May 6, 1930. W. H. HUGHES 1,757,460

FLUID ELEVATOR

Filed Feb. 28, 1928

Fig. 1

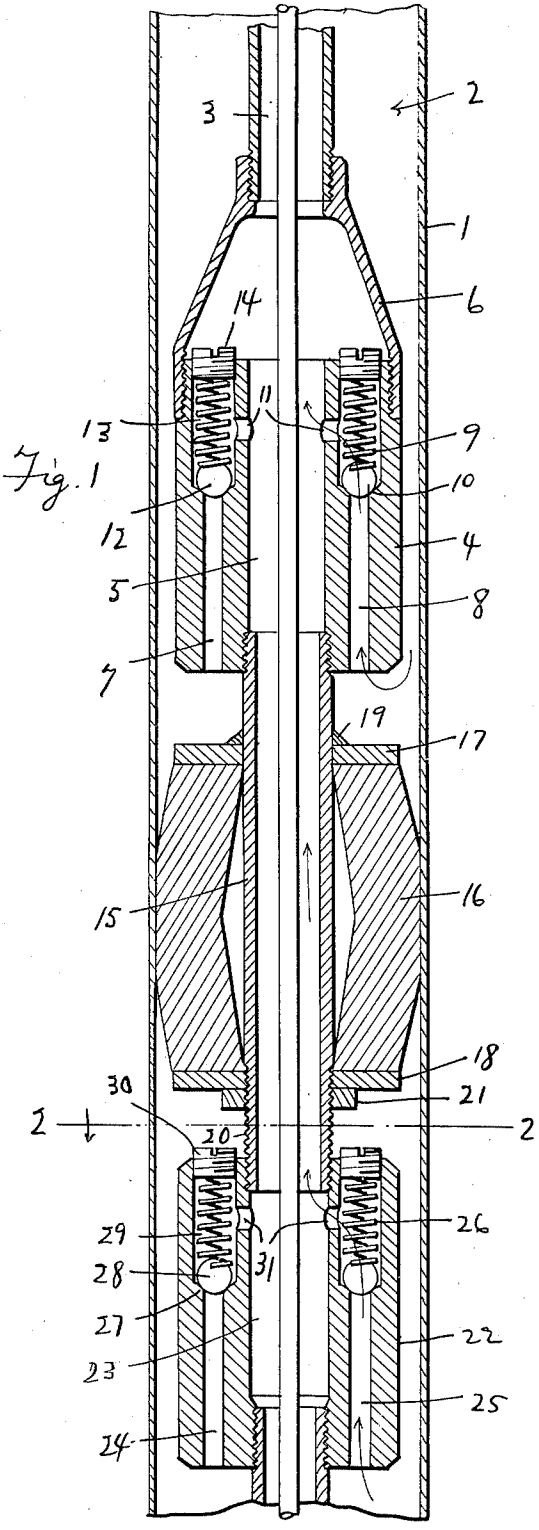
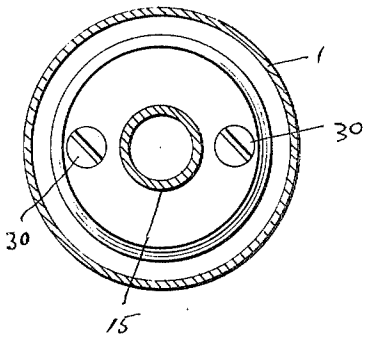


Fig. 2.



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FLUID ELEVATOR

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The present invention relates to improvements in fluid elevators for use in conjunction with oil and water wells.

One of the important objects of the present invention is to provide a fluid elevator wherein a packer is associated with the eduction pipe or tube for engagement with the well casing so that a fluid under pressure that is utilized for the purpose of lifting the liquid column in the eduction pipe will be prevented from coming in contact with the liquid below the packer and thus preventing the disturbance of the sand and causing back pressure.

A further object of the invention is to provide a fluid elevator of the above mentioned character wherein a heated fluid is forced downwardly in the well for admission to the eduction pipe where the same commingles with the upwardly flowing liquid and is discharged with the liquid at the top of the well.

A further object is to provide a fluid elevator of the above mentioned character which is simple in construction, inexpensive, strong and durable and further well adapted to the purpose for which it is designed.

Other objects and advantages of the invention will become apparent during the course of the following description when taken in connection with the accompanying drawing.

In the accompanying drawing wherein like reference characters indicate corresponding parts throughout the several views:

Figure 1 is a sectional view of an oil well casing showing the eduction pipe within the casing, and

Figure 2 is a transverse section taken approximately on the line 2—2 of Figure 1.

In the drawing wherein for the purpose of illustration is shown the preferred embodiment of my invention, the numeral 1 designates the usual casing that extends downwardly into the well in the manner well known in the art. An eduction pipe or tube that is designated generally by the numeral 2 is arranged centrally within the casing and the same includes a plurality of interconnected units.

The uppermost unit comprises a pipe section 3 of relatively small diameter the same being threaded at its lower end. The next lower unit comprises a cylindrical head 4 that is formed with a central bore 5, the lower end of which is threaded. The upper portion of the cylindrical head 4 is externally threaded and is spaced with respect to the lower end of the pipe section 3 but is connected thereto by means of the coupling 6.

This cylindrical head 4 is formed with two or more longitudinally extending fluid passages 7 and 8, respectively, the same being arranged on opposite sides of the bore 5 and these passages extend for the full length of the cylindrical body. The upper portion of each passage is enlarged as illustrated at 9 and the shoulder formed at the juncture of each fluid passage and its enlarged upper portion provides a valve seat 10.

Each of the fluid passages of the upper cylindrical head 4 communicates with the bore 5 through the medium of the outlet openings 11 formed adjacent the top of the head as clearly illustrated in Figure 1.

A ball valve 12 is normally held in engagement against the valve seat 10 of each fluid passage by the expansible coil spring 13 arranged in each of the enlarged portions 9 of the fluid passages and the tension of the coil spring is regulated by means of the screw plug 14 threaded in the upper end of each fluid passage as also clearly illustrated in Figure 1 of the drawing. The cylindrical head 4 is spaced into the casing 1 whereby to provide an annular passage for the lifting fluid.

The next lowermost unit of the sectional eduction tube consists of an elongated pipe 15 that is threaded at its upper end in the internally threaded lower end of the bore 5 of the upper cylindrical head 4, the lower end of the pipe 15 being also externally threaded. This pipe 15 is of substantially the same diameter as the uppermost pipe section 3 and supported on this intermediate pipe section 15 is the rubber packer 16.

Upper and lower metallic rings 17 and 18 respectively are arranged for disposition against the upper and lower ends of the rubber packer 16. The upper ring 17 is welded or otherwise secured to the upper portion of

the pipe 15 as illustrated at 19 while the lower ring 18 is threaded on the threaded portion 20 of the pipe 15 whereby said rubber packer 16 may be expanded or contracted, and a washer or nut 21 is threaded on the threaded portion of the pipe 15 for engagement with the bottom face of the threaded ring 18 in the manner as clearly shown in Figure 1 whereby to hold said vertically adjustable ring in its proper position.

This rubber packer is adapted to engage the inner wall of the casing 1 whereby to provide a liquid seal so that the lifting fluid will not come in contact with the sand, and furthermore the oil or other liquid in the lower portion of the casing will not be subjected to agitation by coming in contact with the fluid under pressure that is employed for lifting the liquid.

The sectional eduction tube 2 further includes a lower cylindrical head 22 that is somewhat similar to the upper cylindrical head 4 and this cylindrical head 22 is formed with a central bore 23 that is internally threaded at its respective ends, the upper end of the bore being threaded on the lower threaded end 20 of the intermediate pipe section 15. This lower cylindrical head 22 is formed with the opposed vertical liquid passages 24 and 25 that extend for the full length of the head and the upper portion of each passage is enlarged as indicated at 26 and the shoulder formed at the juncture of the enlarged portion with each liquid passage provides a seat 27 for the ball valve 28 and an expansible coil spring 29 is arranged in each of the enlarged portions 26 for normally holding the valve 28 in a closed position against the seat 27. The plug 30 is secured by threading the same in the upper end of each enlarged portion 26 for adjusting the tension of the respective spring.

Communication between the liquid passages 24 and 25 and the bore 23 is obtained through the medium of the outlet openings 31. A lower pipe section 32 is secured at its upper end in the lower end of the bore 23 of the cylindrical head 22 and the lower portion of this pipe extends downwardly to the bottom portion of the well.

With the parts arranged as shown in the drawing, the packer 16 will form a liquid seal, and the lifting fluid under pressure that enters the top of the casing will flow downwardly in the casing around the upper pipe section 3 and the upper cylindrical head 4 and will then pass upwardly in the passages 7 and 8 and unseat the ball valves 12 so that said fluid will enter the eduction pipe or more particularly the bore 5 whereby to create a vacuum to assist in the upward flow of the liquid through the eduction pipe, the liquid entering the lower portion of the pipe through the liquid passages 24 and 25, and the openings 31, it being understood of course that the ball valves 28 are unseated by the liquid as the same flows upwardly.

If a hot lifting fluid is employed, the eduction pipe will be heated and the heated lifting fluid will be forced upwardly with the liquid through the top of the casing.

While I have shown the preferred embodiment of my invention it is to be understood that various changes in the size, shape and arrangement of parts may be resorted to without departing from the spirit of the invention and the scope of the appended claim.

Having thus described the invention, what I claim as new is:—

Valve means for fluid elevators including a casing with an eduction tube passing therethrough and a packing on the tube for engaging the casing; a head structure on the eduction pipe below the packing, said head being spaced from the casing and provided with a central bore for registry with the eduction pipe, said head being further provided with vertical bores, said head being provided with counter bores extending downwardly from its upper end and communicating with the first-mentioned bores, the said counter-bores communicating with the central bore at their intermediate portions, valve elements in the counter bores, said elements being adapted to seat at the lower ends of the counter bores to close the said first-mentioned bores, threads within the upper portion of each counter bore, a threaded plug for the threaded portion of each counter-bore, a spring for interposition between each plug and its corresponding valve element, said plug adapted to be fed inwardly of the head structure to vary the tension of the spring.

In testimony whereof I affix my signature.

WILLIAM H. HUGHES.