Aug. 20, 1935. R. R. CANDEE 2,012,119

VACUUM BAILER

Filed Sept. 21, 1934

Fig. 1.

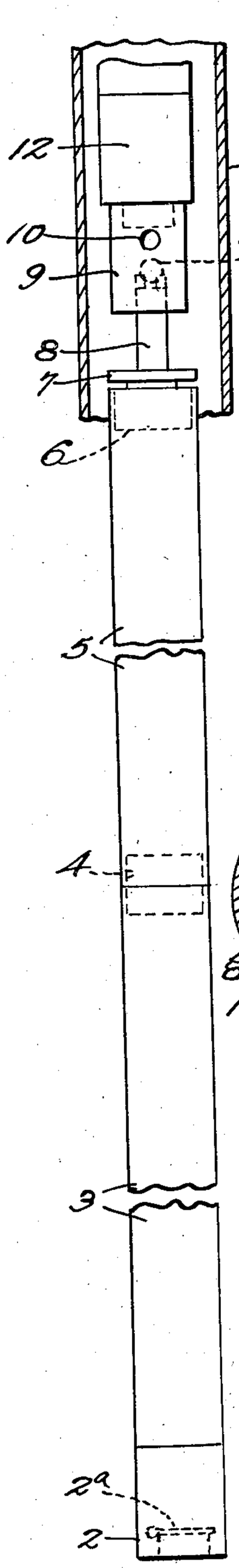


Fig. 2.

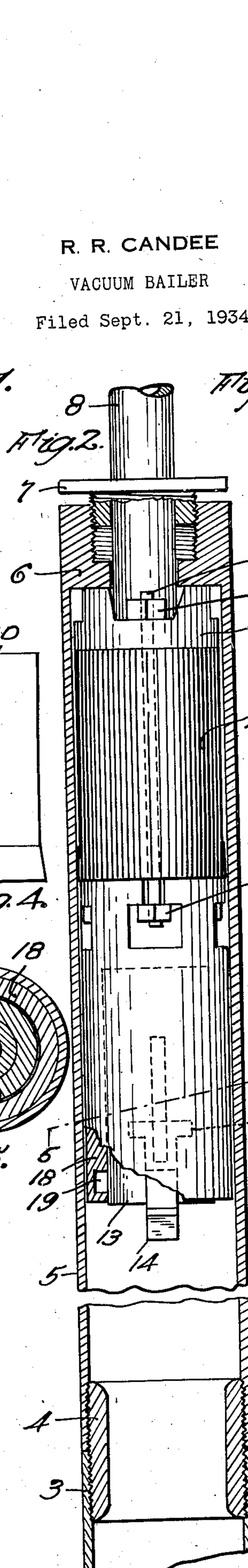


Fig. 3.

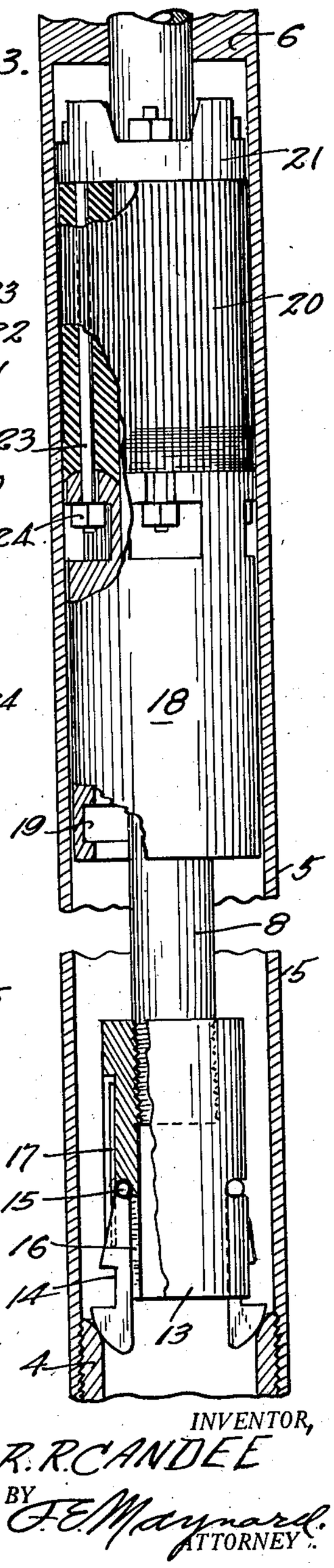


Fig. 4.

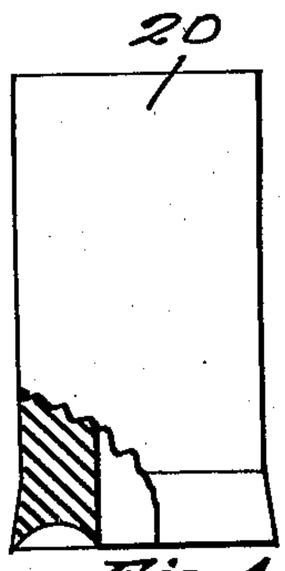
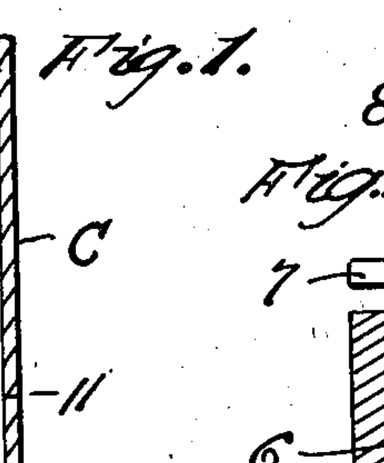


Fig. 5.



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VACUUM BAILER

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Application September 21, 1934, Serial No. 744,926

13 Claims. (Cl. 166—19)

This invention is a bailer of the class used in the art of well drilling for cleaning out the hole.

A general object of the invention is to greatly increase the efficiency of this class of tool by the establishment of a substantial vacuum in the bailer barrel for the induction of as great a load of material from the bottom of the hole as may be practical.

A further purpose is to provide a bailer which may be efficiently used as a tool to work up the material at the bottom of the hole.

An object is to provide a bailer having a barrel in which there is a lockable piston adapted to be drawn in a vacuum-forming stroke and then released so that the column of liquid in the well may be made useful against the inlet valve to instantly force material loose in the bottom of the well up into the bailer chamber formed by the receding piston.

The invention consists of certain advancements in this art as set forth in the ensuing disclosure and having, with the above, additional objects and advantages as hereinafter developed, and whose construction, combination and details of means, and the manner of operation will be made manifest in the description of the herewith illustrative 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 hereinafter.

Figure 1 is a side elevation of an axially broken bailer and shows a fragment of its encasing well casing.

Figure 2 is a sectional elevation of the upper section of the bailer, showing the parts as hung together for lowering into the casing.

Figure 3 is a sectional elevation showing the piston tripped from its draw or piston rod and as in its upper or induction stroke position as effected by fluid pressure in the well in its tendency to reduce the vacuum.

Figure 4 is a side elevation of an end portion of a packing element of the bailer shown partly in section.

Figure 5 is cross-section on line 5—5 of Fig. 2.

A valved, inlet bailer shoe 2 of any desired type is attached to a barrel section 3 which in turn is attached by an internal nipple 4 to an upper barrel section 5 whose top is closed by a bushing 6 receiving a packing gland follower 7.

Working in the gland device is a plunger rod 8 of tubular form topped by a valve cage 9 venting laterally at its port 10 above its closure 11, which seats downwardly in the cage. To the cage is attached any desired operating stem 12 by which the rod 8 and all its associated bailer parts are lowered and raised in the usual manner of a well bailer.

The rod 8 is of a length preferably somewhat greater than that of the bailer section 5 and has attached to its lower end a draw head 13 of tubular form and having a plurality of pendant, outwardly facing latches 14 having pivots 15 at their upper ends sunk in the side walls of side slots 16; the latches being pressed outwardly at their lower ends by suitable springs 17.

When the rod is pulled upwardly by its stem the draw head 13 slides freely into a plunger body slidably fitted in barrel 5 and on the rod 8 and composed of bottom sleeve 18 whose lower end is internally grooved at 19 near its lower end face so that the latches 14 will automatically interlock the draw head 13 with the sleeve in the position of these parts as shown in Fig. 2. Bearing on the upper end face of the sleeve 18 and slidably surrounding the rod 8 is a thick, rubber packing sleeve 20 whose lower end is cupped in the well known manner to spread outwardly and tightly seal on the bore wall of the bailer barrel section 5 in which it is reciprocally mounted.

On the upper end of the packer 20 there is a crown ring 21 whose upper end face is recessed to receive clamp nuts 22 on tie bolts 23 embedded in and extending through the packer and being interlocked in any suitable manner to the plunger sleeve 18; nuts 24 being here shown for that purpose. The plunger sleeve 18, the packer 20 and the crown ring 21 therefore constitute rigidly connected units forming a plunger.

When the bailer is assembled its cage 9 is attached to the stem 12. When the tool is lowered into the well casing C; the bailer barrel bushing 6 rests on the upper end face of the crown ring 21 of the plunger which has been pulled to top position in the barrel 5 by the draw head 13 on the rod 8, Fig. 2. The latch hooks are held intermeshed in the sleeve groove 19 by action of the latch springs.

The operator now lowers the bailer until the shoe 2 strikes well bottom when the bailer barrel body is arrested in its descent while the rod 8, owing to the weight of the stem 12 moves downwardly in the barrel and takes along with it the draw head 13, which in turn draws downwardly the plunger 18 with its packer and crown-ring.

It will be seen that as the crown ring 21 moves downwardly from the arrested bushing 6 of the barrel 5 a vacuum will be created below the gland and above the plunger body; the space in the

barrel being bled through the tubular rod 8 to the vent port 11 of the top valve 9, and the valve 2a of the shoe 2 being closed, in the absence of an entrapped fish, or well debris.

When, eventually, the projected latches 14 engage the top end of the inside nipple 4, Fig. 3, they will be pushed inwardly and therefore release the attached plunger sleeve 18 and this, due to the unbalanced liquid pressure in the bottom of the bailer, will immediately rush upwardly in the barrel section 5 to destroy the vacuum above the crown ring 21. This upward rush of the plunger greatly agitates the muck at the bottom of the well, or at the part of a fish which may have intercepted the bailer in its descent in the well and greatly facilitates the function of the tool in cleaning out sand or loosening or entrapping a fish.

The draw-head may be latched to and released from the plunger as many times as desired without pulling the bailer from the well, since the bailer will bleed through the vent 10 of valve cage 9 when the rod and the plunger and head descend in the arrested barrel, under pressure of the stem parts.

A double suction effect is acquired by reason, first, of the upward rush of the released plunger 18, and, second, by reason of the ascent of the rod in the barrel when the loaded bailer is to be pulled from the well.

It will be observed that there is no valve device directly associated with the vacuum chamber formed between the gland parts 6—7 and the plunger; hence the simplicity of the vacuum device.

The device 9—11 is a simple check valve opening during downward movement of the tubular rod 8 and allowing outflow of liquid at the port 10 into the well, but closing when the bailer is pulled up.

When the plunger 18—20 has been tripped from the draw head 13 (following the vacuum forming stroke) the released plunger is forced back to its upper position against the crown 21 by the hydrostatic pressure of fluid entering the barrel past the foot valve 2a. As the plunger moves downwardly the check valve 11 opens for outlet of displaced liquid.

The packing body 20 forms a packing slidably fitting on the rod 8 and along the shell 5 and is cupped at its bottom end to increase efficiency. The vacuum chamber of the shell is imperforate.

What is claimed is:

1. A vacuum bailer having, in combination, a barrel, a rod working in the barrel, a vacuum forming plunger and means whereby it is slidably packed in the barrel and on the rod, means to connect the plunger to the rod to draw the plunger on the vacuum stroke, and means to automatically release the plunger for reverse stroke under well fluid pressure.

2. A vacuum bailer having a barrel, and movable plunger means dividing the barrel into a bottom charge receiving chamber and into an upper vacuum chamber, and rod means having a connective and disconnective device for interlocking with and controlling the said movable plunger means.

3. A vacuum bailer having a barrel with an imperforate upper portion, a movable means dividing the barrel into a bottom charge receiving chamber and into an upper vacuum chamber at said portion, and means for positively effecting a vacuum forming movement of the movable means and including means providing for free reverse movement of the said movable means as to its positive actuating means.

4. A vacuum bailer having a barrel, a movable means dividing the barrel into a bottom charge receiving chamber and into an upper vacuum chamber, actuating means for positively moving the movable means in one direction and including a device for tripping the movable means from the actuating means and allowing its free opposite movement under fluid reaction.

5. A vacuum bailer having a barrel, an inlet bailing shoe therefor, and means operative in the barrel and producing a sealed vacuum therein when the bailer is arrested and the said means moves down toward the shoe, said means including a plunger and an actuator therefor; and a device to automatically release the plunger from the actuator at a predetermined position of the plunger.

6. A vacuum bailer having a barrel having an imperforate upper portion, an inlet shoe therefor, and means operative in the imperforate portion of the barrel and producing a vacuum therein when the bailer is arrested and the said means moves toward the shoe; and means for effecting said movement of the first named means and its subsequent release for free reverse movement under fluid pressure in excess of the vacuum above the vacuum means.

7. A vacuum bailer having a barrel, an inlet bailing shoe therefor, and valve-less means operative in the barrel and producing a vacuum therein when the bailer is arrested and the said means moves toward the shoe and adapted for free movement away from the shoe under fluid pressure, said means including a piston device and a mechanism whereby it is forced in one direction and is released at a predetermined position.

8. A bailer having a barrel with an inlet shoe on its lower end and being closed and imperforate at its top, a plunger having means whereby it is packed in the barrel to produce a vacuum in the closed portion by movement toward the shoe, and actuating means to move the plunger on its effective stroke and having a device whereby to release it from the actuating means for free well-fluid pressure return.

9. A vacuum bailer having a barrel with an inlet shoe, and means to lower the bailer into a well and to pull it, and including a plunger in the bailer capable of a downward movement to create a vacuum in a chamber of the bailer, a draw device for the plunger, and means to automatically connect the plunger to the said device and to automatically disconnect the plunger from said device for return by fluid pressure below the plunger, when the barrel is arrested.

10. A vacuum bailer having a barrel with an inlet shoe, a plunger working in the barrel and dividing it into an intake chamber and a vacuum chamber, and a plunger rod working in the barrel and on which the plunger works and having means for lowering the barrel and holding the plunger in an upper position and for drawing down the plunger to form a vacuum thereabove when the bailer is arrested and including a trip device to disconnect the plunger from the rod after a predetermined downward stroke in the barrel.

11. A vacuum bailer having a barrel with an inlet shoe, a plunger fitting in the barrel and dividing it into an intake chamber and a vacuum chamber, and a plunger rod working in the barrel

and having means for lowering the barrel and holding the plunger in an upper position and for drawing down the plunger to form a vacuum thereabove when the bailer is arrested; said means including a device to release the plunger from the rod at a predetermined position in the barrel.

12. A vacuum bailer having a barrel with an inlet shoe and a head, a plunger rod working in the barrel head, a draw head fixed on the rod, and a plunger working in the barrel above the shoe and below the barrel head and positively operated on the down stroke to form a vacuum by action of said draw head, and means to automatically connect and automatically disconnect the plunger and the draw head.

13. A bailer of the type set forth in claim 12, and having means fixed in the barrel to effect disconnection of the plunger at a predetermined position thereof in the barrel to free the plunger for fluid pressure reaction against the vacuum side.

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