L. CLAWSON.

AIR PUMP.

APPLICATION FILED MAY 12, 1914.

1,162,222. Patented Nov. 30, 1915.

Fig. 1.

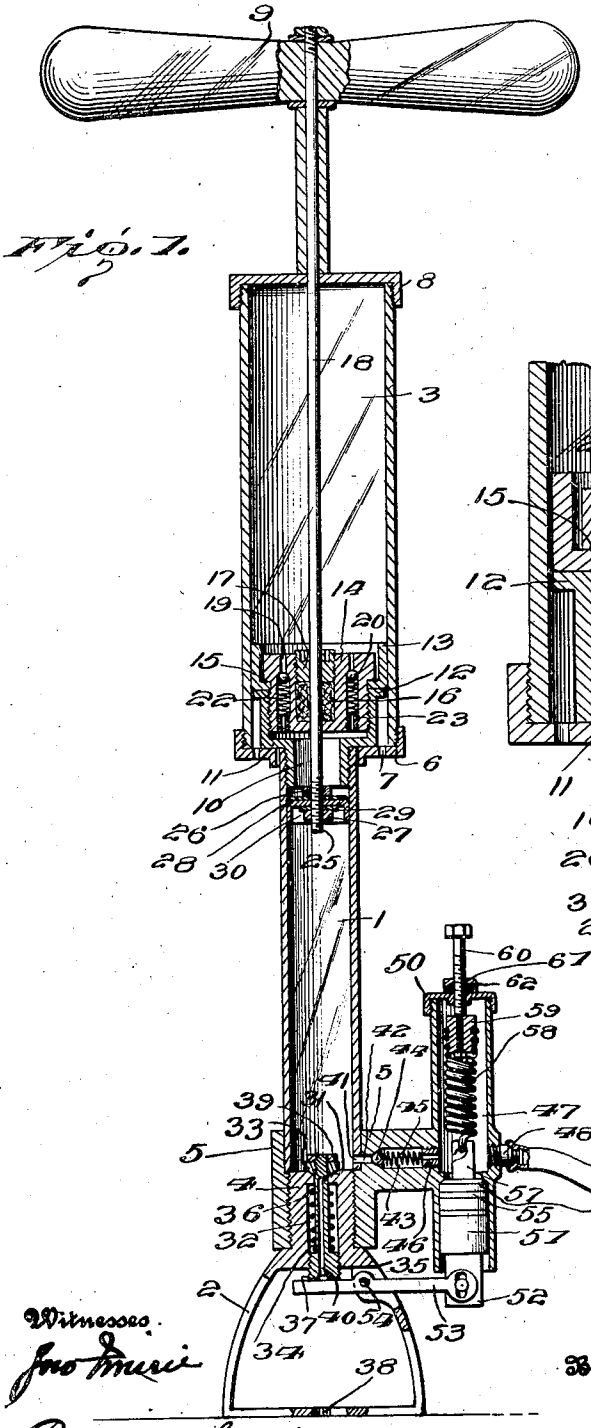
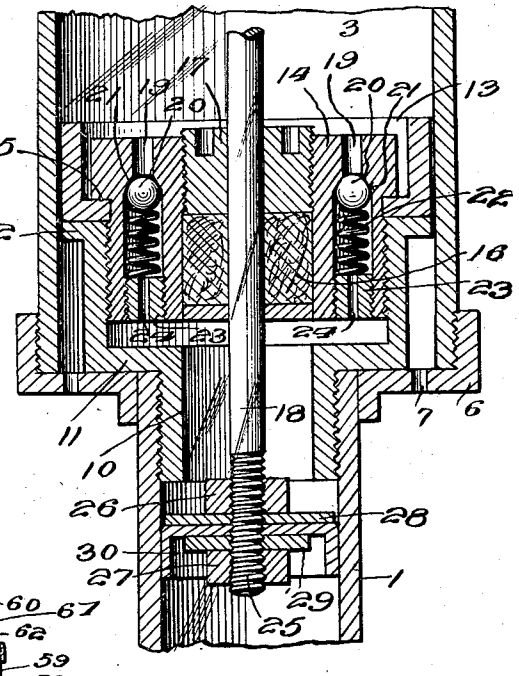


Fig. 2.



Witnesses.

Jno Murie

R. H. Bishop

Inventor

Leroy Clawson,

By

Attorneys.

UNITED STATES PATENT OFFICE.

LEROY CLAWSON, OF HALL, MONTANA, ASSIGNOR OF ONE-HALF TO CHARLES L. CLAWSON, OF HALL, MONTANA.

AIR-PUMP.

1,162,222. Specification of Letters Patent. Patented Nov. 30, 1915.

Application filed May 12, 1914. Serial No. 838,133.

To all whom it may concern:

Be it known that I, LEROY CLAWSON, citizen of the United States, residing at Hall, in the county of Granite and State of Montana, have invented certain new and useful Improvements in Air-Pumps, of which the following is a specification.

This invention relates to air pumps and has special reference to that class of air pumps which are used more particularly for inflating pneumatic tires.

One object of the present invention is to provide a pump of compact form, by the use of which the desired pressure within the tire will be quickly attained, and a further object of the invention is to provide means whereby, if the desired pressure has been attained, any additional air which it may be attempted to force into the tire will be prevented from entering the same and will escape to the atmosphere. The invention also seeks to improve generally the construction and arrangement of the parts of an air pump to the end that the durability and efficiency of the same may be increased.

The several stated objects and such other objects as will incidentally appear from the following description are attained in such a device as is illustrated in the accompanying drawings, and the invention consists in certain novel features which will hereinafter be particularly pointed out in the claims following the detailed description.

In the drawings, Figure 1 is a longitudinal section of an air pump embodying my present improvements; Fig. 2 is an enlarged section through the stationary piston and the members of the two cylinders immediately adjacent the same.

In carrying out my invention, I employ a lower cylinder 1, which is rigidly secured to a base 2, and an upper cylinder 3, which is telescopically mounted upon the lower cylinder. The base 2 is preferably in the form of a stirrup in which the foot of the user may be inserted so as to hold the pump firmly in its operative position and upon the upper end or the apex of the stirrup is formed an extension or plug 4 to which a valve body 5 is rigidly secured, the said valve body being extended above the upper end of the plug 4 so as to receive the lower end of the cylinder 1, and the said lower end of said cylinder being brazed or otherwise rigidly secured in the said valve casing or body. The upper cylinder 3 is, of course, greater in diameter than the lower cylinder and at its lower end is provided with a cap or head 6 which fits around the lower cylinder so as to slide thereon and is provided with inlet ports 7, as shown. The upper end of the cylinder is also equipped with and closed by a cap or head 8 which may be provided with a handle 9, or may be connected with a motor, so that power may be applied to the cylinder. Secured in the upper end of the lower cylinder is a sleeve 10 which is expanded laterally above the cylinder so as to rest thereon, as shown at 11, and from the said expanded portion 11 the sleeve extends axially within the upper cylinder and is preferably provided with an annular rib or flange 12 at its upper extremity, which is spaced slightly from the inner surface of the said upper cylinder, as shown more clearly in Fig. 2. A flexible piston cup or ring 13 rests upon the upper end of the said sleeve and is formed of leather or similar material, in the usual manner. A plug 14 is secured in the upper portion of the sleeve 10 and has an annular shoulder 15 which rests upon the inwardly extending portion of the piston cup 13 so as to clamp the same firmly to the flange 12 and the upper end of the sleeve. The plug 14 is centrally bored to provide a socket adapted to receive packing 16 and a compression plug 17 is fitted in the said socket so as to compress the said packing around the piston rod 18. The plug 14 is also provided with one or more longitudinal passages 19 which are expanded at their lower ends to permit the flow of air from the upper cylinder to the lower cylinder and contain check valves which, in the present instance, are illustrated as consisting of balls 20 adapted to seat against the internal annular shoulders 21 and held normally against said seats by springs 22 fitted within the lower expanded portions of the air passages. Retaining plugs 23 are secured in the lower portions of the said passages so as to prevent escape of the springs and the balls, and also to permit regulation of the tension of the springs in an obvious manner. The said retaining plugs are bored axially at 24 to permit the air to escape from the air passages in the operation of the device.

The piston rod 18, as above stated, extends through the stationary piston, and the packing 16 is compressed around the said rod so as to prevent leakage of air, as will be

readily understood. The upper end of the said piston rod is affixed rigidly to the upper cap or head 8 so that the rod will move with the upper cylinder, and upon the lower end of the said rod 1 secure a piston which is arranged to operate in the lower cylinder. The lower extremity of the piston rod is threaded, as shown at 25, and locking and adjusting nuts 26 and 27 are mounted upon the said threaded extremity. Below and against the upper nut 26 is fitted a disk or washer 28, and between the said washer and a smaller washer 29 which rests against the lower nut 27 I provide the packing or piston cup 30 which is of the usual construction and formed of leather or similar material. The piston cups 13 and 30 operate in the usual manner so that upon the intake stroke the annular members of the cups will yield to the pressure of the air so as to permit the air to flow between the piston cup and the wall of the cylinder while, on the compression or force stroke of the pump, the annular members of the piston cups will fit tightly against the wall of the cylinder and prevent escape of the air.

The plug 4 upon the top of the base or stirrup 2 is formed with a valve seat 31 in its upper end and also with a longitudinal chamber 32 opening through its lower end. A valve 33 is arranged to engage the seat 31 and the said valve is provided with a stem 34 which extends longitudinally through the chamber 32 and around said stem between the head 35 and the upper end of the chamber 32 is coiled a spring 36 which is normally expanded so as to hold the stem in its lowest position with the valve 33 upon its seat 31, thereby preventing escape of the compressed air through the plug. The lower end of the head 35 is constructed with radial grooves 37 which may be engaged by a screw driver or similar tool inserted through an opening 38 in the base of the stirrup 2 so as to adjust the valve stem and place the spring 36 under the desired tension. A nut 39 is mounted upon the upper extremity of the stem above the valve 33 so as to secure the valve in position to seat properly according to the tension placed upon the spring 36. The valve stem is also provided with a longitudinal passage 40 opening through its lower end and having its upper end opening laterally through the stem immediately below the valve 33. In the normal position of the parts, the upper end of this vent passage is covered by the upper portion of the plug directly to the atmosphere. The cylinder 1 is provided at its lower end with a lateral escape port 41 which is in direct alinement with a port 42 in the valve casing 5, and the said port 42 forms the inner end of a passage or chamber 43 in the said casing. A check valve is mounted in the said chamber or passage 43 to permit flow therethrough from the pump and to prevent the flow in the reverse direction.

While any desired form of check valve may be employed, I prefer to use a valve of the same character as those shown in the stationary piston hereinbefore described. In the drawing, 44 indicates the ball or valve member, 45 the spring holding the said ball or valve to its seat and 46 the bored plug secured in the end of the chamber or passage 43 and receiving the thrust of the spring 45. The passage 43 communicates directly with the interior of a supplemental relief cylinder 47 which is formed integral with or secured rigidly to the valve casing 5 and is disposed parallel with the cylinder 1. The said supplemental cylinder is equipped with a nipple 48 upon which may be fitted one end of a hose 49 which is engaged upon the inflation valve of the tire in the usual manner and as will be readily understood. The lower end of the cylinder 47 is open, while the upper end is closed by a cap or head 50, as shown. Within the lower portion of the said cylinder is fitted a piston 51 having a lug or extension 52 at its lower end, to which is loosely and pivotally attached one end of a relief lever 53, said lever being fulcrumed upon the stirrup 2, as shown at 54, and having its free end bearing against the lower end of the head 35. The piston 51 is equipped with packing rings 55 so as to prevent leakage around the piston and its upper end is adapted to seat against an internal annular shoulder 56 in the cylinder 47 below the passage or chamber 43. The upper end of the said piston is equipped with a hook or equivalent device 57 which is engaged by and holds the lower end of a pressure controlling or governor spring 58, the said spring extending axially within the upper portion of the cylinder and having its upper end secured about a swivel plug 59, the said plug 59 being swiveled upon the lower end of an adjusting screw or bolt 60 which is mounted in and extends through the cap 50, and a nut or gland 61 is fitted around the bolt or screw 60 to bear upon the said cap and compress the packing 62 thereagainst to prevent leakage around the adjusting screw or bolt. By rotating the said screw or bolt so that the stem will move longitudinally in the cap 50, the spring 58 will be put under more or less tension and, consequently, may be regulated so as to withstand more or less pressure from the air within the hose 49, the chamber 43 and the cylinder 47.

It is thought the operation and advantages of my improved pump will be readily understood from the foregoing description taken in connection with the accompanying drawings. The spring 58 is adjusted in the described manner so as to resist expansion under any degree of pressure up to that

which it is desired to attain in the tire. The hose 49 is fitted to the inflation valve in the usual manner and the pump is then operated by reciprocating the upper cylinder 3. As the upper cylinder moves downwardly over the lower cylinder the piston connected therewith will, of course, move toward the bottom of the lower cylinder, and any air which may be below said piston will be driven through the ports 41 and 42 into the chamber 43 and thence flow through the hose 49 into the tire. During the downward movement of these parts air will, of course, flow in through the port 7 in the lower end of the upper cylinder, and any air which may be in the upper portion of the upper cylinder will be compressed against the upper stationary piston and will overcome the tension of the springs 22 so as to open the check valves in said piston and thence escape into the lower cylinder. On the up stroke the air in the lower cylinder will flow past the piston cup 30 and be caught in the lower portion of said cylinder. A partial vacuum will also be created in the upper cylinder above the stationary piston, and the pressure of the atmosphere will be sufficient to cause air to flow into the upper cylinder past the piston cup or packing 13 and be caught in the upper cylinder. Upon the next down stroke of the pump this air will, of course, be forced through the stationary piston into the space below the same and will eventually be forced from the lower cylinder through the valve casing 5 into the tire in the manner previously described. The pressure in the tire will, of course, be the same as the pressure in the hose 49 and the cylinder 47, and when this pressure has reached a degree when it will overcome the tension of the spring 58 it will act upon the piston 51 in opposition to said spring so as to move the piston outwardly or downwardly and thereby vibrate the lever 53 so that the free end of said lever will lift the valve stem 34 against the tension of the spring 36 and, consequently, raise the valve 33 from its seat 31 so that the air then in the cylinder will escape from the vent passage 40. The notches or grooves 37 in the lower end of the head 35 will permit said air to flow around the lever 53 and thereby avoid choking of the vent. The operator will be made aware at once of the fact that air is no longer passing into the tire, as he will hear the hissing caused by the escape of air from the vent and will also find the pump immediately working more easily than when the air is being forced into the tire. The packing rings 55 may be removed from the piston 51 so that when the piston moves from its seat air may escape around the piston and the pressure in the cylinder be thereby relieved, but I prefer to use the packing rings for the reason that premature release of the pressure and reduction of the same in the tire is thereby avoided. It will be readily noted that my improved air pump is very compact in the arrangement of its parts and it will be found highly efficient in use inasmuch as the air is gradually compressed in the successive stages of its flow through the stationary piston and the stationary cylinder, and when the operation of the pump ceases there will be a partially compressed supply of air trapped between the lower movable piston and the check valves in the upper stationary piston. The valve casing 5 not only forms a support for the check valve which governs the escape of the air to the tire and the supplemental or pressure governing cylinder, but also serves as a stop to limit the desired movement of the upper cylinder and, consequently, prevents injury to the working parts which might be caused by any tendency to impart an excessive stroke to the upper cylinder.

Having thus described my invention, what I claim is:

1. An air pump comprising a compression cylinder, a piston working therein, a valve casing secured upon the said cylinder and having an outlet passage leading from the said cylinder, a governor cylinder carried by said casing and communicating with the said outlet passage, a check valve in the passage in said casing, a relief valve in the end of the compression cylinder, a piston in the governor cylinder, operative connections between the said piston and the relief valve, a spring disposed within the governor cylinder to normally hold the piston inactive, and means for regulating the tension of said spring.

2. An air pump comprising a compression cylinder, a piston working therein, a plug closing the lower end of said cylinder, a valve seating upon the said plug and having a stem extending therethrough, said stem being provided with a vent passage, means for holding said valve normally seated whereby the vent passage will be closed by the plug, and means controlled by the pressure of the air discharged from the compression cylinder for unseating said valve whereby to open said vent.

3. An air pump comprising a compression cylinder, a piston working therein, a plug closing the end of the cylinder and axially bored, a valve seating upon the said plug and having a stem extending through the plug, said stem being provided with a vent passage, the upper end of which is normally closed by the plug, a spring housed within the plug and holding the valve normally seated whereby said vent passage will be closed, a lever bearing upon the stem in opposition to the said spring, and means controlled by the air discharged from the compression cylinder to vibrate said lever and

thereby unseat the valve to open the said vent passage.

4. An air pump comprising a compression cylinder, a relief valve in the end of said cylinder, a governor cylinder communicating with the outlet from the compression cylinder, a piston slidably mounted within said governor cylinder and exposed to the air discharged from the compression cylinder, means within the governor cylinder for holding said piston yieldably against the pressure of said air, and a lever pivotally connected to said piston and in constant operative engagement with the relief valve.

5. An air pump comprising a compression cylinder, a piston working therein, a governor cylinder in communication with the outlet of the compression cylinder, a relief valve in the end of the compression cylinder, a piston in the governor cylinder exposed to the air discharged from the compression cylinder, operative connections between the said piston and the relief valve, a spring attached to said piston, and an adjusting bolt mounted in the end of the governor cylinder and having a swiveled connection with the said spring.

6. An air pump comprising a compression cylinder, a relief valve in the end of the same, a governor cylinder supported from the compression cylinder and in communication with the outlet thereof, the relief valve in the compression cylinder having a hollow stem projecting beyond the cylinder, the outer end of said stem being transversely grooved, a piston slidably mounted in the governor cylinder and exposed to the pressure from the compression cylinder, means within the governor cylinder for yieldably holding the piston against the said pressure, and a lever mounted between the governor cylinder and the relief valve and having one end pivotally connected to the piston and its opposite end bearing against the transversely grooved end of the relief valve.

7. An air pump consisting of a compression cylinder, a bored plug fitting in the lower end of said cylinder, a valve seating in the upper end of the bore of said plug and having a stem extending through said bore and provided with an enlarged head at its lower end, said stem having a vent passage opening through its lower end and laterally near its upper end, and the upper lateral end of said passage being normally closed by the wall of the bore of the plug, a valve casing secured upon the cylinder above the relief valve and providing an outlet passage for the cylinder, a governor cylinder carried by said valve casing and in communication therewith and having an open lower end, a piston slidably mounted in the governor cylinder and filling and projecting through the open lower end of the same, and a lever fulcrumed between the said piston and the relief valve and having one end pivotally connected to the piston and its opposite end bearing against the enlarged head at the lower end of the stem of the relief valve.

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

LEROY CLAWSON. [L. S.]

Witnesses:

JOHN GRIFFIN,

ARTHUR RAYMOND ENGLE.