H. W. CHENEY.

UNLOADING DEVICE.

APPLICATION FILED NOV. 26, 1909.

995,401. Patented June 13, 1911.

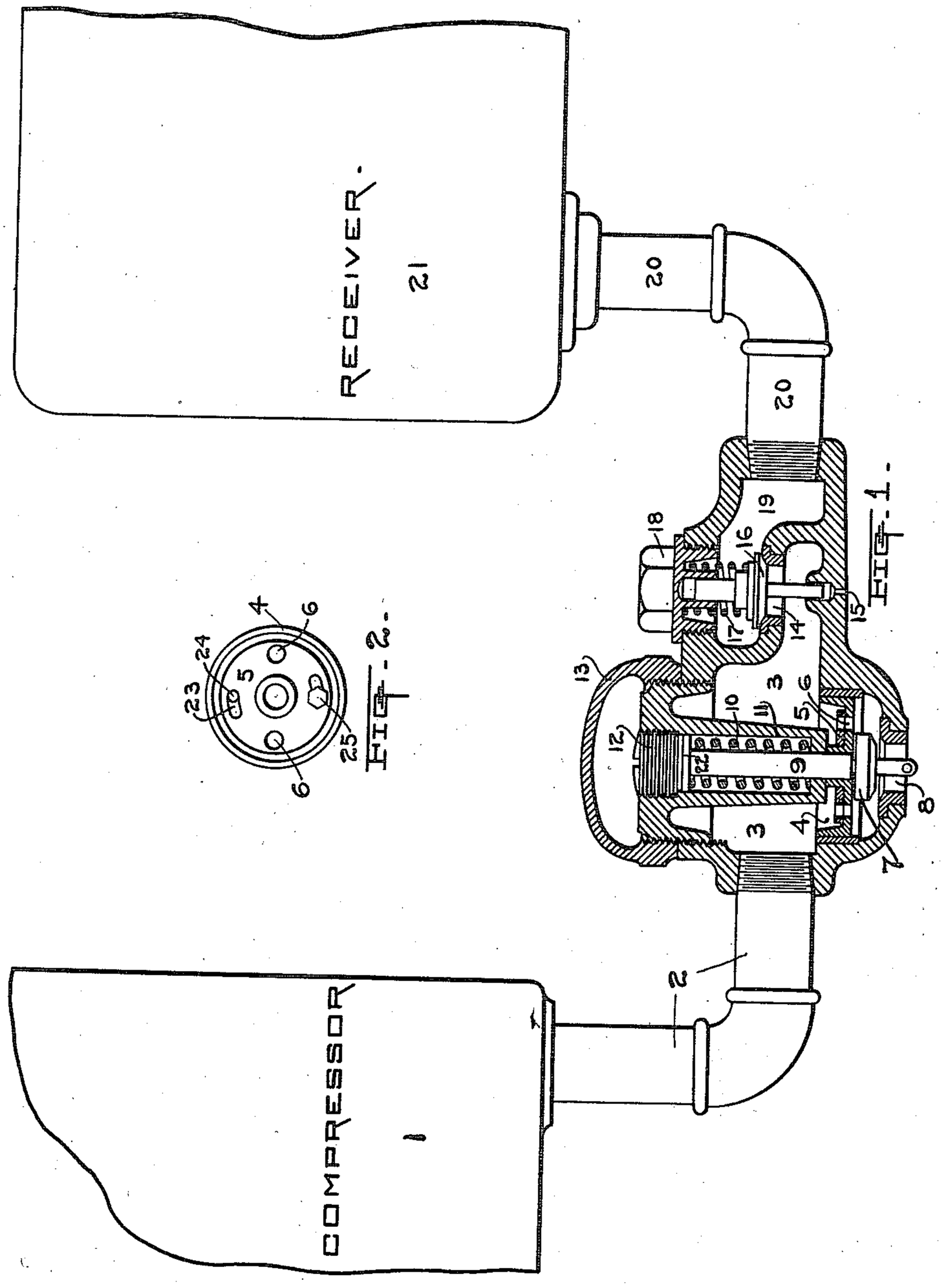

FIG. 1.

FIG. 2.

WITNESSES—

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UNLOADING DEVICE.

995,401. Specification of Letters Patent. Patented June 13, 1911.

Application filed November 26, 1909. Serial No. 529,905.

To all whom it may concern:

Be it known that I, HERBERT W. CHENEY, a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented a certain new and useful Unloading Device, of which the following is a specification.

This invention relates to improvements in the construction of unloading devices for fluid compressors, and particularly to such devices as applied to motor driven compressors in which the motor will not start while subjected to full load.

The object of the invention is to provide a simple and efficient means whereby the motor driving a compressor is allowed to attain nearly full speed before the load is thrown in. Since it is desirous to have unloading devices of this kind work automatically and also to have same away from the working parts of the compressor, the present invention includes these desirable features.

A clear conception of the invention can be obtained by referring to the accompanying drawing in which like reference characters designate the same parts in different views.

Figure 1 is a central vertical section of an unloading device built according to the invention, showing also the connections from the compressor to the unloader and from the unloader to the receiver. Fig. 2 is a top view of the piston valve of the unloading device shown in Fig. 1.

The motor-compressor, which is of such a type that the prime-mover will not start under load, has a discharge 2 leading to the chamber 3 of the unloading device. The chamber 3 connects with a second chamber 19 through the valve port 14, which port 14 is under control of the valve 16. The pipe 20 connects the second chamber 19 with the receiver 21.

The piston 4 is mounted concentric with the rod 9, and has openings 6 passing through it. A valve 7 is mounted on the rod 9 directly below the piston 4, the valve 7 controlling the opening of the port 8 in the casing below it. The rod 9 passes through the spring casing 11 and has a plate 22 attached to its upper end. The helical spring 10 coacts against the lower surface of the plate at its upper and against the bottom of the spring casing 11 at its lower end. The spring casing 11 is screwed into the walls of the chamber 3 and is locked into position by the cap 13. The set screw 12 at the top of the spring casing 11 permits the removal of the rod 9 and the plate 22 from the casing 11.

The piston 4, having the openings 6 passing through it, has a plate 5 coacting upon its upper surface, see Figs. 1 and 2. This plate 5 has corresponding openings 6 passing through it which normally register with the openings 6 of the valve 4. The bolts 25, which screw into the holes 24 in the piston 4, pass through the slot 23 in the plate 5. When the bolts 25 are screwed back so as not to clamp the plate 5 against the piston 4, the plate 5 can be shifted concentrically upon the piston 4, thus throwing the openings 6 in the plate 5 out of register with the openings 6 in the piston 4. The size of passages through the piston 4 and the plate 5, via the openings 6, is therefore variable and may be cut off entirely by the relative shifting of the plate 5 in sufficient degree.

The valve 16 is normally held against its seat and over the port 14 by a helical spring 17 which coacts against the top of the valve 16 and against the bottom of the cap 18, which cap 18 screws into the walls of the chamber 19 above the valve 16. A small opening 15 formed in the casing at any point, preferably directly below the valve 16, connects the chamber 3 with the atmosphere.

In operating the device, suppose a certain pressure to be established in the reservoir 21 and chamber 19, and the compressor 1 to be at rest. The various parts of the unloading device will then be in the positions shown in Fig. 1. As the prime mover of the compressor 1 is slowly started, the fluid displaced in the cylinder of the compressor by the moving piston, is discharged through the pipe 2 into the chamber 3. From the chamber 3 the entering fluid passes through the openings 6 in the piston 4 and plate 5, past the valve 7 and through the port 8 to the atmosphere. As the compressor 1 speeds up, the volume of the fluid discharged into the chamber 3 rapidly increases, causing the pressure in the chamber 3 to increase. Since the openings 6 in the piston 4 and plate 5 are small, the restriction to the passage of fluid therethrough will permit a rapid increase of pressure above the piston 4. As this pressure above the piston 4 becomes

greater than the resistance of the spring 10, which normally holds the piston 4 up and the valve 7 open, the piston 4 begins to move downward toward the port 8, carrying the valve with it. When the prime mover of the compressor has reached about three quarters its full speed, or a speed sufficient to insure its operation under full load, the valve 7 closes the port 8 entirely, thus shutting off communication with the atmosphere. The pressure of the fluid in the chamber 3 then rises sufficiently to overcome the pressure due to the spring 17 and the receiver pressure, and acting upon the valve 16, causes the valve 16 to open. The fluid then passes from the chamber 3 through the port 14 into the chamber 19, and from thence through the pipe 20 to the receiver 21. If the compressor 1 is stopped, the flow of fluid through the port 14 to the receiver 21 is cut off by the closing of the valve 16, due to the combined downward pressure of the fluid in the chamber 19 and of the spring 17 upon the valve 16 as permitted by the release of pressure in the chamber 3. This is released by the flow of the fluid therein to the atmosphere through the small hole 15 below the valve 16. The release of pressure in the chamber 3 permits the valve rod 9 to rise, due to the upward pressure exerted by the spring 10 thereon. This causes the piston 4 and the valve 7 to rise, opening the port 8 and again bringing the unloading device into starting position. If it is desired to regulate the passage of fluid to the atmosphere from the chamber 3, the bolts 25 can be withdrawn and the plate 5 shifted so as to restrict the passage through the openings 6 in the piston 4 and the plate 5 the desired amount. The spring holder 11 may also be adjusted relative to the chamber 3, thus increasing or decreasing the amount of travel of the valve 7 required to close the port 8. Thus it can be seen that the device can be adjusted to any condition of speed for the prime mover or pressure of discharge for compressors, thus giving a simple and efficient unloader for all conditions of operation.

It should be understood that it is not desired to be limited to the exact details of construction shown and described, for obvious modifications will occur to a person skilled in the art.

It is claimed and desired to secure by Letters Patent,—

1. In an unloading device, a compressor, a receiver, a connection between said compressor and said receiver said connection having a plurality of ports connecting to atmosphere, and a plurality of automatically operable valves in said connection, one of said valves controlling one of said ports.

2. In an unloading device, a compressor, a receiver, a connection between said compressor and said receiver, a spring closed valve in said connection, said connection having between said compressor and said valve a plurality of ports connecting to atmosphere, and a spring opened valve controlling one of said ports.

3. In an unloading device, a compressor, a receiver, a connection between said compressor and said receiver, a check valve in said connection, said connection having between said compressor and said valve a port connecting to atmosphere, a valve controlling said port, means tending to open said second valve, and a piston connected to said second valve and adapted to permit a regulable flow thereby and through said port when open.

In testimony whereof, I affix my signature in the presence of two witnesses.

HERBERT W. CHENEY.

Witnesses:

H. C. CASE,

W. H. LIEBER.