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GAS CHOKE FOR PLUNGER LIFT DEVICES

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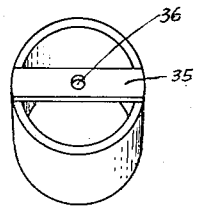


Fig. 3

Fig. 1

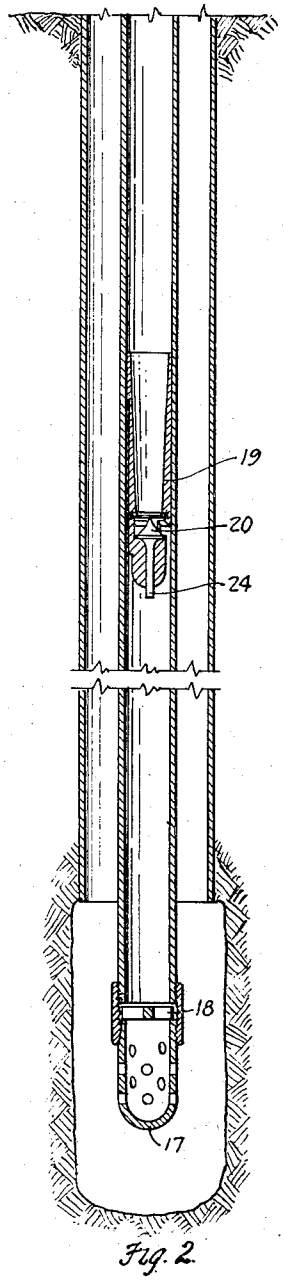


Fig. 2

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UNITED STATES PATENT OFFICE

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GAS CHOKE FOR PLUNGER LIFT DEVICES

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My invention relates to plunger lift apparatus and pertains particularly to an attachment to the discharge line to impede the passage of gas from the well.

In plunger lift devices where gas or air is employed to lift the plunger and its load of liquid, it is desirable to prevent the rapid exhaust of the gaseous fluid following the discharge of the liquid, but it is not desired to also choke down the flow of the liquid.

I desire to provide a choke device which will allow the free discharge of the liquid from the well but which will operate to slow down the passage of gas or air. This will allow the plunger to drop in the draft of gas exhausting from the eduction tube, but will not slow down the operation of the well.

I contemplate the provision of a control valve for the outlet flow line which will open to allow the liquid to pass, but which will close when the liquid has been ejected and choke down the passage of the gaseous fluid.

The invention resides in the construction and arrangement of the parts of my device, the apparatus being capable of considerable modification, however, in carrying out the invention.

In Fig. 1 is shown a central vertical section through the upper end of a plunger lift device with my improvement thereon. Fig. 2 is a similar view of the lower end of the same apparatus.

Fig. 3 is a perspective view of the valve employed.

My attachment is capable of use on any of the usual forms of plunger lift apparatus. I have shown an installation including an outer casing 1 set in the well. The upper end of said casing has a well head 2 thereon. The upper end of the head 2 is closed by a bonnet 3 which is threaded internally at 4 to engage with the extension 5 upon the eduction tube 6. The head has a pipe connection at 7 preferably for the introduction of pressure fluid; but which may be used as a vent or any similar purpose. There is also an outlet port 8 adjacent the upper end of the head.

Between the ports 7 and 8 is an internal flange 9 providing an upper shoulder 10 to support the head 11 upon the eduction tube 6. The head 11 is connected with the eduction tube at its lower end and is formed with a seat 12 at its upper end to interfit with the tubing extension 5. Said extension has discharge slots 13 within the well head 2 and is extended above the bonnet. A cap 14 closes its upper end and a buffer 15 of rubber in said cap acts as a resilient stop member for the plunger if it accidentally is blown too far. A vent 16 is provided at the upper end of the cap for use when desired.

The eduction tube 6 extends to the proper depth in the liquid in the well. It has a strainer plug 17 at its lower end. A stop member 18 above the plug 17 limits the travel of the plunger 19.

Said plunger is of ordinary construction and has an upwardly closing valve 20, the stem 21 on which projects below the body of the plunger.

My attachment is connected with the outlet 8. It includes a T-shaped fitting 22 connected to the outlet pipe 23. The upper branch of the fitting is connected with a float chamber 24, having a cap 25 at its upper end. Said cap has an opening therein at 26 to receive the bypass pipe 27 having an adjustable choke nipple 28 thereon of any preferred construction.

The lower end of the fitting 22 connects with a special nipple 31, the upper end of which is reduced in diameter and projected into the interior of the fitting. The reduced upper end has a cage 32 thereon with lateral ports 33 therein. The outer surface of the cage 32 is cylindrical and a valve member of the sleeve type 34 fits closely but slidably thereon.

The construction of the valve is shown in Fig. 3. It includes the cylindrical sleeve 34 open at both ends but having a diametrical plate 35 at its upper end. Said plate has a central opening 36 to receive a stem 37 which fits loosely therein. Said stem has a head 38 at its lower end below said plate 35 and a nut 39 spaced slightly above said plate to allow a small amount of lost motion in the operation of the valve.

A float 41 is connected with the upper end

of the stem 37. This float is a cylindrical member closed at its upper end by the cap 40 to which the stem is attached. There is a stop 30 secured to the cap 25 to limit the upward movement of the float.

The nipple 31 is connected with the flow line 42 leading to a separator or to storage. The nipple is also connected with the gas outlet 27 by the bypass 29.

This device operates in the usual manner in raising liquid from the well. The plunger with its load of liquid is raised by gas pressure from below and the liquid will discharge through the outlet line 23 to the valve chamber. The float chamber 24 will be filled with liquid and the float will rise to open the valve 34 and allow the liquid to flow into the flow line. When the liquid has been discharged, the plunger will move past the outlet slots 13 in the flow line and the gas and liquid in the extension 5 will stop the plunger and open the valve.

If the gas behind the plunger were allowed to exhaust rapidly, it would interfere with the dropping of the plunger to the bottom. The gas exhaust is therefore slowed down by forcing it to pass through the choke member 28. This will be accomplished by the dropping of the float 41 and the valve 34, thus closing the outlet directly to the flow line and compelling the gas to use the bypass 29 where its speed of flow will be restricted.

This will allow the plunger to drop, with its valve open, to the bottom where the contact of the valve stem 21 with the submerged stop member 18 will place the plunger in position to raise another load.

By providing a choke which allows free outlet for the liquid, but which slows down the outlet of the gas, the cycle of operations at each stroke of the plunger is speeded up and a saving of time is accomplished. This increases the daily output from the well and is of financial advantage to the operator. The device is simple in construction and can be rapidly attached to any ordinary plunger lift installation.

What I claim as new is:

1. The combination with a plunger lift device having an eduction tube, a pneumatically operated swab therein, and a flow line therefrom, of a valve in said flow line, a constricted bypass past said valve, and automatic means to open said valve to allow passage of liquid, and to permit said valve to close when said liquid has passed.

2. In combination, a plunger lift device including a pneumatically operated means to raise liquid from the well and having a discharge line connected therewith; a valve chamber in said discharge line, a valve in said chamber, means operated by liquid in said chamber to open said valve, said valve being closed by gravity, and a bypass in said line around said valve.

3. In combination, a plunger lift device including a pneumatically operated means to raise liquid from the well and having a discharge line connected therewith; a valve chamber in said discharge line, a valve in said chamber, a float on said valve to open and close the same, a bypass in said line around said valve, and a choke device in said bypass to limit the passage of fluid therein.

4. In a plunger lift device including a pneumatically operated means to raise liquid from the well and a flow line connected therewith for liquid and gas, a valve chamber in said line, a valve controlling the passage of fluid directly through said chamber, means to automatically open said valve actuated by liquid in said chamber, and means to restrict the flow of gaseous fluid from said chamber.

5. In a plunger lift device, an eduction tube, a pneumatically operated plunger therein a flow line connected with said tube, a chamber in said flow line, means in said chamber to prevent the passage of gas but allowing free passage of liquid therethrough, and additional means to provide for a continuous and restricted flow of gas therefrom into said flow line.

6. The combination with a plunger lift device having an eduction tube, a pneumatically operated swab therein, and a flow line therefrom, of a valve in said flow line, and means operating in response to the liquid in said line to open said valve to allow the passage of liquid, and to close said valve when said liquid has passed.

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