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C. B. LEWIS ET AL

RELIEF VALVE FOR DEEP WELL PUMPS

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Fig. 1.

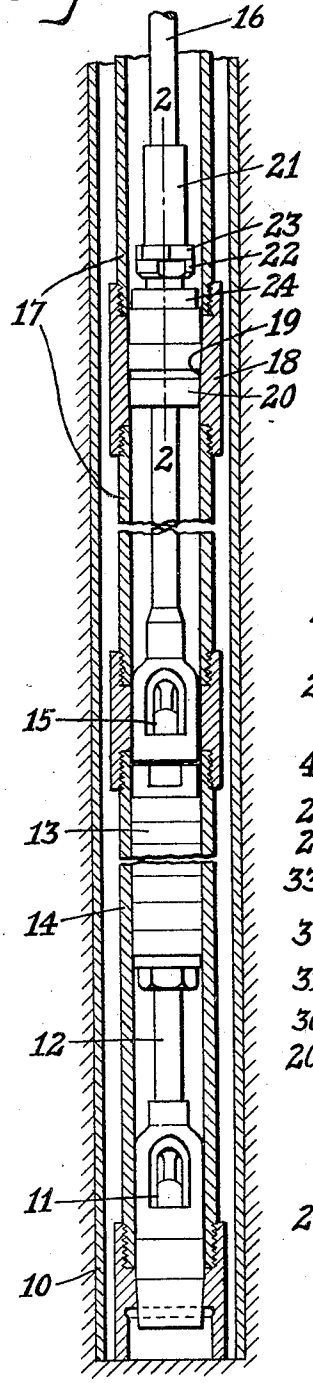


Fig. 2.

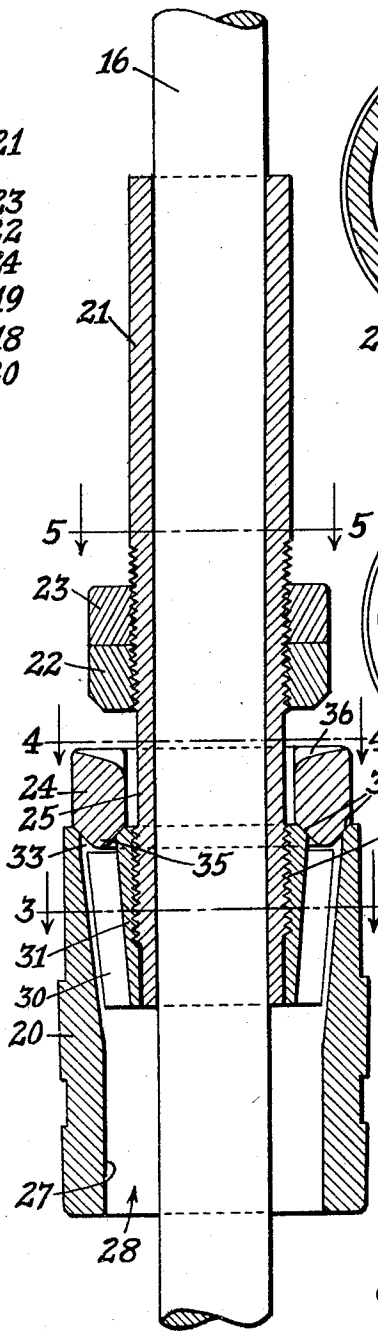


Fig. 3.

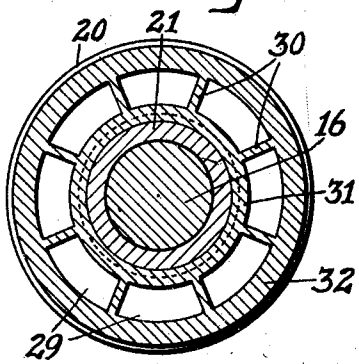


Fig. 4.

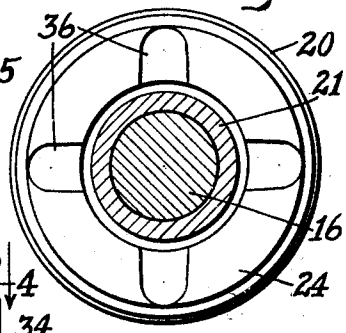
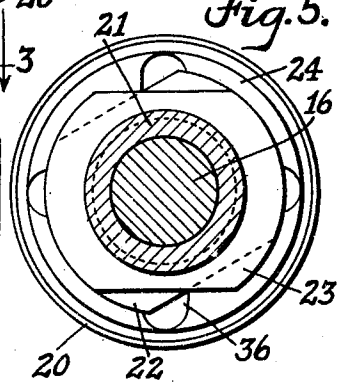


Fig. 5.



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UNITED STATES PATENT OFFICE.

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RELIEF VALVE FOR DEEP-WELL PUMPS.

Application filed September 20, 1926. Serial No. 136,516.

Our invention relates to valves for deep well pumps and more particularly to an improved relief valve for oil well pumps.

The main object of our invention is to provide an improved relief valve or check valve for use above the plunger in an oil well pump, for the purpose of relieving the pressure on the plunger thereof during its downward stroke, and also for the purpose of preventing sediment, particularly sand, from settling and packing around the plunger valve.

A further object is to provide a relief valve, for use as described, having a freely floating flapper which makes contact with a double seat so as to insure positive and complete closure of the valve openings and dependable action of the valve at all times.

A further object is to provide a valve, of the character described, which readily may be cleared of sediment, after having been idle for a time, thus facilitating the resumption of pumping operations.

Other objects and advantages will appear hereinafter and while we show herewith and will describe a preferred form of construction, we desire it to be understood that we do not confine ourselves to such preferred form but that various changes and adaptations may be made therein without departing from the spirit of our invention as hereinafter claimed.

Referring to the drawings which accompany this specification and form a part thereof.

Fig. 1 is a vertical sectional view of the lower part of an oil well and of a pump therein which is equipped with our improved relief valve.

Fig. 2 is an enlarged sectional view of the relief valve shown in Fig. 1, taken on line 2—2 of that figure.

Figs. 3, 4 and 5 are transverse sectional views of the relief valve taken on lines 3—3, 4—4 and 5—5, respectively, of Fig. 2.

Considered more in detail the drawings show a well casing 10 within which is a pump having the usual standing valve 11, Garbutt attachment 12, plunger 13, working barrel 14, plunger valve 15, polish rod 16 and pump tubing 17. A coupling shoe 18, having a slightly tapered seat 19, connects two sections of the pump tubing above working barrel 14, said coupling shoe being especially adapted to receive and support our improved relief valve.

The valve consists of a tubular standing or fixed part 20, adapted by its slightly tapered lower end to rest in seat 19 of shoe 18, a guide-sleeve 21, having its lower end screwed into the upper end of fixed part 20, a limiting nut or stop-nut 22 and a lock-nut 23 screwed onto said guide-sleeve, in spaced relation to said fixed part 20, and a movable part or flapper 24 which encircles said guide-sleeve between said nut 22 and the upper end of fixed part 20. The bore of guide-sleeve 21 is of a diameter slightly larger than that of polish rod 16 so that the latter may move freely therein, as it reciprocates vertically, and the threads of said guide-sleeve, between nut 22 and fixed part 20, are removed so as to leave a reduced smooth section 25 therebetween upon which flapper 24 may move freely under the influence of the varying pressures to which it is subjected.

The upper half, or thereabouts, of the fixed part of the valve has a threaded bore 26 adapted to receive the threaded lower end of guide-sleeve 21 and the lower half has an enlarged bore 27 providing an annular space 28, around the polish rod, through which the upwardly flowing liquid may pass. Vertical openings or ducts 29, communicating with annular space 28 are cut in the upper end of fixed part 20, leaving radial partitions or arms 30 and an inner sleeve 31 which form a connecting spider therein between guide-sleeve 21 and the outer sleeve 32 thereof, as shown in Figs. 2 and 3, The upper ends of radial arms 30 are cut away, as shown in Fig. 2, so as to leave an annular channel 33, in the upper end of fixed part 20, and the inner edges of the channel walls are slightly beveled, as at 34, thus forming two concentric annular seat faces on which the flapper rests when the valve is closed.

The flapper 24 is made in the form of a short heavy sleeve or ring having an inner diameter sufficiently greater than the outer diameter of guide-sleeve 21 to insure free movement of the former on the latter and an outer diameter somewhat less than that of outer sleeve 32 of fixed part 20. The lower end of the ring-flapper is beveled to form an annular V-shaped ridge 35 thereon, the angle of which corresponds to that of the seat faces 34, said V-shaped ridge thus being adapted to drop into annular channel 33 and make double contact with said annular seat faces. Radial grooves 36 are cut in the upper end of ring-flapper 24 to permit a flow of liquid

to the inner side of the ring so as to equalize the pressure on all sides thereof, especially when in contact with stop-nut 22.

The valve, thus made, and placed as shown in Fig. 1, serves as a check valve which permits an upward flow and prevents a downward flow of liquid through the pump. During the upward stroke of the plunger 13 the upward pressure of the liquid, as it flows through openings 29 of the valve, overbalances the downward pressure of the liquid in the upper part of the pump and lifts flapper 24 from its seat 34. As soon as the plunger has reached the limit of its upward stroke, flapper 24 falls back onto its seat where it is rigidly held, during the downward stroke of the plunger, by the downward pressure of the liquid above.

It will be seen that the construction of our valve provides ample clearance for the flapper so that it has exceptional freedom of action. This particular arrangement of the flapper also enables the valve to clear itself of sediment, if not too considerable in amount, when operation of the pump is resumed after a period of rest. This construction also permits the withdrawal of the plunger from the pump when such withdrawal becomes necessary, the valve being so seated that it will pull out with the plunger when the plunger valve comes in contact therewith.

Having thus illustrated and described our invention we claim:

A relief valve for deep well pumps, comprising a fixed tubular member having a seat in its upper end, a central guide extending above said fixed member, said guide being adapted to receive the polish rod of a pump, and a vertically movable ring-flapper directed by said guide, said ring-flapper being adapted to seat on said seat, the upper end of said ring-flapper being provided with radial grooves, and a nut to limit the upper movement of said ring-flapper, said radial grooves equalizing the pressure on all sides of said ring-flapper when the latter is in contact with said nut.

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