 23.

Oftentimes, in drilling wells, it is necessary to drill the well dry, that is, to keep the wall of the well dry while drilling, to prevent the walls from caving in, while at the same time the bottom of the well where the drilling is going on is under water. Under these conditions, water must be lowered into the well without being discharged against the walls and this is accomplished by my construction. The latching attachment permits water to be lowered into a well and automatically discharged when the bailer has reached the bottom of the well. The latch will hold the valve lifted and prevent it from returning to its sealing position.

While I prefer to use the universal joint above referred to, it is obvious that the bailer may be made without this universal joint. It is also obvious that various modifications might be made in the details of construction and arrangements of parts without departing from the spirit of the invention as defined in the appended claims.

I claim:—

1. A bailer bottom having a valve seat, a downwardly closing valve coacting with the seat and having a dart, a spring urging said valve downward against the seat, and means within the bailer whereby the tension of the spring may be increased, lessened or entirely relieved, said means including a many-sided stem extending upward from the valve and through said spring, an internally screw-threaded member mounted within the bailer, an externally screw-threaded member engaging the internally screw-threaded member and having a many-sided passage through its center through which said many-sided stem slides.

2. A bailer bottom having a valve seat, downwardly acting valve coacting with said seat and having a dart, the bailer bottom being internally screw-threaded at its upper end, a sleeve having screw-threaded engagement with the threads on the bailer bottom and having a centrally directed spider, an internally screw-threaded member mounted upon said spider above the valve, an exteriorly screw-threaded guide within the internally screw-threaded member and having a many-sided passage, the valve having a many-sided stem engaging said passage, a spring surrounding the stem and bearing at one end operatively against the valve and at the other bearing against said guide whereby when the valve and stem are turned, the guide will be shifted upward or downward to thereby increase or relax tension on the spring.

3. A bailer bottom having a valve, a downwardly closing valve coacting with the seat and having a dart, the bailer bottom at its lower end having an inwardly extending flange upwardly deflected on its under face, outwardly projecting pairs of wings mounted upon the dart below the valve, and latching means disposed between said pairs of wings and projectible over the flange in the lower end of the bailer bottom when the dart and valve have been raised to a predetermined position.

4. A bailer bottom having a valve seat, a downwardly closing valve coacting with the seat, a dart having a screw-threaded portion at its upper end with which the valve detachably engages, the screw-threaded portion having a stem section, a second stem section having a universal joint connection to the first named stem sec-

tion extending upward therefrom, and a centrally disposed guide mounted within the bottom and with which said second named stem section engages, the stem sections being less in diameter than the interior diameter of the valve whereby the valve may be unscrewed from the dart and removed over said stem sections.

5. A bailer bottom having a valve seat, a downwardly closing valve coacting with the seat and having a dart, the lower end of the bailer bottom being formed with an inwardly extending flange, the dart having oppositely disposed pairs of wings coacting with the flange to center the dart, latching dogs mounted between said pairs of wings, springs urging said latching dogs outward, manually operable means for rendering said springs operative or inoperative.

6. A bailer bottom having a valve seat and a downwardly closing valve coacting with the seat and having a dart, the lower end of the bailer bottom being formed with an inwardly extending flange, the flange being beveled upon its under face, the dart below the valve being formed with oppositely disposed pairs of wings coacting with the flange to center the dart, the dart at its upper end having a transverse opening whereby springs may be applied to the lateral faces of the dart between said wings, said wings at their lower ends having openings for the passage of bolts whereby springs may be mounted at the lower ends of the wings, the wings and dart having a transverse passageway adapted to receive laterally sliding dogs, the wings below this passageway being formed with openings disposed on each side of the dart, upon which rollers may be applied for said dogs, the dart having a bearing extending through it at right angles to the wings wherein a shaft may be disposed.

7. A bailer bottom having a valve seat, a downwardly closing valve coacting with the seat and having a dart, the lower end of the bailer bottom having an inwardly extending flange, the flange being beveled upon its under face, the dart having on opposite faces pairs of wings coacting with the flange to center the dart, springs disposed between said wings and pivotally mounted at their lower ends upon the wings, the springs adjacent their upper ends being outwardly extended to form dogs and then extended upward and inward, and then being outwardly curved at their upper extremities, pins extending through the upper ends of the wings and against which the upper ends of the springs can bear, and manually operable means disposed on the dart whereby the lower ends of the springs may be forced apart to thus place tension on the springs and urge the dogs to a projected position.

8. A bailer bottom having a valve seat, a downwardly closing valve coacting with the seat and having a dart, the lower end of the bailer bottom having an inwardly extending flange, the flange being beveled upon its under face, the dart having on opposite faces pairs of wings coacting with the flange to center the dart, springs disposed between said wings and pivotally mounted at their lower ends upon the wings, the springs adjacent their upper ends being outwardly extended to form dogs and then extended upward and inward, and then being outwardly curved at their upper extremities, pins extending through the upper ends of the wings and against which the upper ends of the springs can bear, and manually operable means disposed on the dart whereby the lower ends of the springs may be forced apart to thus place tension on the springs and urge the dogs to a projected position, said means comprising a shaft passing transversely through the lower end of the dart, the shaft having arms, the dart being slotted to receive said arms, and the arms when the shaft is turned in one direction bearing against the springs and urging them apart, and when turned in the other direction parallel to the dart, permitting the springs to swing inward and become inoperative, the shaft having means whereby it may be adjusted.

9. A bailer bottom having a valve seat, a downwardly closing valve coacting therewith and having a dart, the lower end of the bailer bottom having an inwardly extending flange, the under face of which is upwardly and centrally beveled, the dart having oppositely disposed pairs of wings coacting with the flange to center the dart and having a transversely extending guideway through the dart and wings, dogs mounted in said guideway, the dart having a recess extending downward from said guideway, a member mounted for vertical movement in said recess and having arms engaging said dogs, means mounted upon the dart for urging said dogs outward, and manually detachable means for holding said member in a depressed position with the dogs retracted.

10. A bailer bottom having a valve seat, a downwardly closing valve coacting with the seat and having a dart, a spring urging the valve downward against the seat, and means whereby the tension of the spring may be increased, lessened or entirely relieved including a member bearing against the spring and a second member extending upward through the bailer and having screw-threaded engagement with the first named member to shift it downward or upward when the second named member is rotated in one or the other directions.

11. A bailer bottom having a valve seat, a downwardly closing valve coacting with the seat and having a dart, the lower portion of the bailer bottom having an inwardly extending flange, opposed latching dogs mounted upon the dart and resiliently urged outward, an axially movable member connected with the dogs and when shifted in one direction retracting the dogs, and manually operable means for latching the member in a position with the dogs retracted.

In testimony whereof I hereunto affix my signature.

HERBERT E. RUTHERFORD.