J. B. GARBER.

COMBINED AIR AND WATER PUMP.

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Fig. 1.

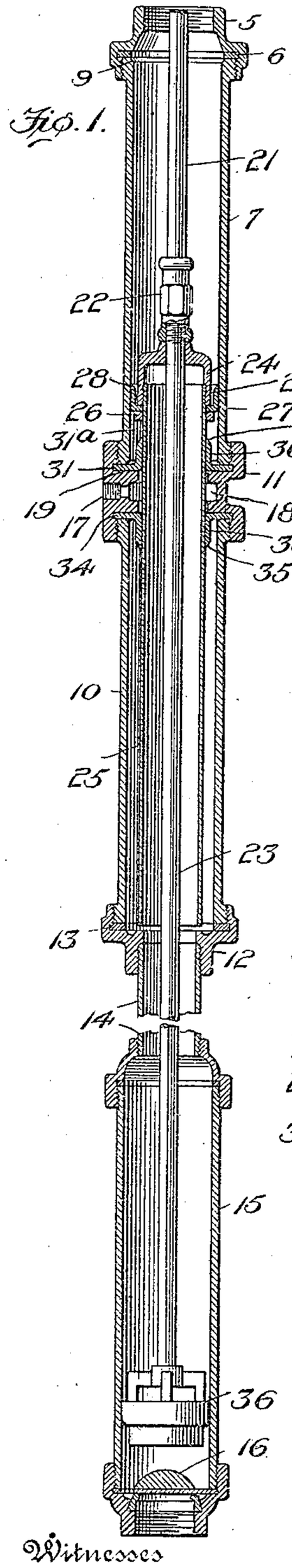


Fig. 2.

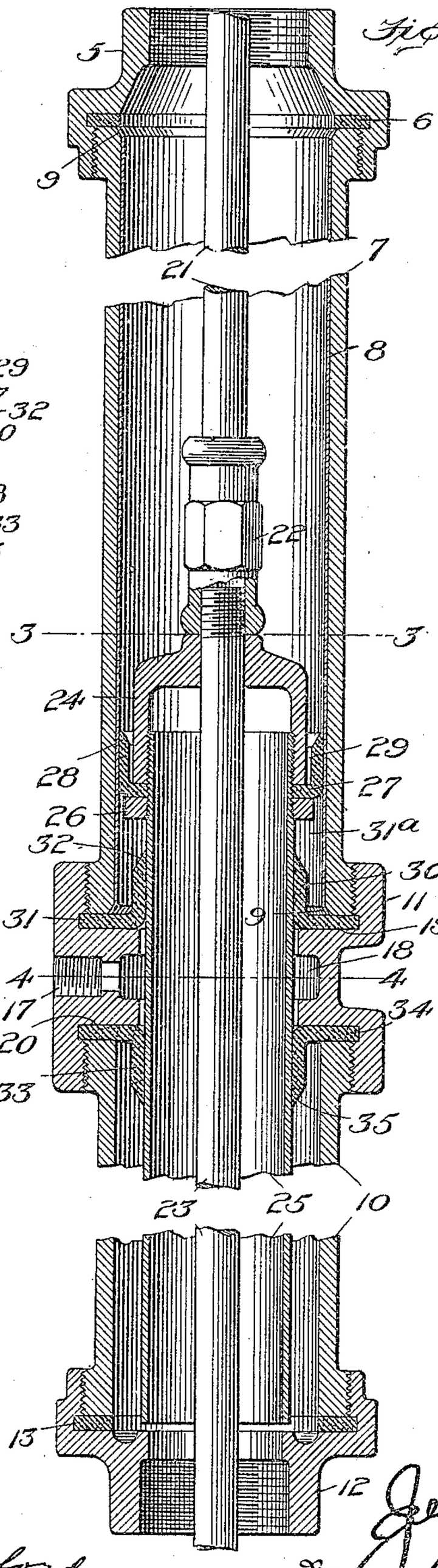


Fig. 3.

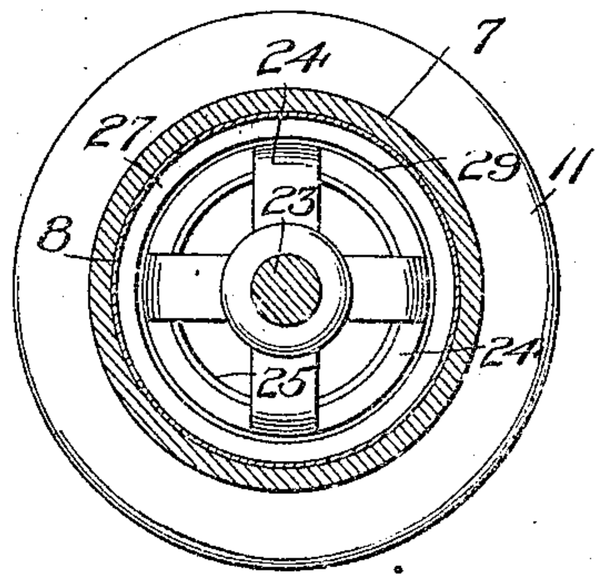
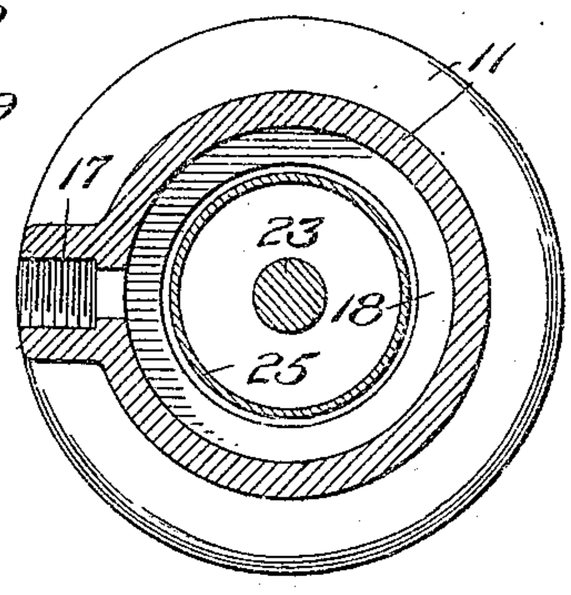


Fig. 4.



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COMBINED AIR AND WATER PUMP.

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To all whom it may concern:

Be it known that I, JESSE B. GARBER, a citizen of the United States, residing at Salem, in the county of Columbiana and State of Ohio, have invented certain new and useful Improvements in Combined Air and Water Pumps; 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.

My present invention relates to pumping apparatus, but has reference more particularly to pumps for use in connection with air pressure systems of water distribution, and to means for aerating a water supply during the operation of pumping.

It has for its object to increase the efficiency of pumps of this class, and to improve same from a structural, economical and durable standpoint.

The invention will be hereinafter particularly described and pointed out in the claims following.

In the accompanying drawings which constitute part of this application for Letters-Patent, and whereupon like reference characters indicate corresponding parts in the several illustrations: Figure 1 represents in longitudinal vertical central section an air pumping cylinder, a water pumping cylinder, suitable connections between the two, a piston-rod, common to both of said cylinders, and suitable valves. Fig. 2 also represents a longitudinal vertical central section through the air pumping cylinder upon a relatively enlarged scale. Fig. 3 is a transverse horizontal section on the line 3—3, Fig. 2, and Fig. 4 is also a transverse horizontal section taken on the line 4—4, Fig. 2.

Reference being had to the drawings and numerals thereon, 5 indicates a top-cap or reducer for screw-threaded attachment to an ordinary drop or well-pipe (not shown), and containing within its open end a ring packing 6. Screwed into the said open end of cap 5 is an upper air pumping cylinder 7, its top end being securely sealed by engagement with the said ring 6. This upper cylinder 7 is preferably lined as at 8 by seamless brass or other lining, its flaring ends 9 crimping it securely in position as clearly shown by Fig. 2. Below said cylinder 7 is a lower cylinder or case 10 the latter suspended from the former by agency of an interposed annular coupling member 11, while, to its opposite end is secured a lower cap or reducer 12 suitably packed against leakage by a second ring packing 13. Threaded into the lower end of the last named cap or reducer 12 is an ordinary connecting pipe 14 leading, as usual in deep well pumps, to a water pumping cylinder 15 below, the latter being equipped with the usual intake or foot valve 16 as shown by Fig. 1. The coupling member 11, of novel form, is entered horizontally by an air duct 17 which opens directly into an annular central air chamber 18, and is shouldered above and below said chamber at 19, 20 respectively, to constitute suitable packing seats for the prevention of leakage as will later appear.

Entering the upper air pumping cylinder 7 centrally from above, is a piston-rod 21 adapted to be reciprocated vertically by power or by hand in any approved manner, and surrounded by a rod-coupling 22 which receives a lower rod section 23. Upon the last named rod-section, and adjacent to the lower end of said coupling 22, which also performs the functions of a jam-nut, is threaded an air pumping plunger mechanism comprising a cage 24, a depending tubular plunger extension 25 threaded upon the interior of said cage, an annular follower 26 surrounding the upper end of said extension, and a cup packing 27, the horizontal annular base whereof is securely clamped between the lower edge of cage 24 and the upper surface of follower 26 as best shown by Fig. 2. The said plunger mechanism is concentrically located with relation to its surrounding pumping cylinder 7, and as will be noted by inspection of Fig. 2, the flexible cup-packing 27 normally engages the interior lining 8 throughout its entire circumference, is beveled outwardly as at 28 upon its upper edge, and is flanked upon its inner circumference by a slight clearance-space 29 to allow for a limited degree of contraction during each down stroke of the plunger as will later appear. Below said cup-packing 27 is an upwardly projecting packing gland 30 hereinafter termed a hat shaped packing, which, like packing 27 is also of annular form and of flexible material, having an outwardly projecting flanged base 31 and an upstanding cylindrical body beveled upon its outer edge as

at 32, said body portion normally bearing upon the exterior surface of tubular plunger extension 25, and adapted to be expanded outwardly during each upstroke of the plunger mechanism. The base 31 of this hat-packing is at all times securely clamped between the lower end of cylinder 7 and shoulder 19 of the coupling member 11. And, as will be noted by reference to Fig. 2, the walls of the cylinder section 7 and the tubular plunger extension 25, combine to produce a compression chamber 31ª of annular form, bounded below by the hat-packing 30 and above by the movable plunger packing 27, into which air is introduced during each upstroke of the plunger, to be compressed and expelled upward during each downstroke thereof. Still lower in the structural arrangement of the present invention is a third flexible packing member 33, hereinafter termed an inverted hat-packing, which, like the corresponding packing gland 30 is retained in position by agency of its outwardly projecting horizontal flange 34 securely clamped between shoulder 20 and the upper end of the lower cylinder or case 10 as shown by Fig. 2. This inverted hat-packing is also beveled outwardly at 35, and normally embraces with its depending annular body the circumference of plunger extension 25, while, as will be seen upon reference to Fig. 2, said extension 25 passing loosely through coupling member 11, is guided in its reciprocation by circumferential engagement of the hat-packings 30 and 33, and its length is approximately determined by that of the pump stroke, since the lower end of said extension should not at any time rise above the inverted hat-packing 33 during an upstroke of the pump. The lower piston rod section 23 passes centrally through plunger extension 25, the connecting pipe 14 and also the water pumping cylinder 15, and at its lower extremity is provided with the usual valved piston 36.

This being a description of my invention its operation may be briefly set forth as follows: An upstroke of the piston rod 21—23 in addition to lifting water in the usual and well understood way through foot valve 16 into the pumping cylinder 15 and above, rarefies the air in compression chamber 31ª and as a consequence a fresh air supply via duct 17 is drawn from the central air chamber 18 past hat-packing 30 which is thereby flexed or expanded circumferentially to permit passage of the air into said compression chamber. And in this connection it will be noted that the said hat-packing member serves the double function of a packing between the lower end of the air pumping cylinder 7 and the shoulder 19 in coupling member 11; as also that of a check-valve for permitting passage of the air supply in one direction only. It will also be noted that plunger-packing or cup-packing 27 rising with the plunger mechanism during each upstroke is expanded circumferentially by weight of the column of water above, assisted by its beveled upper edge 28, and as a consequence is water-packed against the inner wall or lining 8 of the cylinder section 7 the better to assist in rarefying the air in compression chamber 31ª.

Upon the reverse or downstroke of the reciprocating parts of this invention an opposite action occurs so far as the members 27 and 30 are concerned. Air drawn into chamber 31ª as aforesaid is now slightly compressed until cup-packing 27 is contracted circumferentially to permit the escape of said supply air into the cylinder section 7 above where it commingles with the water lifted and flowing through the pump to be pumped off with same into a storage and pressure tank (not shown) for future use. During this action of the cup-packing 27 it will be observed that the clearance space 29, between the inner surface of said packing and its adjacent plunger cage 24, materially assists in the operation by affording room for the circumferential contraction of the cup-packing 27 during each downward stroke as set forth. And it will be further noted that the same compression of air in chamber 31ª acting first upon the beveled upper edge 32 of the hat-packing 30 serves now to securely pack same against the outer circumference of the tubular plunger extension 25, thus performing the offices of a check-valve to prevent the return of supply air from said chamber 31ª to the central air chamber 18 in coupling 11. Likewise during each upstroke it will be seen that the flexible inverted hat-packing 33, beneath coupling 11, is securely packed by pressure of water in the lower cylinder section 10, and is thus held in water-tight contact with the constantly reciprocating tubular plunger extension 25 to prevent leakage into the reserve central air chamber 18 from below.

Having thus described my invention what I now claim and desire to secure by Letters-Patent is:

1. In a hydropneumatic pump the combination with water lifting mechanism, of an air pumping cylinder, a reciprocating plunger in said cylinder, a tubular plunger extension forming a water conduit, a compression chamber between the walls of said cylinder and tubular extension, a check valve guarding an inlet to said chamber, and a flexible plunger packing constructed to permit the escape of air from said chamber during each downstroke.

2. In a hydropneumatic pump the combination with water lifting mechanism, of an air pumping cylinder, a reciprocating plunger in said cylinder, a tubular plunger ex-

tension depending from said plunger and forming a water conduit therethrough, a compression chamber between the walls of said cylinder and tubular extension, a check valve guarding an inlet to said chamber, and a flexible plunger packing constituting a check valve guarding the outlet from said chamber.

3. In a hydropneumatic pump the combination with water lifting mechanism, of an air pumping cylinder, a reciprocating plunger in said cylinder, a tubular open ended plunger extension forming a water conduit, a compression chamber between the walls of said cylinder and tubular extension, a check valve guarding an inlet to said chamber, and a flexible plunger packing constituting an annular check valve guarding the outlet from said compression chamber.

4. In a hydropneumatic pump the combination with water lifting mechanism, of an air pumping cylinder, a reciprocating plunger in said cylinder, a tubular plunger extension forming a water conduit, an annular compression chamber between the walls of said cylinder and tubular extension, an annular check valve guarding an inlet to said chamber, and an annular plunger packing constituting a check valve guarding the outlet from said compression chamber.

5. In a hydropneumatic pump the combination with water lifting mechanism, of an air pumping cylinder, a reciprocating plunger in said cylinder, a tubular plunger extension forming a water conduit, an annular compression chamber between the walls of said cylinder and tubular extension, a check valve guarding an inlet to said chamber comprising a valvular packing gland adapted to permit the passage of air into said chamber and a flexible plunger packing also of valvular construction adapted to permit the escape of air from said compression chamber during each downstroke.

6. In a hydropneumatic pump the combination with water lifting mechanism, of an air pumping cylinder, a reciprocating plunger in said cylinder, a tubular plunger extension open at both ends and forming a water conduit, a compression chamber between the interior of said cylinder and the exterior of said plunger extension, a check valve at the inlet of said chamber comprising an annular packing gland adapted to be flexed to permit passage of air into said chamber, and a flexible cup-packing for said plunger constructed to permit the escape of air from said compression chamber during each downstroke.

7. In a hydropneumatic pump the combination with water lifting mechanism, of an air pumping cylinder, a reciprocating plunger in said cylinder, a tubular plunger extension forming a water conduit, a compression chamber between the walls of said cylinder and tubular extension, a check valve at the inlet of said chamber comprising a hat-shaped packing expansible circumferentially to permit passage of air into said chamber, and an annular plunger cup-packing adapted to contract circumferentially for permitting the upward escape of air from said chamber during each downstroke.

8. In a hydropneumatic pump the combination with water lifting mechanism, of an air pumping cylinder comprising upper and lower sections, a coupling between said cylinder sections, an air inlet to said air chamber, a reciprocating plunger in the upper cylinder section, an open ended tubular plunger extension projecting into both of said cylinder sections, a compression chamber between the walls of said cylinder and plunger extension above the coupling aforesaid, a check valve guarding the inlet to said compression chamber, and a flexible plunger packing serving also as a check valve for the outlet from said compression chamber.

9. In a hydropneumatic pump the combination with water lifting mechanism, of an air pumping cylinder comprising upper and lower sections, a coupling between said cylinder sections having an annular central introductory air chamber, an air inlet to said air chamber, a reciprocating plunger in the upper cylinder section, an open ended tubular plunger extension projecting into both of said cylinder sections, a compression chamber between the walls of said cylinder and plunger extension above the coupling aforesaid, a check valve guarding the inlet to said compression chamber, and a flexible plunger packing serving also as a check valve for the outlet from said compression chamber.

10. In a hydropneumatic pump the combination with water lifting mechanism, of an air pumping cylinder, an air supply duct leading into said cylinder, a reciprocating plunger, a tubular plunger extension, a compression chamber between the walls of said cylinder and plunger extension, an air checking device at the inlet of said chamber, and a valvular cup-packing carried by the plunger constructed to permit the escape of air from said compression chamber during each downstroke.

11. In a hydropneumatic pump the combination with water lifting mechanism, of an air pumping cylinder comprising upper and lower sections, a coupling connecting said cylinder sections, an air supply duct through said coupling, a reciprocating plunger, a tubular plunger extension, a compression chamber between the walls of said cylinder and plunger extension, a flexible hat-shaped packing between said coupling and upper cylinder section in yielding engage-

ment with said tubular extension, an inverted hat-shaped packing similarly located below said coupling, and an annular plunger cup-packing constructed to permit the escape of air from the compression chamber during each downstroke.

12. An air pumping cylinder, in combination with a reciprocating plunger, a tubular plunger extension, a compression chamber formed between the walls of said cylinder and tubular extension, a check-valve at the inlet of said chamber, and a flexible plunger packing constructed to permit the escape of air from said compression chamber during each downstroke.

13. An air pumping cylinder, in combination with a reciprocating plunger, a tubular plunger extension concentrically arranged with relation to said cylinder, a compression chamber intervening between said cylinder and tubular extension, a check-valve at the inlet of said chamber, and a flexible plunger packing constructed to permit the escape of air from said compression chamber during each downstroke.

14. An air pumping cylinder, in combination with a reciprocating plunger, a tubular plunger extension projecting through the lower end of said cylinder, a compression chamber formed concentrically between the walls of said cylinder and tubular extension, a check-valve surrounding and embracing said tubular extension at the inlet of said compression chamber, and a flexible plunger packing at the opposite end of said compression chamber adapted to permit the escape of air in an upward direction during each downstroke of the plunger.

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

JESSE B. GARBER.

Witnesses:
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