

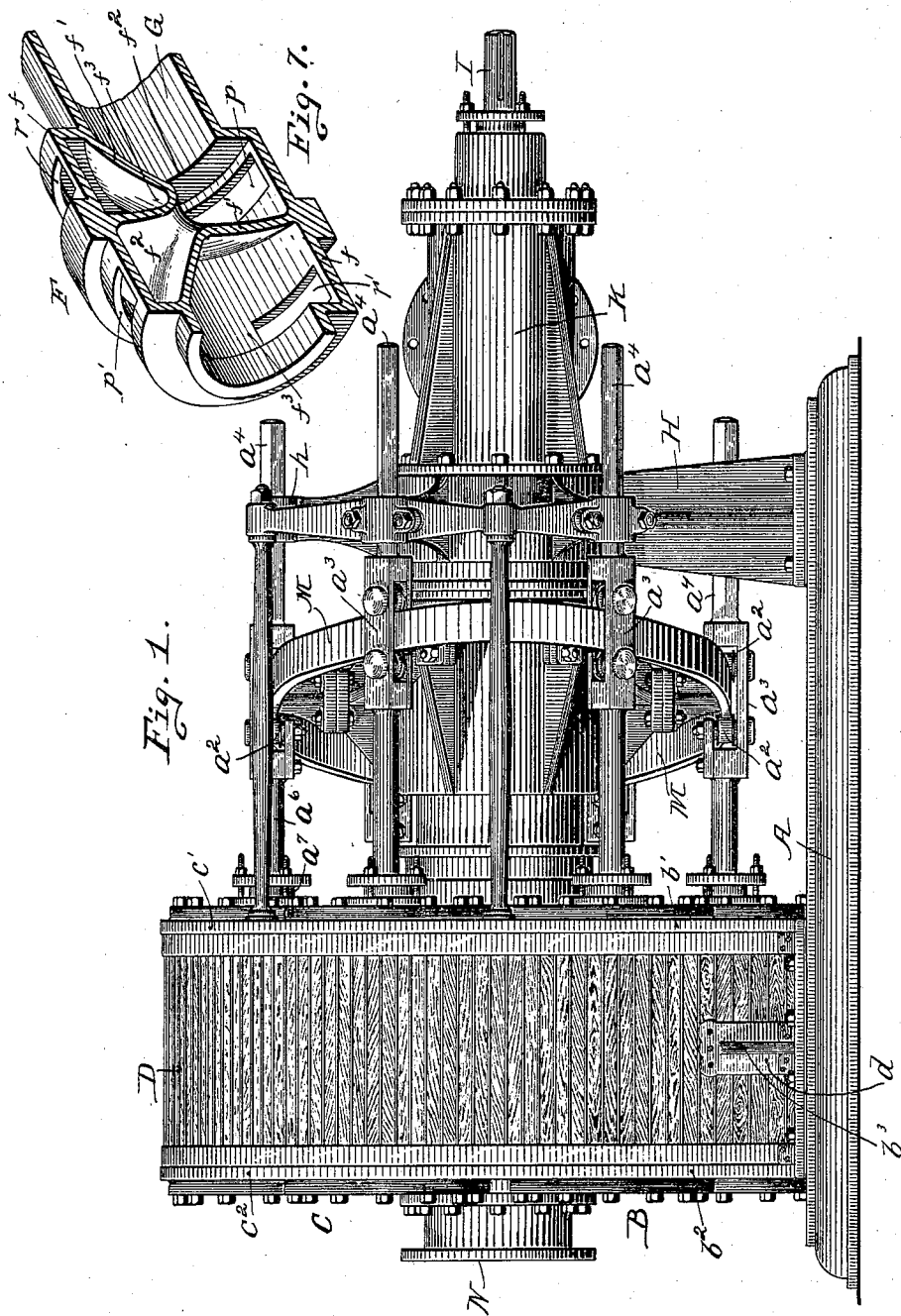
(No Model.)

4 Sheets—Sheet 1.

W. SCHUSTER.  
BLOWER AND EXHAUSTER.

No. 588,735.

Patented Aug. 24, 1897.



WITNESSES:

Robert C. Totten  
Walter Tamariss

INVENTOR

William Schuster  
BY *Way & Tobben*  
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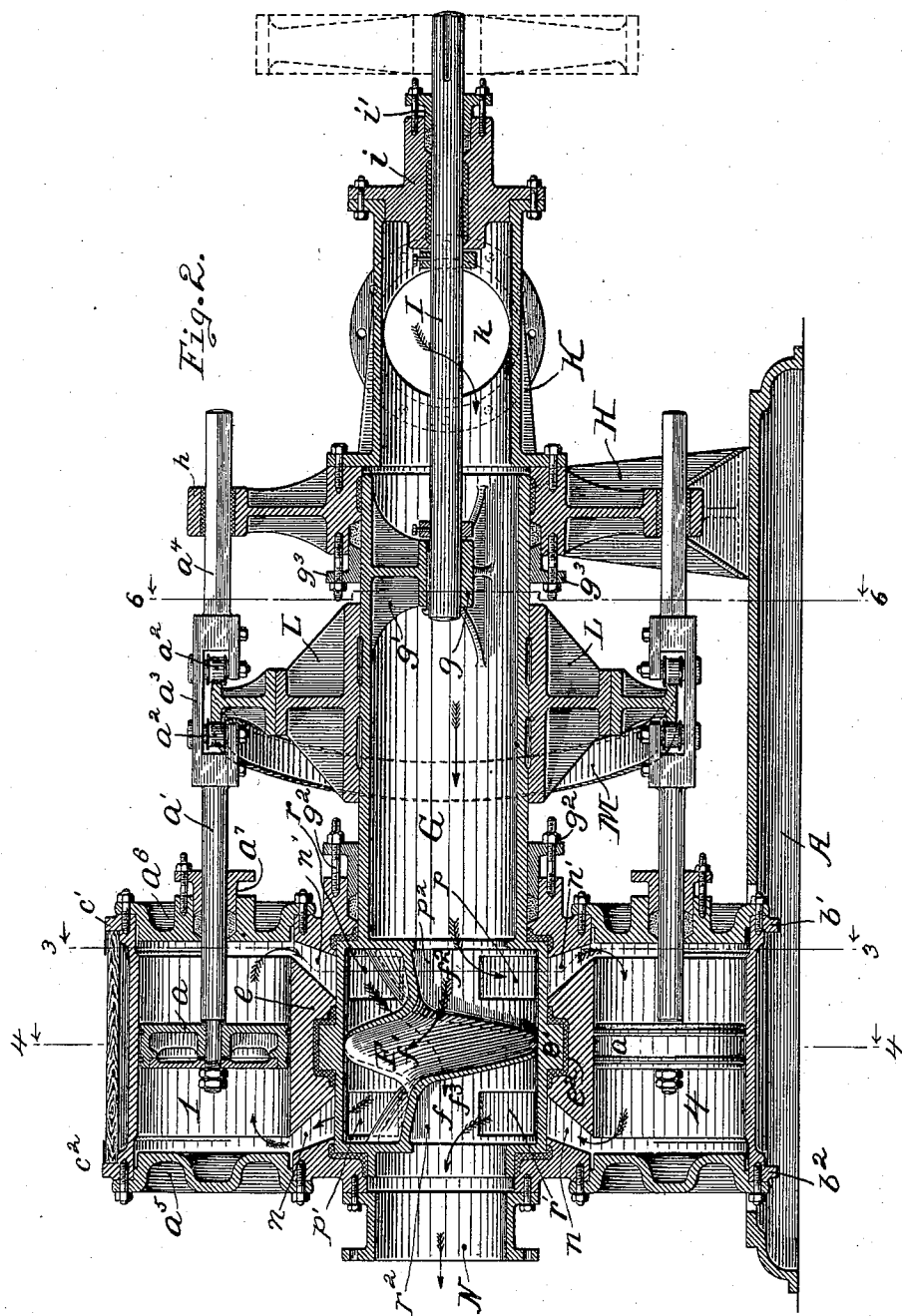
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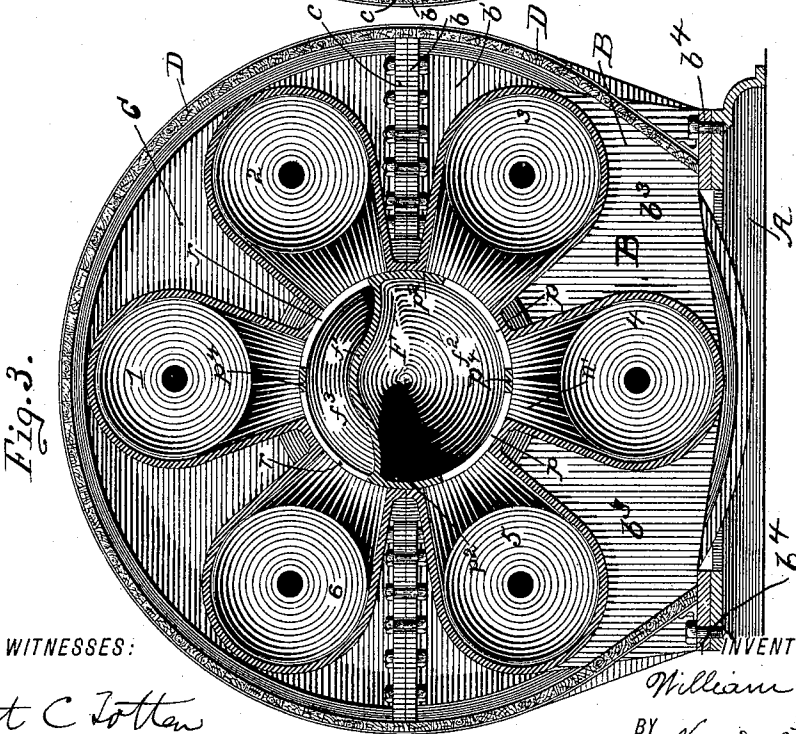
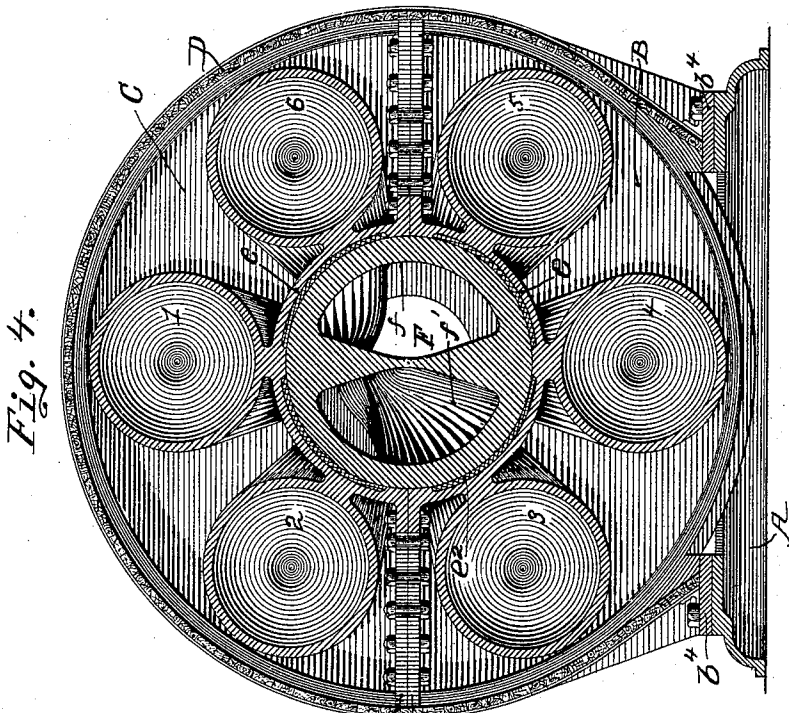
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Fig. 6.

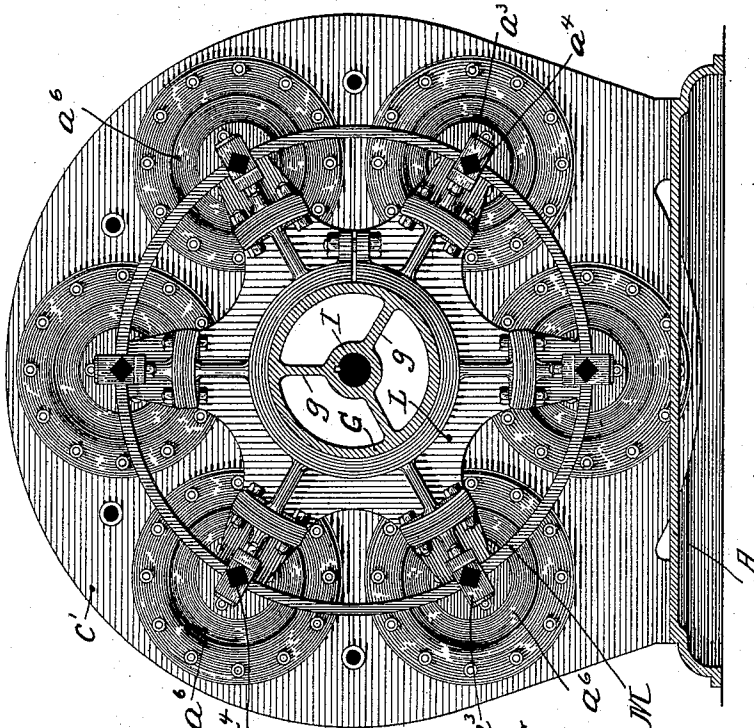
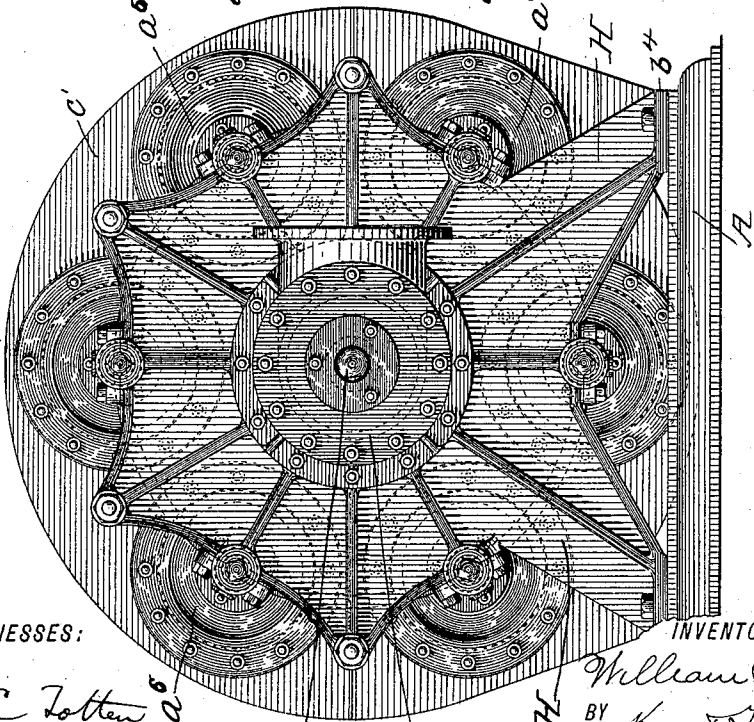


Fig. 5.



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# UNITED STATES PATENT OFFICE.

WILLIAM SCHUSTER, OF PITTSBURG, PENNSYLVANIA.

## BLOWER AND EXHAUSTER.

SPECIFICATION forming part of Letters Patent No. 588,735, dated August 24, 1897.

Application filed January 7, 1896. Serial No. 574,640. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM SCHUSTER, a resident of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Blowers and Exhausters; and I do hereby declare the following to be a full, clear, and exact description thereof.

My invention relates to pumping apparatus operated by rotary power for compressing the air, gas, or other fluid by means of the reciprocating action of pistons within cylinders and at the same time providing by means of a single valve for the control of the ports of a cluster of such cylinders located around such valve, which serves as a valve for the entire cluster, so providing for positive compression or suction of the air or other fluid and yet providing a simple apparatus which is capable of forcing a large bulk of fluid.

My invention comprises, generally stated, a cluster of cylinders arranged around a rotating valve controlling the flow to and from the cylinder and a rotating cylinder communicating with said valve and rigidly connected with an encircling ring set obliquely thereto and engaging with the piston-rods to impart reciprocating motion to the same.

It also comprises certain other improvements, all of which will be fully set forth and claimed.

To enable others skilled in the art to make and use my invention, I will describe the same more fully, referring to the accompanying drawings, in which—

Figure 1 is a side view of the pumping apparatus. Fig. 2 is a longitudinal central section showing the rods and parts of the apparatus in full lines, the section of the spiral portion of the controlling-valve not being central, but being shown with the outside shell removed so that its shape may be seen. Fig. 3 is a cross-section on the line 3 3, Fig. 2. Fig. 4 is a cross-section on the line 4 4, Fig. 2. Fig. 5 is an end view of the driving end of the apparatus. Fig. 6 is a cross-section on the line 6 6, Fig. 2; and Fig. 7 is a central sectional perspective of the controlling-valve.

Like letters and numerals of reference indicate like parts in each of the views.

The general construction of the apparatus is clearly set forth in Fig. 2. The apparatus

is illustrated with six compressing-cylinders, marked, respectively, 1, 2, 3, 4, 5, and 6. These cylinders are stationary, and, as fully shown in Figs. 3 and 4, are cast in two sections, the lower section B, connected to the bed-plate A, carrying the cylinders 3, 4, and 5, while the upper section C carries the cylinders 1, 2, and 6, said sections having the flanges  $b$  and  $c$ , by which the two sections are bolted together. For the purpose of strengthening the sections B and C have the end walls  $b'b^2$  and  $c'c^2$  between the cylinders and to which the cylinder-heads are connected, and to further strengthen or brace the cylinders I employ the central plates  $b^3$ , cast between the cylinders 3 and 4 and 4 and 5, respectively, and extending out to the flanges  $b^4$ , by which the lower section is bolted to the bed-plate A. To inclose the several cylinders, as shown more clearly in Figs. 1, 3, and 4, a wooden casing D is built around the cylinders between the end walls  $b'b^2$  and  $c'c^2$ , said casing also fitting on each side of the plates  $b^3$ , which project from the same and are covered by a suitable plate  $d$ . As the two sections B and C are bolted together they form the central cylindrical bearing  $e$ , in which the valve F is mounted, said valve being part of a casting composed of the valve F and the cylinder G, which extends back to the bearing H, in which it is mounted, said bearing also carrying rear journals or bearings for the several piston-rods. Said bearing H has also attached to it in line with the cylinder G the hollow head or casing K, which is stationary, being rigidly connected to the bearing H, and which has the entrance  $k$ , with which the pipe carrying the fluid to the pumping apparatus is to be connected.

The valve F and cylinder G are formed as one casting, and in order to turn the same the central shaft I is rigidly connected to a central hub  $g$ , supported by webs  $g'$ , projecting inwardly within the cylinder G, this central or driving shaft I extending back through the casing K and being mounted in the bearing  $i$  in the end of the casing, said bearing carrying a stuffing-box  $i'$ , so as to form a packed joint around the central driving-shaft. Power may be connected to said central driving-shaft from any suitable source, so as to impart a rotary motion to the same, and through

such shaft to the cylinder G and valve F. The several compression-cylinders contain pistons  $a$ , which have piston-rods  $a'$  extending back therefrom and carrying the rollers  $a^2$ , mounted in the frame  $a^3$ , formed as part of the piston-rod, the rear end of each of the piston-rods being formed angular and passing through the bearing  $h$ , carried on the rear frame or bearing H. To actuate these pistons, I provide the encircling frame L, which is rigidly secured around the cylinder G and has formed around the same the encircling ring M, which is set obliquely or at an angle to the cylinder G and engages with the piston-rods by fitting between the rolls  $a^2$  in the frames  $a^3$ , so that as the cylinder G is rotated by means of this obliquely-set ring a reciprocating motion is imparted to the several pistons within the several compression-cylinders.

The valve F, hereinafter described in detail, is of such construction that it feeds the air alternately from the entrance-cylinder G to opposite ends of each compression-cylinder and receives the compressed air from the same and delivers it through the central discharge-pipe N.

As thus generally described the operation of the apparatus is practically as follows: By suitable power the central cylinder G and valve F are rotated, and in so doing by means of the encircling ring M reciprocating motion is imparted to the pistons  $a$  in the several cylinders, and the valve F feeds the air as it is rotated with the cylinder G to one or the other end of the compression-cylinders and then receives the air therefrom after it is compressed, and discharges the same through the central outlet N.

I will now describe the parts more in detail, so that their construction may be more clearly understood. The several compression-cylinders have the front piston-heads  $a^5$  secured to the front end walls  $b^2 c^2$ , respectively, the rear piston-heads  $a^6$  secured to the rear end walls  $b' c'$ , respectively, the piston-rods  $a'$  passing through suitable stuffing-box  $a^7$  on the same. Each cylinder has ports at its end—for example, the front ports  $n$  and the rear ports  $n'$ —these several ports leading down through the central bearing  $e$ , in which the valve F is mounted, so as to provide for the flow of air to and from each end of each cylinder.

The central valve F can be clearly understood from an examination of Figs. 2, 3, 4, and 7, said valve being formed of a cylindrical shell or body  $f$ , having in the center thereof a spiral wall  $f'$ , which divides it diagonally into two parts—the inlet-passage  $f^2$  and the outlet-passage  $f^3$ . The inlet-passage  $f^2$  has the ports  $p$  at the rear end of the shell  $f$  and the ports  $p'$  at the front end of the shell, but diagonally opposite to the ports  $p$ , these ports being connected by the diagonal passage  $f^2$ , which is always in communication with the cylinder G. The outlet-passage  $f^3$  has the port  $r$  near the rear end of the shell

$f$  and the port  $r'$  at the front end of the shell diagonally opposite to the port  $r$  and connects by the spiral passage  $f^3$ , which leads to the outlet N. It will be seen by examining Fig. 3 that the valve-shell  $f$ , from which the spiral wall  $f'$  extends across so as to form the inlet and outlet passages  $f^2$  and  $f^3$ , shows two ports  $p p$  or  $r r$ , separated only by a slight web  $p^4$ , but shows the webs  $p^2$ , which extend down from the spiral wall  $f'$ , of a length corresponding about to the width of the ports  $n'$ , so that they will close such ports when the pistons in the compression-cylinders reach the ends of their strokes, so closing such ports  $n'$  at the end of the stroke of each piston and again opening the port on the opposite side of the spiral wall  $f'$ , changing it from supply to exhaust, or vice versa. At the other end of the valve-shell  $f$  the same construction is employed, the web portion  $r^2$  of the shell controlling the ports  $n$  of the respective compression-cylinders and changing them from supply to exhaust, or vice versa. The valve F is mounted in the cylindrical bearing  $e$  in any suitable way, so as to hold the same in proper line or against end thrusts, being shown as having a central projecting ring  $e'$ , fitting into a like recess  $e^2$  in the face of the valve-bearing  $e$ , such projecting ring being surrounded by suitable packing, such as Babbitt metal, while like metal is employed to pack the same at the ends of the valve F. To prevent the escape of air or gas around the cylinder G, I provide the stuffing-box  $g^2$ , surrounding the said cylinder and held by suitable bolts to the rear end walls  $b' c'$ . It is not considered necessary to have a stuffing-box at the other end of the valve, as in case of any escape of air it will pass into the outlet-pipe N, which is rigidly connected to the front end wall  $b^2 c^2$ . The rear end of the cylinder G is packed in like manner by means of the stuffing-box  $g^3$ , which engages with the rear frame or bearing H.

I have preferred to support the encircling frame L with its obliquely-set ring M on the hollow cylinder G and arrange the air-entrance behind the same; but it is to be understood that the air-entrance port may be located at any suitable point to feed air to the central valve F and the encircling obliquely-set ring be supported in any suitable way, so that it can be rotated and can operate upon the several pistons to impart the reciprocating motion thereto.

I will now describe the operation of the apparatus somewhat more in detail, and more especially in connection with the valve F. As the valve is rotated it will be noticed that its ports  $p p'$  in the entrance-passage  $f^2$  communicate with opposite ends of the cylinders, so that in the position shown in Fig. 2 air can pass into the forward ends of the three cylinders 3, 4, and 5 and into the rear ends of the three cylinders 1, 2, and 6, none of the cylinders being cut off from the air-supply. In like manner by means of the ports  $r r'$

the air can be discharged from the forward ends of the cylinders 1, 2, and 6 and from the rear ends of the cylinders 3, 4, and 5. In such position the air will feed into and be forced out from such respective ends of the cylinders, and as the valve F is turned its webs or valve-faces  $p^2$   $r^2$  will act to close the end of each cylinder as the piston therein reaches the end of its stroke. For example, as shown in Fig. 3, the valve F turning to the right the cylinders 6 and 3 will first be cut off, and following that the cylinders 1 and 4, and following that the cylinders 2 and 5. During this movement as the valve F is turned the air will pass to the ports  $p$  and through the spiral passage  $f^2$  to the ports  $p'$  and feed air through the same to the different cylinders as the valve is rotated, while air will be received through the ports  $r$  and  $r'$ , and by means of the spiral passage  $f^3$  will pass from the ports  $r$  and  $r'$  to the outlet-passage N. Meanwhile as the obliquely-set ring M is rotated it imparts a reciprocating motion to the piston-rods  $a'$ , and thence to the pistons  $a$  in the cylinders, forcing them back and forth and compressing or sucking the air or other fluid by means of the same, so that it is discharged through valve to the outlet N. This is accomplished with but little loss of power and practically no friction, as the rollers  $a^2$ , carried by the piston-rod frames, overcome practically all the friction between the obliquely-set ring and the piston-rods. In this way by means of the obliquely-set ring and the cluster of pistons the rotary motion imparted to the pumping apparatus is converted into a reciprocating motion to operate the pumps, while but a single valve and one having large passages therein is required to control the flow of air to and from the several compressing-cylinders. In this way I obtain positive compression or suction, while providing a pumping apparatus which is simple in construction and has large ports or passages, so as to compress or suck the air in large volume.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In combination with a cluster of cylinders extending parallel with each other, reciprocating pistons mounted in the same, and a single rotary valve mounted centrally of the cluster of cylinders and having its axis parallel with the cylinders and controlling the ports thereof, substantially as set forth.

2. In combination with a cluster of cylinders having reciprocating pistons moving therein, a single rotary valve mounted centrally of said cluster of cylinders and having an inlet-opening at one end and an outlet-opening at the other and a diagonally-extending wall dividing it into inlet and outlet passages so as to provide communication thereby with end of each cylinder, substantially as set forth.

3. In combination with a cluster of cylinders having reciprocating pistons moving

therein, a single rotary valve mounted centrally of said cluster of cylinders, having an inlet-port at one end and an outlet-port at the other and a diagonally-extending wall dividing the same into two oblique passages, and each such oblique passage having a port communicating with the cylinder-ports at one end of the cylinder and the cylinder-ports at the other end of the cylinder, and said valve-ports being connected by the diagonal passages formed by said division-wall, substantially as set forth.

4. The combination of a cluster of cylinders having reciprocating pistons therein, the rotary valve F, having diagonal division-wall  $f$  separating it into diagonal inlet and outlet passages,  $f^2$ ,  $f^3$  respectively, and having at each end ports leading respectively from such inlet and outlet passages of the valve, and having the web-faces  $p^2$   $r^2$  respectively closing the ports to the respective cylinders, substantially as set forth.

5. In combination with a cluster of cylinders and pistons reciprocating therein, a rotary valve mounted centrally of the cluster of cylinders and controlling the flow thereto, and a rotary ring rigid with the driving mechanism for the valve and set obliquely thereto and engaging with the several piston-rods to operate the pistons in the cylinders, substantially as set forth.

6. In combination with a cluster of cylinders and pistons reciprocating therein, a central hollow cylinder mounted in bearings in the machine-frame and carrying a rotating valve controlling the ports of the cluster of cylinders, and an encircling ring supported by said central cylinder and set obliquely thereto and engaging with the piston-rods to impart reciprocating motion to the pistons, substantially as set forth.

7. In combination with a cluster of cylinders and pistons reciprocating therein, a central rotating hollow cylinder carrying a valve controlling the ports to and from the cluster of cylinders, the rear end of said rotary cylinder being mounted in a stationary frame carrying a head or casing with which the inlet-pipe communicates, substantially as set forth.

8. In combination with a cluster of cylinders and pistons reciprocating therein, a central rotating hollow cylinder carrying a valve controlling the ports to and from the cluster of cylinders, the rear end of said rotary cylinder being mounted in a stationary frame carrying a head or casing with which the inlet-pipe communicates, and a central driving-shaft passing through a stuffed joint at the end of said stationary casing and rigidly connected to said rotary cylinder, substantially as set forth.

9. The combination of a cluster of cylinders formed in two sections, one resting on the bed-frame and the other section supported by and secured to said section, said two sections forming together a central bearing for

the valve controlling the ports to said cylinders, substantially as set forth.

10. The combination of a cluster of cylinders formed in two sections, one resting on the bed-frame and the other end supported  
5 by and secured to the same, said two sections forming together a central bearing for the valve controlling the ports to said cylinders, and having formed in their faces a central

recess  $e^2$  to receive a projecting ring  $e'$  on said valve, substantially as set forth.

I testimony whereof I, the said WILLIAM SCHUSTER, have hereunto set my hand.

WILLIAM SCHUSTER.

Witnesses:

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ROBERT C. TOTTEN.