

No. 680,842.

Patented Aug. 20, 1901.

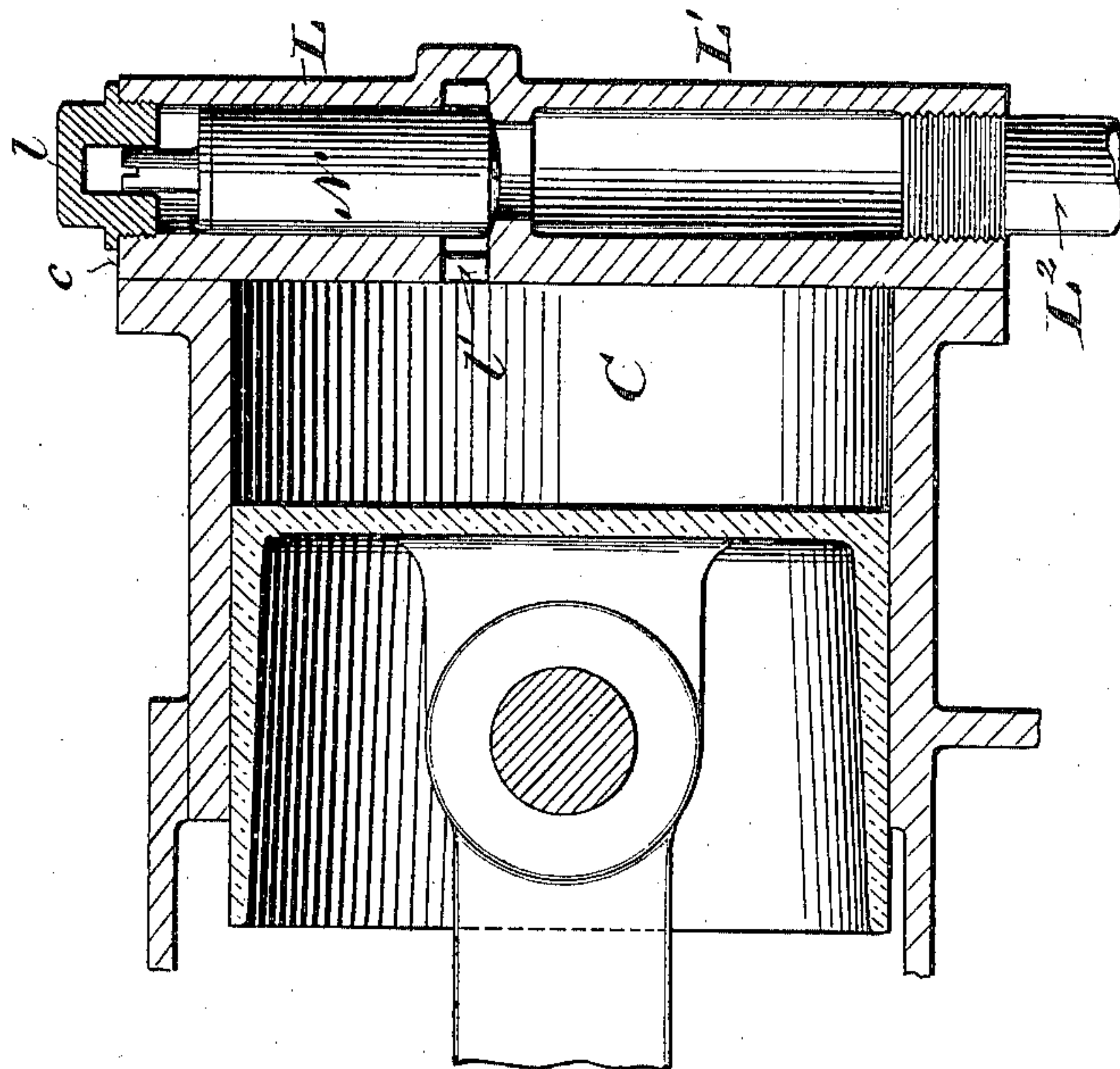
N. A. CHRISTENSEN.  
VALVE FOR COMPRESSORS.

(Application filed July 18, 1898.)

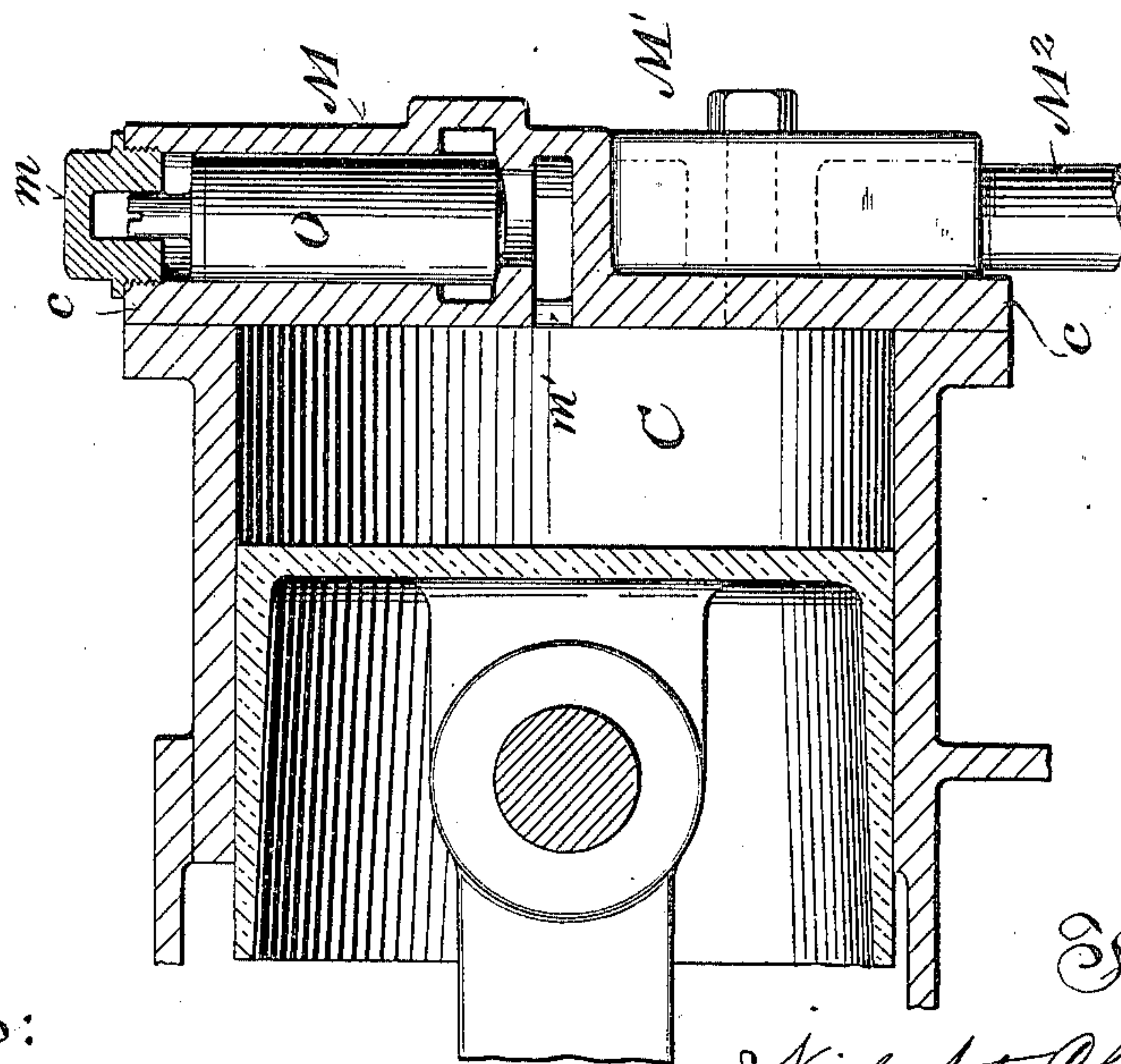
(No Model.)

2 Sheets—Sheet 1.

*Fig. 2.*



*Fig. 1.*



Witnesses:

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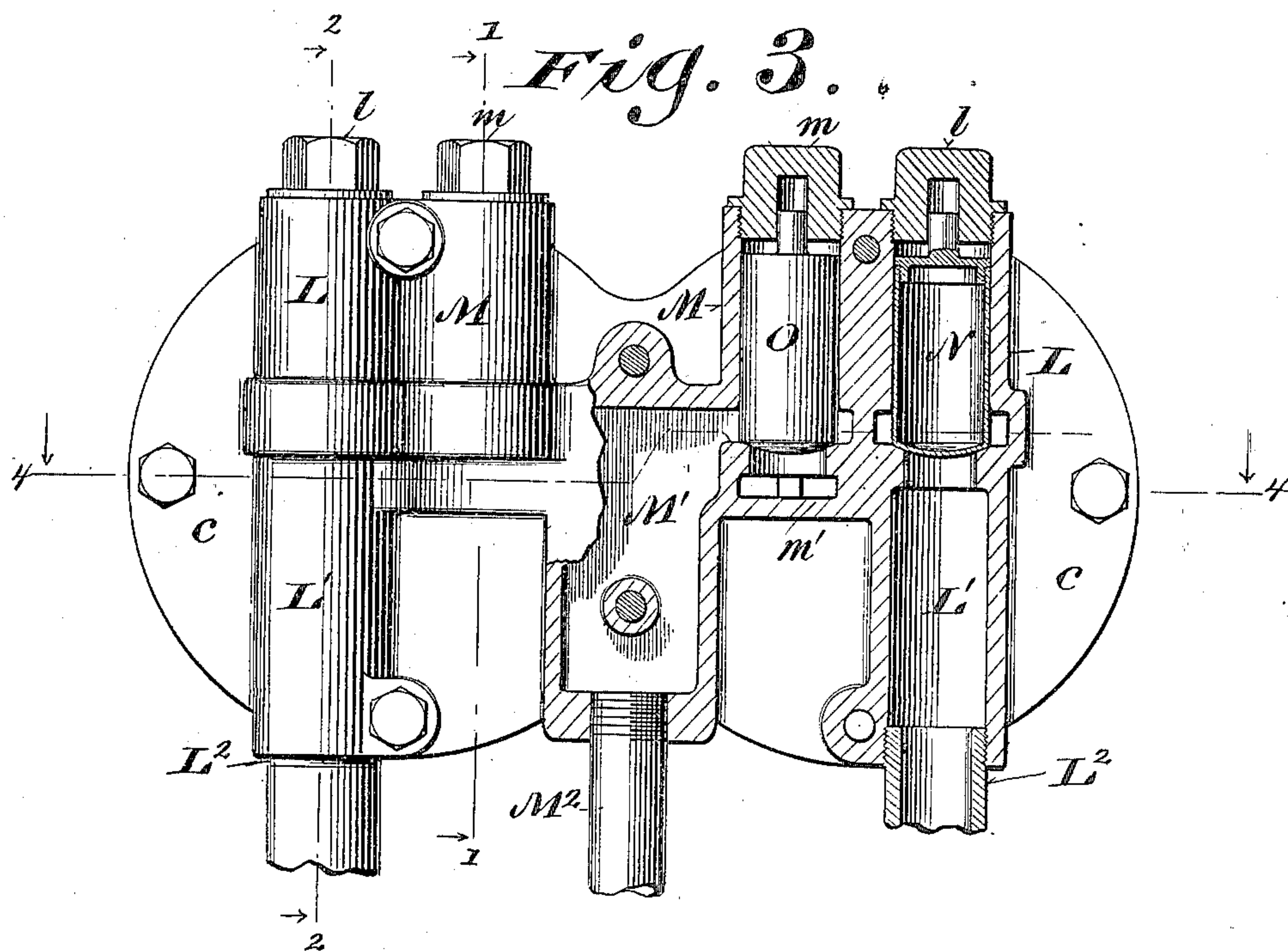
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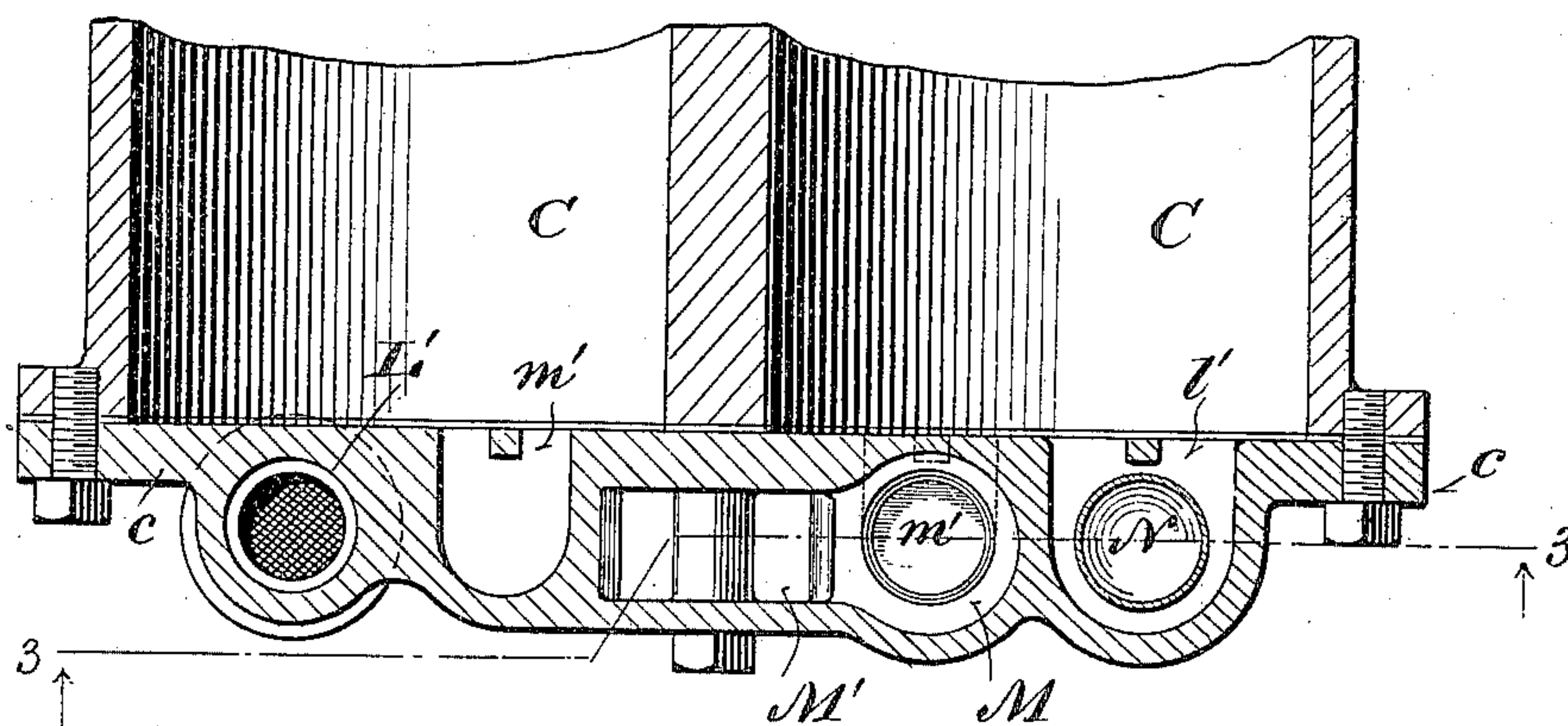
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(No Model.)

2 Sheets—Sheet 2.



*Fig. 4.*



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# UNITED STATES PATENT OFFICE.

NIELS ANTON CHRISTENSEN, OF MILWAUKEE, WISCONSIN.

## VALVE FOR COMPRESSORS.

SPECIFICATION forming part of Letters Patent No. 680,842, dated August 20, 1901.

Application filed July 18, 1898. Serial No. 686,266. (No model.)

*To all whom it may concern:*

Be it known that I, NIELS ANTON CHRISTENSEN, a subject of the King of Denmark, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Valves for Compressors, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

My invention relates particularly to pumps or compressors which are designed to operate upon air or other gases which are elastic and in connection with which it is essential to reduce the clearance-space as much as possible, particularly if high pressures are to be produced and maintained.

Its main objects are to reduce the clearance-space in this class of pumps or compressors, to make the suction and discharge valves interchangeable, and thus avoid the necessity of keeping on hand for repairs a stock or supply of two different kinds of valves, and also prevent increase of the clearance-space which would otherwise occur if the suction and discharge valves were accidentally interchanged or misplaced.

It consists of certain novel features in the construction and arrangement of the valves, valve-chambers, and their connections, as hereinafter particularly described, and pointed out in the claims.

In the accompanying drawings like letters designate the same parts in the several figures.

Figure 1 is a vertical section, (indicated by the line 1 1, Fig. 3,) cutting one cylinder parallel with its axis and passing through the discharge-valve chamber of a twin-cylinder compressor embodying my invention. Fig. 2 is a similar section, (indicated by the line 2 2, Fig. 3,) passing through the suction-valve chamber. Fig. 3 is an elevation of one cylinder-head and a vertical section of the other, (indicated by the line 3 3, Fig. 4,) cutting the valve-chamber centrally in a plane perpendicular to the axes of the cylinders; and Fig. 4 is a horizontal section in a plane cutting the cylinder-heads containing the valves, as indicated by the line 4 4, Fig. 3.

C C designate the cylinders of the compressor, and c c the cylinder-heads, which in the present instance are shown as cast together in one piece. They are each formed

with cylindrical valve-chambers L and M, arranged side by side parallel with each other and in a vertical position. They are open at their upper ends and provided with caps *l* and *m*, which afford easy access thereto and to the valves contained therein. Each suction-valve chamber L communicates above the valve-seat with the interior of its cylinder through a port *l'* and below said seat with a suction or inlet passage *L'*, also formed in the cylinder-head. The force or discharge valve chambers M M communicate above the valve-seats with a common discharge passage or chamber *M'*, formed in the cylinder-heads between the suction-passages *L' L'*, and below the discharge-valve seats said chambers communicate with the interior of their respective cylinders through ports *m'*.

*L*<sup>2</sup> *L*<sup>2</sup> are suction or air-supply pipes which are threaded in or otherwise connected with the lower ends of the passages *L'*, and *M*<sup>2</sup> is the force or discharge pipe threaded in or otherwise connected with the discharge-passage *M'*, as shown in Fig. 3.

N and O designate the suction and discharge valves, respectively. To secure lightness, each valve is made of comparatively thin tubing or sheet metal drawn into cylindrical form, with one closed end, which forms the working face of the valve, and to reduce the clearance-space of the compressor as much as possible the suction-valves N are closed at their upper ends by caps and are made imperforate and air-tight. They are loosely fitted in, but nearly fill, the chambers L. The discharge-valves O are made exactly like the suction-valves N for uniformity and convenience, so that if in removing and replacing the valves they are interchanged the clearance-space of the compressor will not be increased and its operation will not be affected. The valves thus constructed are of light weight as compared with the area of the ports which they close, and are consequently sensitive and prompt in operation. Being of cylindrical form and loosely fitted in chambers of corresponding shape, the working ends of the valves, which are fitted to the valve-seats, are held and guided in a constant relation thereto, so that the fit between the valve-faces and their seats as they become worn by use is preserved. This is a matter of great



importance in the operation of air or gas compressors. The construction and arrangement of the valve-chambers shown in the drawings bring the valve-seats close to the pistons at the ends of their working strokes, thus reducing to a minimum the contents of the passages in which compressed air or gas can expand between the pistons and valves. Springs are dispensed with, and the valves are easily reached and removed for inspection, repairs, and renewal.

I claim—

1. In a compressor the combination with a cylindrical valve-chamber, of a hollow imperforate cylindrical suction-valve closed at both ends and loosely fitting and nearly filling said chamber, substantially as and for the purposes set forth.

2. In a compressor the combination with a cylinder having a cylindrical valve-chamber communicating through a port above the

valve-seat with the interior of the cylinder and below said seat with an inlet passage or opening, of a hollow imperforate cylindrical suction-valve closed at both ends and loosely fitting and nearly filling said chamber, substantially as and for the purposes set forth.

3. In a compressor the combination of a cylinder provided with cylindrical valve-chambers and interchangeable hollow imperforate cylindrical suction and discharge valves closed at both ends, the suction-valve chamber being nearly filled by the valve contained therein, substantially as and for the purposes set forth.

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

NIELS ANTON CHRISTENSEN.

Witnesses:

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