No. 865,014. PATENTED SEPT. 3, 1907.

N. A. CHRISTENSEN.

DISCHARGE VALVE FOR FLUID COMPRESSORS.

APPLICATION FILED DEC. 11, 1899.

Fig. 1.

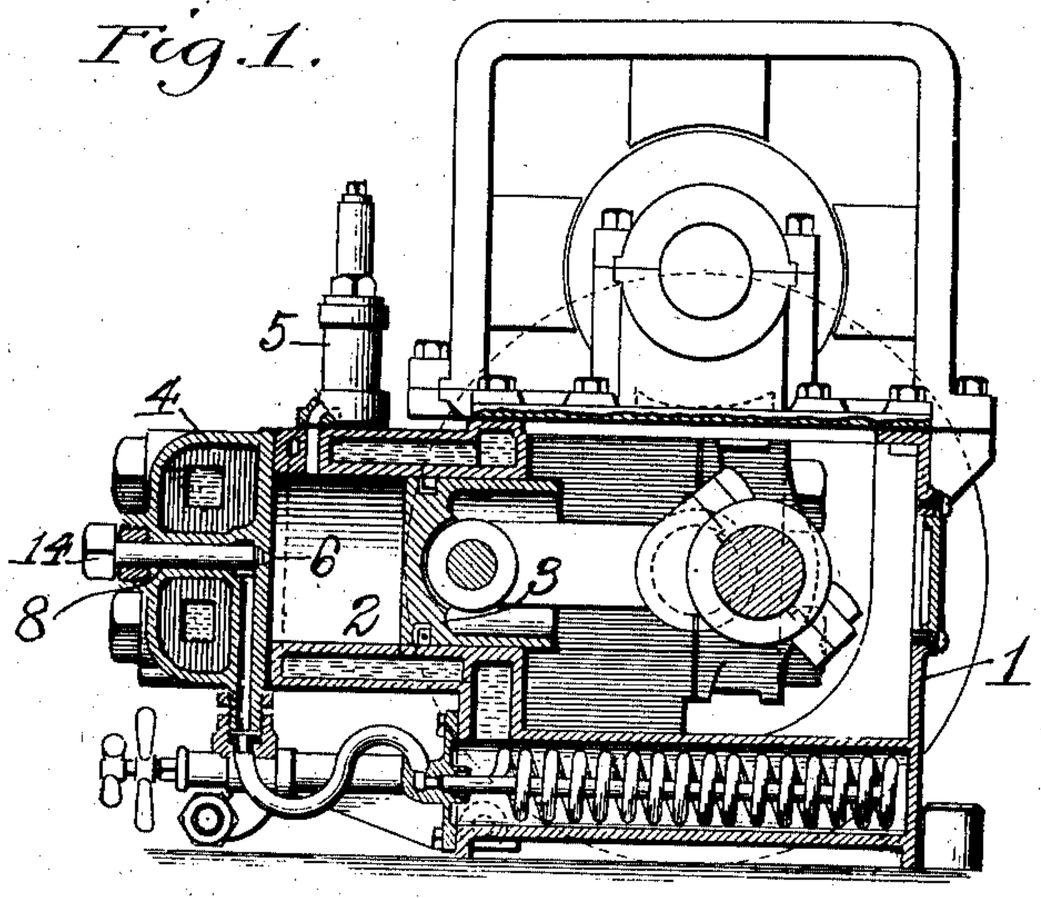


Fig. 2.

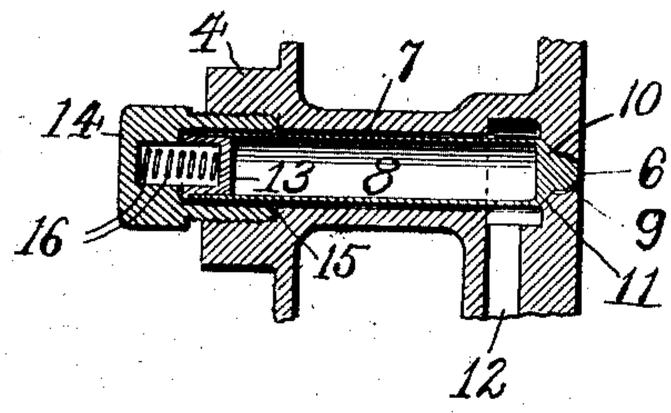
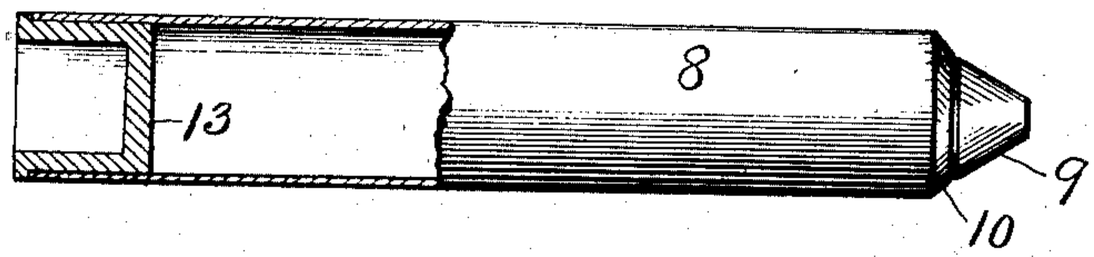


Fig. 3.



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UNITED STATES PATENT OFFICE.

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DISCHARGE-VALVE FOR FLUID-COMPRESSORS.

No. 865,014. Specification of Letters Patent. Patented Sept. 3, 1907.

Original application filed September 9, 1899, Serial No. 729,957. Divided and this application filed December 11, 1899. Serial No. 739,898.

To all whom it may concern:

Be it known that I, NIELS ANTON CHRISTENSEN, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Discharge-Valves for Fluid-Compressors, of which the following is a specification, the within application being divisional of an application filed September 9, 1899, Serial No. 729,957, for a high-pressure compressor.

My invention pertains to fluid compressors, particularly to the discharge valve therefor, and its object is to produce a novel and efficient device of this character, more especially adapted for use in connection with a high pressure fluid compressor, such as used, for instance, in compressing air to a high degree in a single stage, although it will be understood that my invention may be applied wherever applicable.

In the accompanying drawing, Figure 1 is a sectional elevation of one form of compressor showing my discharge valve applied; Fig. 2, an enlarged section of the discharge valve; and Fig. 3, an enlarged elevation of the valve with a part broken away, the same being the full size of the actual valve.

Inasmuch as this application is limited to the construction of the discharge valve of a compressor, it will be understood that the other necessary parts of the compressor may be of any well known or desired construction, and in the drawing I have represented as one exemplification a complete apparatus more particularly designed for obtaining high pressure in a single stage, although it will be understood that the features of my discharge valve are not to be limited to the employment of any particular construction of the remaining parts of the complete apparatus. The description, therefore, of the compressor outside of the discharge valve will be general.

The main frame or compressor casing 1 has a cylinder 2 in which is adapted to reciprocate a single acting piston 3. The end of this chamber is closed by any suitable back head or cover 4 and in this cover is preferably located the discharge valve about to be described. The chamber also has a suction valve device 5 which may, for the purposes of this invention, be of any suitable construction and operation.

The discharge valve is adapted to govern the discharge port 6 in the back cover, which is provided with a cylindrical bore or chamber 7 in axial alinement with such discharge port. The discharge valve preferably consists of a hollow and closed cylindrical stem 8 freely movable in such cylindrical chamber and having a truncated conical end portion 9 and also having behind such portion an oblique annular seat proper 10, located at the base of the walls of the stem or cylinder and adapted to close upon a seat 11 in such discharge port, which is shaped so as to correspond with the form of this end of the valve, but not so as to permit the portion 9 to seat on the port, there being but the slightest clearance at this point, the object being to have the discharge port or passage filled to eliminate clearance but to have only a portion of the valve actually seated. The function of this valve is to permit the discharge of air from the cylinder 2 and into a passage 12 adapted to communicate directly or indirectly with any suitable reservoir.

The outer end of the stem 8 is constructed in the form of a cup which may be done either by making such end integral, or, as shown, by securing therein a cup-shaped piece or thimble 13. As clearly shown in Fig. 3 the outer end of this thimble is provided with a marginal flange against which the outer end of the cylinder bears. The outer end of the cylindrical chamber 7 is counterbored and screw-threaded to receive a hollow nut 14, which receives the outer end of the stem 8 and is adapted to seat upon a shoulder 15. A spring 16 is interposed between the bottom of the cup 13 and the inner end of the hollow nut 14. Inasmuch as the spring thus bears against the valve at its end opposite the discharge port, where considerable heat is generated by the great compression, there is no liability of such spring losing its temper by reason of the heat adjacent to the discharge port, owing to its remoteness therefrom, the heat being radiated, at least in great measure, to the circulating water before reaching the outer end of the valve.

The operation of the valve will be readily understood from the description already given. It is obvious that the air compressed in the cylinder will open the discharge valve against the tension of its spring 16, permitting the discharge air to flow to the reservoir through the passage 12. More particularly in high pressure compressors, it is necessary to eradicate or at least to limit to a minimum the amount of clearance of the discharge valve, as well as of the suction valve. In the construction shown, I have accomplished this result by making the clearance practically nothing inasmuch as the valve body almost completely fills the discharge port, but the construction is not such as to cause the valve to be unreliable because the valve is provided with an annular seat so that the valve does not seat upon the entire surface of the discharge port. The discharge valve is thus a hollow imperforate cylinder having the valve proper at its inner end and sealed at its outer end by means of the thimble 13 which as herein shown has a marginal flange arranged to bear against the outer edge or end of the cylinder. Moreover, the discharge valve is so located in the head of the compression cylinder that it is surrounded on all sides by the water of the water jacket thereof, with the result that the valve is

kept cool and likewise the spring 16 which is comparatively remotely situated with respect to the discharge port to assist in avoiding heating.

The valve is so constructed and arranged in the back cover as that it can not only be readily assembled, but can be removed therefrom in an easy and ready manner by simply unscrewing the nut 14, which is extraneous of the back cover, and then withdrawing the discharge valve. Furthermore, my construction provides an extremely simple form of valve which is very desirable in this type of apparatus where the functions thereof must be performed at all times, both positively and efficiently, with little or no liability of injury and with comparatively little wear.

Although I have described more or less precise forms and details of construction, I do not intend to be understood as limiting myself thereto, as I contemplate changes in form, the proportion of parts and the substitution of equivalents as circumstances may suggest or render expedient, and without departing from the spirit of my invention.

I claim:

1. A compressor discharge valve comprising, in combination with the compressor casing, a cylinder having its inner end closed and forming a valve proper arranged to seat to close the discharge port, a closed thimble 13 secured in the outer end of the cylinder to close such end, said thimble being open at its outer end to form a socket, a cap having an exteriorly threaded extension screwing into the casing and surrounding and forming a guide for the outer end of such cylinder, and a spring interposed between the thimble and the cap and received within the socket of the thimble.

2. A compressor discharge valve comprising, in combination with a cylinder having a discharge port or passage which is of differential taper inwardly and restrictively towards the inner wall of the cylinder, a stem having an end with corresponding differential tapers, the tapered portion 10 alone seating in said port, and the other portion 9 filling its part of the discharge port but not seating thereon with any pressure.

3. A compressor discharge valve comprising, in combination with a cylinder having a discharge port which is of differential taper, a cylinder having a closed inner end of corresponding differential tapers, the tapered portion 10 thereof alone seating and located at the base of the walls of the cylinder.

4. A compressor discharge valve comprising a hollow cylinder whose inner end is closed to form a valve proper to seat upon and govern a discharge port, and a thimble secured in the outer end of such cylinder to seal the same and having a marginal flange against which the outer end of the cylinder bears.

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