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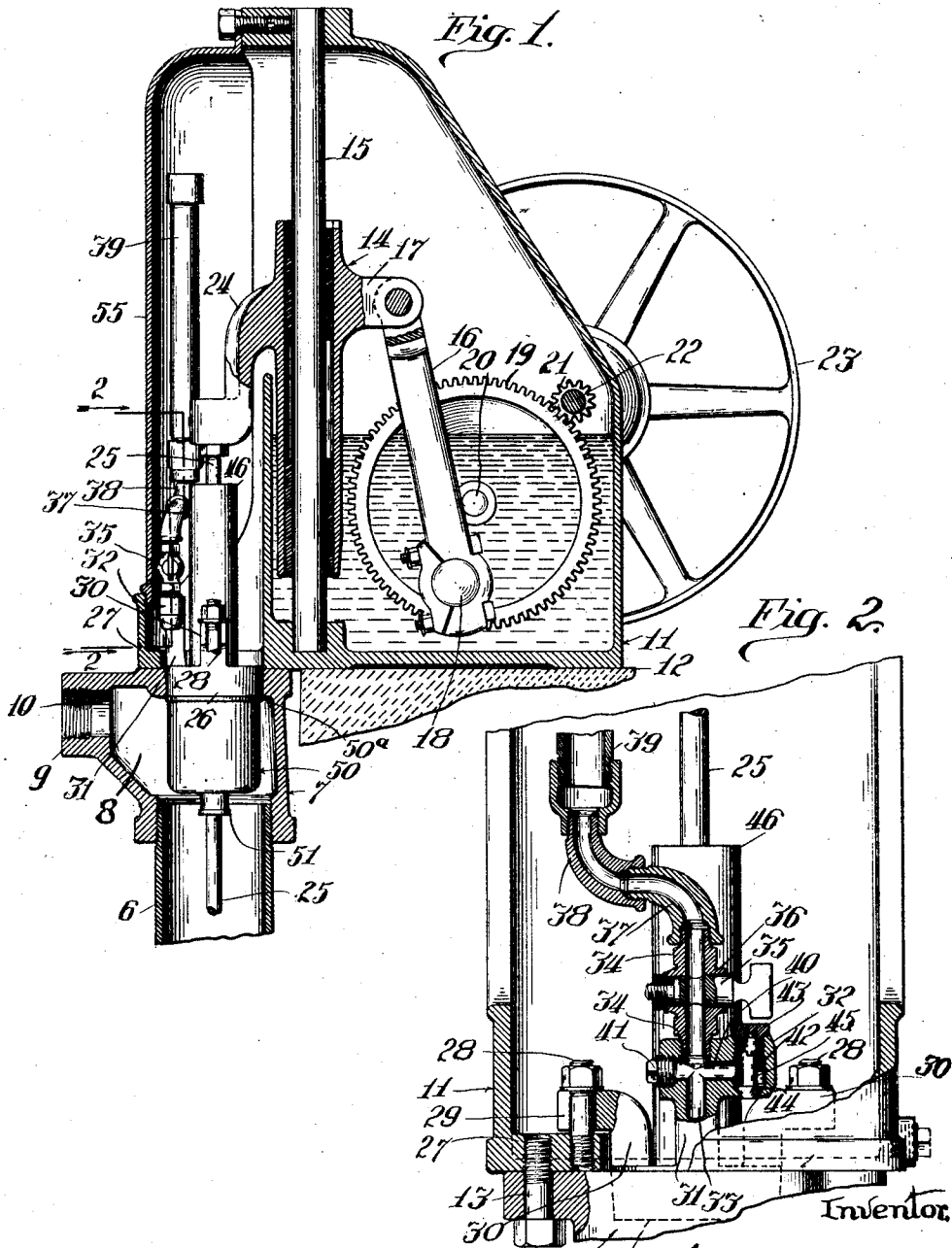
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J. B. SPERRY

PUMPING APPARATUS

Filed April 1, 1926

2 Sheets-Sheet 1



Witness
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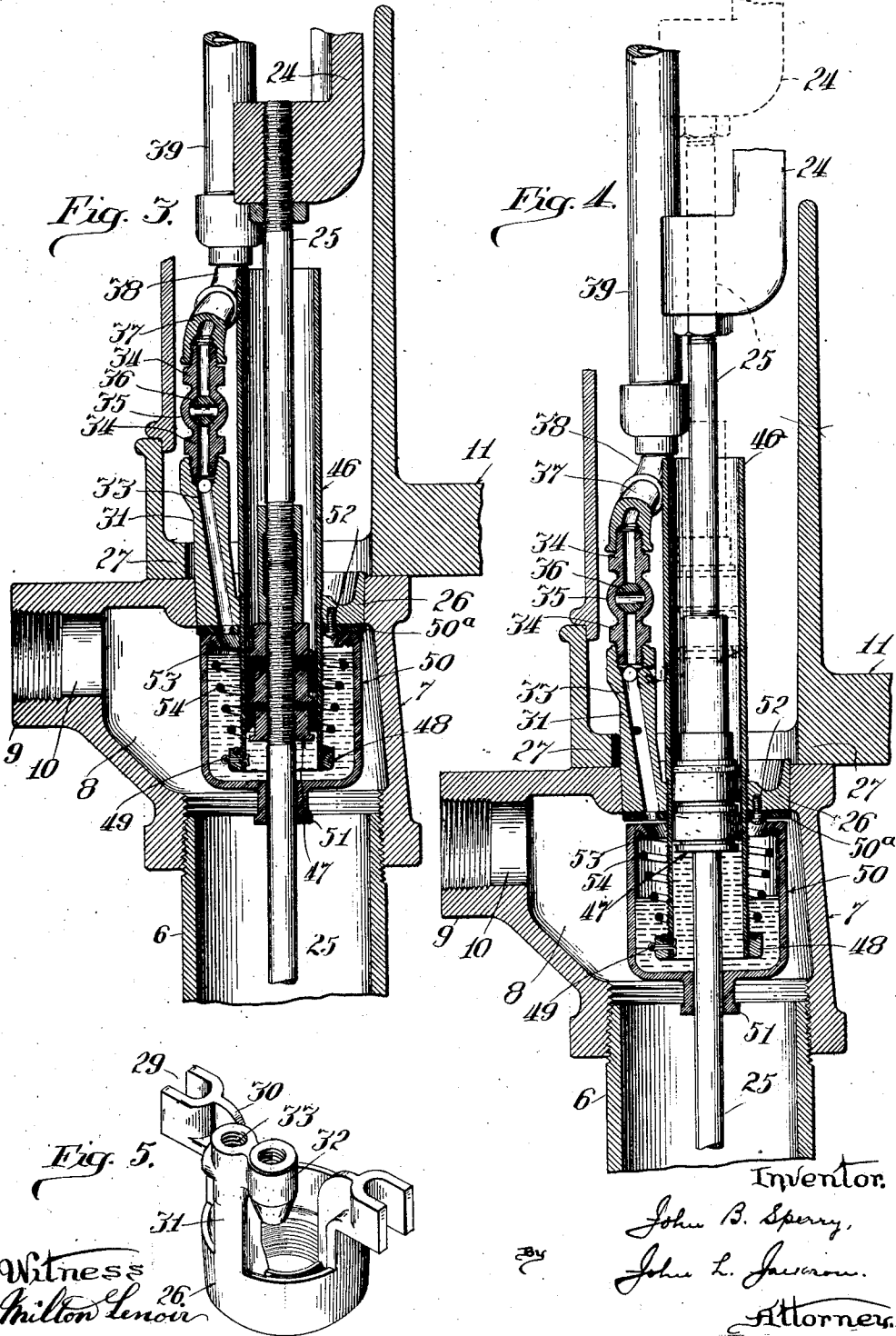
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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE.

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PUMPING APPARATUS.

Application filed April 1, 1926. Serial No. 98,939.

My invention relates to pumping apparatus for furnishing a water supply from deep wells. It is frequently desirable to deliver the water pumped to service pipes under air pressure, the usual arrangement being to pump the water from the well into a reservoir or pressure tank and at the same time to pump air into such tank so that the air pressure thereby created serves to force the water through the service pipes, and it has heretofore been common practice to associate air pumping means with the water pumping apparatus so that the operation of pumping water also provides a supply of air under pressure. Sometimes, however, it is desirable to pump water only, and in that case where the apparatus is arranged to pump both air and water it is necessary that the construction be such that the air pumping means be capable of being disconnected or be otherwise rendered inoperative.

The object of my present invention is to provide improved means for pumping air coincidentally with the pumping of water, and also to provide for rendering such air pumping means inoperative without disconnecting any of the parts. The nature of my improvements and the advantages ensuing therefrom will appear from the following description of my invention as embodied in the structure illustrated in the accompanying drawings which exemplifies the form in which I prefer to embody the same. It should be understood, however, that my invention may be incorporated in various other forms of apparatus other than that shown. What I regard as new is set forth in the claims.

In the accompanying drawings in which I have illustrated my invention as applied to a power head of the type shown and described in my pending application for patent, Serial No. 741,085, filed October 1, 1924,

Fig. 1 is a central vertical section of a power head and the upper portion of the well tube with which it is associated;

Fig. 2 is a partial vertical section substantially on line 2—2 of Fig. 1;

Figs. 3 and 4 are vertical sectional views showing changed positions of the parts, Fig. 3 illustrating the position of the parts at

the beginning of the up stroke of the plunger of the air pumping means, and Fig. 4 illustrating their position on the down stroke of said plunger; and

Fig. 5 is a perspective view of a collar that fits in the discharge head of the well tube and forms a cover for the suction chamber hereinafter described.

Referring to the drawings, 6 indicates the well tube which at its upper end is provided with a head 7 which provides a discharge chamber 8. At one side of the head 7 is a neck 9 which provides a discharge passage 10 for the water, or water and air, pumped. Extending over the upper end of the well tube 6 is a power head casing 11 which is preferably mounted on a base 12 so that a portion of the bottom thereof projects laterally beyond said base and overlies the upper surface of the head 7 on which it rests and to which it is secured, preferably by screws 13, as best shown in Figs. 1 and 2.

Within the power head casing 11 is a cross-head 14 arranged to slide vertically on a guide rod 15 suitably supported in said casing at one side of the well opening. Said cross-head is reciprocated by means of a pitman 16 connected at one end with an arm 17 that forms a part of the cross-head 14, and at its other end with a wrist pin 18 carried by a gear 19 that is mounted on a horizontal shaft 20 journaled in the side walls of the power head casing. The gear 19 is rotated by means of a pinion 21 carried by a shaft 22 that extends outside of said casing and carries a pulley 23 which may be driven by a belt from any suitable source of power. The cross-head 14 also comprises an arm 24 that extends over the well and carries a plunger rod 25 which extends down into the well, where it is provided with means of any suitable description for pumping water to the surface. It will be understood that the operating mechanism contained within the power head casing as above described may be varied, as my present invention is not concerned with the specific means by which the plunger rod 25 is reciprocated.

By reference to Figures 3, 4 and 5, it will be seen that the discharge head 7 is provided with an opening at the top, and that in said

opening is fitted a collar 26 which is preferably slightly tapered, said opening being correspondingly tapered so that the parts fit closely together. Said collar is secured to the bottom plate 27 of the power head casing by means of screws 28 which screw into said bottom plate and are fitted in the forks 29 of forked arms 30 that project at opposite sides of said collar, as best shown in Figs. 2 and 5. Said collar is provided adjacent to one margin with a standard 31 having a laterally disposed boss 32, as shown in said figures. The standard 31 is bored longitudinally to provide a passage 33 which at its lower end opens into the discharge chamber 8, and at its upper end communicates with a passage 34 through a fitting 35 that comprises a stop cock 36. The upper end of the passage 34 is connected by any suitable means, such as elbows 37, 38, with an expansion chamber 39 which is in the form of a tube of suitable dimensions closed at its upper end.

The standard 31 is also bored transversely adjacent to its upper end to provide a transverse passage 40, one end of which is closed by a screw-threaded plug 41 while its other end communicates with a vertical passage 42 formed in the boss 32. The upper end of the latter passage is closed by a screw-threaded plug 43, and the lower end of said passage forms a seat for a check valve 44 having a stem 45 that is guided by the plug 43. The passage 42, therefore, forms a check valve chamber that communicates with the passage 33, and through it with the discharge chamber 8. The purpose of this arrangement is to provide for admitting atmospheric air to the discharge chamber 8 in a manner that will be hereinafter more particularly described.

Secured between its ends in the collar 26, preferably by screw-threaded connection therewith, is a pump cylinder 46, the lower end of which extends down for a considerable distance into the discharge chamber 8, as best shown in Figs. 3 and 4, and operating in said cylinder is a plunger 47 that is carried by the plunger rod 25. The cylinder 46 is open at its lower end and is provided with an external collar 48, preferably secured thereto by screw threads and a cotter pin 49. The lower end of the cylinder 46 is enclosed by a cup 50, the bottom of which is provided with a tubular extension 51 that fits upon and is adapted to slide along the plunger rod 25, the fit being close enough to hold the cup against lateral displacement, but loose enough to permit water to leak through it into the cup, as will be hereinafter explained. The rim of the cup is flattened and is adapted to seat against the under face of the collar 26, a washer 50^a of leather or other suitable material being interposed between the contacting surfaces

so as to make a better closure. Said washer is preferably secured by one or more screws 52 to the under face of the collar 26 and is provided with an opening that registers with the lower end of the passage 33. Projecting inwardly and downwardly from the rim of the cup is an annular flange 53 which forms an annular recess to receive the upper turn of a coiled spring 54, the lower end of which is seated on the collar 48 at the lower end of the cylinder 46. As the position of said cylinder is fixed said spring exerts upward stress on the cup 50 and tends to hold its rim seated against the under face of the collar 26, or more specifically the washer 51.

The operation of the apparatus above described is as follows: When the plunger rod 25 is in operation, on its up stroke water will be pumped up through the well tube 6 to the discharge chamber 8 by the action of the pumping devices (not shown) in the well tube. Some of such water will pass into the cup 50, filling it to a greater or less extent, so that after the pumping apparatus has gone into operation the cup will always contain a quantity of water, as shown in Fig. 3. As has been explained, said cup is normally seated against the washer 50^a, and consequently on the up stroke of the plunger rod the plunger 47 in the cylinder 46 will draw the water in the cup up into the lower end of said cylinder, lowering the water level in the cup and creating a partial vacuum in the upper portion thereof. Said cup, therefore, provides a suction chamber by which suction may be applied to the passage 33 leading to the check valve chamber 42. This reduces the atmospheric pressure in said chamber, and, if the cock 35 is closed, causes air to flow therinto past the check valve 44. The air so admitted flows into the upper part of the cup 50, this flow continuing as long as the plunger 47 continues its upward movement. On the down stroke of the plunger rod 25 the plunger 47 moves downward in the cylinder 46 and therefore forces the water out of said cylinder back into the cup, which compresses the air in the upper portion of the cup, since the check valve 44 then automatically seats, preventing the escape of the air previously drawn into the apparatus. The air pressure thus created in the cup overcomes the tension of the spring 54 and causes the cup to move downward along the plunger rod 25 to the position shown in Fig. 4, thereby permitting the air in the cup to escape over its rim into the discharge chamber 8, from which it passes out with the water delivered from the well through the outlet 10. These operations are repeated as the plunger rod reciprocates so that a supply of air under pressure is constantly delivered with the water discharged from the well. I thus provide a liquid piston actuated by the plunger 47 for supply-

ing air to the water pumped from the well. It will be understood that the above described operations take place if the cock 35 is closed to cut off the expansion chamber 39 from communication with the suction chamber in the cup. If, however, it be desired to operate the pump without delivering air under pressure to the water discharged, this may be accomplished by opening the cock 35 to connect the passage 33 with the expansion chamber 39, by which arrangement on the up stroke of the plunger 47 a partial vacuum will be created in the cup 50 as before, but instead of drawing in atmospheric air suction will be applied to the air in the expansion chamber 39 so that, after the apparatus has been in use for a short time, no atmospheric air will be drawn in past the check valve. On the down stroke of the plunger the reverse movement of the water in the cup 50 will simply force the air back into the expansion chamber without causing the cup 50 to be moved from its seat, since the parts are so designed that the air pressure thereby created will not be sufficient to overcome the tension of the spring 54. The construction above described, therefore, provides a very simple and convenient means by which the pumping of air may be controlled without disconnecting any of the parts, but merely by turning the cock 35.

It will be noted from an inspection of Fig. 1 that the cylinder 46 and also the expansion chamber 39 are located above the well tube, and these parts are all enclosed by a cover plate 55 that forms a part of the power head casing 11.

In addition to the advantages due to its simplicity of control, the apparatus described possesses the further advantages that it provides a positive air pump which is coaxial with the well tube and cylinder 46, and therefore may be applied to discharge heads of standard design without altering their smooth external appearance, and the moving parts are reduced to a minimum. Also a standard design of collar for closing the upper end of the discharge head may be used with all sizes of well tubes. Furthermore, damage to the leathers of the plunger 47 is prevented, should the air attachment become water logged, because of the excessive outlet area provided by the movement of the cup away from its seat. Any leakage of water back through the air device is cared for by drainage into the discharge head.

What I claim as my invention and desire to secure by Letters Patent, is—

1. In a pumping apparatus, the combination with a well tube provided with a discharge chamber for the water pumped, of a cylinder extending at its lower end into said chamber, a cup disposed in said chamber around the lower portion of said cylinder and forming a liquid containing suc-

tion chamber, means adapted to admit atmospheric air to the latter chamber, and a plunger adapted to reciprocate in said cylinder and operating on its up stroke to draw air into said suction chamber, and on its down stroke to force air from the latter chamber into said discharge chamber.

2. In a pumping apparatus, the combination with a well tube provided with a discharge chamber for the water pumped, of a cylinder extending at its lower end into said chamber, a vertically movable cup disposed in said chamber around the lower portion of said cylinder, a seat cooperating with the rim of said cup to form a suction chamber, means adapted to admit atmospheric air to the latter chamber, means for normally seating said cup, and a plunger adapted to reciprocate in said cylinder and operating on its up stroke to draw air into said suction chamber and on its down stroke to move said cup away from its seat to permit air therein to pass into said discharge chamber.

3. In a pumping apparatus, the combination with a well tube having a head provided with a discharge chamber for the water pumped, of a cylinder extending at its lower end into said chamber, a cup disposed in said chamber around the lower portion of said cylinder, a seat carried by said head and cooperating with the rim of said cup to form a suction chamber, a plunger rod extending through said cylinder and cup into the well tube, a plunger carried by said rod and operating in said cylinder, a spring for normally seating said cup, and check valve controlled means for admitting atmospheric air to said suction chamber on the up stroke of said plunger.

4. In a pumping apparatus, the combination with a well tube having a head provided with a discharge chamber for the water pumped, of a cylinder extending at its lower end into said chamber, a collar carried by said head around said cylinder, a plunger rod adapted to reciprocate in said cylinder, a plunger carried by said rod and operating in said cylinder, a cup slidable on said rod and disposed in said discharge chamber around the lower end portion of said cylinder, the rim of said cup being adapted to seat against said collar, a spring normally holding said cup in its seated position, an air duct leading to the upper portion of said cup, and a check valve associated with said duct.

5. In a pumping apparatus, the combination with a well tube provided with a discharge chamber for the water pumped, of a cylinder connected at its lower end with said chamber, a plunger rod extending through said cylinder, a plunger carried by said rod and operating in said cylinder, liquid piston means coaxial with said cylinder, adapted to be actuated by the reciprocation of

said plunger for forcing atmospheric air into said discharge chamber, and means operable to render said air forcing means inoperative.

6. In a pumping apparatus, the combination with a well tube provided with a discharge chamber for the water pumped, of a cylinder connected at its lower end with said chamber, a plunger rod extending through said cylinder, a plunger carried by said rod and operating in said cylinder, liquid piston means coaxial with said cylinder, adapted to be actuated by the reciprocation of said plunger for forcing atmospheric air into said discharge chamber, an expansion chamber associated with said means, and a valve for cutting off said expansion chamber from said air forcing means.

7. In a pumping apparatus, the combination with a well tube provided with a discharge chamber for the water pumped, of a cylinder extending at its lower end into said chamber, a cup disposed in said chamber around the lower portion of said cylinder and forming a liquid containing suction chamber, means adapted to admit atmospheric air to the latter chamber, a plunger adapted to reciprocate in said cylinder and operating on its up stroke to draw air into said suction chamber, and on its down stroke to force air from the latter chamber into said discharge chamber, and means operable to cut off the admission of atmospheric air to said suction chamber.

8. In a pumping apparatus, the combination with a well tube provided with a discharge chamber for the water pumped, of a cylinder extending at its lower end into said chamber, a cup disposed in said chamber around the lower portion of said cylinder and forming a liquid containing suction chamber, means adapted to admit atmospheric air to the latter chamber, a plunger adapted to reciprocate in said cylinder and operating on its up stroke to draw air into said suction chamber, and on its down stroke to force air from the latter chamber into said discharge chamber, an expansion chamber, and a valve controlled passage connecting said expansion chamber with said suction chamber.

9. In a pumping apparatus, the combination with a well tube having a head provided with a discharge chamber for the water pumped, of a cylinder extending at its lower end into said chamber, a collar carried by said head around said cylinder, a plunger rod adapted to reciprocate in said cylinder, a plunger carried by said rod and operating in said cylinder, a cup slidable on said rod and disposed in said discharge chamber around the lower end portion of said cylinder, the rim of said cup being adapted to seat against said collar, a spring normally holding said cup in its seated position, an

air duct leading to the upper portion of said cup, a check valve associated with said duct, an expansion chamber, and valve controlled means connecting said expansion chamber with the upper portion of said cup. 70

10. In a pumping apparatus, the combination with a well tube, a cylinder coaxial therewith, a plunger rod, and a plunger carried by said plunger rod and reciprocating in said cylinder, of liquid piston means coaxial with said cylinder and actuated by the reciprocation of said plunger to supply atmospheric air to the water delivered by the pump. 75

11. In a pumping apparatus, the combination with a well tube, a cylinder coaxial therewith, a plunger rod, and a plunger carried by said plunger rod and reciprocating in said cylinder, of liquid piston means coaxial with said cylinder and actuated by the reciprocation of said plunger to supply atmospheric air to the water delivered by the pump, and means for cutting off the admission of atmospheric air to said liquid piston means. 80 85 90

12. In a pumping apparatus, the combination with a well tube, a cylinder coaxial therewith, a plunger rod, and a plunger carried by said plunger rod and reciprocating in said cylinder, of a liquid containing suction chamber coaxial with said cylinder and communicating therewith, and means for admitting atmospheric air to said suction chamber on the suction stroke of said plunger, said suction chamber being adapted, on the opposite stroke of said plunger, to discharge air with the water delivered by the pump. 95 100

13. In a pumping apparatus, the combination with a well tube, of a cylinder coaxial with said well tube, a cup within the well tube around the lower portion of said cylinder and forming a liquid containing suction chamber, means adapted to admit atmospheric air to said chamber, and a plunger adapted to reciprocate in said cylinder and operating on its suction stroke to draw air into said suction chamber, and on its opposite stroke to discharge air from said chamber with the water delivered by the pump. 105 110 115

14. In a pumping apparatus, the combination with a well tube, of a cylinder coaxial with said well tube, a movable cup within the well tube around the lower portion of said cylinder, a seat cooperating with the rim of said cup to form a suction chamber, means adapted to admit atmospheric air to said chamber, means for normally seating said cup, and a plunger adapted to reciprocate in said cylinder and operating on its suction stroke to draw air into said suction chamber and on its opposite stroke to move said cup away from its seat to permit air therein to be discharged with the water delivered by the pump. 120 125 130

15. In a pumping apparatus, the combination with a well tube having a discharge head, a collar fitted in said head, a cylinder mounted in said collar, a plunger rod adapted to reciprocate in said cylinder, a plunger carried by said rod, a cup enclosing the lower end of said cylinder and movable into or out of seating engagement with said collar, a spring for normally seating said cup, and check valve controlled means for admitting atmospheric air to said cup on the suction stroke of the plunger. 10

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