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BUFFER FOR WELL SWABS

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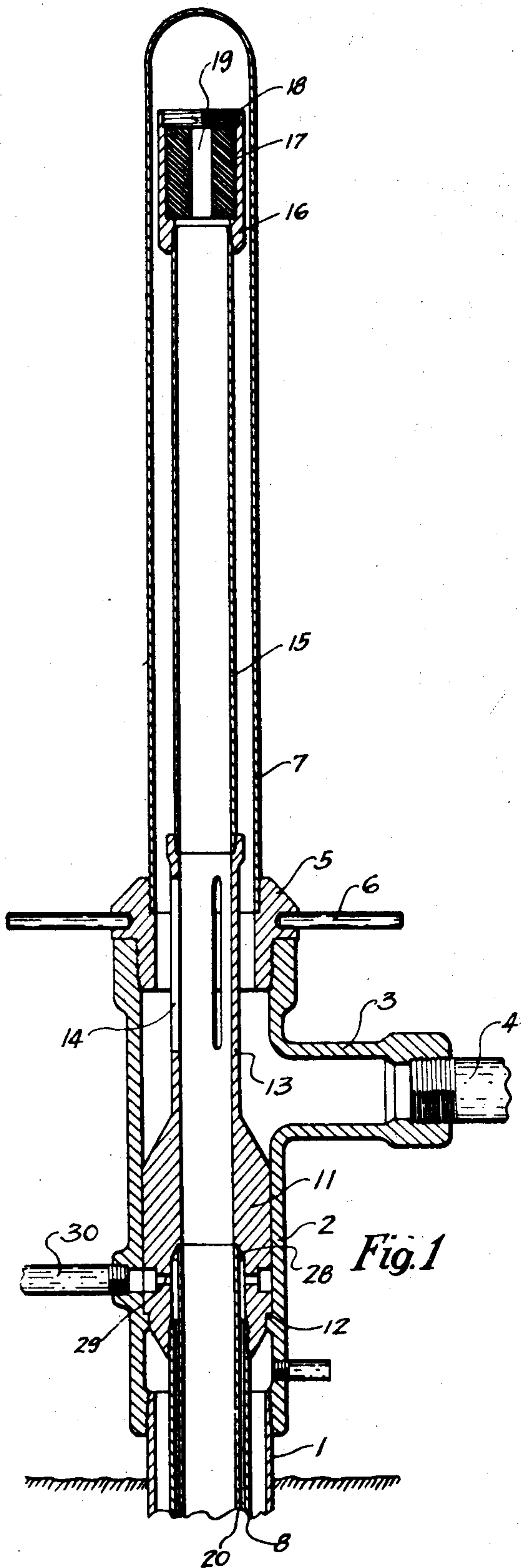


Fig. 1

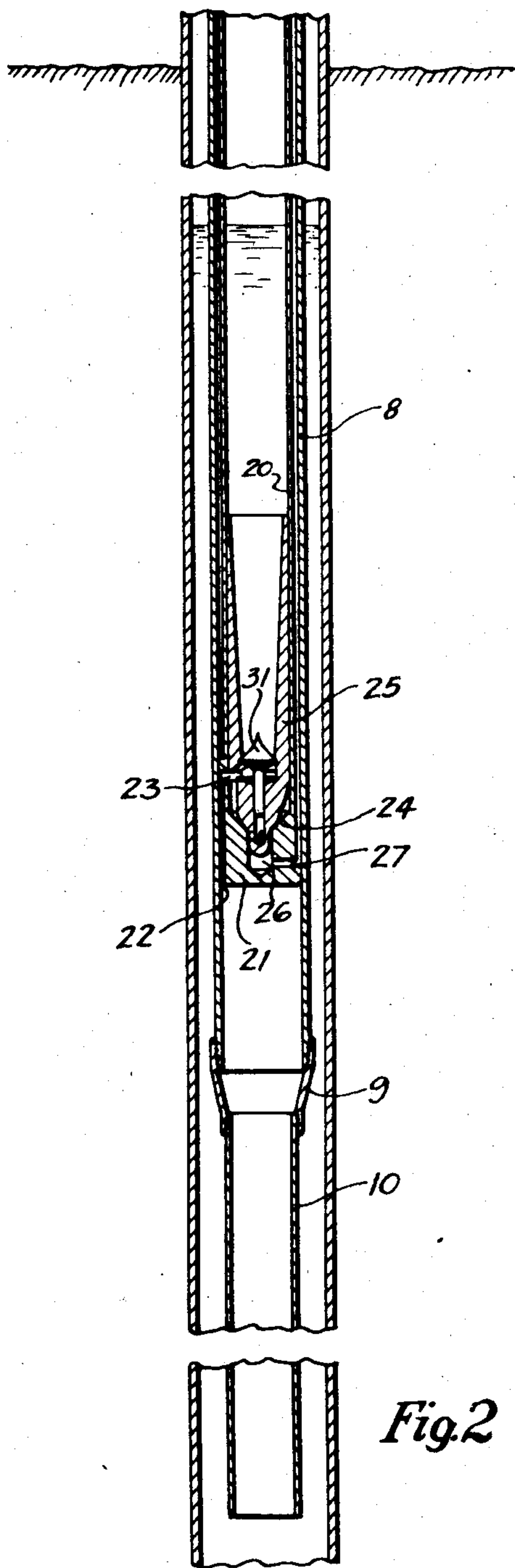


Fig. 2

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BUFFER FOR WELL SWABS

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My invention relates to means for stopping a pneumatically operated well swab at the upper end of its stroke, and to prevent damage to the swab and the well structure.

5 In the operation of pneumatically actuated well swabs to lift liquids from deep wells, it sometimes happens that the plunger is forced upwards in the eduction tube without a load of liquid above it, due to a failure
10 of the liquid and air to exhaust quickly behind the plunger, so that in dropping, the plunger is caught in the air exhaust, and in such case the plunger is blown back with high speed like a projectile, tending to strike the
15 upper end of the tube with great force and damage both the swab and the well tube.

It is an object of this invention to provide a means to stop the plunger at the upper limit of its travel without danger to the plunger
20 or to the pipe.

I desire to equip the eduction tube with shock-absorbing means for the swab plunger, whereby damage to the equipment is avoided.

25 In the drawing is shown a central longitudinal section through a pneumatically operated pumping device employing my invention. Fig. 1 illustrates the structure at the upper end of the well and Fig. 2 shows the
30 lower end of the apparatus.

My swab apparatus includes an outer casing 1 for the well. The upper end of the well casing has a special casing-head 2 thereon, with a lateral outlet 3 connected with a
35 pipe 4 to carry the liquid to storage. The upper end of the casing head 3 has a tubular nut or bushing 5 screwed therein, provided with radial handles 6 thereon to furnish means to rotate the same.

40 The upper end of the bushing 5 is threaded internally to receive an elongated cap or bull plug 7 closing the upper end of the casing head and acting to house the upper end of the eduction tube.

45 The eduction tube is double walled for the greater part of its length. The outer wall or pipe 8 extends downwardly into the well and toward its lower end may be swaged inwardly at 9 and connected to a pipe 10 of smaller
50 diameter. The upper end of the pipe 8 is

connected with a head 11 shaped to fill the inner circumference of the casing head below the outlet 3 and to rest upon a shoulder 12 in said casing head. Its upper end is reduced in diameter adjacent the outlet and terminates at its upper end in a tubular projection
55 13 slotted at 14 to allow the outlet of liquid therefrom. Above the outlet, the projection connects with a nipple 15 which is housed in the bull plug 7, and has at its upper end, a fitting 16 of larger internal diameter, than
60 the nipple. It is closed at its upper end by a nut or plug 18. Within the fitting 17 is a thick pad of rubber or other resilient material 17 which fills the fitting and rests at its
65 lower end upon the upper end of the nipple 16. This rubber pad is preferably cored out axially to provide space for lateral expansion of the rubber of the pad when the plunger engages therewith.
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The inner tube 20 for the eduction of the liquid is spaced slightly from the outer tube 8. It has, at its lower end, a head 21 which closes the said lower end thereof and also fits within and closes the pipe 8, except for
75 a passage 22 extending upwardly along the side of the head for a short distance and entering the tube above the head at 23. The upper end of the head 21 has a seat 24 therein upon which the swab plunger 25 may rest.
80 Below the seat is a small chamber 26 connecting with an inlet passage 27 for the pressure fluid. The upper end of the inner eduction tube is seated in the lower end of the head 11 and makes a tight fit therewith.
85 The space between the tubes 8 and 20 forms a passage for the pressure fluid entering through a lateral passage 29 in the casing head, which receives the fluid from an inlet pipe 30 which is connected with a source of
90 supply of air or gas under pressure, not shown.

The swab plunger 25 may be of any preferred form. I have shown a plunger having an outer cylindrical face shaped to fit with
95 in the inner tube 20. Its lower end is reduced in diameter and has a guide passage therein for the valve stem upon the valve 31. Said valve is normally open by gravity, but seats upwardly by the force of air below
100

the same. In the drawing, the valve is shown closed.

In the operation of my device, the liquid enters the eduction tube through the passage 22 and as the valve 31 is then open by gravity, the liquid will fill the eduction tube to the desired height. The air pressure will then be turned on and will enter the chamber 26 below the plunger and close valve 31 and raise the swab and its load to the surface. The liquid load will discharge through the outlet slots 14 to the interior of the casing head and will pass out through the pipe 4. Some air and liquid will pass the openings 14 into the nipple 15. When the swab plunger reaches the upper end and its load of liquid has been discharged, it will move into the nipple 15. The liquid in the nipple will normally absorb the force of the plunger and will move the valve to open position, so that the plunger may drop to its seat at the lower end of the tube. If, however, the plunger comes up with no liquid above it, it will be shot past the outlet opening and will engage the rubber buffer and will be stopped without danger to the swab or the rest of the apparatus. The valve will be closed when the swab contacts with the buffer, but as the swab drops back in the rising air discharge, it will surge back and forth near the outlet until the valve drops open and then the swab will fall.

What I claim as new is:

1. In a pneumatic swab structure, an eduction tube, a plunger therein, a downwardly opening valve in said plunger, a nipple at the upper end of said eduction tube, there being lateral liquid discharge openings adjacent the lower end of said nipple, means to allow the introduction of pressure fluid below said plunger, and means in said nipple to be engaged by said plunger and absorb the force of its upward movement.

2. In a pneumatic swab structure, an eduction tube having lateral discharge openings adjacent to its upper end, an elongated nipple above said openings, shock absorbing means at the upper end of said nipple, a plunger in said tube and means to introduce pressure fluid below said plunger.

3. In a pneumatic swab structure, an eduction tube having lateral discharge openings adjacent to its upper end, an elongated nipple above said openings, shock absorbing means, including a resilient cushion of flexible material at the upper end of said nipple, a plunger in said tube and means to introduce pressure fluid below said plunger.

4. In a pneumatic swab structure, an eduction tube having lateral discharge openings adjacent to its upper end, an elongated nipple above said openings, a tubular block of flexible shock-absorbing material fixed at the upper end of said nipple, a plunger in said

tube and means to introduce pressure fluid below said plunger.

5. In a pneumatic swab structure including an eduction tube having lateral outlet openings therein at its upper end, a plunger in said tube and means to introduce pressure below said plunger, the combination of a nipple connected with the upper end of said tube, means to close the upper end of said nipple and a resilient cushion for said plunger within said nipple.

6. In a pneumatic swab structure including an eduction tube having lateral outlet openings therein at its upper end, a plunger in said tube and means to introduce pressure below said plunger, the combination of means to close the upper end of said tube above said openings, and means to receive said plunger and absorb the force of its upward movement.

7. In a pneumatic swab structure including an eduction tube having lateral outlet openings therein at its upper end, a plunger in said tube and means to introduce pressure below said plunger, the combination of means to close the upper end of said tube and a rubber sleeve to receive said plunger and limit its upward movement.

In testimony whereof, I hereunto affix my signature this 16th day of August A. D. 1929.

NORMAN H. RICKER.