

No. 702,054.

Patented June 10, 1902.

W. F. GARRISON.  
VALVE FOR VACUUM PUMPS.

(Application filed Feb. 7, 1901.)

(No Model.)

Fig. 1.

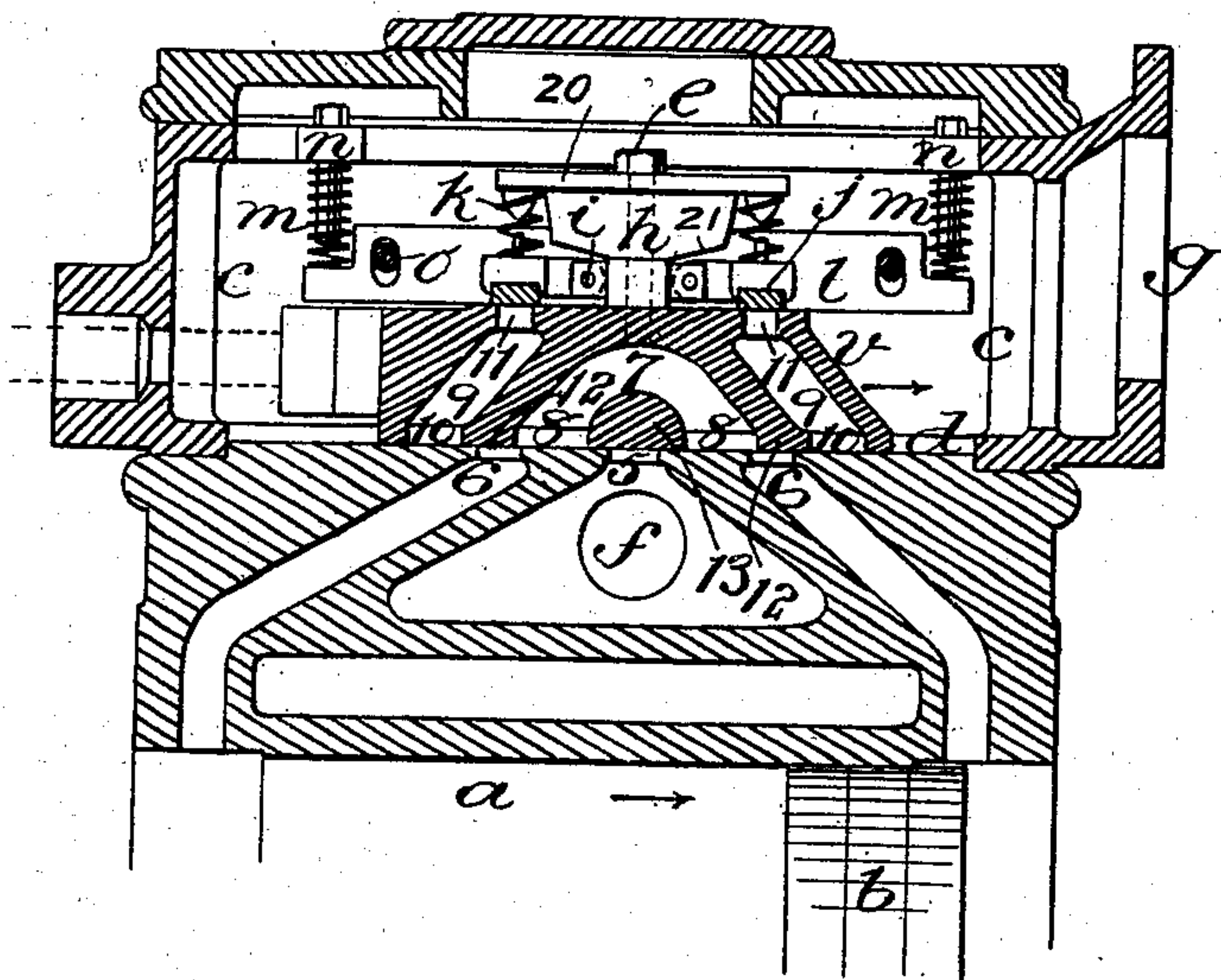
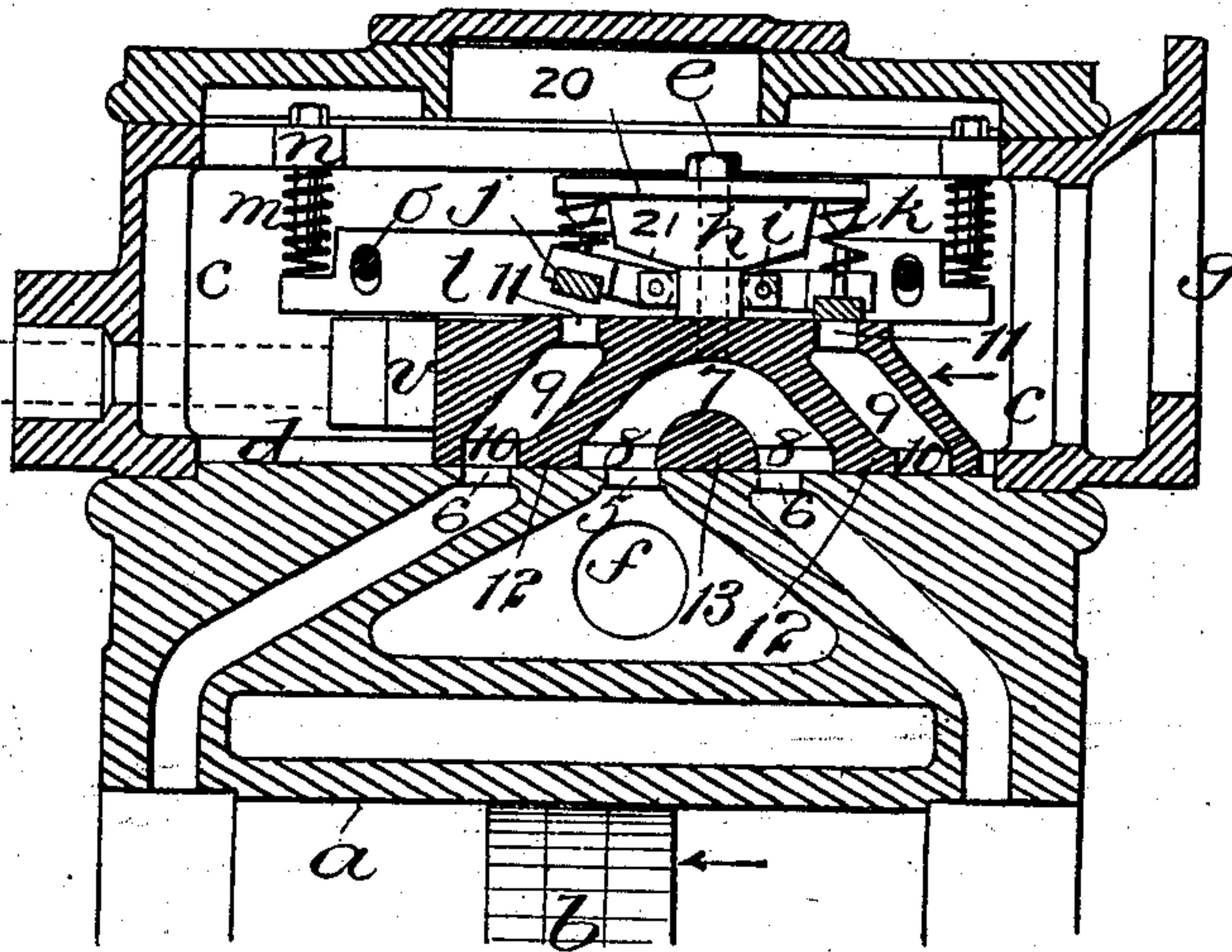


Fig. 2



Witnesses:-

George Barry Jr.  
Henry Pheme.

Inventor:  
William F. Garrison  
By attorneys  
Brown & Howard



# UNITED STATES PATENT OFFICE.

WILLIAM F. GARRISON, OF BROOKLYN, NEW YORK, ASSIGNOR TO GUILD & GARRISON, OF BROOKLYN, NEW YORK, A FIRM.

## VALVE FOR VACUUM-PUMPS.

SPECIFICATION forming part of Letters Patent No. 702,054, dated June 10, 1902.

Application filed February 7, 1901. Serial No. 46,295. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM F. GARRISON, a citizen of the United States, and a resident of the borough of Brooklyn, in the city and State of New York, have invented a new and useful Improvement in Valves for Vacuum-Pumps, of which the following is a specification.

This invention relates to a valve of the slide type which serves the two purposes of an inlet-valve and an outlet-valve.

The object of the improvement is to increase the efficiency of such a valve.

I will first describe my invention in detail with reference to the accompanying drawings of a valve embodying my invention and will afterward point out its novelty in a claim.

Figures 1 and 2 represent longitudinal sectional views of the valve and its chest and a part of the vacuum-cylinder to which they are applied.

Similar characters of reference designate corresponding parts in all the figures.

$a$  is the cylinder;  $b$ , the working piston;  $c$ , the valve-chest;  $d$ , the valve-seat;  $v$ , the slide-valve. In the seat  $d$  there are three ports—viz., a central port 5, communicating with the inlet-pipe at  $f$ , and two ports 6, communicating with the cylinder, one at each end thereof. From the interior of the valve-chest  $c$  there is an outlet at  $g$ . The valve has it in three passages—viz., a central arch-shaped passage 7, which terminates in its face with two ports 8, and two separated passages 9, the latter passages, which extend right through the valve, having ports 10 in its face at equal distances from the adjacent ports 8 and having ports 11 in its back. The parts 12 of the valve-face between its ports 8 are long enough to cover the ports 6, the central part 13 of the valve-face is more than long enough to cover the central port 5 in the seat, and the valve-ports 8 are longer than the seat-ports 6 and have their respective outer ends so far apart that when the valve is in its central position and the piston  $b$  at either end of its stroke, as shown in Fig. 1, there is a communication through the passages 7 and ports 6 between the two ends of the cylinder. To the back of the so-constructed slide-valve  $v$ , at about the middle of its length, there is fixedly se-

cured by a bolt  $e$  a crown  $h$ , to which there are hinged at  $i$  two automatically-operating flap-valves  $j$ , each covering one of the ports 11. These valves  $j$  are normally closed by very light springs  $k$ , applied between their backs and bearings constituted by a flange 20 on the crown; but each is opened by the pressure produced in the cylinder on its respective side of the piston in the movements of the latter. Between this flange 20 and the hinges there are shoulders 21 on the said crown, which constitute stops to limit the opening movement of said valve. On each side of the crown  $h$  there is arranged lengthwise on the back of the valve  $v$  one of two straight parallel bars  $l$ , only one of which is shown, to which are applied, between them and the lugs  $n$  in the interior of the valve-chest, light springs  $m$ , which tend to hold the said bars with a light pressure upon portions of the back of the valve that are parallel with its face, but which permit the valve to rise and liberate any accidental accumulation of pressure in the cylinder. These bars  $l$  are prevented from moving lengthwise by means of stationary rods or pins  $o$ , which pass through them and are secured in the sides of the valve-chest; but to permit the said bars to move vertically, and so permit the valve to rise from its seat whenever necessary, the holes provided in the said bars for the rods or pins  $o$  are elongated vertically. This valve  $v$  is intended to receive such a positive and regular reciprocating motion as to be approximately at the middle of its stroke, as shown in Fig. 1, when the piston  $b$  is at either end of its stroke, the valve moving in the same direction in which the piston has been moving; or, in other words, the movement of the valve always following the movement of the piston in either direction. This movement may be given to the valve by any suitable means—as, for example, by an eccentric on the crank-shaft of an engine which drives piston  $b$ .

The operation is as follows: First, suppose the piston  $b$  to have just arrived at the right-hand end of its stroke. The valve  $v$  will be moving to the right and at this instant will be at the middle of its stroke, the inlet-port 5 will be closed, and the seat-ports 6 will both



be slightly open to their corresponding valve-ports 8, so that there will be communication formed between the two ends of the cylinder through the valve-passage 7, and the piston 5 will be for the moment *in equilibrio*. As the valve continues its movement to the right it will gradually open the right-hand seat-port 6 wide to its port 8 and will at the same time open its left-hand port 8 to the inlet-port 5 10 and open its left-hand port 10 to the left-hand seat-port 6, as shown in Fig. 2, in which the piston is shown at the middle of its stroke and the valve as having completed its stroke to the right. The right-hand end of the cylinder 15 is now freely open through the valve-passage 7 to the inlet-pipe *f*, while the left-hand end of the cylinder is open to the interior of the valve-chest and to the discharge-outlet *g* through the left-hand valve-passage 20 9 and its port 11 and valve *j*, the closing-spring *k* of which yields automatically to permit its opening by the pressure of the gas or vapor in front of the piston. By the time the piston *b* has arrived at the left-hand end of its stroke the slide-valve will have made half 25 its return movement and so have again arrived at the central position, (shown in Fig. 1,) and the pressure will be balanced between the two ends of the cylinder. Then the continued movement of the valve to the left will 30 produce communications between the several valve-ports and seat-ports precisely the reverse of that hereinabove described with reference to the movement of the piston to the left—that is to say, the left-hand end of the 35 cylinder will be opened through the ports 6 8, passage 7, and ports 5 to the inlet *f*, and the right-hand end of the cylinder will be open through its port 6 and the right-hand valve-

passage 9 and valve *j* to the valve-chest and 40 the outlet *g*.

It may be understood that the proportion and spacing of the ports 8 and 6 of the valve and seat, as herein described, to form communication between the cylinder ends prevent the retention in the clearance-space between the piston and either end of the cylinder at the termination of the piston's stroke of any air or gas which would have to expand at atmospheric pressure before any fresh air 50 or gas could enter.

In the above-described operations the valves *j* might close automatically by the pressure within the valve-chest during the movements of the piston from their respective end of the 55 cylinder; but the purpose of the spring *k* is to insure them a more prompt and lively action.

What I claim as my invention is—

In a vacuum-pump, the combination with 60 a slide-valve in which are two separated passages extending through it for communication between the cylinder-ports and the discharge-outlet, valves hinged to the back of said slide-valve for closing said passages, 65 springs for closing said hinged valves, and a crown on the slide-valve forming bearings for said springs and stops to said hinged valves, substantially as herein described.

In testimony that I claim the foregoing as 70 my invention I have signed my name, in presence of two witnesses, this 14th day of January, 1901.

WILLIAM F. GARRISON.

Witnesses:

FREDK. HAYNES,  
LIDA M. EGBERT.