M. A. ESTES.

AIR COMPRESSOR.

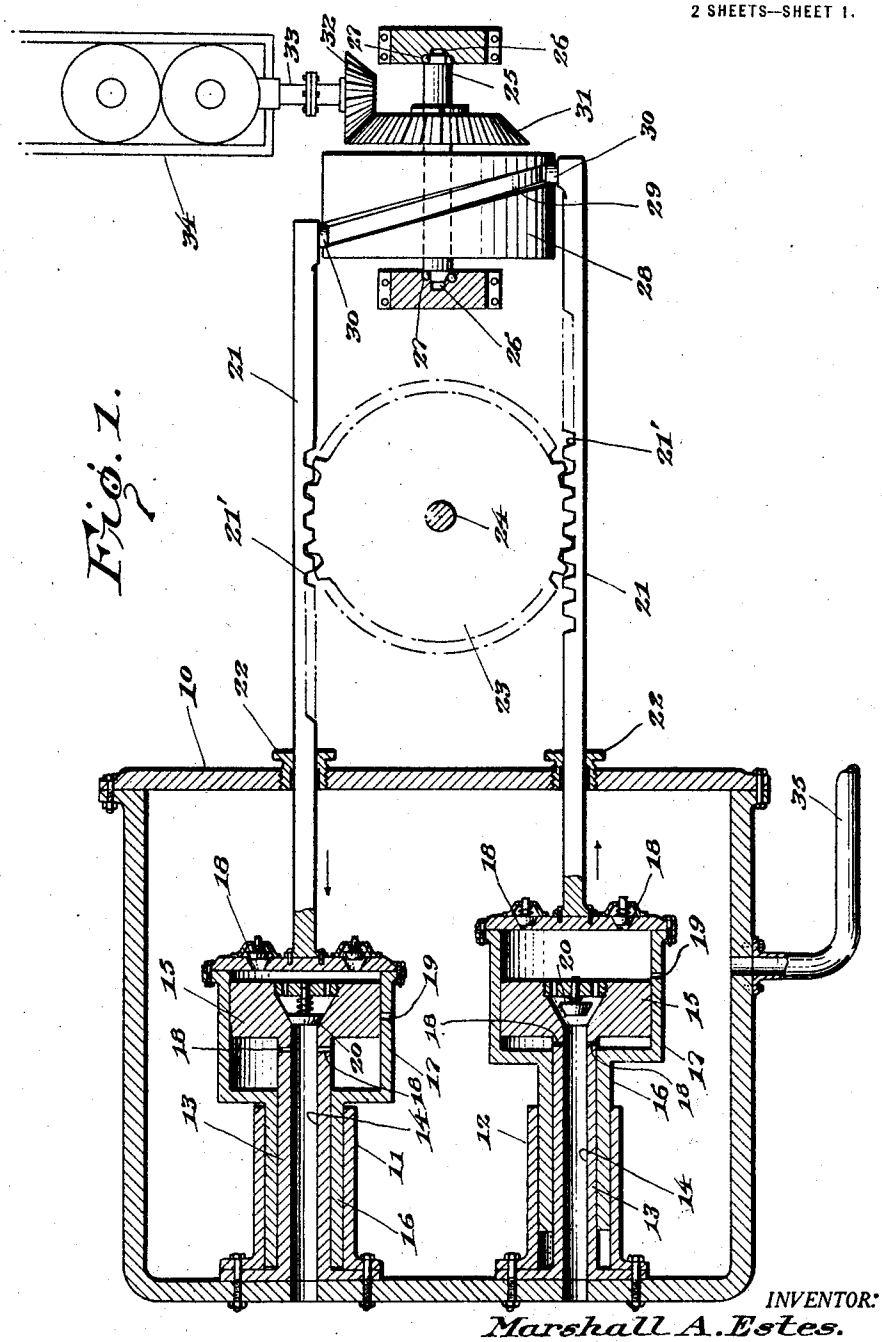
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1,389,039.

Patented Aug. 30, 1921.

2 SHEETS—SHEET 1.

Fig. 1.



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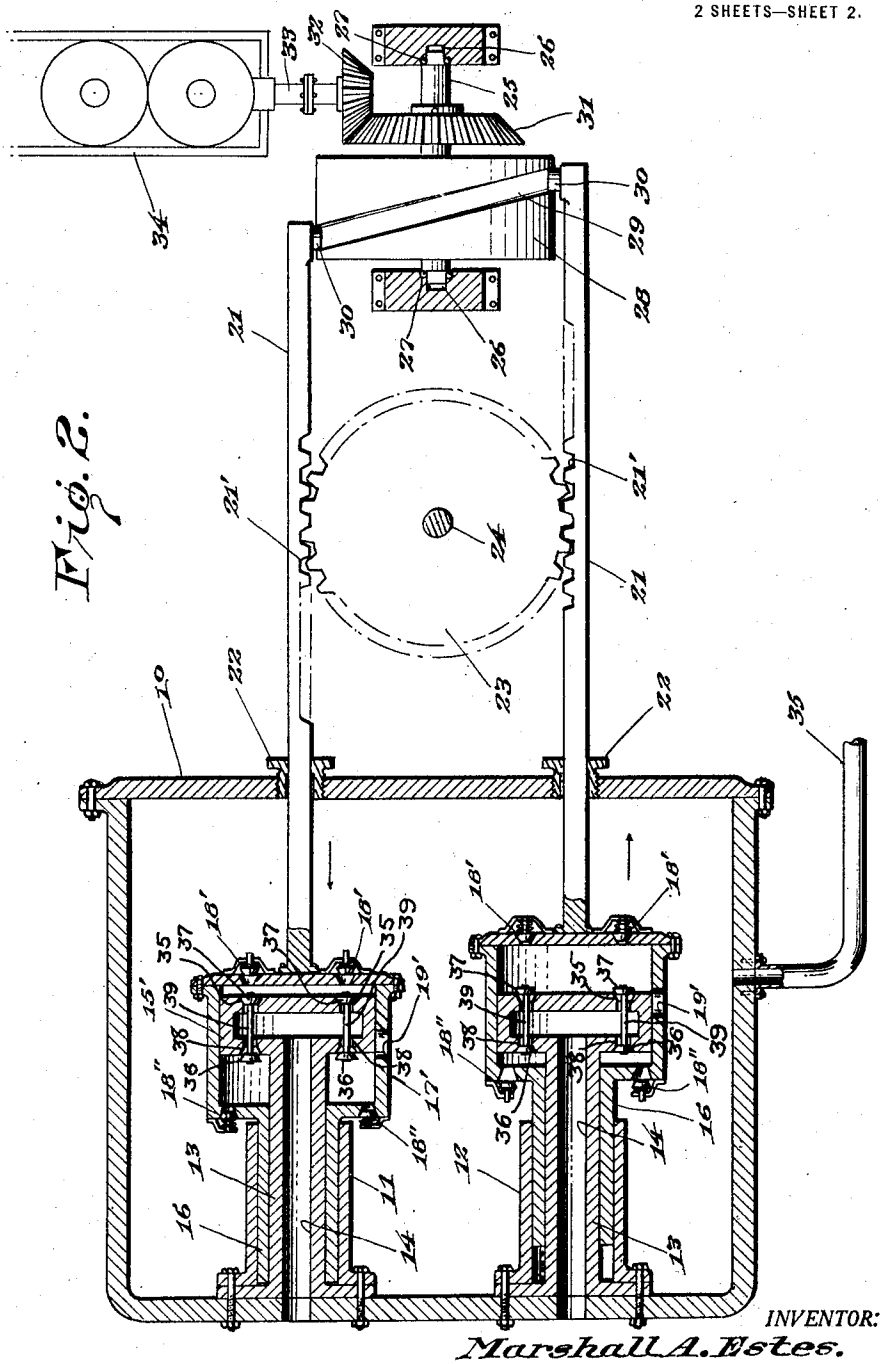
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2 SHEETS—SHEET 2.

Fig. 2.



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UNITED STATES PATENT OFFICE.

MARSHALL A. ESTES, OF ESTES, VIRGINIA.

AIR-COMPRESSOR.

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To all whom it may concern:

Be it known that I, MARSHALL A. ESTES, a citizen of the United States, residing at Estes, in the county of Rappahannock, State of Virginia, have invented certain new and useful Improvements in Air-Compressors; 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.

This invention relates to new and useful improvements in pumping machinery and particularly to machines for compressing air.

One object of the present invention is to provide a novel and improved device of this character wherein the compressed pistons of the pumps will be properly balanced so that the operation will be easy and effective.

Another object is to provide a novel and improved device of this character wherein the reciprocatory movements of the pistons are produced by a continuously rotating element.

Other objects and advantages will be apparent from the following description when taken in connection with the accompanying drawing.

In the drawing:

Figure 1 is a horizontal longitudinal sectional view through the invention.

Fig. 2 is a sectional detail of the piston and casing showing a modification wherein the pump is rendered double-acting.

Referring particularly to the accompanying drawing, 10 represents a tank of any suitable size or shape. Within the tank, and rising from one end thereof are two cylinders or tubes 11 and 12, and concentrically within each cylinder or tube is a cylindrical stem 13 having a longitudinal bore 14 therethrough, and having a piston head 15 formed on its inner end. In the space surrounding the stem 13, and between said stem and each of the tubes 11 and 12 is a tubular stem 16 having formed on its inner end the working cylinder 17 of the pump. This cylinder 17 has the head 15 movable longitudinally therein, while the tubular stem 16 slides between the stem 13 and the tube 11. In the inner end of the cylinder 17 there are mounted the valves 18 which open toward the interior of the tank to permit the air from the cylinders to discharge into said tank. Formed transversely in the stem 13, to establish communication between the interior of the cylinder 17, below the piston head 15, and the central bore 14 of said stem, are the ports 18 which permit ingress and egress of atmospheric air between the bottom of the cylinder and the bore 14, thus preventing suction below the piston.

In one side of the cylinder 17, at a point where it will be uncovered when the cylinder is at the uppermost limit of its stroke, and covered at other times during the movement of the piston and cylinder, is a port 19 which permits air from within the tank, and which is at a high pressure, to enter the cylinder above the piston, and thus raise the pressure of the air drawn in by the cylinder and piston, so that it will more readily discharge into the tank through the valves 18. This will also assist the piston and cylinder in their relative movements so that the high pressure in the tank will not react against the piston and cylinder.

In the inner end of the bore 14 there is mounted a check valve 20 which opens in a direction toward the adjacent end of the cylinder, this valve automatically opening as the cylinder moves upwardly, thereby permitting the atmospheric air to pass through the bore into the cylinder 17 above the piston.

Connected to the inner end of each of the cylinders 17 is a pitman rod 21 which is slidable through a packing gland 22 in the upper wall of the tank. Each of the rods has its inner face formed with longitudinal series of teeth 21′ which mesh with opposite portions of the toothed periphery of the pinion 23, mounted above the tank, between the said rods and on the transverse shaft 24. Disposed between the outer ends of the rods 21, and in parallel relation thereto, is a shaft 25, the ends of which are mounted in thrust bearings 26 which have antifriction balls 27 therein. On this shaft 25 is mounted a drum 28 and formed in the peripheral face of this drum is a serpentine groove 29 in which play the inturned rollered ends 30 of the rods 21. The other end of the shaft 25 is provided with a bevel pinion 31 which meshes with a similar pinion 32 on the shaft 33 of the motor 34. The tank is provided with a pipe 35 for conveying the air from the tank to a point of storage or to an engine.

The pinion 23 serves as a balance for the

rods 21 to hold them against back lash, so that the strain will be distributed more evenly on the pistons. By discharging the air into the tank, and locating the cylinders within the tank, the pressure of the air in said tank serves to equalize the movements of the pistons, and when the pressure in the tank reaches a point greater than the power in the strokes of the pistons, the pumps will stop until such time as the pressure in the tank is reduced below such point.

In Fig. 2 there is shown a modification of the invention wherein the pump is double-acting. In this form the other or outer end of the cylinder 17′ is provided with the valves 18″ similar in form to the valves 18′. The port 19′ is also disposed at such a point in the side wall of the cylinder 17″, and the piston 15′ is of such thickness that said port will be uncovered at each end of the stroke of the piston.

The piston 15′ is preferably hollow and has the valve seats 35 and 36 in its inner and outer end walls, and arranged to be seated on said seats are the valves 37 and 38. Each valve 37 is connected to a valve 38 by means of a stem 39, of such length that when one valve is seated the other valve will be unseated.

In this form of the device, as shown in Fig. 2, the upper cylinder 17′ is moving toward the left and the lower cylinder toward the right, as indicated by the arrows, so the upper piston 15′ is forcing air past the valves 18′ into the tank while air is being drawn into the cylinder at the other side of the piston through the passage 14 and valves 36, at the same time the lower piston is forcing air into the tank past the valves 18″. When either piston has uncovered the port 19′, at either end of its stroke, air under pressure, from within the tank will flow into the cylinder and close the valves 37 or 38 so that the other will be open to permit the air from without the tank to pass into the cylinder.

What is claimed is:

1. An air compressor comprising a tank, a tube rising from the bottom of the tank and having its inner end open, a cylindrical member rising concentrically within the tube, a pump cylinder having a hollow stem slidable between the cylindrical member and the tube, said cylindrical member having a valved piston head within the pump cylinder and a longitudinal bore therethrough, the pump cylinder having check valves, and means for reciprocating the pump cylinder.

2. An air compressor including a tank for receiving compressed air, a stationary valved piston within the tank, a reciprocable valved cylinder movable on the piston, said piston having a longitudinal bore and lateral passages therefrom to the interior of the cylinder, the cylinder having a port in one side to permit pressure from the tank to enter the cylinder at times to counteract the pressure from within the tank.

In testimony whereof, I affix my signature.

MARSHALL A. ESTES.