No. 791,733. PATENTED JUNE 6, 1905.

F. E. TEN EYCK.

PUMP.

APPLICATION FILED JULY 24, 1903.

Fig. 1.

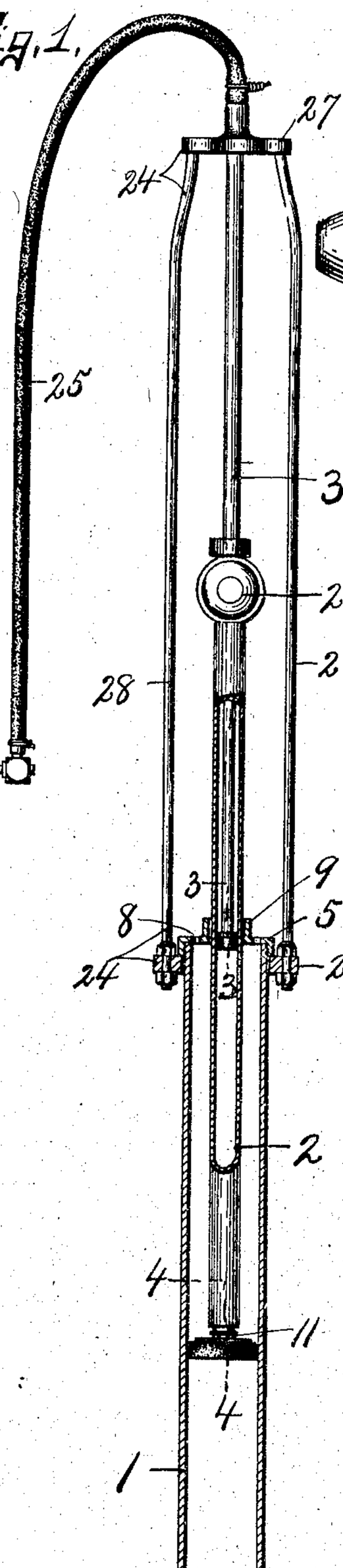


Fig. 2.

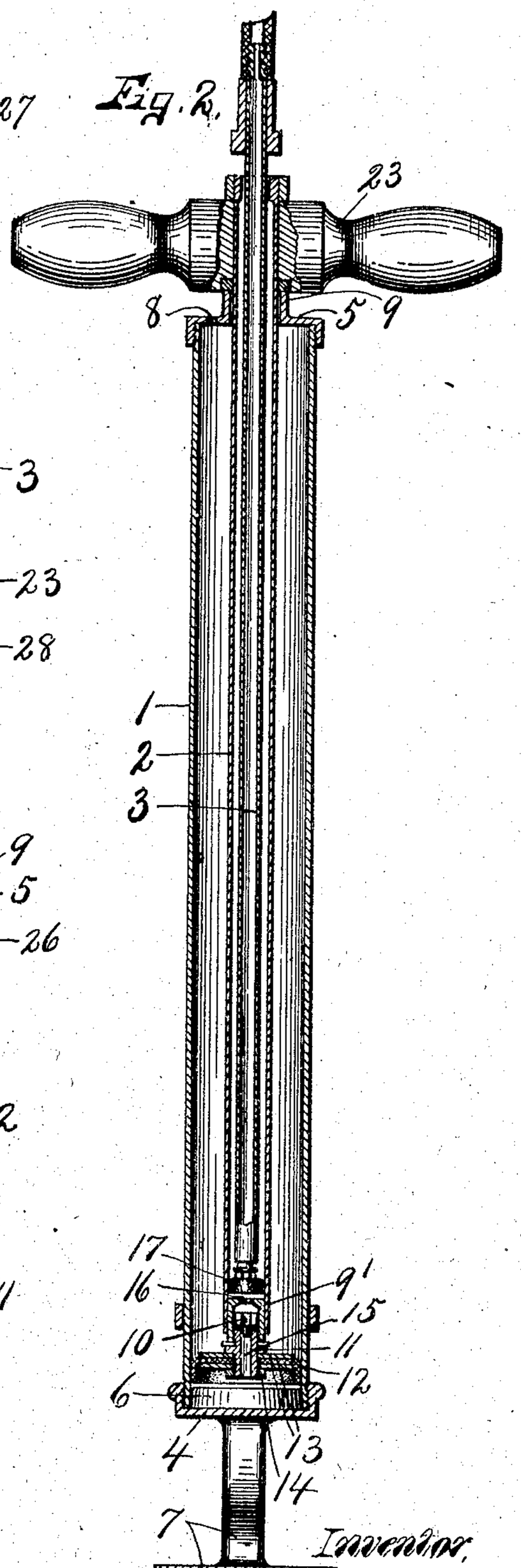


Fig. 3.

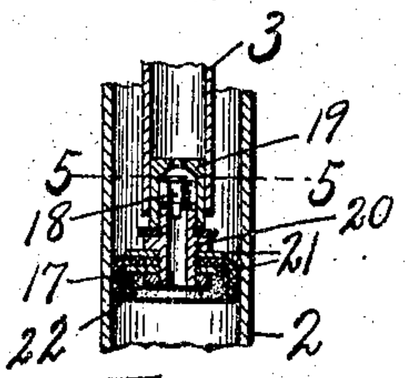


Fig. 4.

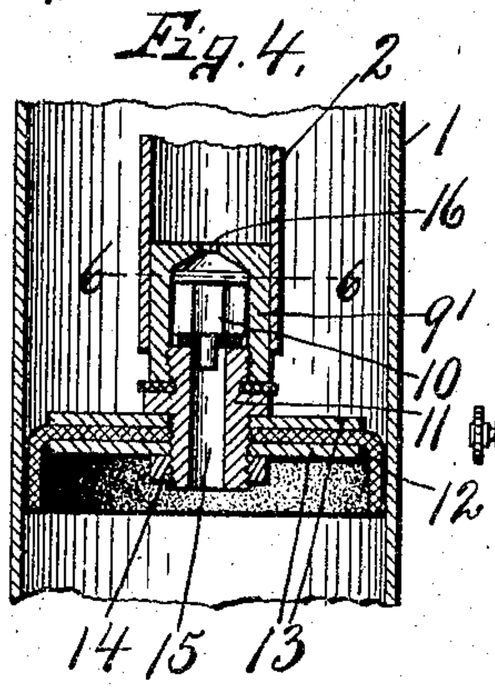


Fig. 5.

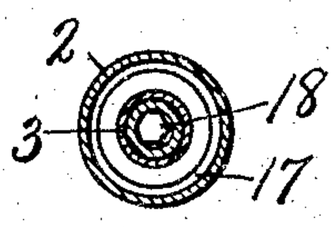
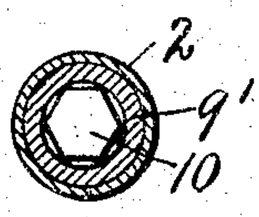


Fig. 6.



Witnesses:
F. E. Arthur,
H. E. Chase

Inventor:
Frank E. Ten Eyck.
By Howard P. Denison
Attorney.

No. 791,733. Patented June 6, 1905.

UNITED STATES PATENT OFFICE.

FRANK E. TEN EYCK, OF AUBURN, NEW YORK.

PUMP.

SPECIFICATION forming part of Letters Patent No. 791,733, dated June 6, 1905.

Application filed July 24, 1903. Serial No. 166,853.

To all whom it may concern:

Be it known that I, FRANK E. TEN EYCK, of Auburn, in the county of Cayuga, in the State of New York, have invented new and useful Improvements in Pumps, of which the following, taken in connection with the accompanying drawings, is a full, clear, and exact description.

This invention relates to improvements in pumps, and refers more particularly to compound air-compression pumps adapted for inflating pneumatic tires and for other purposes in which a high degree of compression is required.

My object is to produce a simple, compact, and durable air-pump which normally occupies a minimum space and is capable of producing a high degree of compression in a short space of time and with a small degree of power.

Other objects will be brought out in the following description.

In the drawings, Figure 1 is a vertical sectional view, partly in elevation, of my improved pump shown in its extreme distended position. Fig. 2 is an enlarged vertical section of the same, but at right angles to that seen in Fig. 1, showing the parts in their extreme compressed or normal positions. Figs. 3, 4, 5, and 6 are sectional views taken on lines 3 3 and 4 4, Fig. 1, 5 5, Fig. 3, and 6 6, Fig. 4.

Similar reference characters indicate corresponding parts in all the views.

This invention comprises, essentially, three concentric tubular cylinders 1, 2, and 3, which are constructed and arranged to carry out the object previously stated, and are mounted in an upright position and adapted for inflating pneumatic tires. It will be evident, however, from the subsequent description that the essential features of the invention may be utilized for other purposes and operated by other than hand power.

The outer or larger cylinder is threaded exteriorly at both ends to receive lower and upper screw-caps 4 and 5, and a tapering bushing or plug 6 is inserted in its lower end, so that when the lower cap is screwed in place the plug or bushing operates to slightly expand said lower end of the cylinder, and thus brings the threads into closer and more positive locking engagement to prevent buckling or spring of the metal and to render the joint more perfectly air-tight and better adapted to resist the strains to which it is subjected. A suitable foot-piece or stirrup 7 is secured to the lower end of the cylinder 1 and in this instance forms a part of the lower cap 4 to support the pump in an upright position, said lower cap being imperforate and serving to close the lower end of the cylinder.

Both of the caps are removable to permit the parts of the pump to be more readily assembled or dissembled; but the upper cap is provided with one or more air-intake and vent openings 8 and with a central hollow boss or guide 9, which latter receives and partially guides the cylinder 2 in its reciprocal movement, as presently described. This cylinder 2 consists of a metal tube which is arranged centrally within the outer cylinder 1, and tightly fitted in its lower end is a valve-case or hollow bushing 9′, in which is movable a valve 10. A second hollow bushing or coupling 11 is screwed into the lower end of the part 9, so as to be easily removed when desired. Secured to the lower end of this coupling is a piston 12, which consists of an inverted leather cup held in place by suitable washers 13 and a lock-nut 14, the washers being of slightly less diameter than the piston to permit the piston to compress slightly on the upstroke, so that the air may readily pass from the upper to the lower part of the cylinder around the piston. The coupling or bushing 11 is formed with a lengthwise air-passage 15, having its lower end communicating with the interior of the outer cylinder 1 beneath the piston 12, and its upper end communicates with the interior of the bushing 9 above the piston. The valve 10 is normally seated on the upper end of the bushing 11 to close the passage 15, and preferably consists of a hexagonal metal body having a leather or similar packing on its lower face and is arranged to move endwise in the bushing 9 with its corners in sliding engagement with the inner walls of said bushing, so that the air may readily pass upwardly along the sides of the valve when it is unseated by the downward stroke of the piston. The upper end of

the bushing 9 has a restricted central opening 16, through which the air may pass into the interior of the cylinder 2 from beneath the piston 12, and it is now evident that when the piston 12 is depressed by the downward movement of the cylinder 2 the air is expelled from the lower end of the cylinder through the passages 15 and 16 into the cylinder 2. The cylinder 3 is movable endwise in the cylinder 2 and also consists of a metal tube of less diameter than the inner diameter of the cylinder 2, and its lower end is provided with a piston 17 and a valve 18, which are similar to but much smaller than the like parts of the cylinder 2 and operate in substantially the same manner—that is, the piston 17 is connected to the cylinder 3 by bushing or couplings 19 and 20, similar to the bushings 9 and 11, and is held in place by washers 21 and a lock-nut 22, similar to the like parts 13 and 14 of the piston 12.

The upper end of the cylinder 2 is hollow to form a guide for the tube 3 and is provided with a suitable handle 23, by which it may be moved endwise in the cylinder 1 to operate the piston 12. The upper end of the inner tube or cylinder 3 extends through and above the upper end of the cylinder 2 and handle 23 and is secured to the upper end of a sliding frame or yoke 24, to which a flexible tube 25 is secured and communicates with the tube 3. This sliding frame or yoke 24 consists of lower and upper heads 26 and 27 and a pair of tie-rods 28, uniting said heads, the lower head being mounted with a sliding fit upon the outer cylinder 1 and usually consists of an open metal ring having apertured lugs to which the lower ends of the tie-rods 28 are secured. The lower and upper caps 4 and 5 serve as stops for engaging the head 26 and limiting the reciprocal movement of the frame 24.

In the operation of my improved pump, assuming that the tube 25 is connected to the tire to be inflated and that the parts are in their normal position, (seen in Fig. 2,) the operator first raises the cylinder 2 to the limit of its upward movement by means of the handle 23, which operation also raises the frame 24 and inner cylinder 3 and permits the air to pass around the piston 12 into the base of the cylinder 1. The cylinder 2 and its piston are then forced downwardly by the handle 23; but the inner cylinder 3 and frame 24 remain, held by friction, in their extreme upper position, so that the air in the base of the cylinder 1 is expelled into the cylinders 2 and 3 and passes under light pressure into the tube 25 and tire, if the latter is deflated, it being evident that the valves of both cylinders 2 and 3 open automatically on such downstroke of the piston 12. It is now apparent that the air is partially compressed in the cylinders 2 and 3 and that a considerable space intervenes between the pistons 12 and 17, so that when the piston 12 is returned on the upstroke the valve 10 closes automatically by air-pressure from above, and the air in the cylinders 2 and 3 is thus still further compressed in the tire.

It will be observed that the cylinder 2 and piston 17 are of considerably less cross-sectional area than the cylinder 1 and piston 12 and that as the piston 12 is moved downwardly away from the piston 17 and the compression-space in the cylinder 1 gradually reduced the space in the cylinder 2 between the pistons is gradually increased, so that the downward stroke of the piston 12 is effected with comparative ease and little power; but at the same time the air is compressed in the cylinder 2 and is held therein by the valve 10, while the valve 18 prevents back pressure from the tire to the cylinder 2. On the other hand, the smallness of the diameters of the cylinder 2 and piston 17 permits the piston 12 to be drawn upwardly toward the piston 17 with comparative ease and at the same time rapidly produces a high degree of compression in the tire by reason of the previous partial compression of air in the cylinder 2. It is thus seen that the work of compression is distributed between the two pistons 12 and 17, which reduces the liability of overheating of the pump.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. An air-pump comprising an outer cylinder, an inner tube, and a yoke connected thereto and having sliding connection with the outer cylinder and provided with a piston and a valved passage, and an additional cylinder movable in the outer cylinder and receiving the piston of the inner cylinder, said additional cylinder having a piston fitting in the outer cylinder.

2. An air-pump comprising an outer cylinder, an inner cylinder movable in the outer cylinder and having a valved passage in its lower end, a piston on the inner cylinder and fitting in the outer cylinder, and a tube in the inner cylinder having a valved passage in its lower end and an outlet-passage in its upper end.

3. An air-pump comprising an outer cylinder, an inner cylinder movable in the outer cylinder and having a valved passage in its lower end, a piston on the inner cylinder and fitting in the outer cylinder, and a tube in the inner cylinder having a valved passage in its lower end and an outlet-passage in its upper end, and a flexible tube secured to the upper end of the last-named tube.

4. An air-pump comprising an outer cylinder, an inner cylinder movable in the outer cylinder, and having a valved passage in its lower end, a piston on the inner cylinder and fitting in the outer cylinder, and a tube in the inner cylinder having a valved passage in its lower end and an outlet-passage in its upper

end, and a yoke attached to said tube and having sliding connection with the outer cylinder.

5. An air-pump comprising an outer cylinder having an imperforate bottom and an air-inlet at its top, a second cylinder movable in the first-named cylinder and provided with a flexible cup-piston contracting on the upstroke to allow the air to pass below, and expanding on the downstroke against the sides of the first cylinder to force air upwardly into the second cylinder, a check-valve in the lower end of the second cylinder and a tube in the second cylinder having a flexible cup-piston and a valved passage for the purpose described.

6. A pump comprising a main cylinder having one end closed and its other end provided with a guide-opening, a second cylinder movable lengthwise in the main cylinder and in said guide-opening, a piston and a valve on one end of the second cylinder and a handle on its other end, a third cylinder movable lengthwise in the second cylinder, a piston and a valve on the inner end of the third cylinder, and a sliding head movable lengthwise of the main cylinder and connected to the outer end of the third cylinder.

7. A pump comprising a main cylinder having one end closed and its other end provided with a guide-opening, a second cylinder movable lengthwise in the main cylinder and in said guide-opening, a piston and a valve on one end of the second cylinder, a third cylinder movable lengthwise in the second cylinder, a piston and a valve on the inner end of the third cylinder and a head in sliding engagement with the main cylinder and connected with the outer end of the third cylinder.

8. A pump comprising a main cylinder having one end closed and its other end provided with a guide-opening, a second cylinder movable lengthwise in the main cylinder and in said guide-opening, a third cylinder movable in the second cylinder, the latter two cylinders having passages through their lower ends, valves in said passages, pistons on the second and third cylinders in proximity to the valves, and a head in sliding engagement with the main cylinder and operatively connected to the outer end of the third cylinder to hold it in its adjusted position.

In witness whereof I have hereunto set my hand this 13th day of July, 1903.

FRANK E. TEN EYCK.

Witnesses:

H. E. CHASE,

HOWARD P. DENISON.