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S. N. HALL.
PUMP.

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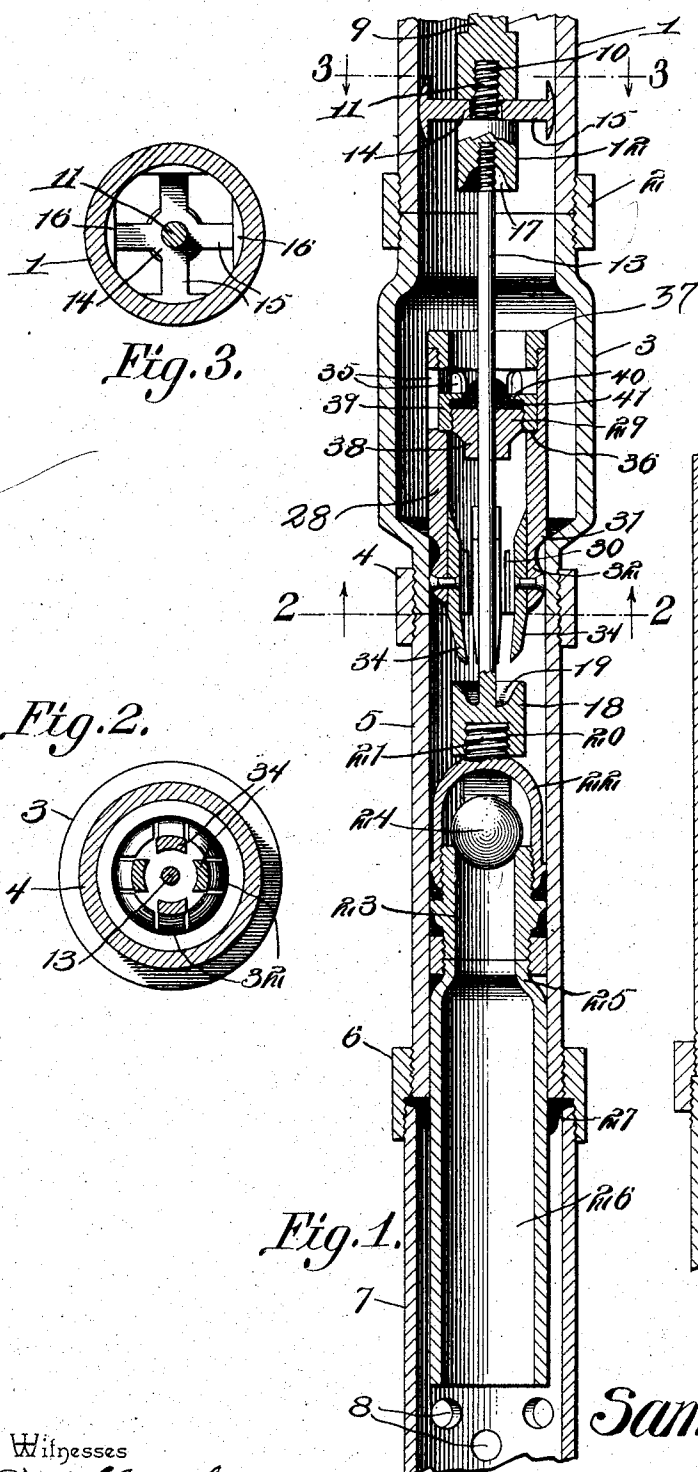
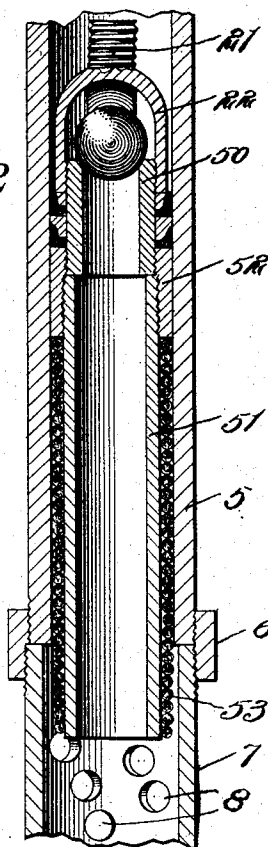


Fig. 4.



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PUMP.

SPECIFICATION forming part of Letters Patent No. 780,993, dated January 31, 1905.

Application filed November 17, 1903. Serial No. 181,540.

To all whom it may concern:

Be it known that I, SAMUEL N. HALL, a citizen of the United States, residing at Houston, in the county of Harris and State of Texas, have invented a new and useful Pump, of which the following is a specification.

This invention relates to pumps, and more especially to pumps for use in deep wells, such as oil-wells.

The principal object of the invention is to improve the construction of pumps of the type specified by providing improved means for detachably securing in position at the top of the working barrel of the pump a casing provided at the top with a check-valve in order to facilitate the removal of the casing from the well with the piston and to make the reinsertion of the casing with the piston easier of accomplishment.

A further object of the invention is to provide an improved form of packing-washer upon a check-valve in the casing to compensate automatically for wear of the sucker-rod by movement through the valve and to provide on the sucker-rod a device adapted for cooperation with the novel packing-washer to keep it always in operative position.

A further object of the invention is to provide novel devices attached to the sucker-rod for guiding the said rod in its reciprocations within the well-tube.

Another object of the invention is to provide at the bottom of the working barrel of the pump a novel form of packing-washer adapted for close contact with the outer surface of the hollow piston to prevent the upward passage of sand between the outer surface of the piston and the barrel of the pump.

In the attainment of the objects above stated and other objects of minor character, which will appear as the invention is more fully disclosed, I make use of the novel construction and combination of parts of a pump herein-after described, illustrated in the accompanying drawings, forming a part of this specification, and having the novel features thereof particularly pointed out in the appended claims, it being understood that changes in the form, proportions, and exact mode of assemblage of

the elements exhibited may be made without departing from the spirit of the invention.

In the drawings, Figure 1 is a view in vertical longitudinal section through the lower portion of a well-tube and the pump mechanism associated therewith. Fig. 2 is a view in transverse section on the line 2 2 in Fig. 1. Fig. 3 is a transverse section on the line 3 3 in Fig. 1. Fig. 4 is a view in longitudinal section through a modified form of pump mechanism, showing a different form of packing to prevent the upward passage of sand into the pump-barrel.

Referring to the drawings, in which corresponding parts are designated by similar characters of reference, 1 designates the bottom section of the well-tube proper, to which is attached, by means of a threaded collar or coupling 2, a housing 3, secured, by means of a coupling or member 4, at the top of the working barrel 5 of the pump. The working barrel is secured, by means of a threaded coupling 6, upon the top of a foot-pipe 7, provided with a plurality of perforations 8 for the admission of oil or other liquid into the interior of the pipe. A sucker-rod 9 reciprocates within the well-tube and is provided at the bottom with a threaded socket 10 for the reception of a threaded projection 11 at the top of a member 12, in the lower end of which the piston-rod proper, 13, is screwed. The member 12 has fitted over the threaded projection 11 a plate 14, having a plurality of radially-disposed arms 15—in this instance four in number—each of which is provided at the end with a rounded head 16. The member 12 is provided at the bottom with a cavity 17 of approximately conical form, whose utility will presently be explained. The piston-rod 13, which has its upper end screwed into the member 12, is provided at its lower end with a circular enlargement 18, which is provided on the upper surface with a cavity 19, which tapers toward the bottom, as shown in Fig. 1. The enlargement 18 is provided on the lower surface with a threaded socket 20 for the reception of a threaded projection 21 at the top of the cage 22, secured upon the top of the piston 23 to retain the ball 24, which forms a

lifting-valve, in position above the piston. The piston 23 consists, preferably, of a tubular member having a contracted throat 25 at the top of the larger chamber 26 below. On the outside of the constricted upper portion 5 suitable packing devices of any preferred character are provided. The piston is arranged for reciprocation in the barrel 5, but at the bottom of its stroke passes down into the foot-pipe 7, as shown. In order to prevent sand from passing upward into the space between the piston 23 and the barrel 5 of the pump, packing devices of suitable character are provided. In the preferred form of the invention the packing-devices employed for this purpose consist of a washer 27, of leather or other suitable material, secured between the upper end of the foot-pipe 7 and the lower end of the pump-barrel 5, the threaded coupling member 6 being so formed that it also engages with the upper surface of the packing-washer 27 and forces it firmly against the upper end of the foot-pipe 7. The internal diameter of the packing-washer is considerably less than the external diameter of the lower portion of the piston 23, and consequently when the piston is forced through the opening in the washer the washer will take the form shown in Fig. 1, the central portion 30 being depressed and lying in contact with the outer surface of the piston. The washer 27 is retained in this position by the pressure exerted thereon by the mixture of sand and oil in the foot-pipe when the piston is forced downward into the foot-pipe, as shown in Fig. 1. Consequently the packing-washer prevents any sand from passing upward between the piston and the working barrel, and it adapts itself automatically to the reduced diameter of the piston as the piston becomes worn from use.

A casing 28 of cylindrical form and of smaller diameter than the housing 3 is fitted into the lower end of the housing to afford a support for the check-valve 29 at the top of the casing. The casing has a plurality of kerfs or slits 30 formed in the lower end thereof, which is reduced in size, as shown, to form an annular shoulder 31, adapted for contact with the lower portion of the housing 3. By means of the slits or kerfs 30 the lower portion of the casing 28 is formed of a plurality of tongues of metal 32, each of which is rendered elastic by the reduction of the external diameter of the casing just below the shoulder 31. Each of the tongues 32 has attached thereto by means of a rivet or screw an extension 34, which extends downward into the barrel of the pump, as shown, and is bent inward toward the piston-rod. The extensions 34 have their lower ends bent inward sufficiently to cause them to enter the cavity 19 in the enlargement 18 at the lower end of the piston-rod when the piston is drawn upward to move the piston from the well.

The elasticity of the tongues 32 causes them to press upon the inner surface of the lower end of the housing 3 with sufficient force to retain the casing in position when the parts are in the position shown in Fig. 1; but when the piston-rod is drawn upward the lower ends of the extensions 34 enter the cavity 19 and the tapered form of the cavity causes the said extensions to be pressed inward as the piston-rod is drawn up, so that the tongues 32 are forced out of contact with the housing and the casing 28 is free to rise with the piston-rod. Similarly when the piston is reinserted into the pump the extensions 34 are pressed inward by being inserted into the cavity 19, and the casing 28 will then descend with the piston until the shoulder 31 contacts with the constricted portion of the housing 3 and further downward movement of the housing is checked. The continued downward movement of the piston releases the extensions 34 from engagement with the side of the cavity 19 and permits the tongues 32 to spring outward into contact with the housing to retain the casing in proper position.

At the top of the housing, which is provided with a plurality of slots 35, there is provided a check-valve 29, which has a limited vertical movement in the casing, the downward movement being stopped by an annular shoulder 36 in the casing and the upward movement being limited by a collar 37, screwed into the top of the casing. The valve 29 comprises a member 38 of smaller diameter than the casing, which fits closely around the piston-rod, and a collar 39, threaded on the member 38 and provided at the top with an inwardly-disposed flange 40, which engages with a washer 41, of leather or other suitable material, and which rests upon the top of the member 38 and fits closely around the piston-rod. The internal diameter of the washer 41 is less than the diameter of the piston-rod, and consequently the washer presents a central upward projection of conical form, which is adapted to enter the cavity 17 at the bottom of the member 12. The downward movement of the piston-rod, which brings the member 12 into contact with the washer 41, causes the upper portion of the washer to be forced into contact with the piston-rod, and so insures such engagement of the washer with the piston-rod as will effectively prevent the backward flow of oil between the piston-rod and the washer. Thus it will be seen that the natural wear of the piston-rod from continued use, which would otherwise cause a leak in the check-valve, has no injurious effect upon the operation of the pump, because the washer 41 adapts itself to the reduced diameter of the rod as the wear of the rod occurs.

In Fig. 4 I have illustrated a modified form of the invention, in which the packing-washer 27, employed in the preferred form of the

invention at the top of the foot-pipe 7, is dispensed with and the piston 23 is replaced by a piston of somewhat different form. The modified form of piston consists of a short tube 50, upon which the case 22 is secured, a longer tube 51 at the bottom of the short tube, and a threaded coupling 52, by which the two devices are connected. The packing devices are secured upon the short tube 50, as usual, and on the exterior of the longer tube 51, which has an external diameter less than the internal diameter of the working barrel of the pump, there is wound a cord 53, which is of suitable diameter to fill the space between the outer surface of the tube 51 and the inner surface of the working barrel of the pump. The cord 53 serves the same purpose as the washer 27 in preventing sand from getting between the threaded coupling 52 and the inner surface of the working barrel.

The operation of the improved form of pump will be readily understood from the drawings and from the foregoing description. The sucker-rod 9 is operated in the usual manner and is guided in its reciprocations by the member 14, mounted upon the member 12 at the bottom of the sucker-rod. The ends of the arms 15 rest in contact with the inner surface of the well-tube 1, and thus keep the sucker-rod properly centered throughout its entire range of movement. The downward movement of the piston allows the check-valve to close and causes the formation of a partial vacuum over the lifting-valve 24, so causing oil or other liquid to be drawn upward by suction through the valve 24 in the working barrel of the pump. Each upstroke of the piston causes the elevation of any liquid in the barrel of the pump and also causes the opening of the check-valve to permit the liquid so elevated to pass through the slots at the top of the casing and enter the housing within which the casing is secured. As the oil or other liquid increases in quantity above the check-valve the downward pressure of the liquid on the check-valve increases and the packing-washer will be pressed more and more firmly against the piston-rod to prevent backward flow of the oil through the space between the piston-rod and the check-valve.

The removal of the piston and other internal mechanism from the well-tube is accomplished, as already explained in a preceding paragraph, by simply drawing the sucker-rod upward. The extensions 34 at the bottom of the casing are forced inward by engagement with the tapering cavity in the enlargement 18 at the bottom of the piston-rod, so that the frictional engagement of the tongues 32 with the interior of the housing 3 at its lower end is completely overcome and the casing allowed to move upward with the piston-rod. By having the casing held in position by the frictional engagement of the tongues 32 with the lower portion of the housing instead of

employing positive locking-catches, as is often done, the possibility of the hanging of one or more of such catches and preventing the withdrawal of the casing from the well-tube is entirely obviated. In like manner by having the casing secured by the frictional engagement of the tongues with the housing the insertion of the casing into the well-tube and its proper positioning therein are insured. With positively-operating latches there is always a possibility of one or more of the latches failing to engage with the member provided for that purpose, and inaccurate positioning of the casing may result.

Having thus described the nature and operation of my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a deep-well pump, the combination of a working barrel, a foot-pipe of greater diameter than the working barrel, a washer member seated between the foot-pipe and the barrel, an exteriorly-disposed ring connecting said foot-pipe and barrel, and a reciprocating piston operatively engaging the working barrel at its upper end, said piston extending downwardly within the upper end of the foot-pipe, spaced from the latter, and in operative engagement with the washer between the foot-pipe and the working barrel.

2. The combination in a pump, a barrel, a reciprocating piston within said barrel, a foot-pipe of larger diameter than the barrel secured at the lower end thereof, and a packing-washer secured between said barrel and said foot-pipe and having the central portion thereof disposed downward to contact with the outer surface of the piston in the lower portion of its range of movement.

3. The combination in a pump, of a reciprocating piston-rod, a check-valve surrounding said piston-rod, a packing-washer provided on the top of said check-valve and having the central portion thereof disposed upward to form a conical elevation around said piston-rod, and a member secured on the top of said piston-rod and having a conical cavity adapted to engage the elevation and force said washer into close engagement with the piston-rod.

4. The combination in a pump, of a working barrel, a valve-casing removably secured in the upper end of said barrel, a piston-rod arranged for reciprocation in said barrel and said casing, a check-valve through which said piston-rod passes, a packing-washer mounted on said check-valve and surrounding said piston-rod, said packing-washer having the central portion thereof disposed upward, and means carried by said piston-rod for engaging with said packing-washer and forcing it into close contact with said piston-rod upon each downstroke of said rod.

5. The combination in a pump, of a piston-rod arranged for reciprocation in the pump, a check-valve surrounding said piston, a pack-

ing-washer secured upon the top of said check-valve and having the central portion thereof disposed upward and in close contact with the surface of the piston-rod, and a member mounted on said piston-rod and adapted for engagement with said washer upon each downstroke of the rod, said member being provided on its under surface with a conical concavity into which said washer is pressed upon each downstroke of the piston.

6. The combination in a pump, of a working barrel, a reciprocatory piston in the barrel, a foot-pipe of larger diameter than said

barrel secured below the barrel, said piston being adapted to extend below the barrel upon its downstroke, and packing devices arranged to prevent the passage of sand upward into the working barrel when the piston is raised.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

SAMUEL N. HALL.

Witnesses:

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A. J. ROSS.