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S. B. REDFIELD

BY-PASS CLEARANCE UNLOADER

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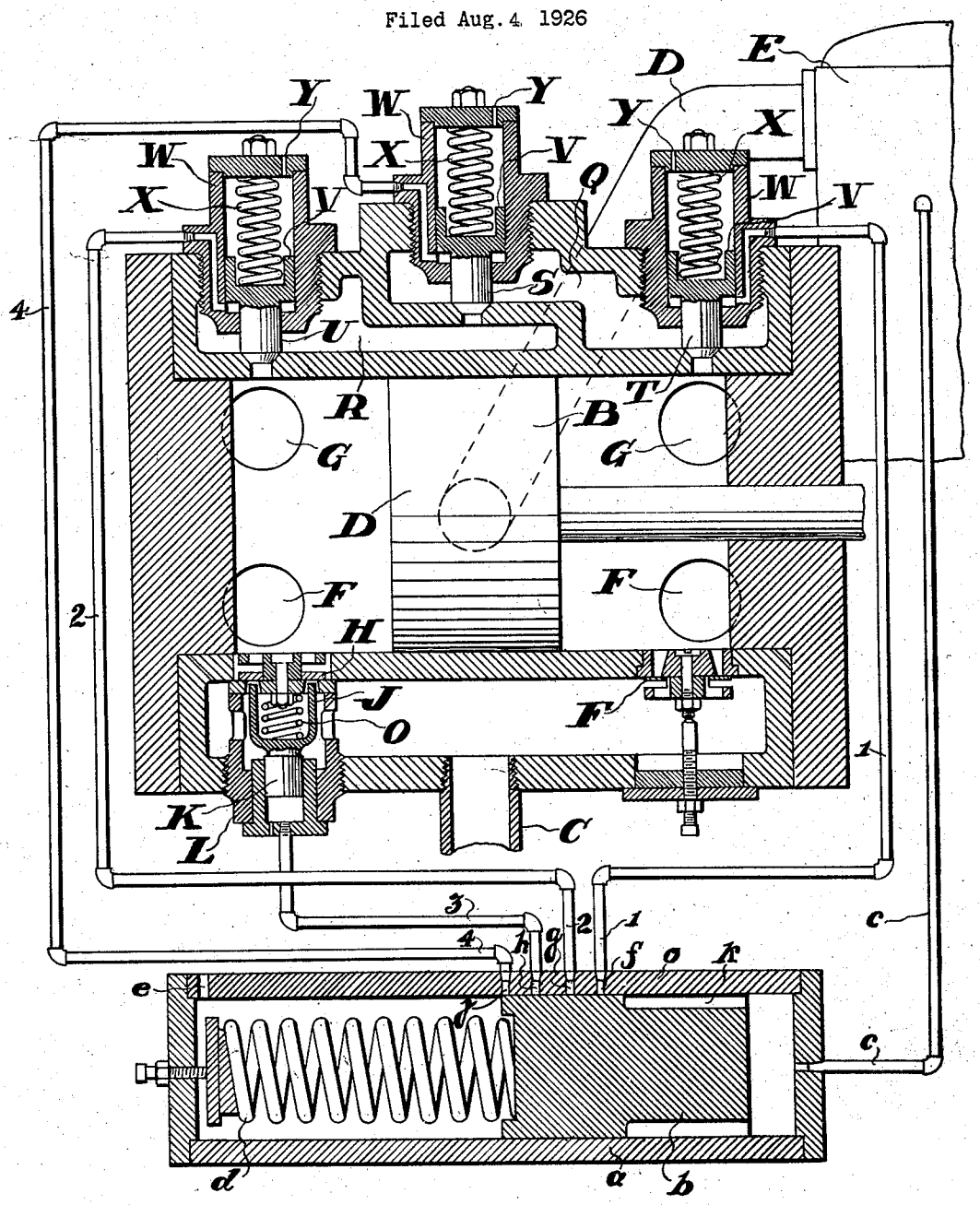

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BY-PASS CLEARANCE UNLOADER.

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This invention relates to compressors, but more particularly to a clearance unloader having two clearance chambers with a by-pass or auxiliary valve between them.

The objects of the invention are to enable a multiplicity of steps of unloading to be obtained by means of the two clearance chambers having the by-pass connection and an inlet valve opener or openers, so that the series of steps are obtained partly by clearance and partly by holding an inlet valve or valves open.

The invention is shown in one preferred form in the accompanying drawing, in which The figure is a diagrammatic representation of an unloading system partly in longitudinal sectional elevation.

Referring to the drawings, the cylinder A is provided with the piston B and the air drawn in at the inlet C is discharged at the discharge outlet D into the receiver E. The cylinder is provided with the usual inlet and discharge valves F and G and one inlet valve H is provided with a valve opener of any suitable form comprising the fingers J connected to the stem of the piston K operating in the cylinder L. A spring O normally retracts the fingers and pressure fluid is supplied through the pipe 3 behind the piston K to hold the valve open.

The clearance chambers Q and R are preferably so arranged so that one clearance chamber is provided for each end of the cylinder. A by-pass valve S is located between the clearance chambers and the two chambers are provided with at least one clearance valve although in this instance two clearance valves T and U are shown, one for each end of the cylinder. The two clearance valves T and U and the by-pass valve S are each provided with pistons V operating in cylinders W and pressure fluid is supplied to the pistons for opening the valves through the pipes 1, 2 and 4 respectively. The pistons V are returned by the springs X and the cylinders W having the vents Y.

A suitable regulator *a* is provided for controlling the clearance valves, the by-pass valve and the inlet valve opener and in the cycle of operations the clearance valve T is first opened to produce three quarters load. This valve remains open and the clearance valve U at the opposite end of the cylinder is then opened to produce half load. The inlet valve opener is next operated to hold open the inlet valve H to produce one quarter load while the clearance valves T and U are maintained open. Finally the by-pass valve S is open to wholly unload the compressor.

Any suitable regulator may be provided for carrying out this cycle of operations, it being understood that the cycle is repeated in reverse order for reloading the compressor. The simple regulator *a* shown includes the piston *b* moved in one direction by fluid pressure through the pipe *c* connected to the receiver E and retracted by the adjustable spring *d*. A vent *e* is provided for the end of the regulator cylinder opposite that at which pressure is introduced. The pipes 1, 2, 3 and 4 lead respectively to the ports *f*, *g*, *h* and *j* and the reduced end *k* of the piston *b* permits pressure to pass successively through the pipes 1, 2, 3 and 4 to operate the valves described responsively to the pressure in the receiver.

In the operation of the apparatus assuming that the compressor is fully loaded as indicated in Figure 1, when the shoulder *o* on the piston overruns the port *f*, the clearance valve T will be opened to unload the compressor one quarter and as the piston *b* moves to the left step by step, pressure fluid will be successively applied through the ports *g*, *h* and *j* and the pipes 2, 3 and 4 respectively, to the opposite clearance valve U then to the valve opener of the inlet valve H and finally to the by-pass valve S for carrying out the steps described.

I claim:

1. In a compressor unloader, the combination of a cylinder and piston, inlet and discharge valves, a receiver, two clearance chambers, a by-pass valve between said chambers, at least one clearance valve for said chambers, a valve opener for one of the inlet valves, and pressure fluid means for controlling said clearance valve, by-pass valve and valve opener.

2. In a compressor unloader, the combination of a cylinder and piston, inlet and discharge valves, a receiver, two clearance chambers, a by-pass valve between said chambers, at least one clearance valve for said chambers, a valve opener for one of the inlet valves, and a regulator responsive to receiver pressure for controlling said clearance valve, by-pass valve and 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 clearance chamber and clearance valves for each end of the cylinder, a by-pass valve between said chambers, a valve opener for one of the inlet valves, and pressure fluid means for controlling said clearance valves, by-pass valve and inlet valve opener.

4. In a compressor unloader, the combination of a cylinder and piston, inlet and discharge valves, a receiver, a clearance chamber and clearance valves for each end of the cylinder, a by-pass valve between said chambers, a valve opener for one of the inlet valves, and a regulator responsive to receiver pressure for controlling said clearance valves, by-pass valve and inlet valve opener in predetermined order for step by step unloading.

5. In a compressor unloader, the combination of a cylinder and piston, inlet and discharge valves, a receiver, a clearance chamber and clearance valves for each end of the cylinder, a by-pass valve between said chambers, a valve opener for one of the inlet valves, and automatic means for first opening the clearance valve at one end of the cylinder, then opening the clearance valve for the opposite end of the cylinder while maintaining the first clearance valve open, then opening an inlet valve by means of the said valve opener, and finally opening the by-pass valve to wholly unload the compressor.

In testimony whereof I have signed this specification.

SNOWDEN B. REDFIELD.