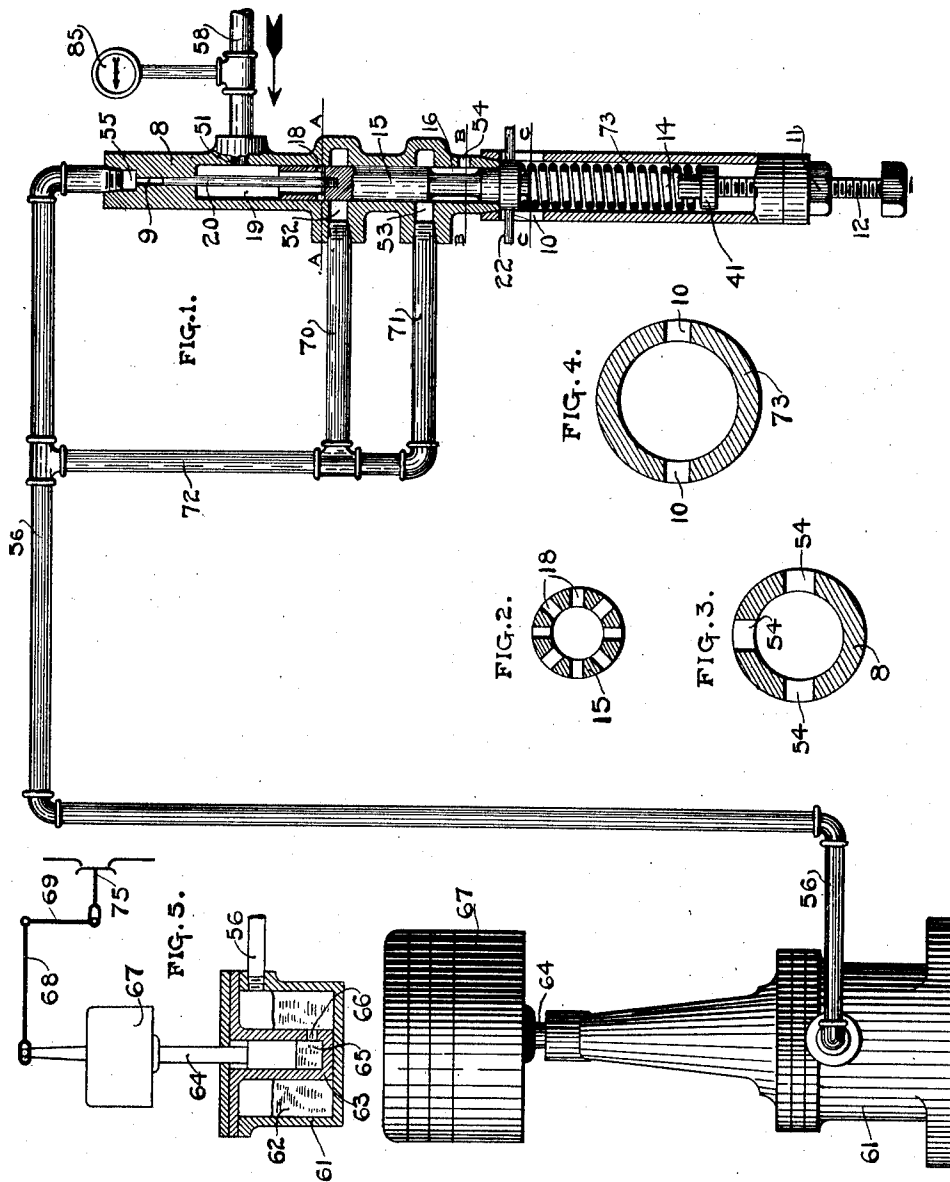


C. G. SPRADO.
UNLOADING DEVICE.
APPLICATION FILED MAY 12, 1910.

1,002,770.

Patented Sept. 5, 1911.



WITNESSES.

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UNLOADING DEVICE.

1,002,770.

Specification of Letters Patent.

Patented Sept. 5, 1911.

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To all whom it may concern:

Be it known that I, CARL G. SPRADO, 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 Improvement in Unloading Devices, of which the following is a specification.

This invention relates to improvements in the construction of devices for unloading compressors or blowers.

The object of the invention is to provide an unloading device for compressors or blowing engines which is simple in its construction and efficient in its operation. The efficiency of devices of this kind depends upon the rapidity and the positiveness of operation thereof, thereby producing a sensitive regulation of the compressor or blower, and it is the object of this invention to have these desirable operative features embodied in a device of simple construction.

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

Figure 1 is a plan view of an unloading device for a compressor or blower, the regulator thereof being shown partly in section. Fig. 2 is an enlarged transverse section through the regulator piston, of the device shown in Fig. 1, the section being taken on the line A—A of Fig. 1. Fig. 3 is an enlarged transverse section through the regulator casing, of the device shown in Fig. 1, the section being taken on the line B—B of Fig. 1. Fig. 4 is a section similar to that of Fig. 3 through the regulator spring casing, the section in this case being taken on the line C—C of Fig. 1. Fig. 5 is a diagrammatic central vertical section through the oil cylinder of the device shown in Fig. 1, showing also the return weights and the connection of the unloader to a valve of the compressor.

The regulator casing 8, see Fig. 1, is cylindrical in form, being bored to receive the pistons 15, 20. The smaller and upper piston 20 is received by the bore 9 in the upper end of the casing 8, the lower piston 15 coacting with the larger bore 19. The receiver inlet pipe 58 connects with the port 51 which opens into the interior of the casing 8 above the larger piston 15. The pres-

sure gage 85 on the pipe 58 serves as a means for determining the receiver pressure. The piston 15 is cup shaped at its upper end and has ports 18 formed through its walls near the lower end of the bore which forms the cup, see Figs. 1 and 2, the cup and ports 18 forming a slide valve on the piston 15. The upper piston 20 has its lower end fastened to the piston 15, the two pistons being concentric in the construction shown. The annular chamber 52 surrounds the piston 15 below the plane of the ports 18, with the piston 15 in its upper position as shown. The discharge pipe 70 connects with the chamber 52 and with the pipe 72. The lower end of the piston 15 is reduced in cross-section for a portion of its length, thus forming an annular chamber 16 around the piston 15 and within the bore 19. The annular chamber 53 connects with the upper end of the chamber 16, with the piston 15 in its upper position as shown. The ports 54, formed through the casing 8, see Figs. 1 and 3, connect the chamber 16 with the atmosphere. The pipe 71, which connects the chamber 53 with the pipe 72, forms an atmospheric outlet connection from the pipe 72, through the chambers 53, 16 and ports 54.

The regulator spring casing 73 is circular in section and is fastened to the lower end of the casing 8, being concentric therewith. The lower end of the piston 15 projects down into the casing 73, the projecting portion being of slightly increased diameter and carrying the radial operating stubs 22. These stubs 22 project through slots 10, see Figs. 1 and 4, in the spring casing 73, and serve as a means for lowering the piston 15 manually, as well as a means for preventing rotation of the piston 15 within the casing 8. The enlargement of the piston 15 which carries the stub 22, butts up against the lower end of the casing 8, with the piston 15 in its upper position.

The compression spring 14 coacts with the lower end of the piston 15 within the casing 73. The lower end of the spring 14 coacts against a removable cap 41 at the upper end of the adjusting tap bolt 12, which bolt 12 screws into the lower end of the spring casing 73. The locking nut 11 coacts with the bolt 12 and with the lower end of the casing 73, and serves as a means for locking the bolt 12 into any desired position. It will be noted that this construction gives

an efficient means for varying the tension of the spring 14.

The bore 9 at the upper end of the casing 8 connects with the chamber 55. The pipe 56 connects the chamber 55 with the pipe 72 and also connects the pipe 72 and chamber 55 with the interior of the oil cylinder 61, see Figs. 1 and 5. The oil cylinder 61 has a concentric cylinder 63 of smaller diameter, formed therein. This cylinder 63 has a small port 66 near its lower end which connects the interiors of the cylinders 61, 63. The oil or other liquid 62 surrounds the cylinder 63 and partially fills the chamber within the cylinder 61. The piston chamber 65 within the cylinder 63 contains the piston 64 and is filled with liquid 62 below the piston 64. The piston 64 carries a number of removable weights 67 at its upper end, these weights 67 normally tending to force the piston 64 downward and hence to force the oil 62 from the chamber 65 through the port 66.

The suction valve 75 of the compressor is operatively connected with the weights 67 in any suitable manner, as by a bell crank 69 and lever 68, as shown diagrammatically in Fig. 5, this connection being adapted to lift the valves while unloading.

During the operation of the device the spring 14 is set to exert a pressure which is about equal to the receiver pressure desired, against the bottom of the piston 15. This can be accomplished by admitting the receiver pressure against the upper end of the piston 15, through the inlet pipe 58, and while observing the gage 85, adjusting the bolt 12 until the desired receiver pressure and the spring pressure are balanced, that is to say, until the piston 15 floats between the two pressures. With the spring 14 properly set, assume the receiver pressure to drop off. The working parts will then assume the position shown in Fig. 1 and the suction valves 75 of the compressor will be working normally. As the air pressure in the receiver, and hence above the piston 15 increases, the piston 15 is gradually forced downward until the ports 18 partially connect the chamber 52 with the receiver pressure above the piston 15. The atmospheric connection from the pipe 71 through the chambers 53, 16, and ports 54 is then cut off and the receiver pressure is partially established in the pipes 70, 72 and 56. The establishment of this higher pressure against the piston 20 through the pipe 56 and chamber 55, causes a sudden additional unbalancing of the opposing pressures of the spring 14 and the receiver pressure on the piston 15, causing the piston 15 to be forced quickly downward, thus throwing the ports 18 full open to the chamber 52. The full receiver pressure is thus suddenly established within the pipes 70, 71, 72, 56, and the interior of the cylinder 61.

This high pressure acting on the surface of the liquid 62, is transmitted through the liquid 62 to the lower end of the piston 64, causing said piston to rise carrying with it the weights 67. The upward motion of the weights transmitted through the lever 68 causes the bell crank 69 to quickly lift the suction valve 75 of the compressor or blower. With the suction valves 75 lifted, the air drawn into the compressor cylinder on the suction stroke will be discharged through the lifted suction valve on the return stroke, thus unloading the compressor. As the pressure in the receiver decreases, the spring 14 gradually forces the piston 15 upward until the ports 18 are cut off from the chamber 52. As the ports 18 close, the chambers 53, 16 are connected, thus forming a connection from the cylinder 61, pipes 56, 72, 70, 71, to atmosphere through the chambers 53, 16 and the ports 54. This atmospheric connection causes the pressure above the piston 20 to be suddenly released, thus unbalancing the pressures above and below the piston 15 and causing the piston 15 to rise quickly to the position shown. With a drop in pressure above the liquid 62, the weights 67 drop, returning the suction valves 75 to normal running position.

By employing a construction of liquid cylinders 61, 63, as shown, applicant avoids a too sudden up and down motion of the piston 64, the shock being somewhat subsided by the passage of the liquid 62 through the port 66. The port 66 could be needle controlled, thus giving means for adjusting the size of passage between the interiors of the cylinders 61, 63, but this is not essential. By having the weights 67 removable, the rapidity of the action of the device is further controllable, inasmuch as a heavy weight 67 will cause a quicker return of the suction valve 75 and a slower lifting than a light weight 67.

If it is desired to have the suction valves 75 lifted before the normal receiver pressure is reached, the piston 15 can be quickly manipulated to produce such result by means of the stubs 22. With this arrangement the compressor can be independently manually controlled as well as automatically.

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 for compressors, a suction valve, fluid actuated means for rendering said valve inoperative, a regulator for said means including a piston, means for admitting fluid under pressure to one side of said piston, means coacting with

said piston for counterbalancing said fluid pressure, means for suddenly changing the total pressure of the fluid admitted to said piston, said pressure changing means including a valve operated by said piston and controlling the admission and release of fluid under pressure to said fluid actuated means for rendering said suction valve inoperative and a pipe for communicating to said piston the pressure controlled by said valve.

2. In an unloading device for compressors, a regulator including a piston, means for admitting fluid under pressure to one side of said piston, means for counterbalancing said fluid pressure, means for suddenly changing the total pressure of the fluid admitted to said piston, said pressure changing means including a valve for suddenly

admitting or releasing fluid under pressure to and from a portion of said side of said piston and a pipe communicating from said valve to said piston portion.

3. In an unloading device for compressors a regulator comprising a piston, means for admitting fluid under pressure to one side of said piston, a spring pressing on the opposite side of said piston, and means for suddenly changing the total pressure of the fluid admitted to said piston, said piston being movable before said sudden change is effected.

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

CARL G. SPRADO.

Witnesses:

W. H. LIEBER,
H. C. CASE.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."