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COMPRESSOR UNLOADER

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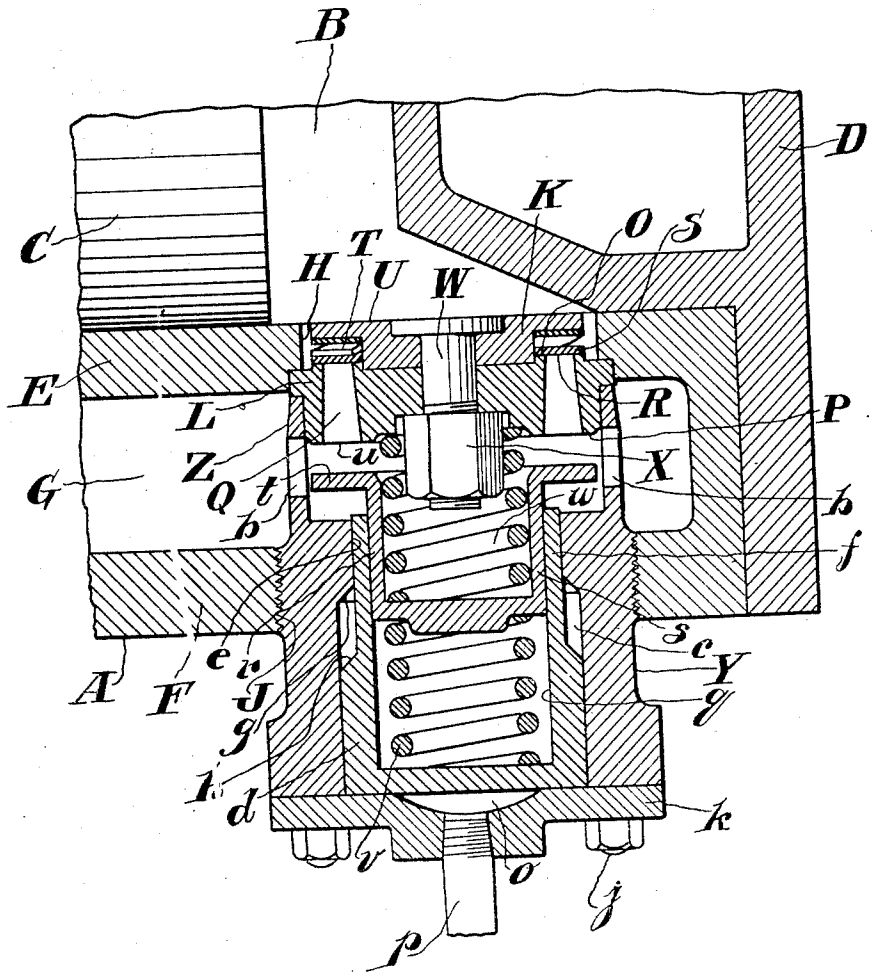

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UNITED STATES PATENT OFFICE

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COMPRESSOR UNLOADER

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This invention relates to compressors, but more particularly to a compressor unloader adapted to automatically unseat the inlet valve or valves of compressors whenever the pressure in the receiver into which the compressor discharges reaches a certain predetermined value.

One object of the invention is to prevent communication between the cylinder of the compressor and the channels through which air is conveyed to the cylinder.

Another object is to protect the unloader and cooperating elements against severe jars or strains by suitable cushioning means which will yield gradually to the pressure applied for actuating the unloader.

Other objects will be in part obvious and in part pointed out hereinafter.

The figure in the accompanying drawing is a sectional elevation of a compressor unloader constructed in accordance with the practice of the invention and showing the unloader applied to a compressor.

Referring more particularly to the drawing, A represents a portion of a compressor cylinder having a compressor chamber B in which is disposed a piston C. A closure is provided for the compressor chamber B by a head D which may be secured to the cylinder in any suitable and convenient manner.

The cylinder A comprises an inner wall E and an outer wall F spaced with respect to the wall E to form therebetween a passage G through which air, either compressed air from a lower stage cylinder or atmospheric air, may flow to the compressor chamber B. The walls E and F are provided with apertures H and J respectively which are arranged coaxially with respect to each other.

The aperture H is adapted to accommodate valve mechanism designated generally by K, and comprising a valve seat L which seats against the wall E and in this instance has seating surfaces O and P at opposite ends. In the valve seat L is a port or ports Q through which the air from the passage G enters the compressor chamber B. The outlet end R of the port Q is controlled in this instance by a valve plate S which cooperates with the seating surface O for this purpose and is urged thereagainst by a spring T interposed between the valve plate S and a stop plate U which may be secured to the valve seat in any suitable manner, as by a bolt W and a nut X.

In order to conveniently hold the valve assembly in the aperture H an unloader cylinder Y is threaded into the aperture J and said unloader cylinder carries at its inner end a skirt Z adapted to bear against the valve seat L. In this skirt are formed ports *b* to afford free communication between the passage G and the port Q in the valve seat.

In addition to the function described, the unloaded cylinder Y also serves as a housing for unloading devices intended to selectively cut off communication between the port Q and the passage G. To this end the cylinder Y is provided with a bore *c* to slidably receive a hollow plunger *d*. The bore *c* extends entirely through the unloader cylinder Y, although the inner portion, that is, the portion adjacent the skirt Z is of somewhat reduced diameter as at *e* to accommodate a reduced extension *f* of the plunger *d*. In this way is formed a shoulder *g* in the bore *c* which may act as a stop for a shoulder *h* on the plunger *d* in order to assure the retention of the plunger in the bore, particularly during the assembly of the device in the compressor.

Secured to the outer end of the unloader cylinder, as by means of bolts *j*, is a cover *k* which forms a closure for the bore *c*, and said cover *k* is preferably provided with a cavity *o* to serve as a chamber into which pressure fluid from a suitable source of supply may be introduced into the end of the bore *c* for depressing the plunger *d*. For this purpose a pipe *p* is threaded into the cover *k*.

The cavity *q* in the plunger *d* is adapted to accommodate slidably a valve *r* of cup shape having a hollow body portion *s* and at its open end a lateral flange *t* to cooperate with the seating surface P for closing the inlet end of the port Q.

In order to normally assure the retracted positions of the plunger *d* and the valve *r*, a spring *v* is disposed within the plunger *d*

to bear against the end of the valve r, and a spring w is interposed between the valve seat L and the valve r.

Any suitable and well known means, as for instance, an auxiliary valve (not shown) may be interposed in the pipe p for automatically controlling the admission of pressure fluid into the chamber o, when the receiver pressure exceeds a certain predetermined value, and to automatically exhaust such pressure fluid from the chamber o after the pressure in the storage receiver has again dropped below that which it is desired to maintain.

During the normal operation of the compressor, as when the compressor is operating under full load conditions, the plunger d and the valve r will be held in the retracted position by the springs v and w. Air will then flow from the passage G through the port Q and into the chamber B where it will be compressed by the piston C. This operation may continue until the pressure in the storage receiver into which the compressor discharges reaches a maximum value which it is desired to maintain therein and at which such controlling devices as may be interposed in the pipe p are adapted to act for unloading the compressor.

Whenever this pressure has been attained, pressure fluid will be admitted into the pressure chamber o to act against the plunger d and to move the plunger in the direction of the valve assembly. The movement of the plunger will be transmitted through the spring v to the valve r and the spring w will then also act to resist the movement of the plunger as well as the movement of the valve r. The plunger and the valve will however be moved inwardly until the flange t seats against the seating surface P to close the inlet opening of the port Q. This pressure of the valve may be reached without compressing the spring v to such an extent where the innermost end of the reduced portion f of the plunger will contact with the flange t, depending, of course, upon the tension of the spring v. The plunger may however be pressed into body contact with the flange t to hold the valve r in the closed position until the receiver pressure has again been decreased below the maximum pressure at which the unloader is intended to act. When this condition in the receiver obtains the means provided for automatically releasing the pressure fluid in the chamber o may then act and the plunger d and the valve r will again be restored to the retracted positions by the springs acting thereagainst.

I claim:

1. A compressor unloader, comprising a valve seat having a port, a valve plate for controlling one end of the port, an unloader cylinder over the valve seat, a pressure actuated plunger therein, a valve slidable in the plunger and adapted to seat over the other end of the port, and a spring between the plunger and the valve for transmitting the movement of the plunger to the last said valve.

2. A compressor unloader, comprising a valve seat having a port, a valve plate for controlling the outlet end of the port, an unloader cylinder over the valve seat, a pressure actuated plunger therein, a valve slidable in the plunger and adapted to seat over the inlet end of the port, and a spring between the plunger and valve for causing the last said valve to follow the movement of the plunger.

3. A compressor unloader, comprising a valve seat having a port, a valve plate for controlling the outlet end of the port, an unloader cylinder over the valve seat, a pressure actuated plunger therein, a valve slidable in the plunger and having a flange adapted to seat over the inlet end of the port, a spring between the plunger and valve for transmitting the movement of the plunger to the last said valve, and a second spring between the valve plate and the valve to normally maintain the valve free from the valve seat.

4. A compressor unloader, comprising a valve seat having a port, a valve plate for controlling the outlet end of the port, an unloader cylinder over the valve seat, a pressure actuated plunger therein, a cup-shaped valve slidable in the plunger and having a flange at its open end adapted to seat over the inlet end of the port, a spring in the plunger abutting the closed end of the valve for transmitting the movement of the plunger to the last said valve, and a second spring positioned in the cup-shaped valve and abutting the valve plate to normally maintain the valve free from the valve seat.

In testimony whereof I have signed this specification.

JOHN LE VALLEY.