Apr. 10, 1923. 1,451,033

S. H. TODD

COMPRESSOR

Filed June 28, 1921

Fig. 1.

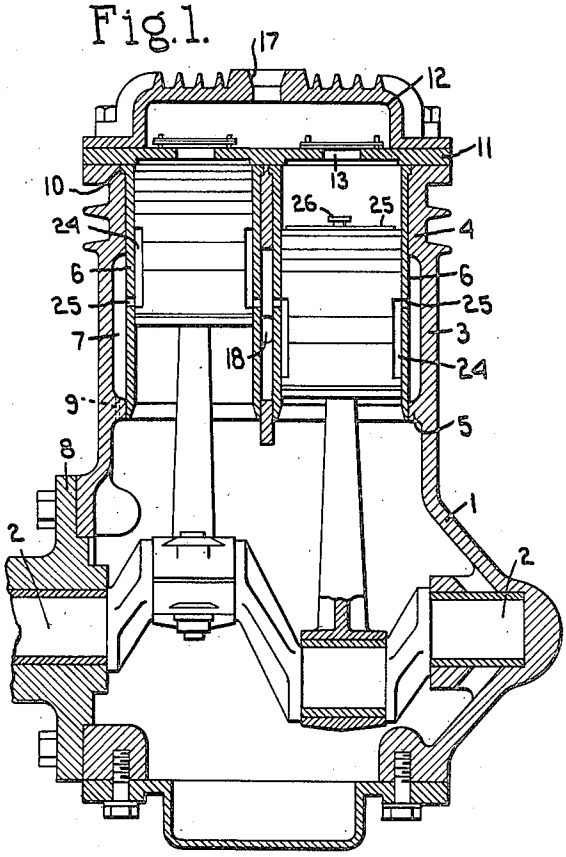


Fig. 2.

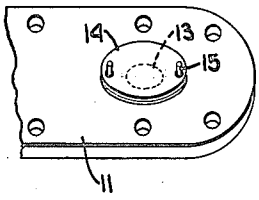


Fig. 4.

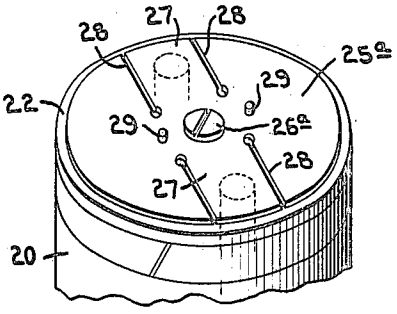
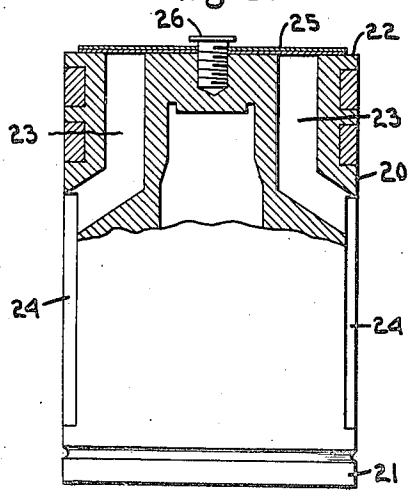


Fig. 3.



INVENTOR.

Samuel H. Todd

BY

ATTORNEY.

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UNITED STATES PATENT OFFICE.

SAMUEL H. TODD, OF DETROIT, MICHIGAN.

COMPRESSOR.

Application filed June 28, 1921. Serial No. 481,011.

To all whom it may concern:

Be it known that I, SAMUEL H. TODD, a citizen of the United States, residing at Detroit, in the county of Wayne and State of Michigan, have invented a certain new and useful Improvement in Compressors, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

This invention relates to compressors for expansible gases and especially to those of small size such as are employed for inflating tires, for condensing gases, and in the art of mechanical refrigeration. The objects of the invention are the provision of a compressor of great simplicity and cheapness which shall have a very high volumetric efficiency, which will start easily under load, and in which lubrication of the moving parts can be effected without danger of the lubricant becoming entrained in the gas; the provision of a simplified and improved construction of compressor valve; while further objects and advantages of the invention will become apparent as the description proceeds.

In the drawing accompanying and forming a part of this application I have shown certain simple physical forms in which my inventive idea can be embodied, but without intent to restrict myself to any of the mechanical features therein shown except as the same are described in my claims.

Fig. 1 is a vertical longitudinal sectional view showing my improvements as applied to a two-cylinder compressor; Fig. 2 is a perspective view of a portion of the cylinder head illustrating a simple type of valve construction; Fig. 3 is an enlarged side elevation, partly in section, of one of the pistons; and Fig. 4 is a perspective view of part of a similar piston showing a modified valve construction.

Describing the parts by reference characters, 1 represents the crank-case portion of a compressor having journaled therein the usual crank shaft 2 and having integral therewith a hollow cylinder block 3 formed at its upper and lower ends with internal flanges 4 and 5; these flanges are formed with circular seats snugly receiving the sleeves 6—6 which constitute the cylinders. I have shown a two-cylinder compressor since that is the simplest balanced form but I do not restrict myself thereto since either a smaller or a larger number of cylinders can be used. Each sleeve is spaced from the cylinder block to form in conjunction with the flanges 4—5 an annular chamber 7. The crank case is completely closed excepting for the removable end-plate 8 which is hermetically secured thereto, and for one or more restricted openings 9 which lead to each of the chambers 7.

The upper end of each sleeve is externally flanged as at 10 to fit in a rabbet formed in the block, and across the upper ends of these sleeves is bolted a head-plate 11 surmounted by a hollow cap 12. This plate is preferably merely faced on its two sides and formed with outlet ports 13, one upon the axis of each cylinder. The simplest valve consists merely of a metal disc 14 loosely carried by this plate above each port, suitable means being provided to prevent lateral displacement thereof, such for example as pins 15 projecting loosely through holes in the discs. These discs can be made of thick or thin metal, single or double ply, rigid or flexible as desired. I have shown in Fig. 2 a two-ply disc, the lower layer being of phosphor-bronze which is soft and non-corrodible, the upper being of steel and arranged to protect the softer metal. The cap 12 is formed with the connection 17 for an outlet pipe and the side of the cylinder block is formed with an inlet opening 18 for the inlet pipe.

The pistons consist of hollow cylindrical bodies having bearing surfaces 20—21 at their sides and flat end surfaces 22 through which the inlet ports 23—23 open, the other ends of said ports being in communication with the inlet opening 18. So far as concerns the present invention the path of this communication is immaterial, although for practical purposes I prefer the arrangement herein shown where the sides of the pistons are formed with longitudinal recesses 24 which communicate at all times with ports 25 formed in the walls of the sleeve 6.

Mounted upon the head of each piston is a valve consisting of a circular metallic disc whose lower face is adapted to make sealing contact with the end surface 22 and whose margin extends just as close to the cylinder walls as is safe and still avoid the nature of scoring. This disc can be made either single ply or double ply, rigid or flexible, thick or thin, and in any event is preferably secured in place by means of a central screw 26 so located as to enter the port 13 upon the com-

pression stroke. In Fig. 3 the valve 25 is shown as made of two-plies of sheet metal, the upper of steel and the lower of phosphor-bronze or other non-corrodible metal, and assuming it to possess considerable rigidity, the screw 26 has its head spaced sufficiently therefrom to enable the disc to rise sufficiently to open the ports.

In Fig. 4 the disc 25^a is made of a single thickness of flexible metal and the screw 26^a is set down tightly thereon, the valve having two narrow tongues 27—27 severed from the rest of the disc by parallel slots 28—28 so that the ports can be uncovered without bending so much of the metal. In this case rotation of the disc is prevented by pins 29—29 carried by the piston head, but in Fig. 3 the disc is free to rotate.

The form of piston-head valve herein disclosed is very cheaply and simply made, fills the cylinder space entirely without necessitating any expensive slotting of either the piston or the cylinder head and necessitates a minimum of care in the assembling. A compressor constructed as herein described can be manufactured at a minimum of cost, operated with a minimum of power, and lubricated with a minimum of contamination of the compressed gases; but I do not limit myself to any special details of construction except as recited in the claims hereto annexed.

Having thus described my invention what I claim is:

1. In a compressor of the reciprocating piston type, in combination, a cylinder having a head formed with an axial outlet port, a valve covering the upper end of said port, a piston having a flat end wall and ports traversing the same at one or more points between its center and circumference, a flat circular valve disc mounted upon such end wall and extending substantially to the edges of the same so as to fill the cylinder completely upon the end of the compression stroke, and a screw mounted in the center of the piston to hold the disc in place, said screw having a head which enters said outlet port at the end of such compression stroke.

2. In a compressor of the reciprocating piston type, in combination, a piston having a flat end wall and ports traversing the same at one or more points between its center and circumference, a flat circular valve disc mounted upon such end wall and extending substantially to the edges of the same, and a central screw mounted in the piston and holding the disc against lateral displacement, said disc having slots which define flexible tongues, one for each port.

3. A valve for compressor pistons consisting of a flat circular sheet metal disc having a diameter substantially as great as that of the cylinder and having slots therein defining flexible tongues adapted to cooperate with the gas ports.

In testimony whereof, I hereunto affix my signature.

SAMUEL H. TODD.