No. 677,547. Patented July 2, 1901.

J. E. KIRK.

PUMPING APPARATUS.

(Application filed Oct. 9, 1900.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.

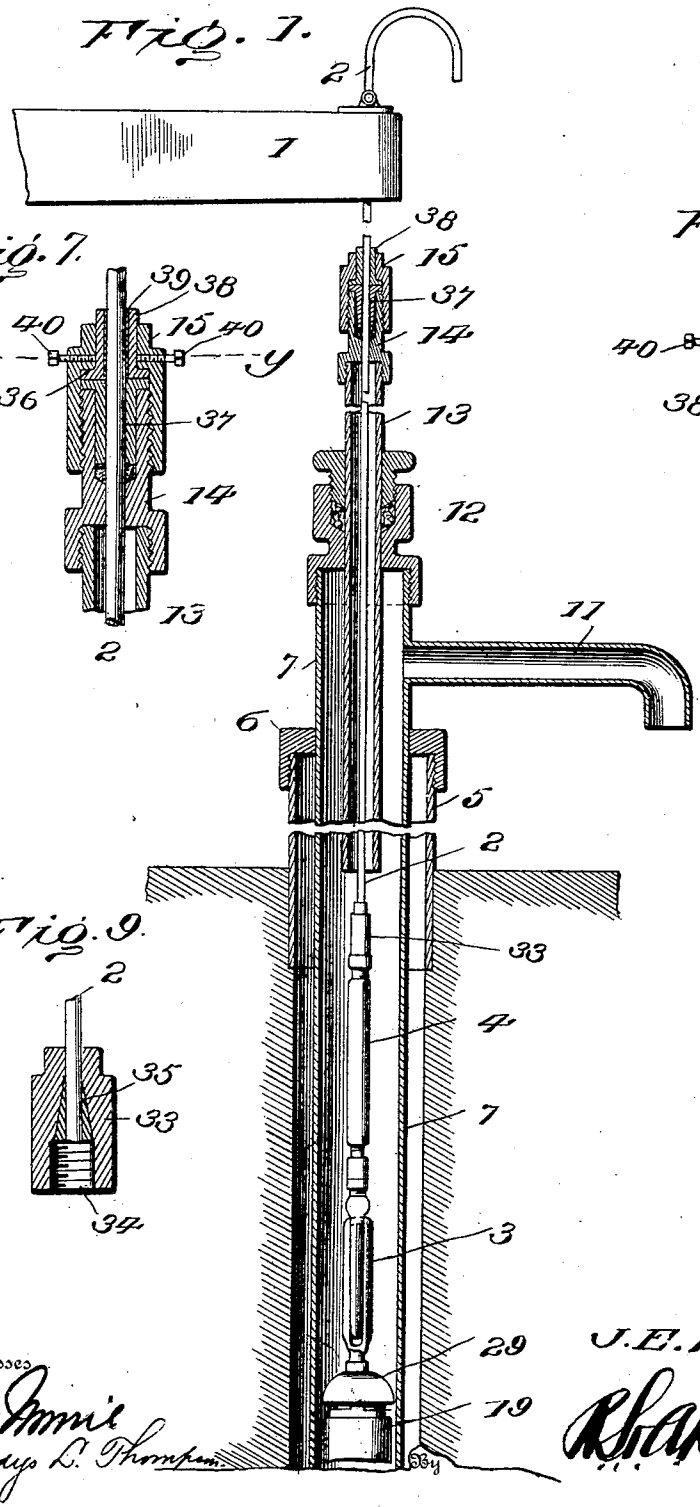


Fig. 7.

Fig. 8.

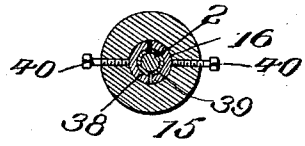


Fig. 9.

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Fig. 2.

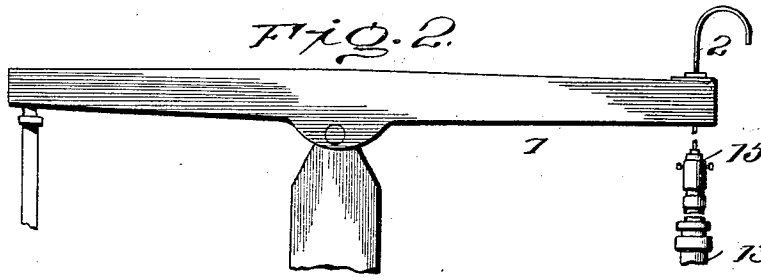


Fig. 3.

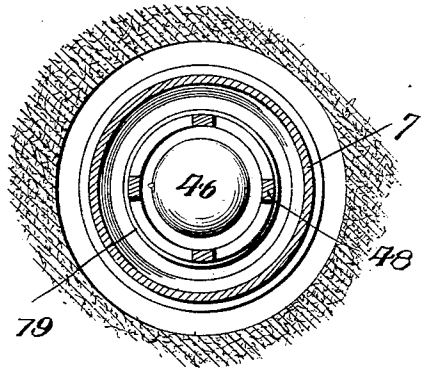
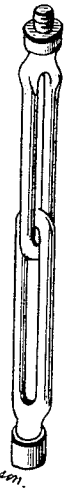
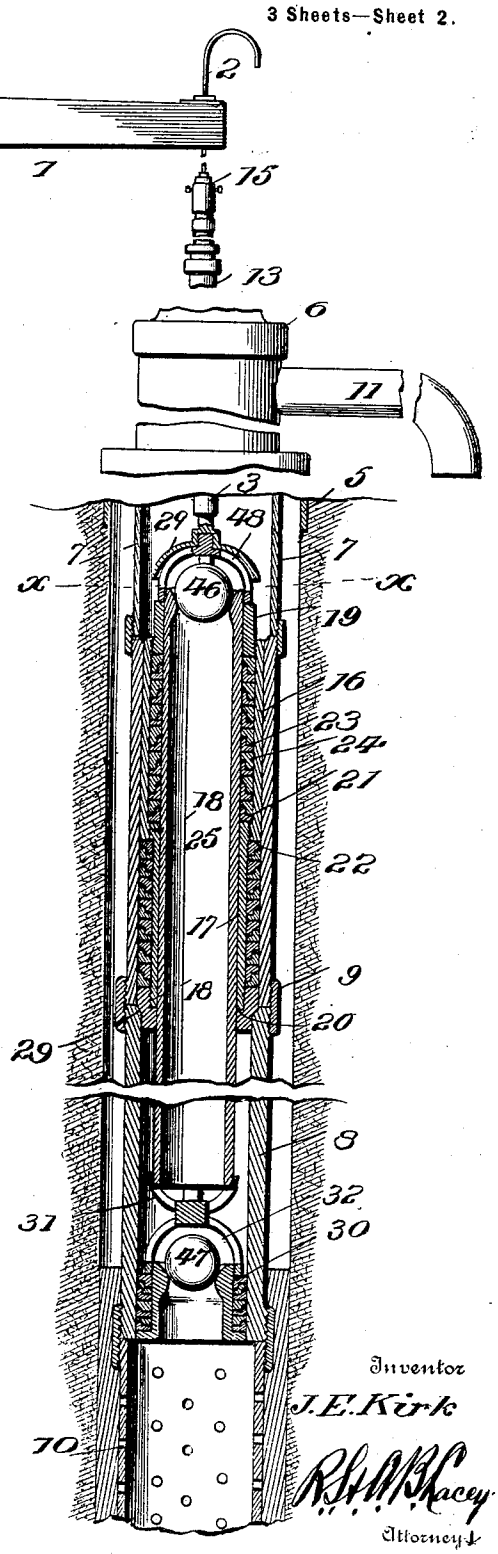


Fig. 10.





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(No Model.) 3 Sheets—Sheet 3.

Fig. 4.

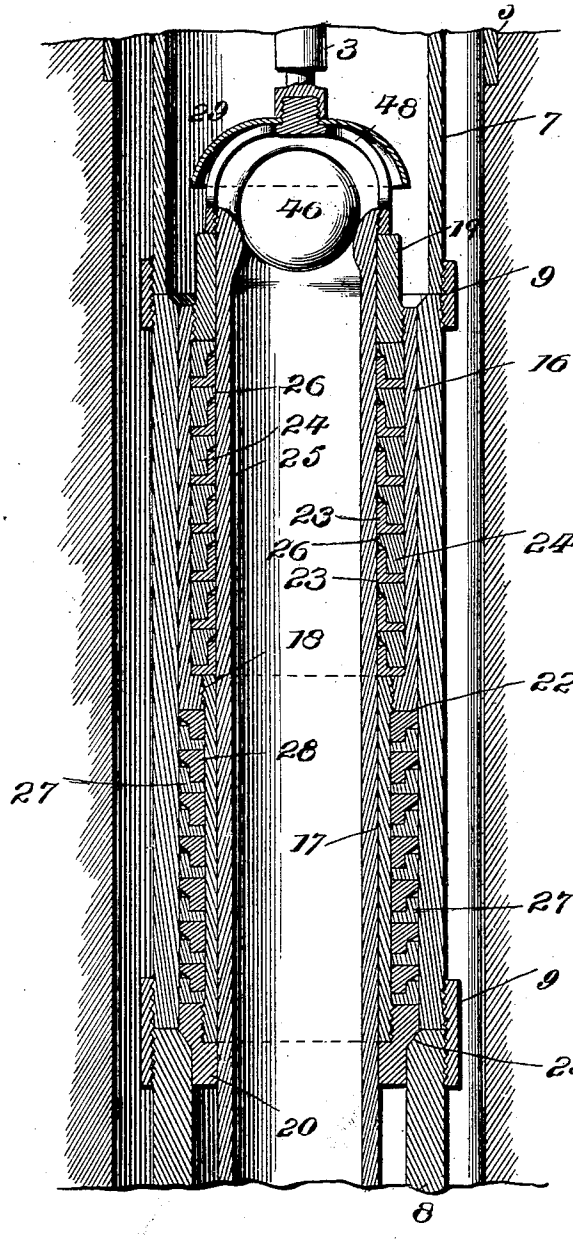


Fig. 5.

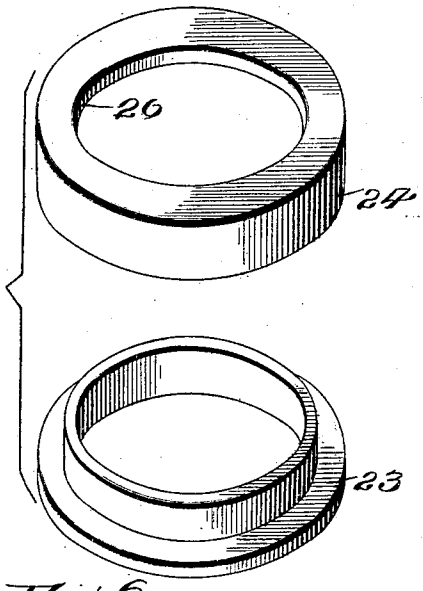
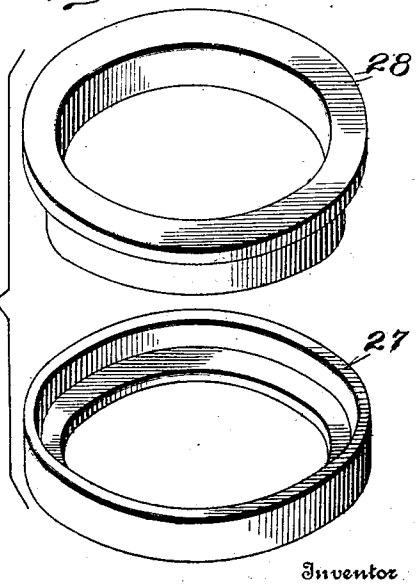


Fig. 6.



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UNITED STATES PATENT OFFICE.

JOSEPH E. KIRK, OF SISTERSVILLE, WEST VIRGINIA.

PUMPING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 677,547, dated July 2, 1901.

Application filed October 9, 1900. Serial No. 32,525. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH E. KIRK, a citizen of the United States, residing at Sistersville, in the county of Tyler and State of West Virginia, have invented certain new and useful Improvements in Pumping Apparatuses; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

In deep-well pumping apparatus as generally constructed and operated considerable force is required to be expended on the downstroke of the piston to cause it to descend through the liquid in the barrel, especially when the tubing is filled to overflowing.

This invention aims to materially overcome the resistance to the downward movement of the piston, as aforesaid, and to utilize the pressure of the column of liquid upon the piston to force it to descend and to maintain a down pull upon the pump-operating line at all times, whether the piston is moving up or down.

The invention also consists of the novel features, details of construction, and combination of the parts, which hereinafter will be more fully disclosed and finally claimed, and for this purpose and also to acquire a knowledge of the merits of the invention and the structural details of the means whereby the results are attained reference is to be had to the appended description and the drawings hereto attached.

While the essential and characteristic features of the invention are necessarily susceptible of modification, still the preferred embodiment of the invention is illustrated in the accompanying drawings, in which—

Figure 1 is a vertical central section of a well, showing the application of the invention, the lower portion of the piston and the pump-barrel being omitted. Fig. 2 is a view similar to Fig. 1, showing the piston and barrel in detail. Fig. 3 is a plan section about on the line X X of Fig. 2. Fig. 4 is a central vertical section of the upper portion of the piston and the packing or stuffing box through which it operates. Fig. 5 is a perspective view of a packing-ring and spacer for the upper portion of the piston stuffing-box. Fig. 6 is a perspective view of a lower packing-ring and spacer of the piston stuffing-box. Fig. 7 is a vertical section of the line connections at the upper end of the hollow rod. Fig. 8 is a plan section on the line Y Y of Fig. 7. Fig. 9 is a vertical section of the connection between the operating-line and the weight. Fig. 10 is a detail perspective view of the jar.

Corresponding and like parts are referred to in the following description and indicated in all the views of the drawings by the same reference characters.

The walking-beam or pump-bob 1 has the operating-line 2, of wire cable or chain, attached thereto in the usual or any convenient way. The pump-piston, jar 3, and weight 4 are attached in any substantial manner to the lower end of the operating-line 2. The jar 3 may be of any type such as commonly employed in well-drilling machinery and is provided to cause the piston to descend in the event of sticking, especially when lowering the piston into the well and when priming the same. The weight 4 coöperates with the jar 3 and is intended to insure the descent of the piston when it is required to lower the same, either upon the downstroke of the piston or when lowering the latter into the well. This weight 4 may be a rod or bar of iron, lead, or other metal and will be of a size to insure the successful operation of the pump. The pump-piston is secured to the lower end of the jar 3, and the latter in turn is attached to the lower end of the weight 4, which is clamped or otherwise attached to the lower end of the operating-line 2.

The pumping mechanism, including the barrel and piston and the piston-actuating mechanism, may be located directly in the well or in a casing and may be of any size, depending upon the lifting capacity of the pump. The well is lined by a casing 5, which is closed by a cap 6, through which the pump-tubing 7 passes. The pump-barrel 8 is coupled to the lower end of the tubing 7, preferably by means of a ring 9, and the perforated pipe 10 is similarly jointed to the lower end of the barrel. The pump-tubing 7 projects a short distance above the cap 6 and is provided with a spout 11, through which the liquid elevated is discharged. A stuffing-box 12 is fitted to

the upper end of the pump-tubing, and the operating-line 2 passes therethrough. A hollow rod or pipe 13 is mounted to reciprocate in the stuffing-box 12 and has the operating-line 2 clamped or otherwise attached thereto, so that the two move in unison. A tight joint is maintained between the operating-line 2 and the hollow rod 13 by means of a stuffing-box 14, applied to the upper end of the said part 13. A coupling 15 of suitable construction connects the stuffing-box 14 with the operating-line 2, whereby the parts are caused to move together.

The packing or stuffing box for the piston is located immediately above the pump-barrel 8 and at the lower end of the pump-tubing 7 and consists of an upper tubular section 16 and a lower tubular section 17, of smaller diameter and connected thereto by a screw-thread joint 18. An end 19 is fitted by a screw-thread joint to the upper extremity of the section 16, and a corresponding end 20 is similarly fitted to the lower end of the section 17. The ends 19 and 20 are short lengths of tube, the one screwing into and the other screwing upon the respective sections. An inner shoulder 21 is provided at the juncture of the sections 16 and 17 and supports the upper series of packing-rings and spacers. The outer shoulder 22, formed by the lower end of the section 16, constitutes a stop for the lower series of packing-rings and spacers. The upper series of packing-rings 23 are clamped at their outer edges between the spacers 24, and their inner edges are bent upward and bear against the tubular body 25 of the pump-piston. The spacers 24 are metal rings having inner flanges 26 at their upper edges to form a support for the horizontal portion of the packing-rings 23. The packing-rings 23 and spacers 24 are placed within the section 16 in alternation and are clamped between the shoulder 21 and the end 19. The lower packing-rings 27 are clamped at their inner edges between spacers 28, and their outer edge portions are bent upward to fit tightly against the inner wall of the lowermost portion of the pump-tubing 7. The packing-rings 27 and spacers 28 are similarly constructed with the corresponding parts 23 and 24 and are clamped between the outer shoulder 22 and the lower end 20. The piston stuffing-box is supported upon a seat 29, formed at the upper end of the pump-barrel 8, and is held in place when the pump is in operation by the pressure of the column of liquid in the pump-tubing supplemented by the weight and its component parts and the friction between the stuffing-box and the contiguous walls of the pump-tubing.

The pump-piston consists, essentially, of a hollow or tubular body 25, upper and lower valves 46 and 47, and piston-head 30. The upper valve 46 closes downwardly and obtains a seat upon the upper end portion of the piston-body 25, and being preferably of the ball type is prevented from displacement by a cage 48, fitted to the upper end of the piston-body 25 and secured to the lower end of the jar 3. A cap 29 is fitted over the valve 46 and in the operation of the pump relieves said valve in a great measure of the vertical pressure of the column of liquid, thereby permitting said valve 46 to readily open upon the upstroke of the piston, whereby the liquid can pass upward into the pump-tubing. As the piston rapidly ascends a partial vacuum or suction is created in the wake of the cap 29. Hence little or no resistance is offered to the unseating of the valve 46 by the upflowing liquid passing through the piston. The piston-head 30 is connected to the lower end of the tubular body 25 by means of a spider 31 and cage 32 or analogous means for attaining the desired end. The valve 47 is of the ball type and opens upwardly and is held in place by the cage 32. The piston-head 30 operates in the pump-barrel 8 and draws liquid thereinto on its upstroke. The piston-body 25 is of uniform external diameter and reciprocates in the packing or stuffing box provided at the lower end of the pump-tubing and immediately above pump-barrel.

The parts being assembled substantially as illustrated and set forth and the walking-beam or pump-bob being set in operation, the upstroke of the piston creates a suction in the pump-barrel and causes the liquid to flow therein. On the downstroke of the piston the liquid filling the pump-barrel being supported therein by atmospheric pressure exerts an upward pressure against the valve 47 and unseats it and passes above the same. The valve 46 being seated prevents any disturbance of the conditions aforesaid, whereby the liquid is enabled to pass freely from a point below the piston-head 30 to a point above the same during the entire downstroke of the pump-piston. On the second upward stroke of the piston a portion of the liquid above the valve 47 and piston-head 30 is forced into and through the hollow body 25 and above the valve 46, and at the same time the pump-barrel is a second time charged. On the second and succeeding upstrokes of the piston a part of the liquid will be forced above the valve 46 and until the pump-tubing is filled to overflowing and discharges through the spout 11. When the pump-tubing is filled, the pressure of the column of liquid is supported at all times by the valve 46, and the piston-head is relieved from such pressure. Hence the valve 47 is enabled to work freely, and the weight of the column of liquid can be utilized to advantage in effecting the downstroke of the piston when charging the pump-barrel. On the descent of the pump-piston the valve 46 acts in the capacity of the ordinary foot or stand valve and prevents the liquid previously elevated from flowing back into the well. After the pump has been primed and is in working condition the operating-line 2 is at all times under tension, since the piston supports the column of liquid standing in the

pump-tubing. The piston stuffing-box maintains a tight joint between the piston and the pump-tubing, which is essential to the successful operation of the apparatus.

The connection 33 between the operating-line 2 and the weight 4 consists of a union having the inner or upper end of its threaded opening 34 made tapering, as shown at 35, to receive Babbitt metal or kindred composition poured therein in a molten state about the end of the operating-line 2, so as to prevent accidental withdrawal of said line when the apparatus is in operation. After the operating-line 2 has been made fast to the part 33 in the manner stated said part is screwed upon a threaded extension of the weight 4, as will be readily comprehended.

The coupling 15 between the operating-line and the stuffing-box 14 consists of a sleeve internally threaded at its lower end to make screw-thread connection with the upper end of the inner shoulder 36 near its upper end to hold the packing-gland 37 and the clips 38 in place, the flanged ends of said parts 37 and 38 being clamped between the terminal of the stuffing-box 14 and the said inner shoulder 36, as shown most clearly in Fig. 7. The clips 38 (two in number) are lined, as shown at 39, with Babbitt metal or analogous composition, so as to prevent injurious contact with the operating-line when clamped against the sides thereof by means of the set-screws 40, let into threaded openings in opposite sides of the body of the connection, as indicated most clearly in Figs. 7 and 8.

Having thus described the invention, what is claimed as new is—

1. In pumping apparatus, and in combination with the pump-piston consisting of a tubular body provided at opposite ends with upwardly-opening valves and arranged to operate in a casing, a stuffing-box to maintain a tight joint between the body of the pump-piston and its casing and comprising upper and lower sets of packing-rings constructed to obtain a close fit against the respective walls of the piston-body and the casing therefor, substantially as set forth.

2. In pumping apparatus, the combination with the pump-piston arranged to operate in a casing and comprising a tubular body having upwardly-opening valves at its ends, a stuffing-box having inner and outer shoulders intermediate of its ends, packing-rings fitted within and upon the respective end portions of the stuffing-box and held against the respective shoulders thereof, and end pieces fitted to the extremities of the stuffing-box and clamping the packing-rings against the coacting shoulders, substantially as set forth.

3. In pumping apparatus, and in combination with the pump-piston comprising a tubular body provided at its ends with upwardly-opening valves, a sectional stuffing-box having the sections united at their inner ends and of different diameters and providing inner and outer shoulders, packing-rings fitted within the upper section and against the inner shoulder and other packing-rings slipped upon the lower section against the outer shoulder and end pieces fitted to the outer terminal portions of the respective sections and clamping the corresponding packing-rings, substantially as specified.

4. In pumping apparatus, and in combination with the piston, operating-line, and hollow guide-tube, a stuffing-box, a connection fitted to the upper end of the stuffing-box, and clips located within the said connection and clamped against opposite sides of the operating-line and lined with Babbitt metal or kindred composition, substantially as set forth.

5. In pumping apparatus, and in combination with the piston, pump-tubing, operating-line and hollow guide-tube, a stuffing-box secured to the upper end of said guide-tube, a connection having an inner shoulder, a packing-gland, and clips having their inner ends flanged and clamped between the inner shoulder of said connection and the terminal of the stuffing-box, said clips being lined with Babbitt metal or kindred composition, substantially as set forth.

6. In pumping apparatus, and in combination with the piston, pump-tubing, operating-line, and hollow guide-rod, a connection between the operating-line and the said hollow guide-rod, metal-lined clips located within the connection, and set-screws let into the threaded openings in the side of said connection to cause said clips to clamp opposite sides of the operating-line, substantially as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

JOSEPH E. KIRK. [L. S.]

Witnesses:
F. D. YOUNG,
JAS. H. PINE.