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W. H. DUMBLE

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WELL BAILER

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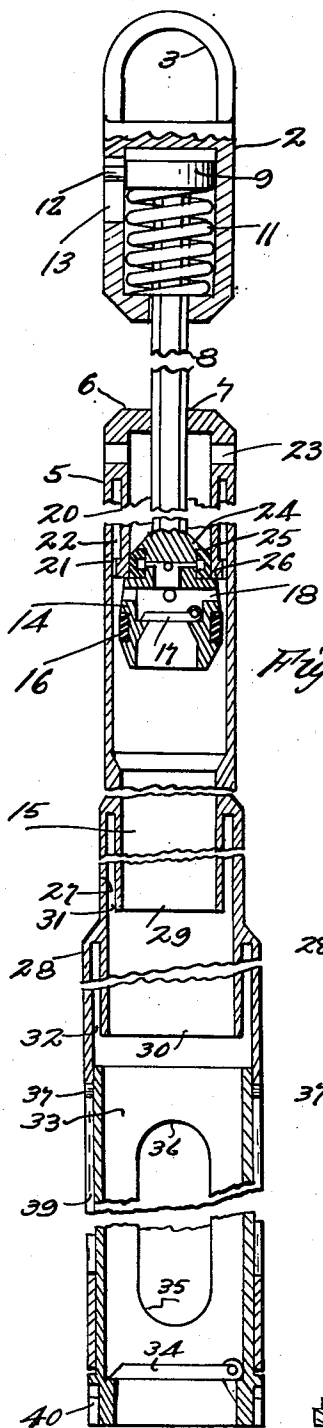


Fig. 1.

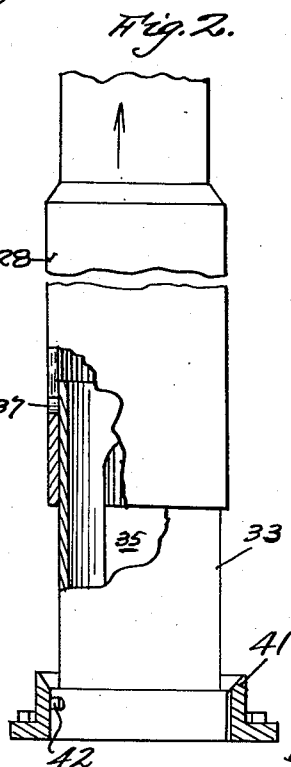


Fig. 2.

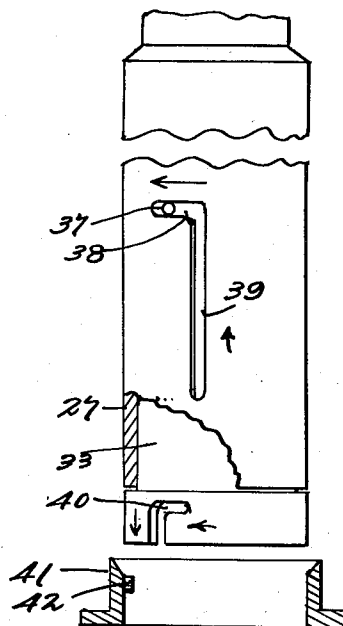


Fig. 3.

Inventor,
W. H. Dumble;
By *Thos. Coffey*
Frederick E. Maynard

UNITED STATES PATENT OFFICE

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WELL BAILER

William H. Dumble, Bakersfield, Calif., assignor
to Paul Cavins, Long Beach, Calif.

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8 Claims. (Cl. 166—19)

This invention is a well bailer.

This bailer is of the type adapted to be lowered by a cable line to the bottom of well holes to clean out sand or drill cuttings or loose or soft earth formation and one of the objects of the invention is to facilitate the fishing of the bailer by means of a rotary tool string in event it should be lost in the hole. Heretofore difficulty has been had in hooking onto such bailers because of the fact that the top bow is generally of a swivel type connection with the bucket, and means are here provided to enable a desired reciprocation between the bow and the bucket without relative rotation of the bow.

A further object is to provide a reciprocative bow with means for absorbing tensional shock incident to the elevation of the cable and the bow in lifting effort on the loaded or stuck bucket.

An additional object of the invention is to provide a bucket structure embodying a main body or barrel having a telescopic bucket bottom whereby to facilitate the unloading of the bailer when lifted to the head of the hole or well.

Also an object of the invention is to provide a bailer barrel embodying progressively enlarged chamber portions toward the discharge outlet of the bucket to facilitate the breaking down of bridges or arches of sand or other debris packed up in the bucket through its bottom trap valve.

In this connection it is an object to provide for the utilization of hydrostatically compressed air in chambers of the barrel to aid in the discharge of the muck from the barrel when its discharge outlet is opened.

Still further, an object is to provide a long stroke cylinder barrel portion and a working, valved piston having an initial reciprocative function for the purpose of agitating the bottom muck to accelerate load induction past the bucket bottom, and to provide for a second functional action by the piston as it is pulled to lift the bailer, to set up a suction to greatly increase the loading capacity under increment due to higher static head of water, if any, in the hole.

The invention consists of certain improvements in this art as set forth in the ensuing disclosure and having, with the above, additional objects and advantages as hereinafter developed, and whose constructions, combinations and details of means and the manner of operation, and the method of facilitating bailing, will be made manifest in the description of the herewith illustrated embodiment; it being understood that modifications, variations and adaptations may be resorted to within the scope, principle and spirit of the

invention as it is more directly claimed hereinbelow.

Figure 1 is an axial, vertical section of the bailer showing the parts in normal lowering, relative positions; the structure being longitudinally broken away.

Figure 2 is an axial, broken away section showing parts in elevated, unloading position.

Figure 3 is a side elevation of the lower end of the bucket and section of the platform floor dump key cooperative therewith to unload the bailer.

The upper end of the bailer includes a cylindrical or other suitable cage 2 having an upstanding bow 3 into the eye of which it is possible to readily interhook the pick-up end of one or another forms of fishing tools (not shown) commonly employed for well fishing operations. In this invention the bow cage 2 is adapted for reciprocative cooperation with the upper end of the bailer body which is here shown as including an elongate upper cylinder 5 with a dome 6 having an axial, non-circular hole 7.

A form of connection is here shown between the cage 2 and the upper cylinder 5 to so hold the cage from rotation as to greatly aid in the operation of picking up the bailer by a fishing tool.

This connection includes a non-circular stem or piston rod 8 complementary to the hole 7 within the dome to effect a splined sliding coaction with the cylinder 5, and being provided with a head or shoulder 9 sliding in the cage 2 and supported on a stout spring 11 set on the bottom of the cage. It will be seen that the spring 11 constitutes a cushion or shock absorber to take the jolt incident to lift of the loaded bailer by the rod.

The head 9 of the rod is suitably splined to the cage 2 as by means of a pin 12 fixed on the head and sliding in a guide slot 13 therefor in the inner wall of the cage.

A piston 14 fixed on the lower end of the rod 8 is adapted to move down into and reciprocate in a reduced part or piston chamber 15 of the bailer just below the larger chamber portion 5. The piston 14 has a cylindrical packing 16 adapted to snugly fit in the reduced chamber 15 and also is provided with a freely upwardly opening by-pass, a check valve 17 in the by-pass to close the same against downward flow and allowing water, or oil or air to flow upward, under hydrostatic pressure, to pass above the valve and laterally flow outwardly through ports 18 to the piston and to the upper bailer chamber space when the piston is positioned in the chamber 15.

A very considerable stroke of the valved piston is effective to elongate the load capacity of the bailer and an important feature of the invention is the provision of one or more inverted air reservoirs into which air, entrapped at atmospheric pressure at the head of the well, will be hydrostatically compressed as the bailer is lowered into the water or other liquid which may be in the well. One such reservoir is formed concentrically in the upper cylinder 5 by provision of an inner sleeve 20 of suitable length spaced from the wall and having flange-end ports 21 about its lower end leading to the air reservoir 22.

While the bailer is lowered into liquid in the well excess air, from below the reservoir 22, and water will flow upwardly past valve 17 outwardly through ports 18, upwardly through the sleeve 20 and thence will escape via the body ports 23 to the well.

For the purpose of holding the compressed air which may be trapped in the bailer against premature loss while the bailer is being pulled from the well, the piston 14 is provided with a reduced body part 24 where it joins the rod 8 and thereabout has a hydraulically or pneumatically expansible packer 25 of such a size as to tightly telescope into the lower end of the bore of the inner wall 20 as the piston is pulled upwardly to lift the bailer; this being effected by the engagement of a piston shoulder 26, adjoining the upper end of and projecting outwardly beyond packing 25, with the cooperative lower end of the sleeve 20.

It will be seen that compressed air will be trapped by the valve-forming piston part 24 just as soon as piston 14 moves upwardly enough to close off the bore of wall 20 and before the bailer body assembly is lifted from the well muck. Hence when the bailer passes out of liquid (water or oil) in the well and is pulled to the top of the hole, the stored pneumatic energy is sealed for use in expelling the bucket load from the bailer.

The lower end of the bailer body, barrel or shell is shown as having one or more successive enlargements 27 and 28, the first having an inner, concentric sleeve 29 continuing from the cylinder 15, and the second having an inner, concentric sleeve 30 each sleeve forming thereabout a respective, closed-top air reservoir in the shell structure and open only at the lower ends into the bailer below the piston chamber 15 so that liquid entering the bailer bottom will compress the trapped air as above set forth, for later expansive use. Shell 27 extends as an inner concentric sleeve 30 forming thereabout an open-bottom reservoir 32 in shell part 28. When the piston runs downwardly out of guide sleeve 29, it, the piston, will be washed by liquid submerging its surfaces. This downwardly, progressive enlargement of the inner bores of the lower part of the bailer is highly desirable since it greatly facilitates the natural fall of the muck when the bailer is discharged; more especially when aided by the expansive effort of the trapped compressed air sealed in the loaded bailer. When it is understood that liquid heads of thousands of feet are commonly available in deep wells to hydrostatically compress the air it will be clear that a densely packed body of muck can be quickly discharged from the bailer without need of chopping or washing the pack.

A further feature of the bailer is a distinctive unloading or dumping means. The lowermost body enlargement 28 is here provided with a telescopic bottom or bucket 33 having an up-

wardly opening loading or check valve 34 and an elongate side wall discharge port 35 which, when the bucket is extended from the enlarged chamber 28, will provide a large area for quick unloading of the well muck and the shearing action of the upper lip 36 of the port 35 will facilitate the breaking up of the sand pack lodged against the bore face of the chamber 28. Means to lock the bucket in closed or loading position in the chamber 28 is here shown in the form of pin 37 10 on the upper end of the bucket to turn laterally in the cross-end 38 of a bayonet slot 39 in the wall of the chamber 28. Thus by turning the bailer body to the right hand (looking down) the pin will be alined with the length of the slot 39 and the bailer can be elevated (after it is hung over the well platform) to pull the chamber 28 upward on the bucket while this is suitably held to the floor of the platform.

For so holding the bucket of the bailer while the bailer body is pulled up to unload the bucket the lower end of the bucket 33 is provided with a short bayonet slot 40 opening to the bottom edge thereof, and cooperative with this device there is provided a short socket 41 fixed to the derrick platform or floor and having suitable inwardly projecting lugs 42 complementary to the slot or slots 40 of the bailer bucket 33. While the loaded bailer is hung by the usual elevator over the floor the foot of the bailer is lowered into and interlocked with the socket or "dump key" by turning the bailer to the right (looking down). It is then turned a little further until the pin 37 unlocks from the head of slot 39, after which the bailer is elevated as to the locked bucket in the socket.

This action uncovers the side discharge port 35 of the bucket and the load either freely falls from the bucket or is forcibly ejected by reaction of the compressed air from the bailer reservoirs.

It will be seen that when the plunger or piston 14 is pulled upward from the chamber 15 after a load is drawn into the bucket 33 the packing 16 in moving upward will be washed by liquid in the body part 28, and the packing 16 will be further washed by the liquid as it is blown down by the expanding gaseous medium from reservoir 22 incident to the opening of the bucket to unload the contents.

This invention is an improvement in the old suction type bailer of Moody Patent 298,876, May 20, 1884, in which a piston plunger E when pulled upward in the barrel A causes a suction at the bottom inlet valve B. The piston E has a top valve ring F which closes the outlet in cap C (receiving the piston rod) when the piston E, which is packed by the long film of liquid thereabout, is pulled upward in the barrel A. The present invention provides an air trap in the chamber of the barrel to catch and retain gas under well pressure: this function is an advance in the art as disclosed by the suction bailer of Moody with a piston-top valve device. No broad claim is here made to a suction plunger like Moody with such a top valve to close the bailer vent at the top.

What is claimed is:

1. A bailer body having a lifting plunger with a peripheral packer, a chamber part in which the plunger packer is slidable on down stroke of the plunger, a constricted upper body part open at its top to the well hole, and said plunger having a valve for air flow to the said upper part and having packing to seal on said upper part when the plunger is pulled from the chamber to lift the bailer.

2. The bailer as in claim 1, and the said latter packing being expansive in effective position by trapped pressure in the bailer when the piston is at top stroke.

3. A well bailer having a body provided with a piston chamber, and inner bell walls joining the body at their tops and forming air reservoirs provided both above and below the chamber for trapping hydrostatically compressed air for expelling the bailer load.

4. The bailer of claim 3, said chamber being formed with a pendant concentric wall along the body bore to establish a surrounding air reservoir.

5. A suction bailer having a body provided with a constricted piston chamber in its lower portion, a concentric wall joined at its top to the body to form an air trap or reservoir, and a piston movable downwardly to seal and slide in the said chamber and being washed by liquid in the body on piston upstroke and by downward surge of liquid as expelled by the expanding air when the bailer is being unloaded; the piston moving clear of the body bore during reciprocation therein.

6. A suction bailer having a barrel, a head closure on the upper end of the barrel, a plunger slidably mounted in the head closure and having a piston on the lower end thereof reciprocable within the barrel, said piston being movable upwardly in the barrel to create suction at the bailer bottom, an imperforate tube within the barrel and connected at its upper end to the head closure, the tube being smaller than the barrel and spaced from the inner wall face thereof to provide a gas trapping space wholly within the barrel and opening downwardly into the barrel, the piston having a valve part thereon engageable at the upper end of its stroke with

an annular seat formed on the lower end of the tube, and the upper end of the bailer structure having outwardly opening ports at a point or level above the junction of the head closure and the tube to permit fluid escape as the piston is moved upwardly.

7. A bottom-valved, suction bailer, a head closure on the upper end of the barrel, a plunger slidably mounted in the said closure and having a piston slidably fitting in a part of said barrel and movable upwardly to create suction at the bailer bottom, a seat part in the barrel and the piston having a valve part thereon engageable at the upper end of its suction stroke with said seat, the upper end of the bailer structure having outlet ports from said barrel at a level above the said seat to permit fluid escape as the piston is moved upwardly, and tubular, imperforate means having parts spaced inwardly from the inner face of the barrel and connected therewith to provide gas trapping space wholly within the barrel and opening only downwardly into the chamber of the barrel.

8. A suction bailer including a shell having a barrel part, a head closure on the shell, a plunger rod slidably mounted in the said shell closure and a piston on the lower part of the rod and fitting and movable upwardly in the barrel to create suction at the bailer intake and the piston having a part to impact on an abutment in the upper part of the shell; the upper part of the shell at the upper end of the said barrel being internally of greater diameter than the barrel bore so that the piston when moved up from the barrel may accelerate its speed toward said abutment for increased jar impact.

WILLIAM H. DUMBLE.