

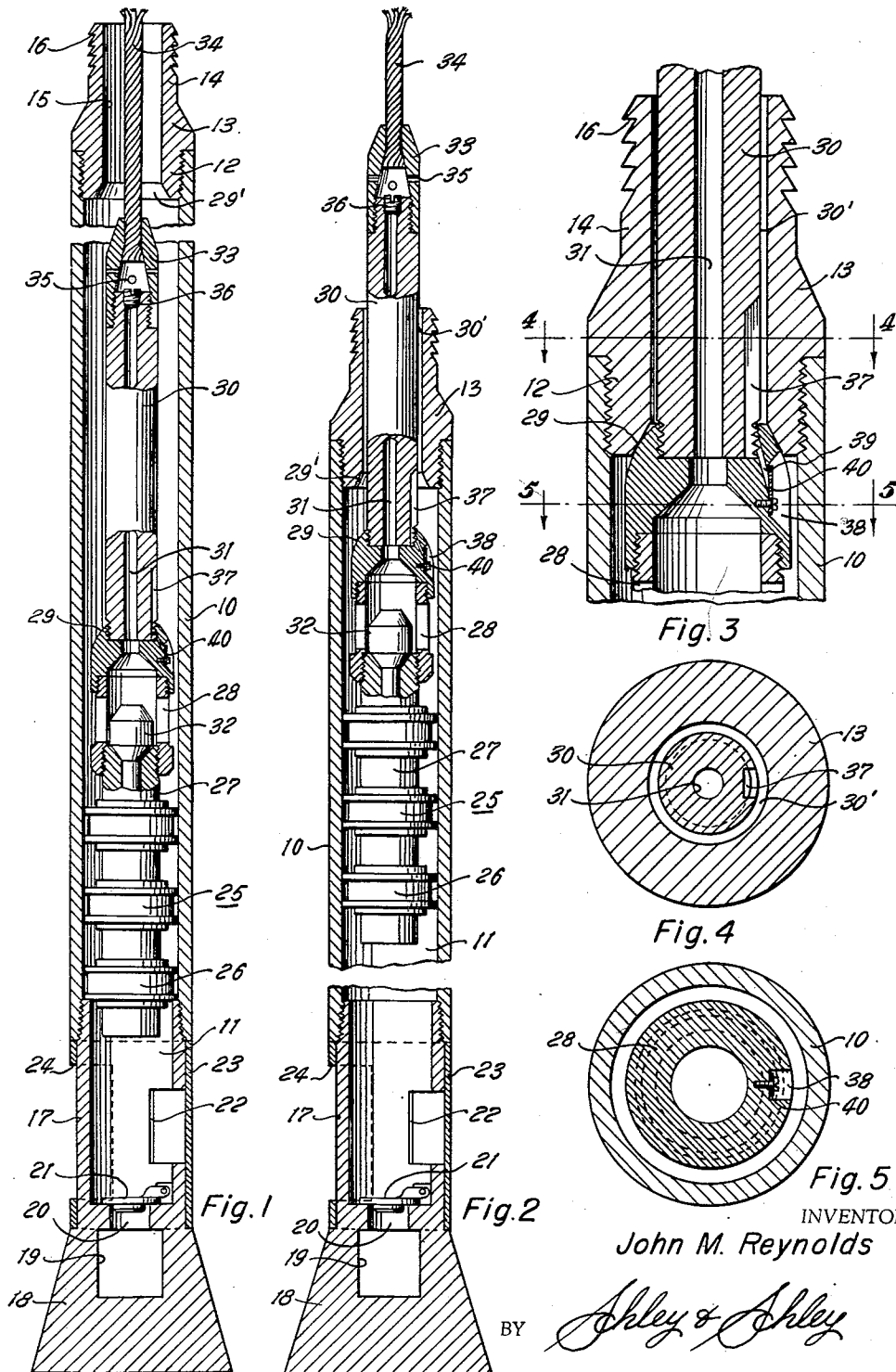
March 19, 1957

J. M. REYNOLDS

2,785,756

WELL BAILERS

Filed May 26, 1954



INVENTOR
John M. Reynolds

BY *Shley & Shley*

ATTORNEYS

1

2,785,756

WELL BAILERS

John M. Reynolds, Shreveport, La.

Application May 26, 1954, Serial No. 432,514

2 Claims. (Cl. 166—187)

This invention relates to new and useful improvements in well bailers.

One object of the invention is to provide a well bailer having therein a plunger for drawing solid material from a well bore into the bailer, and having provision for establishing a dash pot effect as the plunger nears the upper end of its stroke to prevent damaging impact of the plunger with the bailer structure.

Another object of the invention is to provide an improved well bailer having simple and durable valve means for maintaining a pressure within the barrel of the bailer as the same is raised to the surface from the well bore whereby the discharge from the bailer of the solid material drawn thereinto from the well is facilitated; and the valve further functioning to provide vacuum relief within the bailer barrel when such is required for emptying of the bailer.

Still another object of the invention is to provide an improved well bailer having therein a venting passage which is readily opened or closed off whereby the operator may choose between the retention of pressure in the bailer, or equalization between the pressures within the bailer and atmospheric pressure.

A construction designed to carry out the invention will be hereinafter described, together with other features of the invention.

The invention will be more readily understood from a reading of the following specification and by reference to the accompanying drawing, wherein an example of the invention is shown, and wherein:

Fig. 1 is a vertical sectional view of a well bailer constructed in accordance with this invention, portions of the bailer being shown in elevation, and the plunger of the bailer being shown at the bottom of its stroke.

Fig. 2 is a view similar to Fig. 1 showing the bailer plunger nearing the upper end of its stroke,

Fig. 3 is an enlarged fragmentary, vertical sectional view of the upper portion of the bailer structure showing the upper end of the plunger seated on the bailer housing at the upper end of its stroke, and

Figs. 4 and 5 are horizontal, cross-sectional views taken upon the respective lines of Fig. 3.

In the drawings, the numeral 10 designates an elongate tubular barrel enclosing a loading or entrapping chamber 11 into which solid or foreign material may be drawn from a well bore. The upper end of the barrel is provided with internal screw threads which receive the depending reduced pin 12 of a tubular head 13 having a reduced upstanding neck 14 and an axial bore or passage 15. Suitable tool or fishing grooves 16 may be provided upon the neck 14 for engagement by a fishing tool (not shown) or other device during emergency withdrawal of the bailer from the well bore.

The lower end of the barrel 10 is also internally screw threaded and receives the tubular shank 17 of a drill bit or cutting device 18. The drill or cutting device 18 may be of any suitable or desirable type, it having been found preferable to use a chisel type drill bit having

2

medially thereof a window 19 forming a communicating passage leading upwardly to a reduced axial opening 20 in the bottom of the tubular shank 17. A gravity or pressure-closing flapper valve 21 is provided in the bottom of the tubular shank 17 overlying the opening 20 and is adapted to close off the latter and entrap material within the chamber 11.

The shank 17 forms a continuation of the chamber 11 and is provided with a large, lateral window 22 in one side wall normally maintained closed by a tubular sleeve 23 rotatably confined upon the outer surface of the shank 17 between the lower end of the barrel 10 and the upper portion of the drill bit structure 18. The sleeve 23 is also provided with an enlarged window 24, and upon rotation of the sleeve around the shank to bring the windows 22 and 24 into registry, fluids and solids may be discharged from the chamber 11 through the aligned windows.

An elongate plunger structure 25, which is of conventional construction and which includes one or more piston or ring units 26, is carried slidably within the barrel 10 upon a tubular mandrel 27 having a traveling valve 28 at its upper end. The upper extremity 29 of the traveling valve is hemispherical or otherwise suitably shaped to form a valve element or member adapted to be received in a beveled or chamfered valve seat 29' provided on the lower extremity of the pin 12 of the head member 13. A reduced tubular plunger or stem 30 is screw threaded into the upper end of the traveling valve 28 and has its passage 31 communicating with the traveling valve above the valve element 29 of the latter.

It is to be noted that the stem 30 is adapted to pass upwardly through the bore 15 of the head member 13 with a reduced or restricted annular clearance space 30' being present between the stem and the wall of the bore (Fig. 2). Further, the length of the stem 30 is such that it does not enter the bore 15 upon upward movement of the plunger structure until the plunger is nearing the upper end of its stroke and the hemispherical upper end 29 of the traveling valve is approaching engagement with the seat 29'.

For supporting the structure in the well, lowering the bailer, and raising the plunger within the bailer prior to withdrawal of the entire unit from the well bore, there is provided a rope socket 33 upon the upper end of the stem 30 adapted to receive a wire line or rope 34 and having lateral ports 35 with which the bore 31 of the stem may be placed in communication. The upper end of the bore 31 is screw threaded and receives a removable plug 36 the insertion or removal of which will close off the bore 31 from the ports 35, or place the bore in communication with the ports. The plug 36 may or may not be apertured.

The stem 30 is provided on its outer surface and near its lower end with a longitudinal groove or recess 37 in the same vertical plane as a recess 38 cut into the lateral surface of the upper portion of the traveling valve 28. A restricted passage 39 extends between the two recesses for providing communication therebetween, and a leaf or spring valve 40, affixed within the recess 38, overlies that end of the passage 39 and prevents the movement of fluid from the recess 38 to the recess 37. Reverse movement of fluid from the groove 37 to the recess 38 may readily take place.

In operation, this tool is lowered into the well bore upon the wire rope or cable 34 until it reaches the bottom of the bore hole. In downward passage through any fluid present in the well bore, such fluid may pass upwardly around the outside of the barrel 10. Since the downward movement of the tool through such fluid will tend to raise the barrel structure more or less with respect to the plunger structure, some fluid may also by-

3

pass upwardly through the barrel and the bore of the mandrel 27 and past the valve 32 so as to exit through the annular space 30' between the stem 30 and the bore 15 of the head member 13. Should the resistance to downward movement through the fluid in the well bore be sufficiently great as to raise the barrel and its head member free of the stem 30, then this by-passed fluid may pass upwardly unrestrictedly through the bore 15 which then would carry only the cable 34, as shown in Fig. 1.

Upon reaching the bottom or the point of obstruction in a bore hole, the tool is moved upwardly and downwardly sufficiently to permit the drill bit 13 to loosen any cuttings or other foreign material which may be present in the bore hole, or in the event drilling operations are being carried out with this tool, it is vertically reciprocated in the manner of a table tool to effect the drilling operation.

When it is desired to draw cuttings or other solid or foreign material into the bailer structure, the bit and barrel assembly is allowed to rest upon the bottom of the well bore or the point of obstruction therein, and the plunger is lowered to its lowermost point, as shown in Fig. 1. The barrel 10 is relatively long and of quite appreciable weight, whereby the barrel will not be raised as the plunger is moved vertically therein, but instead, cuttings and other material are drawn through the window 19 and the passage 20 into the chamber 11 of the barrel as the plunger is then moved toward the upper end of its stroke. When the plunger is moved upwardly, the valve 32 is seated and down flow through the bore of said plunger is shut off. The stem 30 and bore 15 are important in this operation in preventing the upper end of the traveling valve 28 from striking the seat 29 with severe or damaging force. As the plunger nears the upper end of its stroke, the stem 30 enters the bore 15 as shown in Fig. 2, and the discharge of fluid from the barrel above the plunger cups 26 is subjected to a back pressure because the fluid must flow through the restricted annular space 30' between the stem and the bore. Fluid continues to be exhausted from this upper portion of the barrel through this restricted annulus, but the rate of exhaustion is reduced, the upward movement of the plunger is slowed, and the plunger is prevented from striking the seat 29 with any appreciable force or impact. Thus, the operator of the tool may feel free to apply optimum upward force through the cable 34 to move the plunger 25 upwardly at the most suitable speed within the barrel and obtain an efficient bailing action, without, at the same time, endangering the bailer unit due to violent seating of the plunger in the upper end of the bailer or running the risk of parting the wire rope 34 due to the sudden impact thus created. With the present structure, the plunger moves smoothly and relatively gently into engagement with the seat 29, thus not only protecting the wire rope 34 and the bailer unit as a whole, but also protecting the seating surfaces upon the lower end of the pin 12 and the upper end of the traveling valve 28. The area of the annulus 30' may be varied in accordance with the desired degree of leakage past the plunger 25, and the plug 36 may be suitably apertured to vary the dampening or dash pot effect obtained.

One important advantage of this structure is to permit "jarring" of the bailer should the same become stuck or lodged in the well bore, without endangering the tool. Sharp upward movement of the plunger will deliver a powerful "jar" to the bailer by trapping liquid in the upper portion of the barrel without involving any damaging metal-to-metal impact. Further, as the upward pull is continued, the escape of fluid through the annulus 30' and past the plunger cups will cause the tool to vibrate or "chatter" and aid additionally in freeing a stuck tool.

When the plunger has reached the upper end of its stroke, as shown in Fig. 3, the continued upward movement of the cable 34 raises the entire bailer unit in the

4

well bore whereby it may be withdrawn with its load or charge of cuttings or other material withdrawn from the bottom of the well bore. Obviously, the chamber 11 is loaded at bottom hole pressure since it is open to the well bore at the bottom thereof, but as the bailer is raised in the well the valve 21 is closed, and the seating of the traveling valve against the seat 29' at the lower end of the pin 12 effectively traps pressure within the chamber 11. The leaf valve 40 will not permit the release of this pressure and hence, the tool reaches the surface of the ground while still loaded internally at substantially bottom hole pressure. Thus, when the sleeve 23 is rotated to bring the window 24 into registry with the window 22, the charge or load of the bailer is rapidly and effectively discharged under a considerable pressure impetus, insuring quick and full dumping of the bailer unit. There is no tendency to create a vacuum above the load within the chamber 11 since the leaf valve 40 will permit the passage of air downwardly through the restricted annulus 30' into the upper end of the bailer unit, and past the plunger 25. It is noted that valve 40 does not relieve pressure from the bailer as it is raised to the derrick floor, but retains such pressure. The valve 40 functions only after the bailer has been raised to the floor level and window 22 is opened. After the bottom hole pressure has exhausted some fluid from the bailer, and as the fluid continues to drain, valve 40 opens to admit air and prevent the creation of a vacuum above the bailer load which would result in incomplete draining. The plunger 25 does not have an airtight fit in the barrel 10 and hence will permit the by-passing of air.

Under some conditions, it is not desirable to retain the pressure within the chamber 11 as the bailer is raised to the ground level, and under these conditions, the screw threaded plug 36 may be removed from the upper end of the bore 31 and thereby prevent the trapping of pressure within the chamber 11. An instance of an occasion when this procedure would be desirable would be the retrieving of relatively large pieces of matter, metallic or non-metallic, such as rotary drill cutter cones and the like. It might be dangerous to discharge such elements under a considerable pressure loading at the ground surface, and hence the plug 36 may be omitted to allow the pressure within and without the barrel 10 to equalize through the passage 31 as the bailer is raised from the bottom of the well. It is quite manifest that the closeness of the fit between the pistons or cups 26 of the plunger 25 in conjunction with the degree of restriction of the annular flow space between the stem 30 and the bore 15 will determine the dash pot or dampening effect realized in the seating of the plunger at the upper end of its stroke. Obviously, by increasing or decreasing this annular clearance, the dash pot effect may be reduced or enhanced to any desired degree.

Further, it is to be noted that the flapper valve 40 provides a one-way by-pass around the closure formed by the seating of the plunger on the seat 29, a closure that is extremely durable and permanent, and is not subject to damage, premature wearing out, or deleterious effect due to the composition or pressure of the well fluids.

The foregoing description of the invention is explanatory thereof and various changes in the size, shape and materials, as well as in the details of the illustrated construction may be made, within the scope of the appended claims, without departing from the spirit of the invention.

What I claim and desire to secure by Letters Patent is:
1. In a well bailer having a barrel providing an entrapping chamber having an inlet, entrapping means co-acting with the inlet to trap material in the chamber, a plunger reciprocable in the barrel adapted upon reciprocation to draw material into the chamber through the inlet, a head member on the upper end of the barrel

5

having a reduced axial passage, the barrel being im-
 perforate, a valve seat in the barrel below the passage,
 and a reduced axial stem extending upwardly from the
 plunger and adapted to enter the passage, the improve-
 ment which includes a valve member on the plunger 5
 seating against the valve seat at the upper end of the
 plunger stroke to positively shut off flow through the
 passage, the stem and passage being of such relative
 diameters as to provide therebetween when the stem
 enters the passage a closely restricted flow space of such 10
 area as to prevent impact of the valve member on the
 valve seat when liquid is present in the barrel above
 the plunger, the stem being provided with a bore open-
 ing from the barrel to the space above and exterior of
 the stem and having at least a portion restricted to resist 15
 liquid flow therethrough, and a removable closure in the
 bore.

2. In a well bailer having a barrel providing an en-
 trapping chamber having an inlet, entrapping means co-
 acting with the inlet to trap material in the chamber, a 20
 plunger reciprocable in the barrel and adapted upon re-
 ciprocation to draw material into the chamber through
 the inlet, a head member on the upper end of the barrel
 having a reduced axial passage, said barrel being im-

6

perforate between the plunger and the head member, a
 valve seat in the barrel below the passage, a reduced
 axial stem extending upwardly from the plunger and
 adapted to enter the passage, the improvement which
 includes a valve member on the plunger seating against
 the valve seat at the upper end of the plunger stroke to
 positively shut off upward flow through the passage, the
 stem and passage being of such relative diameters as to
 provide therebetween when said stem enters the passage
 a closely restricted flow space of such area as to prevent
 impact of the valve member on the valve seat when liquid
 is present in the barrel above the plunger, said stem
 having a longitudinal bore, and a removable plug in the
 bore.

References Cited in the file of this patent

UNITED STATES PATENTS

1,957,100	Diepenbrock	May 1, 1934
1,958,915	Fletcher	May 15, 1934
2,168,729	Cavins	Aug. 8, 1939
2,237,686	Parr	Apr. 8, 1941
2,454,945	Reynolds	Nov. 30, 1948
2,649,917	Simmons	Aug. 25, 1953