

B. BLACK.
PUMP.

APPLICATION FILED NOV. 24, 1908.

980,050.

Patented Dec. 27, 1910.

3 SHEETS—SHEET 1.

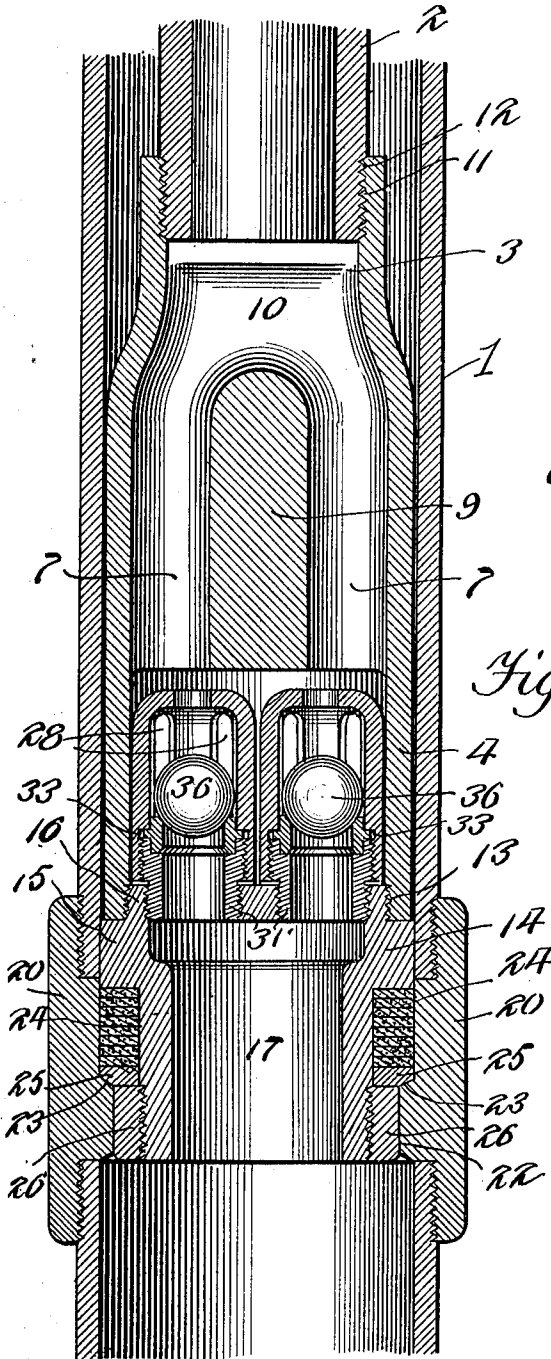


Fig 1.

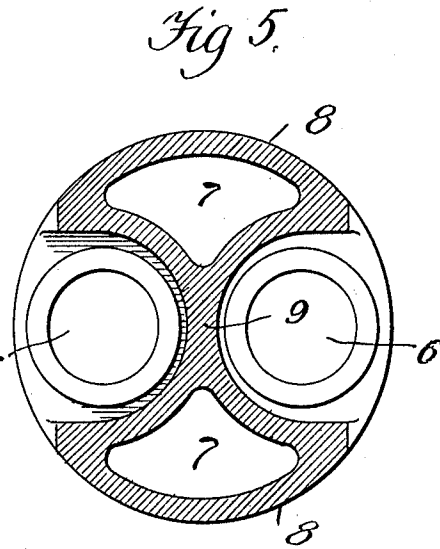


Fig 5.

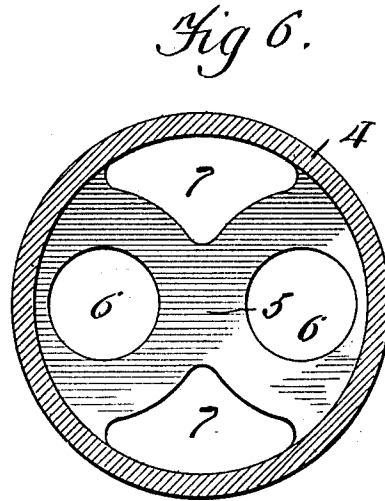


Fig 6.

Witnesses

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3 SHEETS—SHEET 2.

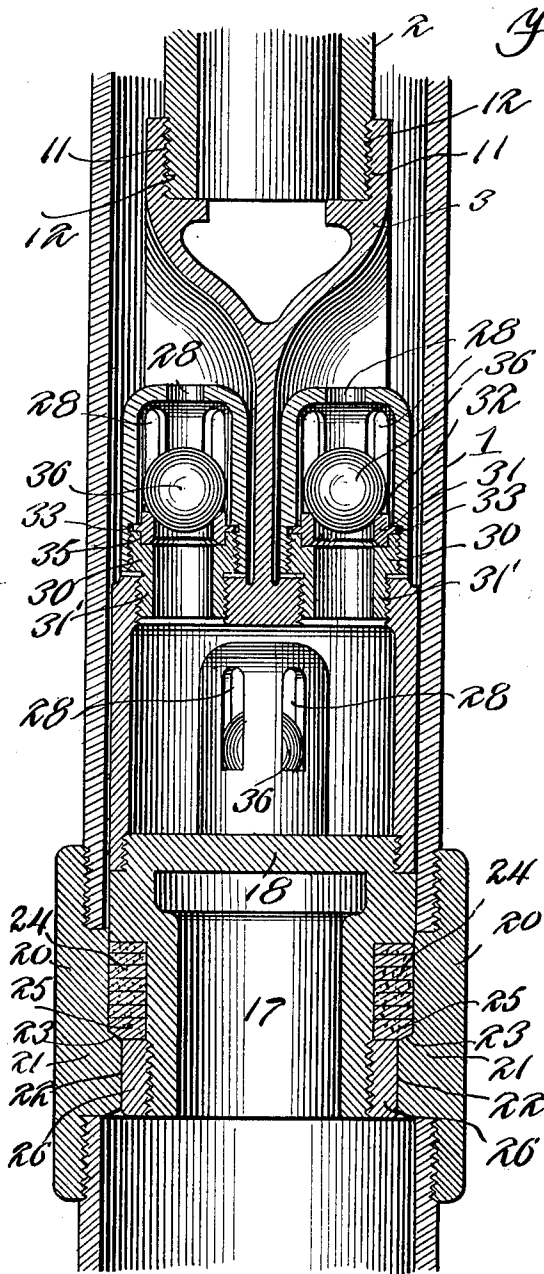


Fig 2.

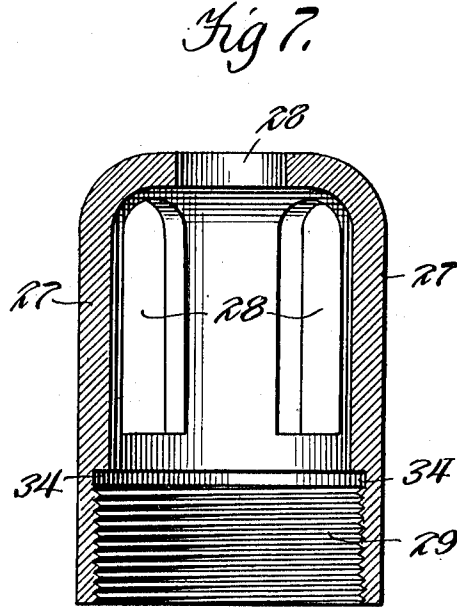


Fig 7.

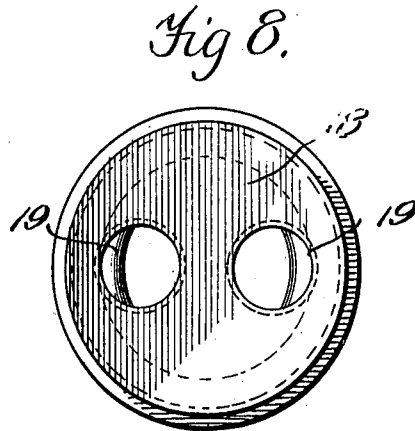


Fig 8.

Witnesses

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3 SHEETS—SHEET 3.

Fig 3.

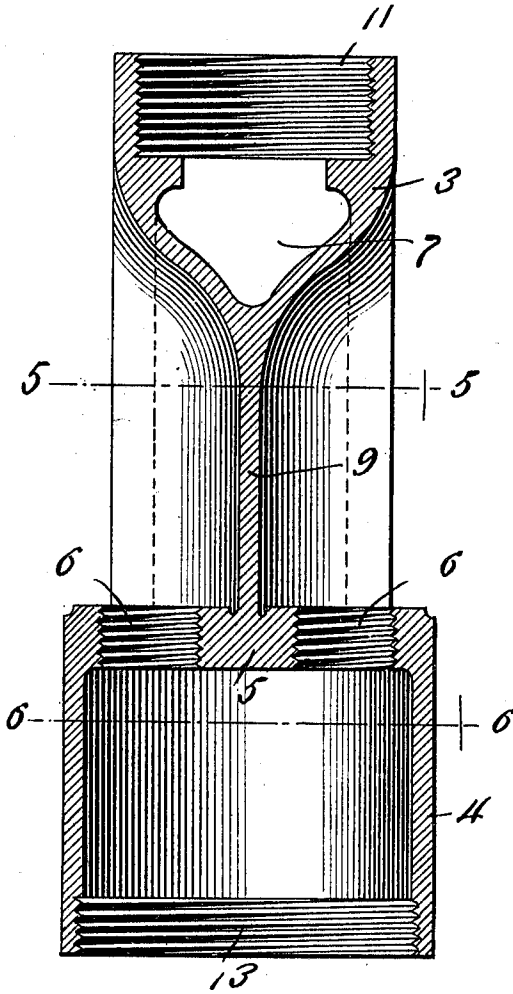
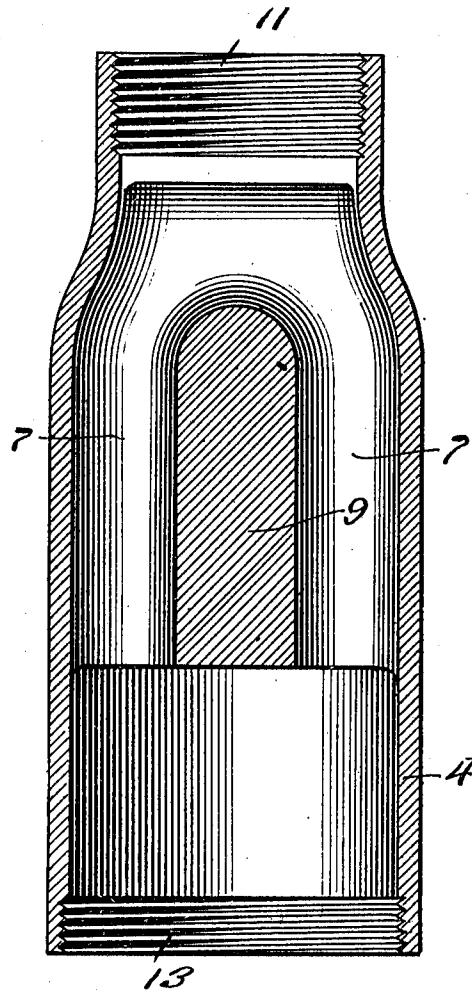


Fig 4.



Witnesses

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UNITED STATES PATENT OFFICE.

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980,050.

Specification of Letters Patent.

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Application filed November 24, 1908. Serial No. 464,230.

To all whom it may concern:

Be it known that I, BURTON BLACK, a citizen of the United States, residing at Orcutt, in the county of Santa Barbara and State of California, have invented new and useful Improvements in Pumps, of which the following is a specification.

The invention relates to an improvement in pumps, being more particularly directed to a pump for oil and water wells.

The main object of the present invention is the provision of a pump structure in which the material delivered therefrom is forced upwardly between the well casing and the piston barrel instead of through the piston and barrel as in the usual construction.

Another object of the invention is the provision of a construction whereby a fluid under pressure can be delivered to assist the operative stroke of the plunger.

Another object of the invention is the provision of means whereby a cleansing fluid admitted through the plunger barrel and below the plunger can be directed through the check valves to thoroughly cleanse them of adhering grit, sand, or the like.

The invention will be described in the following specification, reference being had particularly to the accompanying drawings, in which:—

Figure 1 is a longitudinal sectional view, illustrating the novel features of my invention. Fig. 2 is a similar view taken on a line at right angles to the line of section of Fig. 1. Fig. 3 is a vertical sectional view of what I term the valve sleeve. Fig. 4 is a similar view on a line at right angles to the line of section of Fig. 3. Fig. 5 is a section on line 5—5 of Fig. 3. Fig. 6 is a section on line 6—6 of Fig. 3. Fig. 7 is an enlarged vertical section of one of the valve cages. Fig. 8 is a top plan view of what I term the standing valve body.

Referring particularly to the accompanying drawings, my improved pump, as designed for use in connection with oil wells or the like, is adapted to operate within the well casing 1, and to be mainly carried by the plunger barrel 2, both of which parts are of any usual or preferred construction. As is understood the plunger barrel in wells as at present constructed is fitted within the well casing and, by virtue of the different respective diameters of the barrel and cas-

ing, a considerable free space surrounds the barrel.

In the usual type of well a plunger or piston operates within the barrel in which plunger there is arranged inlet and check valves for the passage of the material, it being understood that as the plunger descends the material passes through the same and collects in the barrel above the plunger, being lifted for discharge in the upstroke of the plunger. Under these conditions the material is, of course, compelled to pass through the valves which are smaller than the surface area of the piston and, therefore, the piston does not descend freely. As a consequence the rod couplings securing the sections of the piston rod together are forced into more or less close contact with the wall of the barrel and, owing to the comparatively large percentage of grit, sand, and gravel in the material being pumped, the contact on the rod couplings and barrel quickly wears the parts to a condition in which they are of little use. The present invention is designed to entirely obviate these objections by utilizing a solid plunger, or in other words one without valves of any kind, and to pump the material from the well through that portion of the casing arranged beyond the plunger barrel, and not in the slightest degree through the latter.

In carrying out the preferred form of details of the present invention I provide what I term a valve sleeve 3, which is designed to be secured to the plunger barrel and during operation be fixed with relation to the casing. The sleeve is of peculiar construction, being cylindrical at the lower portion, as at 4, and of an exterior diameter to fit more or less snugly the interior diameter of the casing 1. The cylindrical portion is approximately one-third the height of the sleeve and is closed by a transverse partition 5 in which are formed a series of diametrically opposed circular openings 6 and a series of diametrically opposed outlets 7, the latter being of triangular shape and located on a line at right angles to the line of the opening 6. Above the partition 5 the sleeve is continued in the form of tube-like projections 8, which conform in sectional dimension with the respective openings 7 in the partition, said tubes rising vertically from the partition in alinement with the openings. The

tubes 8 are connected at their inner edges by a partition 9, which partition extends upwardly from the partition 5 and terminates below the relatively upper end of the sleeve, so that at said point the upper ends of the tubes 8 communicate to provide a chamber 10. That portion of the sleeve above the openings 6 is thus free of an outer encircling wall, being divided, however, into two distinct spaces by the partition 9. As the partition 9 terminates below the upper end of the valve sleeve it will be obvious, particularly from Fig. 1, that the chamber included within the circular portion of the sleeve below the partition 5 is in communication with the chamber 10 by two distinct tube-like passages 8 and is also in communication with the space between the casing 1 and the valve sleeve through two distinct openings 6.

The upper end of the valve sleeve is interiorly threaded, as at 11, and is of a size to engage the exteriorly threaded lower end 12 of the plunger barrel 2. The lower end of the valve sleeve, or more properly the lower end of the circular portion 4 is interiorly threaded at 13 to receive what I term a valve body 14. The valve body 14 for a portion of its length near the upper end, as at 15, is of an exterior diameter corresponding to the similar dimension of the circular portion of the valve sleeve, being, however, above said portion 15 circumferentially reduced to provide an annular projection 16 exteriorly threaded to fit within the threaded portion 13 of the sleeve. Below the portion 15 the valve body is circumferentially reduced throughout its length, as at 17, for a purpose which will presently appear.

As shown more particularly in Fig. 8, the upper end of the valve body is closed by a partition or plate 18 formed with a pair of diametrically opposed interiorly threaded openings 19, and the valve body when secured in place in the sleeve is so arranged that the respective openings 19 aline with the tube-like passages 8, or in other words the openings 19 are disposed directly below the openings 7 in the partition 5, as is more particularly shown in Fig. 1.

To provide for securing the operative parts in applied position within the casing 1 I arrange at the appropriate point of said casing a coupling collar 20 interiorly threaded at opposing ends to receive the respective ends of the casing sections, and so connect the sections as to form a continuous casing. Intermediate the sections, however, the collar is thickened, as at 21, which thickened portion in the upper part terminates with its inner surface in alinement with the inner surface of the casing in the lower part, as at 22, and extends inwardly beyond the normally inner surface of the casing, providing thereby a shoulder 23, which preferably in-

clines in a downward and inward direction, as clearly shown in Fig. 2. The valve sleeve and connected body are designed to have a direct bearing upon the coupling collar, and to provide the airtight connection necessary at this point I arrange about the reduced portion 17 of the body a series of packing rings 24 and below and in contact with the lowermost ring I arrange a metallic packing ring 25. Below the packing ring 25 is arranged a jam nut 26 having threaded connection with the lower end of the valve body and designed to exert a pressure upon the packing ring 25 with the effect to spread the rings 24. The lower surface of the ring 25 is formed on its outer edge with an inclined portion to cooperate with the inclined shoulder 23 of the coupling collar, so that with the parts properly applied the packing ring 25 bears squarely upon the shoulder 23 of the coupling collar and the packing elements 24 above said ring engage the inner surface of the collar with the effect to provide an airtight juncture.

In connection with the openings 6 and 19, which, for the purpose of the invention are identical in size and shape, I use valve members of identical construction. Each of said members comprises a cage 27 formed with suitable outlets, as 28, and interiorly threaded at the lower end, as at 29, the interior diameter of the cage exceeding that of the opening with which it is to be connected.

Secured within the cage is a bushing 30, having the upper portion threaded to fit within the threaded portion 29 of the cage, and the lower portion circumferentially reduced and threaded, as at 31', to fit within the threaded openings 6 or 19. A valve seat 31 comprising a sleeve-like body formed at opposing ends with a ground valve engaging surface, as 32, is secured within the cage, being centrally provided with an exterior laterally projecting flange 33, which is designed to engage beneath a shoulder 34 formed interiorly of the cage immediately above the threaded portion 29 and the upper end of the bushing 30, that portion of the valve seat projecting below the flange being normally seated in a reduced portion formed in the bushing. It will thus be apparent that the valve seat is secured in place in a manner to permit its convenient removal when desired, and that the remaining parts are also arranged for convenient connection and disconnection. A valve 36 of the ball type is arranged in each cage to cooperate with the valve seat therein, being disposed above the seat so as to close by pressure from above and open by pressure from beneath.

As has been previously stated the respective openings 6 and 19 are each provided with one of the valve members so that each of said openings is open to the free upward

travel of the material but closed against the downward travel thereof. Owing to the previously described arrangement of the openings 6 and 19, it will be obvious that a pair of valve members, those connected with the openings 19, are arranged within the circular portion 4 of the valve sleeve below the plate 5, while a pair of said members are arranged above the plate 5 on each side of the partition 9, in communication, of course, with the openings 6.

As thus constructed and arranged the operation of the improved pump is as follows: On the initial or upstroke of the plunger the material from below the pump is drawn upward through the valves closing the openings 19 and on upward through the tube-like passages 8 into the chamber 10 and thence to the plunger barrel 2. During this upward movement of the plunger there is no material passing through the valve members closing the openings 6, as it will be obvious that said openings are beyond the suction created by the plunger. As a matter of fact the pull of the plunger is exerted to close the valves guarding the openings 6. Upon the downstroke of the plunger the material accumulated below the same, in the chamber 10 and passages 8, is forced downwardly. This movement immediately closes the valves guarding the openings 19, and as the material must have an outlet it will immediately rise past the valve guarding the openings 6 and out through the cages of said valves into the space between the valve sleeve and casing, finding its way in a continued pumping operation up between the casing and plunger barrel.

By reason of the fact that a solid plunger is used within the barrel 2 I am enabled to utilize the space normally above the plunger as a receptacle for water or gas under pressure to aid the operative or downward movement of the plunger, thereby facilitating the free and constant flow of the material from the casing. By reason of the arrangement described I am enabled to gain an additional advantage in that by allowing water or the like to accumulate or flow beneath the plunger, I can by a simple downward movement of the plunger effectively flush and cleanse the check valves controlling the openings 6, as said cleansing fluid will be forced past and through said valves. By this means the effectiveness of the pump is increased as it will be appreciated that in the case of the valves closing the openings 19, and hereinafter termed the inlet valves, the entire downward pressure of the plunger is utilized as a valve closing force while in the outlet check valves the pressure of the fluid above them between the casing and barrel is the primary closing means.

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

1. A valve sleeve for use in pumps including a body formed at one end to provide a circular portion closed at the upper end by a plate, said plate being formed with pairs of diametrically opposed openings, the sleeve above the plate being formed with vertically extending oppositely disposed semi-circular sections, said sections coinciding at their central portions and having their free terminals connected by walls coincident with the periphery of the plate whereby to form opposing tubes in communication with one pair of openings, and valves removably mounted in the opposing pairs of openings and beyond the semi-circular section, whereby to permit access to the valves from beyond the tubes.

2. A valve sleeve for use in pumps including a body formed at one end to provide a circular portion closed at the upper end by a plate, said plate being formed with pairs of diametrically opposed openings, the sleeve above the plate being formed with vertically extending oppositely disposed semi-circular sections, said sections coinciding at their central portions and having their free terminals connected by walls coincident with the periphery of the plate whereby to form opposing tubes in communication with one pair of openings, the vertically extending semi-circular sections terminating at their upper ends below the upper end of the connecting walls, whereby to provide communication between the tubes, and valves removably mounted in the remaining pair of openings and beyond the semi-circular sections.

3. A valve sleeve for use in pumps formed to provide opposing vertically extending tubes communicating at their upper ends, and valves arranged in diametrically opposite relation on the sections and wholly beyond the tube walls, and a circular member having threaded connection with the lower end of the sleeve and formed with valve passages, in combination with a pump casing made in sections, a connector between two adjacent sections said connection being formed with an annular projection of less interior diameter than the similar dimension of the casing, said circular member being circumferentially reduced above the said projection, and packing arranged in said reduced portion to bear upon the projection to secure an air-tight connection between the parts.

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

BURTON BLACK.

Witnesses:

GEO. P. MERRITT,
A. N. SCOTT.