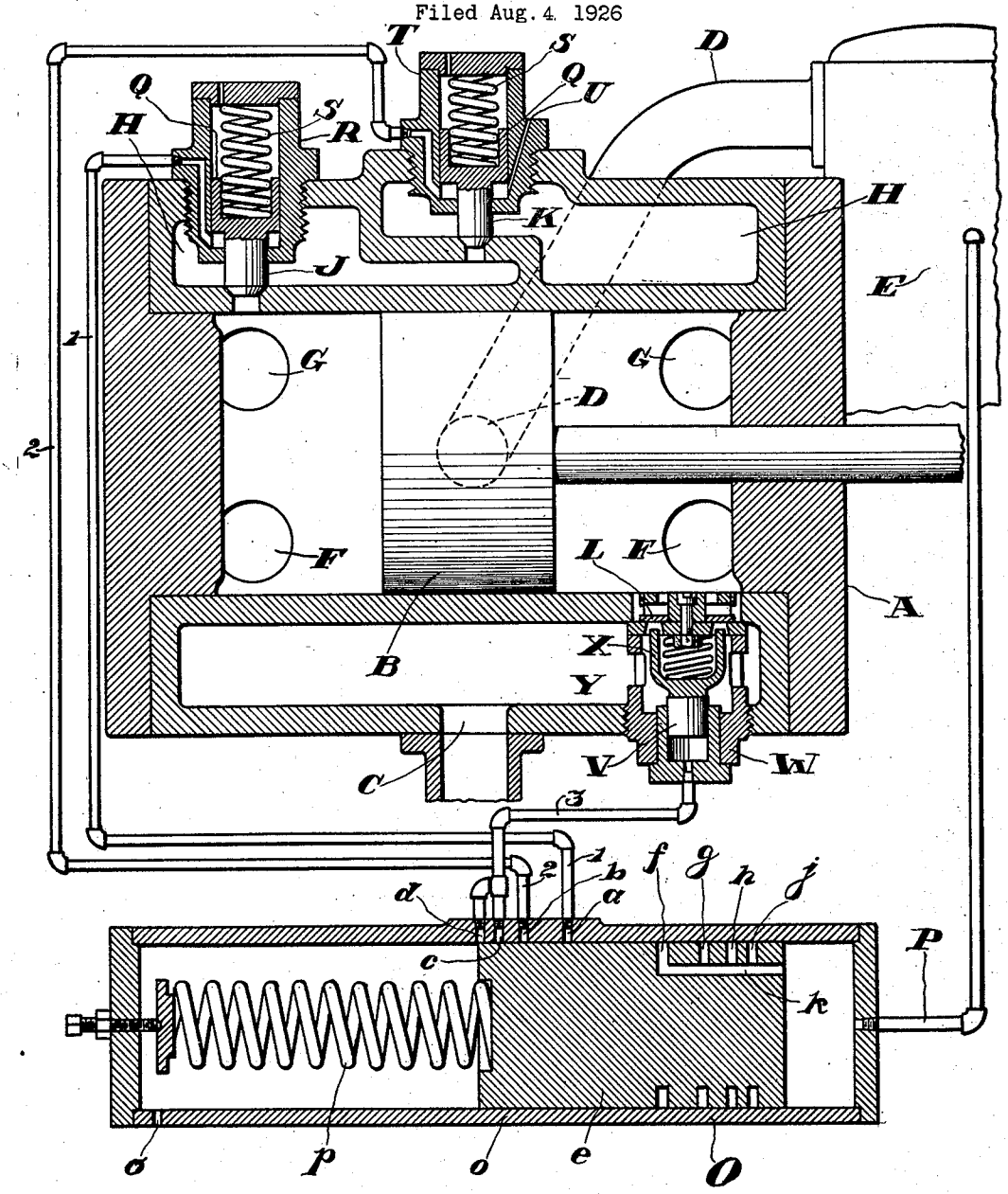
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SINGLE END CLEARANCE UNLOADER

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SINGLE-END CLEARANCE UNLOADER.

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This invention relates to compressors, but more particularly to a clearance unloader having a divided clearance chamber adapted to be applied to a single end of a compressor.

The objects of the invention are to enable a multiplicity of steps of unloading to be attained by means of a divided clearance chamber applied to one end of the cylinder and an inlet valve opener or openers applied to the opposite end of the cylinder. By this means the desired number of steps may be obtained in a simple manner.

The invention is shown in one suitable form in the accompanying drawing, in which—

The figure is a diagrammatic representation of a single end clearance unloader partly in longitudinal sectional elevation.

Referring to the drawings, the cylinder A is provided with a piston B and air drawn in at the intake C is discharged through the discharge outlet D to the receiver E. The cylinder is provided with the usual inlet and discharge valves F and G of any suitable type as for instance plate valves. A divided clearance chamber H is located in any suitable position on the cylinder and provided with a clearance valve J at one end of the cylinder. An auxiliary valve K controls communication between the divisions of the clearance chamber. One inlet valve L at the end of the cylinder opposite the clearance valve J is provided with a suitable valve opener and the clearance valve J and auxiliary valve K are each provided with means for opening the valves. A suitable regulator O responsive to receiver pressure through the pipe P controls the clearance valve J, the auxiliary valve K and the valve opener of the inlet valve L for producing step by step clearance control.

The first step of unloading consists in opening the clearance valve J which unloads the compressor one quarter. This valve is then maintained opened and the auxiliary valve K is opened which doubles the capacity of the clearance chamber and produces half load.

The clearance valve J is maintained opened for the third step but the auxiliary valve K is closed and the inlet valve L at the opposite end of the cylinder from the clearance valve J is opened producing one quarter load. In the final step the clearance valve J and the inlet valve L are maintained opened and the auxiliary valve K is reopened to wholly unload the compressor. These steps are repeated in reverse order when the compressor is reloaded.

The clearance valve J is provided with the piston Q in the cylinder R and pressure fluid is supplied beneath the piston through the pipe 1 to open the valve J and maintain it open until returned by the spring S. The auxiliary valve K is provided with the piston Q in the cylinder T and is supplied with pressure beneath the piston through the pipe 2. After the valve K is opened and pressure is cut off from the pipe 2, the valve will rapidly close due to leakage of pressure through the vent U which is of sufficient size to permit this operation. The inlet valve L has the piston V in the cylinder W and fingers X connected to the piston rod are adapted to bear on the valve and open the valve when pressure is supplied to the cylinder through the pipe 3. A spring Y normally retracts the fingers.

The pipes 1, 2, and 3 lead respectively to the ports *a*, *b* and *c* in the cylinder of the regulator O, a fourth port *d* also connects with the pipe 3. The regulator is provided with the piston *e* having the ports *f*, *g*, *h* and *j* connected by the passage *k* with that end of the cylinder to which pressure is introduced. The opposite end of the cylinder is vented at *o* and an adjustable spring *p* retracts the piston *e*.

In the operation of the apparatus, assuming that the compressor is loaded as indicated in Figure 1, the first step of unloading is effected when the port *f* registers with the port *a* so that pressure fluid is supplied to the cylinder R of the clearance valve J to open said valve and unload the compressor one quarter producing three quarters load. In the next step of unloading the ports *f* and *g* register respectively with the ports *b* and *a* so that the clearance valve J is maintained open and the auxiliary valve K is open to double the capacity of the clearance chamber and produce half load. In the next step of unloading the ports *f* and *h* register with the ports *c* and *a* respectively while the port *b* is cut off in which case the auxiliary valve K closes and the inlet valve L is opened thus producing the condition of one quarter load or three quarters unloading.

In the final position of the regulator, the ports *f*, *g* and *j* register respectively with the ports *d*, *b* and *a* so that the inlet valve L and the clearance valve J are both maintained opened while the auxiliary valve K is reopened and the compressor is wholly unloaded.

I claim:

1. In a compressor unloader, the combination of a cylinder and piston, inlet and discharge valves, a receiver, a divided clearance chamber for one end of the cylinder, an auxiliary valve between the divisions of said chamber, a clearance valve for said chamber opening into one end of the cylinder, an inlet valve opener for an inlet valve at the opposite end of the cylinder, and pressure fluid means for controlling said clearance valve, the auxiliary valve, and the inlet valve opener.

2. In a compressor unloader, the combination of a cylinder and piston, inlet and discharge valves, a receiver, a divided clearance chamber for one end of the cylinder, an auxiliary valve between the divisions of said chamber, a clearance valve for said chamber opening into one end of the cylinder, an inlet valve opener for an inlet valve at the opposite end of the cylinder, and a regulator responsive to receiver pressure for controlling said clearance valve, the auxiliary valve and the inlet valve opener in predetermined order for step by step unloading.

3. In a compressor unloader, the combination of a cylinder and piston, inlet and discharge valves, a receiver, a divided clearance chamber for one end of the cylinder, an auxiliary valve between the divisions of said chamber, a clearance valve for said chamber opening into one end of the cylinder, an inlet valve opener for an inlet valve at the opposite end of the cylinder, and automatic means for first opening the clearance valve, then opening the auxiliary valve, then closing the auxiliary valve and opening said inlet valve by means of said inlet valve opener while maintaining the clearance valve open, and finally reopening the auxiliary valve while maintaining both the clearance valve and the said inlet valve open.

In testimony whereof I have signed this specification.

SNOWDEN B. REDFIELD.