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GAS LIFT APPARATUS
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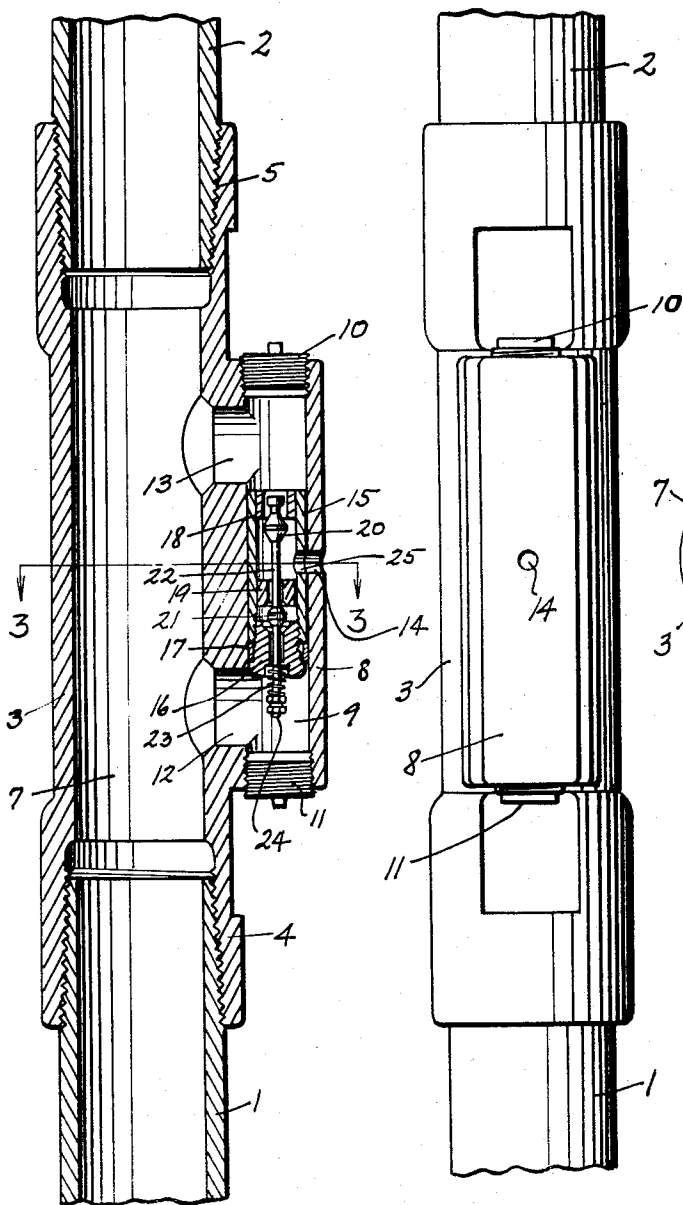


Fig. 1.

Fig. 2.

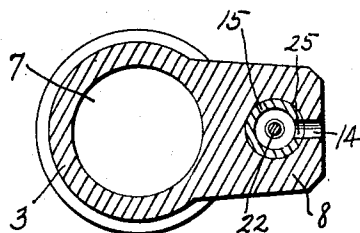


Fig. 3.

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GAS LIFT APPARATUS

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2 Claims. (Cl. 103—232)

This invention relates to a well flowing apparatus and has for its general object the provision of an efficient and inexpensive mounting for a valve for controlling the admission of air or gas under pressure into an eduction tubing for conducting fluid upwardly.

It is well known that in flowing wells an eduction tubing is usually run into a well within a casing comprising a pipe of larger size than the tubing, and the liquid from the well is permitted to flow therefrom through this tubing as long as the natural producing formation pressure is sufficient to cause such flow. When the formation pressure is originally or eventually becomes so low that it will not force the liquid from the well, artificial means are resorted to for causing the well to flow.

Among these artificial means for causing a well to flow is the means known as air lift or gas lift, wherein air or gas under pressure is forced into the annular space within the casing and admitted to the tubing at a point or points below the static level of the liquid in the well to cause the well to flow. Valves of various types have been devised for controlling this flow into the tubing and various fittings for mounting these valves have been provided. This invention has to do particularly with these fittings and with the manner of mounting the valves therein. However, these fittings have in the past been complicated and expensive to construct, have required the use of gaskets, etc., for sealing one part thereof to another, or have required that certain highly difficult fitting and seating operations be performed within the fitting itself.

It is an object of this invention, therefore, to provide a fitting of the type set forth which will be simple in design and require a minimum of expensive construction operations.

Another object is to provide a fitting of the type set forth which will not require the use of gaskets or the like.

Another object is to provide a valve mounting which will render it unnecessary to perform any difficult fitting or seating operations within a fitting which would interfere with those operations.

Other objects and advantages will become apparent from the following description and the accompanying drawing wherein is set forth, by way of illustration, one embodiment of my invention.

In the drawing:

Fig. 1 is a vertical cross section through a fitting constructed in accordance with this invention, illustrating a valve in place therein.

Fig. 2 is a side elevation of the same structure, looking from the right as the structure appears in Fig. 1.

Fig. 3 is a horizontal cross section taken along the line 3—3 of Fig. 1.

The numerals 1 and 2 indicate sections of the well tubing to which the body 3 of the fitting forming part of this invention is secured by means of internal threads 4 and 5 at its lower and upper ends, respectively. This body 3 has a liquid flow channel 7 therethrough in alignment with the remainder of the tubing and adapted to conduct liquid from the well to the surface of the ground. It is noted that this channel is unobstructed when the valve is in place.

The body 3 is formed with an integral lateral extension 8 having a bore 9 therethrough threaded at its opposite ends to receive upper and lower closure plugs 10 and 11 which completely close the ends of this bore. Passageways 12 and 13 provide communication between the bore 9 and the liquid flow channel 7 adjacent the lower and upper ends, respectively, of the bore 9, and a lateral passageway or opening 14 provides communication between the exterior of the fitting and the bore.

The fitting just described may be made of cast metal with the channel 7 and the openings 12 and 13 preferably cored, but the lateral extension 8 is cast solid except for the openings 13 and 14, and the bore 9 formed by drilling out to provide a smooth internal surface. The opening 14 is also preferably drilled.

Pressed into that portion of the bore 9 between the openings 12 and 13 is a valve housing and valve structure consisting of a tubular valve housing 15, a threaded bushing 16, and a spacer ring 17, all of which are of the same outer diameter as the inner diameter of the bore 9 and adapted to be forced therein with a press fit, the valve seats 18 and 19, the valve elements 20 and 21, the valve stem 22, the spring 23, and the adjusting nuts 24 on the valve stem. The valve housing 15 is internally threaded at its lower end to receive the bushing 16 and the ring 17 is interposed therebetween to facilitate the adjustment of the bushing. The housing 15 is also provided with a lateral opening 25 adapted when the housing is pressed into place in the bore 9 to register with the opening 14 through the fitting.

The relative large upper valve seat member 18 and the lower one 19 are press fitted into the housing 15 in position to properly seat the relatively large upper valve element 20 and the relatively small lower element 21, respectively. The

spring 23 constantly urges the elements 20 and 21 away from their seats and its tension is adjusted by means of the nuts 24.

5 The valve and housing assembly is first assembled as a unit outside the fitting 3 and the valve elements ground in and seated on their respective valve seats, and the spring adjusted to its proper tension. The entire assemblage is then inserted as a unit into one end of the bore and pressed into position, after which the ends of
10 the bore are completely closed by the plugs 10 and 11.

While the valve illustrated forms as such no part of this invention, and it is to be understood
15 that any valve may be used which is capable of cooperation in substantially the same manner with the fitting set forth, the operation of the valve illustrated will be set forth as follows:

The valve elements 20 and 21 are normally held
20 away from their seats 18 and 19 by the spring 23. As the air or gas under pressure enters through the openings 14 and 25, past the valve elements 20 and 21 into the tubing, it forms an air piston beneath the fluid standing in the well
25 and forces it upwardly. As this liquid moves up and out of the well the pressure within the tubing at the valve decreases and the flow of air or gas into the tubing increases. This flow has a greater effect on the large upper element 20 than on
30 the small lower element 21, and when said flow becomes great enough the resultant force exerted upon the valve stem overcomes the spring 23 and closes the valve.

The air already admitted continues to expand
35 and force the liquid out of the well, after which the liquid again begins to rise in the tubing.

When this liquid rises high enough so that it causes a pressure upon the valve elements 20 and 21 sufficient to overcome the action of the air pressure in the casing thereon, the spring 23 will again move the elements from their seats and
5 open the valve.

It will be seen from the foregoing that a means has been provided for carrying out all of the objects and advantages sought by this invention.

Having described my invention, I claim:

10 1. In combination, a body having a liquid flow channel therethrough, a laterally positioned bore in communication with said channel and opening at one end to the exterior of said body, and a lateral opening from said bore to the exterior of
15 said body, a valve housing and valve therewithin insertible as a unit through said one end and fitted snugly within said bore, said housing having a passageway registering with said lateral opening whereby said valve can control flow
20 therethrough, and removable means for closing said end of said bore.

2. In combination, a body having a liquid flow channel therethrough, a laterally positioned bore in communication with said channel and opening
25 at one end to the exterior of said body, and a lateral opening from said bore to the exterior of said body, a valve housing insertible through said one end and fitted snugly within said bore and having a passageway registering with said lateral
30 opening, a valve within said valve housing for controlling flow inwardly through said lateral opening, and removable means for closing said end of said bore.

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