Nov. 17, 1931. C. F. RIGBY 1,832,323

COMBINATION SAND PUMP AND BAILER

Filed May 21, 1929 2 Sheets-Sheet 1

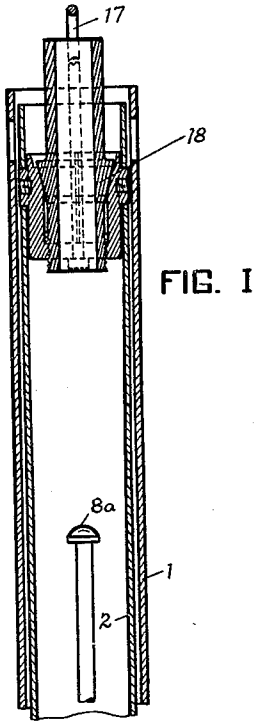


FIG. I

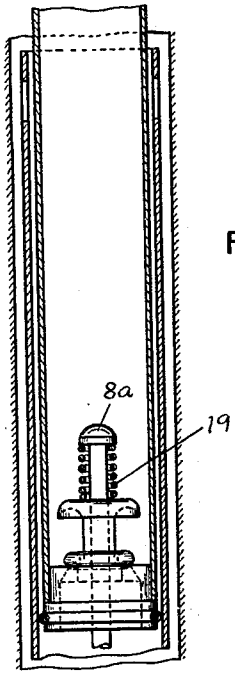


FIG. II

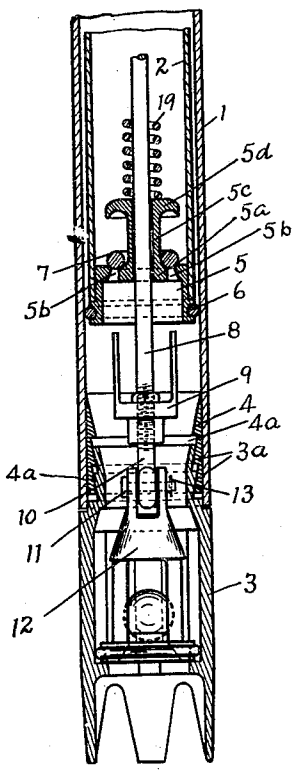
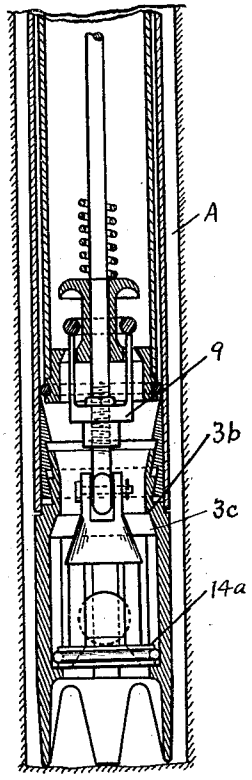
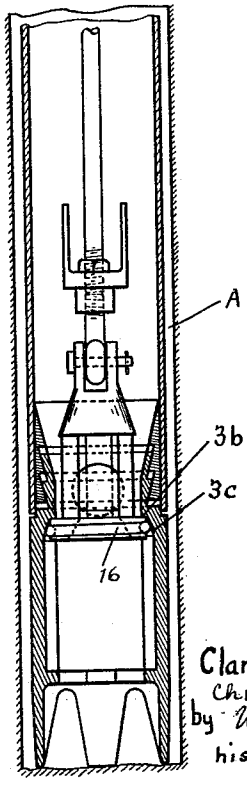


FIG. III



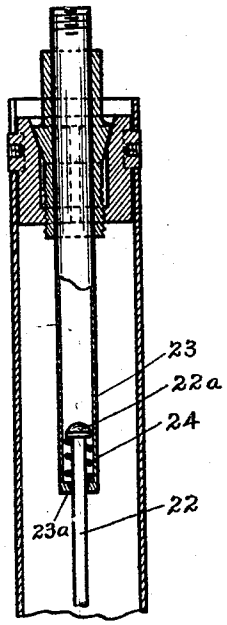


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COMBINATION SAND PUMP AND BAILER

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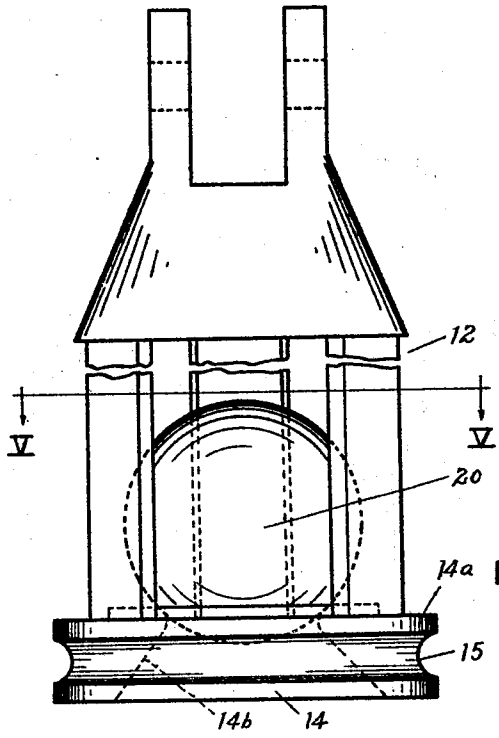


FIG. IV

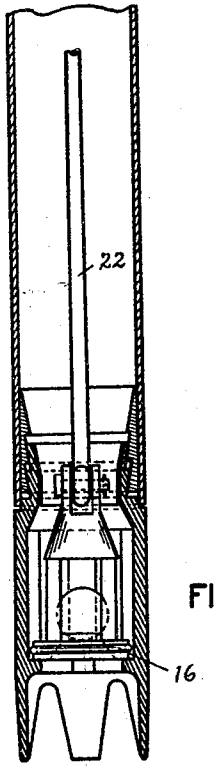


FIG. VI

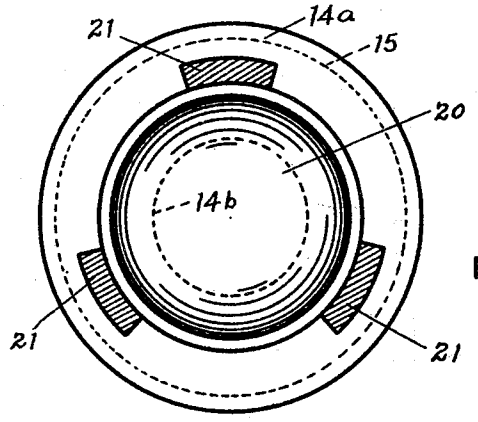


FIG. V

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UNITED STATES PATENT OFFICE

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COMBINATION SAND-PUMP AND BAILER

Application filed May 21, 1929. Serial No. 364,753.

This invention relates to a combination sand-pump and bailer.

Combination sand-pumps and bailers, which are composed of telescoping sections are not new in the art. When it is desired to pump sand, both the inner and outer telescoping sections are functionally employed, and when the device is used as a bailer, only the outer section functions. That is, it is customary to lock the inner and outer sections in collapsed position when the device is to be used to remove only water. In the latter use, the inner section has no utility.

The object of this invention is to provide a telescoping sand-pump which is provided with means which permit the ready disconnection and removal of the inner telescoping section thereof to permit the outer section to be employed as a bailer.

A further object of the invention is to provide a novel and simple method of fixing the foot-piece of the pump in the outer section thereof.

A still further object of the invention is to provide novel valving means, which operate efficiently, and which have a minimum of machine operations necessary for their manufacture.

In the accompanying drawings Figure I is a vertical broken sectional view through the device of the present invention, as it is arranged for pumping sand; Figure II is a sectional view through the lower portion of the same, showing the inner telescoping section in its raised position at the end of the suction stroke; Figure III is a vertical broken sectional view through the present combination pump, showing the inner section thereof at the start of the suction stroke; Figure IV is an enlarged side elevation of the foot valve of the present invention; Figure V is a sectional view of the same taken on the line V—V of Fig. IV; and Figure VI is a sectional view, showing the device arranged as a bailer.

The device of the present invention, when used as a sand-pump, comprises an outer tubular member 1 and an inner tubular member 2, which telescopes or slides within the outer member. This general arrangement and its operation is illustrated and described in my Patent No. 1,158,292, dated October 26, 1915, but certain improvements are embodied in the present invention.

Heretofore, there has been considerable machining necessary to affix the foot-piece 3 in the member 1. The present arrangement needs very little machining, and it is easily positioned in place. It will be noted that the upper portion of the foot-piece is provided with two tapered annular surfaces 3*a*. A rubber sleeve 4 is provided with correspondingly tapered annular portions 4*a*, into which the upper portion of the foot-piece is placed. This assemblage is then pressed into the tubular member 1, as illustrated, and obviously, any tendency for the member 3 to withdraw from this position increases the frictional engagement between the member 4 and the tubular member 1. This feature has proven very satisfactory.

The lower end of the inner member 2 is closed by a valving base 5, which may be riveted or welded into the said inner member. A rubber ring 6 is sprung into the groove provided in the member 5, and serves, in a manner similar to piston rings, to give a tight or close sliding fit with the inner surface of the member 1. The valve seating portion 5*a* of the member 5 is provided with openings 5*b*, which are normally closed by the rubber ring or torus 7. It may be noted that the member 5 is formed integral with a sleeve portion 5*c* which is topped by the flange portion 5*d*. The sleeve portion guides the torus shaped valve member 7 as it rises from its normal position, and the flange 5*d* prevents the same from becoming dislodged from the sleeve. It is of practical importance that the flange 5*d* be of a diameter which will allow the rubber valving member 7 to be expanded and forced over the same. This is for the reason that, when a member 7 becomes worn and leaky, a new valve member, such as 7, may be readily sprung into place without taking the apparatus apart.

As is usual in devices of this nature, a central rod 8 is connected to a valve in the foot-piece 3. In the present device the rod 8 is threaded into the U shaped bracket 9, which

raises the valve 7, as explained infra, and the eye bolt 10 is also threaded into the bracket in vertical alignment with the rod 8. By means of a bolt 11 the eye bolt is pivotally connected to the valve member 12. This bolt 11, it will be noticed, is held in position by a cotter pin 13, which may be quickly and easily removed to disconnect the eye bolt from the valve 12 so that the inner portion of the pump may be withdrawn and leave the outer portion to serve as a bailer.

The structure of the valve member 12 is of prime importance. As may be seen to advantage in Figures IV and V of the drawings, there is provided a lower portion 14, which is provided with an annular groove 15 for the reception of an integral rubber ring 16. This rubber ring or torus may be readily forced over the bottom of the portion 14 to seat in the groove 15 similar to the manner in which the ring 6 is positioned in the member 5, explained supra. When this valve is in its raised or closed position, as shown in Fig. II, the ring 16 is pressed against the tapered surface 3*c*, and gives an efficient closure to the outer member 1. Since the surface 3*c* is tapered, there is no tendency for sand or dirt to cause the valve to stick in its closed position.

In the operation of the device as a sand pump, the sand-line, not shown, is attached to the U shaped member or bail 17, which is fixed within the member 2 by means of the head device 18. The detail structure and operation of this head device and bail will not be described in detail herein, since its complete illustration and description appears in my copending application Serial No. 364,759, filed May 21, 1929.

When the device is used as a sand pump, and it is being lowered into a well, the telescoping sections are expanded, as illustrated in Fig. II. That is, the sand-line is fixed by the member 17 to the inner section 2, which withdraws from the member 1 until the spring 19 arrests the movement by coming into contact with the stop 8*a* of the rod 8. This obviously raises the valve member 12 to seat in the foot-piece 3. To prevent all of the weight from being borne by the ring 16, a shoulder 14*a* on the portion 14 of the member 12 bears against a suitable seat 3*b* in the member 3.

After the pump is lowered and the foot-piece 3 strikes the bottom of the well A, the inner member 2 lowers and telescopes into the member 1, the drop valve 12 lowering, due to its weight and that of the rod 8. As shown in Fig. I, the spring 19 is moved away from the stop 8*a*. In the ordinary drop valve of this type, it often happens that the gas and liquid pressure below the valve in its closed or raised position prevents the same from lowering. The present valve 12, however, is designed to prevent this.

In the portion 14 of this valve there is a central opening 14*b*, which is normally closed by the solid rubber ball 20, and if any pressure below the valve member 14 exists, the ball 20 rises and allows the valve to drop to its intake position, shown in Fig. I. It will be noted that there are three legs or guide pieces 21, which constrain the ball 20 in a region therebetween.

The rubber composition of the ball 20 is relatively elastic. Obviously, the unmachined upper periphery of the opening 14*b* may be tightly sealed by the rubber mass 20 when water and sand is drawn into the pump member 1. This is for the reason that the resultant pressure of the water and sand reacts on top of the ball 20 when the valve member 12 is closed. The spaces between the adjacent legs 21 are such that as the ball 20 becomes worn or rotted, it may be removed from the member 12, and a new one forced through one of the said spaces to take its place. These spaces are just wide enough to permit a ball to be pressed through them, and it is possible to do this only when the ball is composed of a relatively elastic rubber. That is, it must be possible to distort the ball to force it into the region wherein it seats. The ball is of such a diameter, that once it has been pressed into the said region, it will not work its way out between the legs 21.

Thus it may be understood that the structure of valve member 12 is of such a nature that little machine work is required in its manufacture, and in addition, it is a very simple operation to change the ball 20 and the ring 16. The pump does not have to be taken down to make these changes.

When the foot-piece 3 strikes the bottom of the oil well, and the valve 12 drops, as said, the inner member 2 telescopes within the member 1 until the U bracket 9 engages and raises the valving member 7, as shown in Fig. III. In this position all of the ports are open, and the water at the bottom of the well A may flow in through the foot-piece 3 into the member 2. After the pump has been at the bottom of the well long enough to fill, the sand-line is quickly tightened and lifted. This causes the inner member 2 to withdraw from the member 1, and this action violently sucks a mixture of sand and water into the member 1. When the spring 19, which is supported on flange 5*d* of the member 5 strikes the stop 8*a*, the valve member 12 rises and closes to retain the sand and water in the aforesaid member, and the continued hoisting of the sand-line lifts the whole device.

The device is ultimately lifted, and swung from the well. It is then lowered until the foot-piece 3 strikes the dumping floor. The same action of the valves take place to discharge the pumps, as takes place when the pump strikes the bottom of the well.

In order to remove the inner portion of the pump to permit the outer portion to be employed as a bailer, it is simply necessary to remove the cotter pin 13 and withdraw the bolt 11. The inner member 2 and the rod 8 with its fixtures may then be readily removed. The head 18 may then be locked into the outer member 1, and the rod 8 may be unscrewed from the bracket 9 and removed from within the member 2. It may then be reassembled in the bracket 9 and reconnected to the valve member 12. If desired, however, an auxiliary integral eye rod 22 may be connected to the member 12, as shown in Fig. VI. This will save the time and labor of disconnecting the rod 8 from within the member 2. The upper end of the rod 22 terminates in a stop head 22*a*, which rests in the tubular member 23. A spring 24 prevents violent shocks between the tube closure 23*a* and the stop 22*a*, when the sand-line is tightened to lift the bailer.

The sand-line is attached in any suitable manner to the top of tube 23. By removing the inner member 2 from the device, it is very much lightened for its use as a bailer, and is therefore much more desirable than combinations of this type now in use.

What I claim is:

1. In a sand-pump having telescoping cylinders adapted to removably enter a well, a hollow inlet foot-piece for the outer of said cylinders, said foot-piece having an outer tapered surface to engage a member of resilient material in the bottom of said outer cylinder to frictionally retain the foot-piece in position, an annular tapered surface within the foot-piece, a shoulder within the foot-piece adjacent the latter tapered surface, a valve member slidable within said foot-piece, said valve member having an annulus of resilient material in a groove therein to close against the tapered portion within said foot-piece, and a shoulder on the valve member to seat against the shoulder within said foot-piece.

2. In a sand-pump having telescoping cylinders adapted to removably enter a well, a hollow inlet foot-piece for the outer of said cylinders, said foot-piece having an outer tapered surface to engage a member of resilient material in the bottom of said outer cylinder to frictionally retain the foot-piece in position, an annular tapered surface within the foot-piece, a shoulder adjacent the latter tapered surface, a valve member slidable in said foot-piece, said valve member having an annulus of resilient material in a groove therein to close against a tapered portion within said foot-piece, a shoulder on the valve member to seat against the shoulder within said foot-piece, a closure member for the bottom of the inner of the telescoping cylinders having an annulus of resilient material therein to form a sliding fit between the two cylinders, ports in said closure member, and a torus of rubber arranged to valve said ports in said closure member.

3. In a sand-pump having telescoping cylinders adapted to removably enter a well, a hollow inlet foot-piece for the outer of said cylinders, said foot-piece having an outer tapered surface to engage a member of resilient material in the bottom of said outer cylinder to frictionally retain the foot-piece in position, an annular tapered surface within the foot-piece, a shoulder adjacent the latter tapered surface, a valve member slidable in said foot-piece, said valve member having an annulus of resilient material in a groove therein to seat against a tapered portion within said foot-piece, a shoulder on the valve member to engage the shoulder within said foot-piece, a closure member for the bottom of the inner of the telescoping cylinders having an annulus of resilient material therein to form a sliding fit between the two cylinders, ports in said closure member, a torus of rubber arranged to valve the ports in said closure member, an operative connection between the inner cylinder and the foot-piece valve member, and means on said operative connection to engage and unseat the torus of resilient material arranged to valve the closure member aforesaid.

4. In a foot-piece for a sand-pump and bailer the combination of a valve member slidable therein, an annulus of resilient material mounted in a groove in said valve member, and a tapered bore portion within said foot-piece having an adjacent shoulder portion, said valve having a shoulder and being movable to bring said shoulder into contact with the shoulder portion within the foot-piece and said annulus into contact with said tapered bore to close the same.

5. A valve member for a sand-pump and bailer comprising a base portion, a ring of resilient material in a groove in said base portion, a central opening through said base portion, a resilient ball freely seating over and closing said opening, guiding members to laterally constrain said ball, and an upper portion on the valve member connected to an operating rod, said upper portion and said base portion being integrally interconnected by said guiding members.

6. A valve member for a sand-pump and bailer comprising a base portion, a ring of resilient material in a groove in said base portion, a central opening through said base portion, a ball of resilient material freely seating over and closing said opening, spaced guiding members to laterally constrain said ball, the spaces between the guiding members being of a width sufficient to permit the ball to be forced therethrough and of insufficient width to permit the ball to pass therethrough without considerable external force, and an upper portion on the valve member connected to an operating rod, said upper portion and

said base portion being integrally interconnected by said guiding members.

7. In a foot-piece for a sand-pump and bailer the combination of a valve member slidable therein, said valve comprising a base portion, a ring of resilient material in a groove in said base portion, a central opening through said base portion, a rubber ball freely seating over and closing said opening, guiding members to laterally constrain said ball, an upper portion on the valve member connected to an operating rod, said upper portion and said base portion being integrally interconnected by said guiding members, and a tapered bore within said foot-piece having an adjacent shoulder portion, said valve member being movable to bring its base portion into contact with the said shoulder portion and said ring of resilient material into contact with said tapered bore to close the same.

8. In a valving and closure device for the inner telescoping section of a sand-pump the combination of a member affixed to the bottom of said section, a valve rod slidably passing through said member, a groove containing a resilient torus adjacent the lower periphery of said member, valve ports in the member, a ring of resilient material normally closing said ports, and means on said valve rod to raise said ring.

9. In a valving and closure device for the inner telescoping section of a sand-pump the combination of a member affixed to the bottom of said section, a valve rod slidably passing through said member, a groove containing a resilient torus adjacent the lower periphery of said member, valve ports in the member, a torus of resilient material normally closing said ports and means on said valve rod arranged to pass through said ports and maintain the said torus away from the ports to open the same.

10. In a valving and closure member for the inner telescoping section of a sand-pump a groove to receive a ring of resilient material adjacent its lower periphery, a sleeve portion topped by a flange portion on said member, ports opening through said member adjacent the base of the sleeve portion, and a torus of resilient material encircling the sleeve portion and normally closing said ports.

11. In a valving and closure member for the inner telescoping section of a sand-pump a groove to receive a ring of resilient material adjacent its lower periphery, a sleeve portion topped by a flange portion on said member, ports opening through said member, and a torus of resilient material encircling the sleeve portion to valve said ports therein, the aforesaid flange being shaped and of such diameter to permit said torus to be expanded thereover into operative position and to prevent said torus from normally becoming dislodged from around said sleeve.

12. In a sand pump the combination of a pump cylinder, an inlet foot-piece at the lower terminus of such cylinder, a neck portion on said foot piece extending into the cylinder, said neck portion being provided with an outer tapering surface which is arranged at an interval of space from the inner wall of said cylinder, and an expansible member located between said neck portion and the inner wall of said cylinder, which expansible member is formed with a tapering surface that fits the first-mentioned tapering surface, whereby the foot-piece is wedged in secure position at said terminus of the cylinder.

In testimony whereof I have hereunto set my hand.

CLARK F. RIGBY.