J. M. JEWELL.

COMPRESSION PUMP.

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1,414,283. **Patented Apr. 25, 1922.**

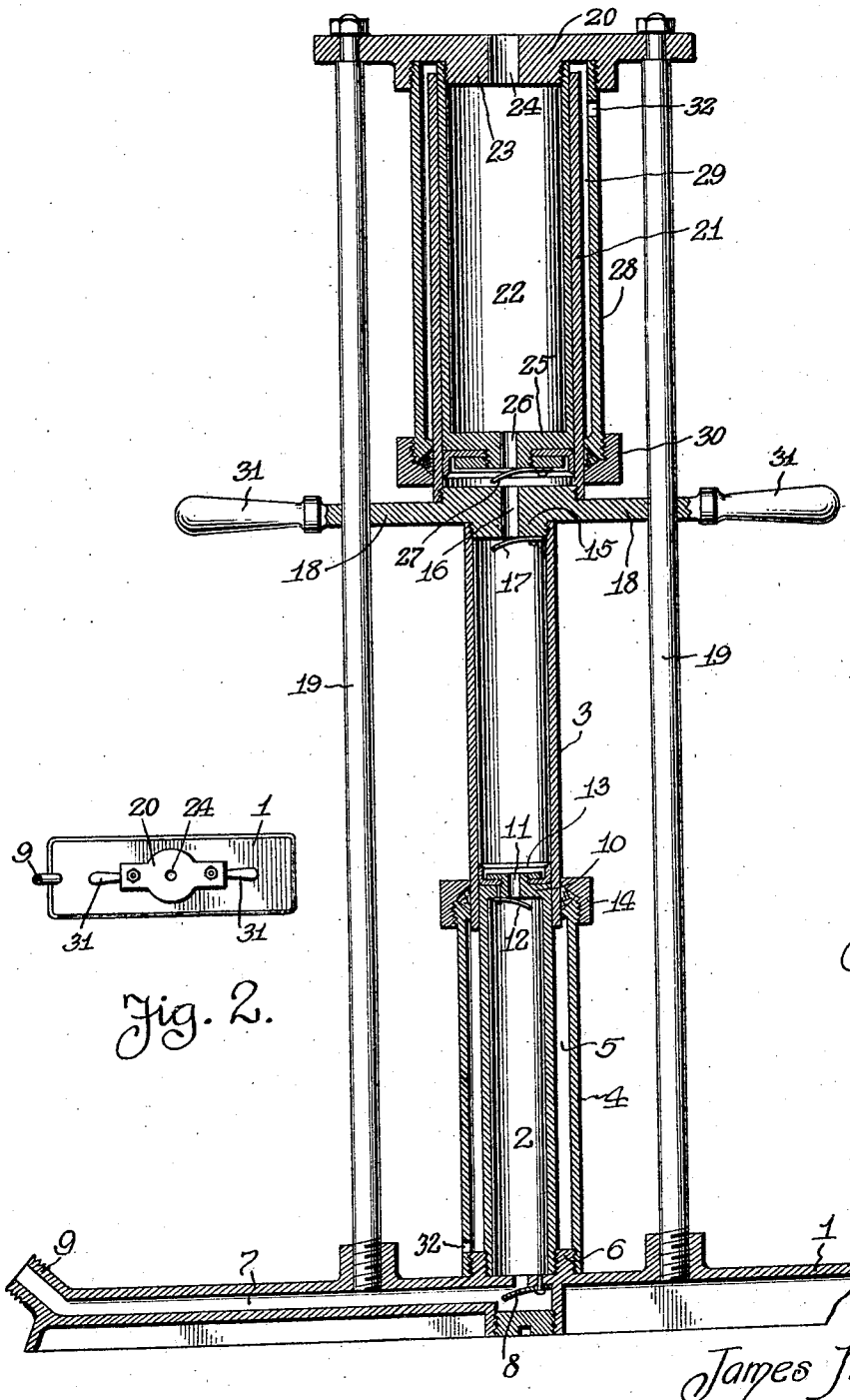


Fig. 1.

Fig. 2.

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COMPRESSION PUMP.

1,414,283. Specification of Letters Patent. Patented Apr. 25, 1922.

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To all whom it may concern:

Be it known that I, JAMES M. JEWELL, a citizen of the United States of America, residing at Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Compression Pumps, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to means for pumping and compressing air or other fluids, and its object is to secure high pressures with the expenditure of a minimum of power and time, and to provide a device which is simple in construction and efficient in operation. A further object is to provide certain other new and useful features, all as hereinafter more fully described.

With the above and other objects in view, the invention consists in providing a plurality of connected movable cylinders and stationary pistons therein, whereby a stage compression of fluid is effected and a simple, compact, and efficient arrangement secured. The invention further consists in certain other matters hereinafter set forth and more particularly pointed out in the appended claims, reference being had to the accompanying drawing in which—

Fig. 1 is a vertical section through a device illustrative of the invention, and

Fig. 2 a plan view of the same drawn to a much smaller scale.

In the drawing, 1 indicates a suitable base from which rises a tubular member 2 forming a stationary piston adapted to fit within a movable sleeve member 3 forming a cylinder, the piston 2 being preferably encased with a tubular shell 4 which is of such diameter as to leave a space 5 around the piston for the cylinder 3 to slide freely therein. The lower end of the hollow piston 2 is fixed to the base 1 in any suitable manner as by screw-threading said end externally to engage an internally screw-threaded boss 6 on the base, which base is formed with an outlet passage 7 communicating with the interior of the hollow piston. An outwardly opening valve 8 controls the outlet from the piston into said passage and a suitable nipple 9 or other suitable means may be provided on the base for the outlet end of the passage for the attachment of a hose (not shown) or other means for conducting the compressed fluid away. The upper end of the piston is closed by an end wall or head 10 having an opening or passage 11 therein affording communication of the interior of the cylinder 3 with the interior of the piston 2 and this passage is controlled by a suitable check valve 12 for checking the air or fluid from the cylinder into the piston. Any suitable means may be provided for making a tight joint between cylinder and piston and prevent leakage around the piston from the cylinder into the space 5, the means shown comprising a cupped washer 13 secured to the head 10 with the free upstanding edge of the washer resting against the interior surface of the cylinder. If found desirable, a suitable nut or packing gland 14 may be provided upon the upper end of the shell 4 to form a tight joint between the shell and exterior of the movable cylinder and to assist in guiding the cylinder in its reciprocating movement upon the fixed piston 2.

The upper end of the cylinder 3 is closed by a suitable head 15 having an axial inlet passage 16 therethrough for admitting air to the upper end of the cylinder 3, said passage being controlled by a suitable check valve 17 for checking the air into the cylinder, and this head or closure 15 may have laterally extending arms 18 provided with openings through which guide rods 19 extend, said closure 15 and arms 18 forming a cross head to guide the upper end of the cylinder, the guide rods 19 being rigidly secured at their lower ends to the base 1 in any suitable manner and extending parallel with the axis of the cylinder at each side thereof. At their extreme upper ends, these guide rods are rigidly connected together by a cap 20, the rods and cap thus making a rigid vertical guide for the upper end of the cylinder 3 and for a second tubular member or cylinder 21 which is rigidly secured at its lower end in any suitable manner to the cross-head, as by providing an externally screw-threaded boss 22 on the upper side of the cross head in axial alignment with the cylinder 3 to receive the internally screw-theaded lower end of the second cylinder 21.

Carried by the cap 20 is a fixed piston 22 over which the cylinder 21 fits and slides thereon and the upper end of this piston 22 is secured in any suitable manner to the cap, as by providing an externally screw-thread-

ed boss 23 on the cap to engage the internally screw-threaded upper end of the piston. Air is admitted into the tubular piston 22 through an axial passage 24 in the cap and the lower end of the piston is closed by a wall or head 25 having an axial passage 26 therein for the escape of air into the cylinder 21, a suitable check valve 27 being provided to control said passage and permit the free passage of air from the hollow piston into the cylinder but effectually closing the passage against the escape of air therethrough from the cylinder into the piston upon an upward movement of the cylinder which is reciprocated with the cross-head and cylinder 3. To prevent leakage around the piston 22 between it and the inner surface of the cylinder 21, a cupped washer 28 similar to the washer 13 is shown as secured to the head 25.

Enclosing the cylinder 21 is a tubular shell or casing 28 which is secured in any suitable manner at its upper end to the cap 20 and is of such diameter as to provide a space 29 between it and the piston 22, within which space the cylinder 21 reciprocates. If found desirable a suitable packing gland or nut 30 may be secured upon the lower end of this tubular shell to make a tight joint between it and the cylinder 21 and to guide the cylinder in its reciprocating movement.

The cross head may be moved along the guide rods 19 by the application of power thereto in any suitable manner, the means shown being a handle 31 extending laterally from each end of the cross head, which handles may be grasped by the operator to reciprocate the cross-head and cylinders 3 and 21 carried thereby.

When this device is used as a hand pump for pumping air into tires of motor vehicles, or for like purposes, the operator will grasp the handles 31 and reciprocate the cylinders 3 and 21 in that manner, but it will be understood that the device may be made in any desired size and operated by power.

Upon downward movement of the cross-head and cylinders carried thereby, air will be drawn into the hollow piston 22 through the opening 24 in the cap 20 and pass out of the lower end thereof through the passage 26 past the check valve 27, into the interior of the cylinder 21. Upon upward movement of the cross-head and cylinders, the air trapped within the cylinder 21 by the check valve 27, will be forced through the passage 16 past the check valve 17 into the cylinder 3 which is of less diameter and consequently less capacity than the cylinder 21 and will, therefore, be compressed. Upon the next down stroke of the cross-head, the air trapped in the cylinder 3 by the check valve 17, will be forced out through the passage 11 past the check valve 12 into the tubular piston 2 which is of less diameter and capacity than the cylinder 3 and there the air will be further compressed and pass out of the lower end of the piston past the check valve 8 into the passage 7 and out through the end thereof to the tire or other container connected to the end of the passage to receive the compressed air.

The air is thus forced from a larger into a smaller chamber at each stage of its passage through the pump and a "stage" compression is therefore secured, giving a very high compression at the discharge end of the pump in proportion to the power required to reciprocate the parts. The arrangement of aligned movable cylinders and fixed hollow pistons provides a compact and efficient arrangement and by providing the tubular shell 4 and 28 enclosing the pistons, cooling of the cylinders is effected by the forced circulation of air, which air is drawn into the spaces 5 and 29 and expelled therefrom through outlets 32 provided in the shells adjacent the fixed ends thereof.

Obviously, changes may be made in the size and proportion of the several cylinders, and the particular construction and arrangement of cross-head and guides may be varied to suit the conditions of use within the scope of the appended claims without departing from the spirit of the invention and other changes may be made in the construction and arrangement of parts shown.

Having thus fully described my invention, what I claim is:

1. A stage compression pump comprising a base, a vertical tubular piston fixed on the base, a tubular cylinder slidable on said piston, a second piston fixed in longitudinal axial alignment with said first piston and spaced therefrom, a second tubular cylinder of greater capacity than said first cylinder and slidable upon said second piston, a cross-head connecting the adjacent ends of said cylinders, said cross head having a passage connecting said cylinders and said first piston being arranged to receive fluid from said first cylinder, a check valve controlling the passage in said cross head and permitting flow of fluid from said second to said first cylinder in that direction only, and a check valve permitting flow of fluid from said first cylinder into said first piston in that direction only.

2. A stage compression pump comprising a base, a tubular piston fixed on the base and having an inlet at its upper end and an outlet at its lower end, vertical guide rods fixed at one end to the base at each side of the said fixed piston, a head carried by the upper ends of said rods and connecting the same, a second piston fixed at its upper end to said head in longitudinal axial alignment with said first piston, a cross-head reciprocable upon said rods between the adjacent ends of said pistons, tubular cylin-

ders fixed to opposite sides of said cross-head and sleeved upon said pistons to reciprocate thereon, one of said cylinders being of greater capacity than the other and being in communication at their adjacent ends, a check valve controlling communication between said cylinders and permitting flow from the cylinder of larger capacity into the cylinder of lesser capacity only, and check valves for the inlet and outlet of said first named piston.

3. A stage compression pump comprising a base, a tubular piston secured at its lower end to the base and having a head provided with an inlet, said piston having an outlet at its lower end, a valve for checking fluid into said piston through its inlet, a tubular casing surrounding said piston with a space between the piston and casing wall, said casing being secured to the base, rods secured at their lower ends to the base and extending upward at each side of the piston and casing, a head connecting the upper ends of said rods, a tubular piston secured at its upper end to the head and having a head at its lower end provided with an outlet, a tubular casing surrounding said piston and spaced therefrom and secured at its upper end to the head to which the piston is attached, a cross-head reciprocable upon said rods between the adjacent ends of the pistons, cylinders secured at adjacent ends to opposite sides of said cross head and adapted to slide upon said pistons within the spaces between the pistons and casings, one of said cylinders being of greater diameter than the other and said pistons being of diameters to fit within said cylinders, said cross-head being provided with a passage affording communication between said cylinders, means for reciprocating the cross-head and attached cylinders, and check valves for the passage connecting the cylinders, the outlet for the second piston into the upper cylinder and the inlet into the lower piston.

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

JAMES M. JEWELL.

Witnesses:
LEWIS E. FLANDERS,
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