

April 8, 1924.

1,489,912

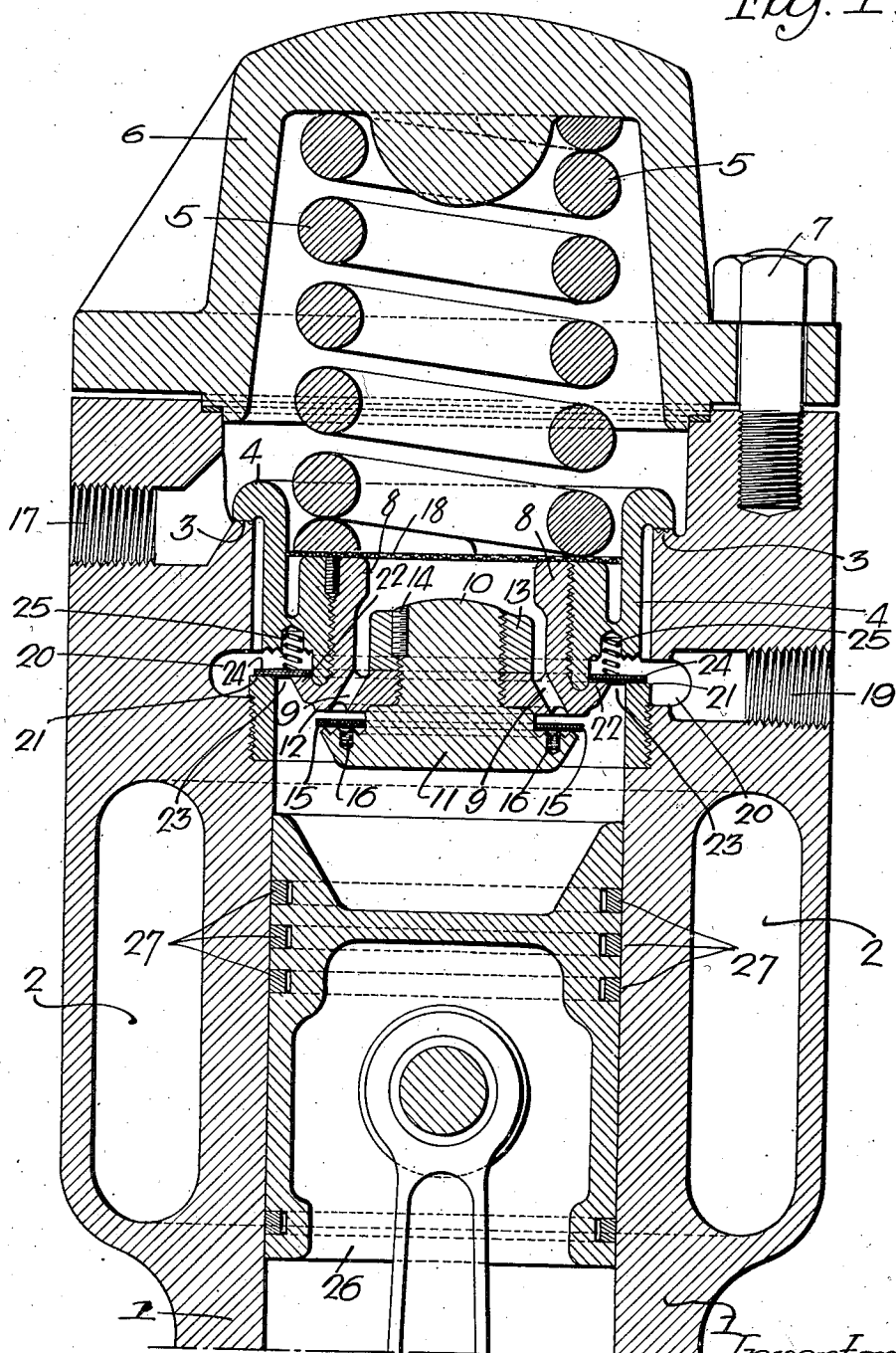
J. F. WINKLER

COMPRESSOR

Filed March 22, 1922

2 Sheets-Sheet 1

Fig. 1.



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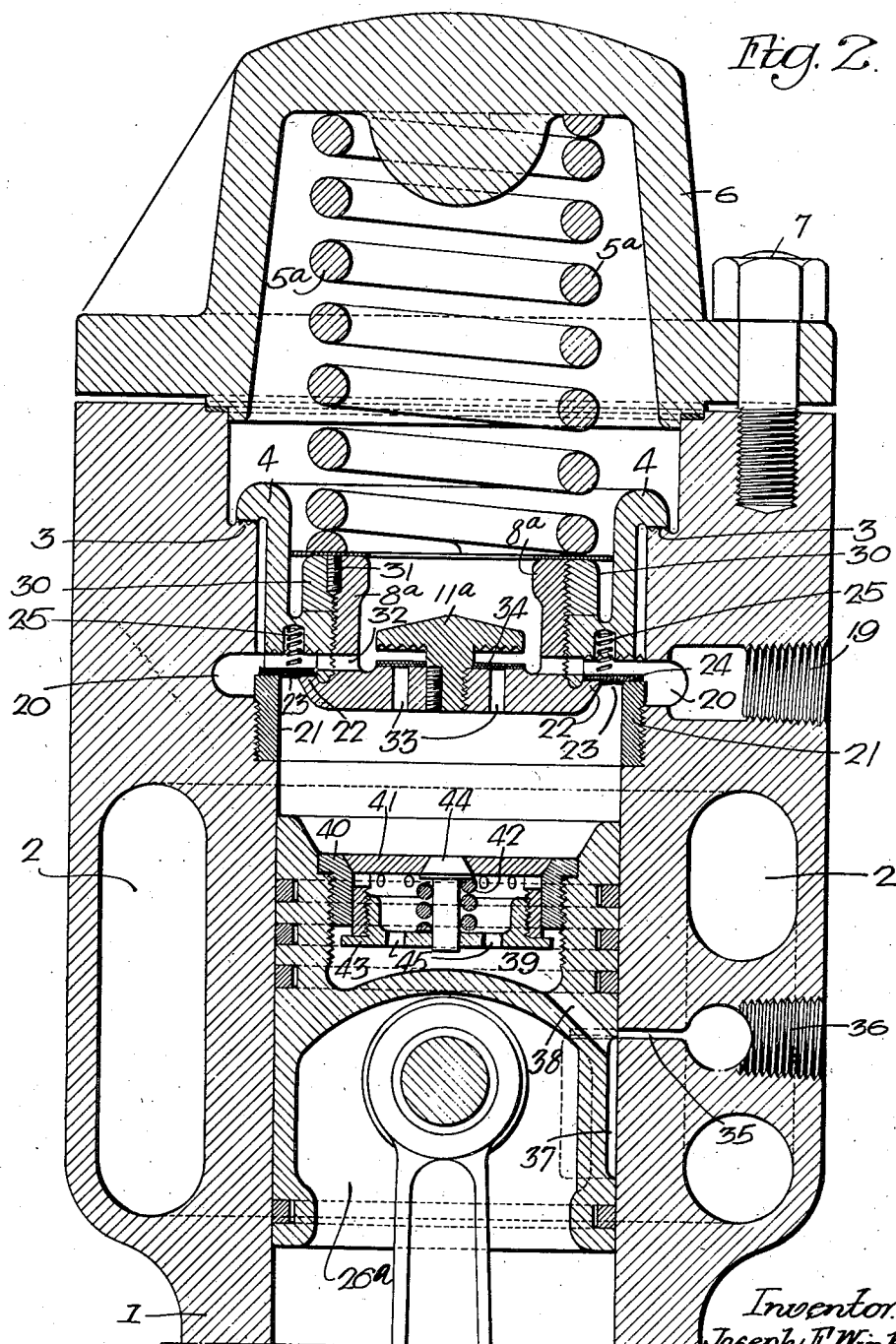
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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

JOSEPH F. WINKLER, OF PHILADELPHIA, PENNSYLVANIA.

COMPRESSOR.

Application filed March 22, 1922. Serial No. 545,806.

To all whom it may concern:

Be it known that I, JOSEPH F. WINKLER, a citizen of the United States, residing in Philadelphia, Pennsylvania, have invented
5 Compressors, of which the following is a specification.

One object of this invention is to provide a relatively compact, inexpensive, substantial and simple form of compressor particularly adapted for use in refrigerating systems and which shall include such an arrangement and assemblage of parts as will result in efficient, economical, noiseless and safe operation.

15 I further desire to provide a form of compressor including valves which shall be relatively light in construction with a view to the avoidance of objectionable shock, wear and noise under operating conditions, the
20 invention including an arrangement of parts which shall be conveniently accessible for inspection or replacement.

A further object of my invention is to provide a compressor so designed as to have
25 a minimum clearance and which shall include a safety valve of novel arrangement and construction.

I also desire to provide a compressor having safety, discharge and suction valves assembled in a novel manner, particularly
30 designed, in one form of my invention, to avoid the use of a suction valve in the piston, and to reduce the likelihood of oil passing from the crank case to the discharge side
35 of the compressor.

The invention also contemplates a novel construction of safety head with suction and discharge valves so constructed and assembled as to reduce to a minimum the
40 likelihood of damage to the compressor in case liquid should be admitted to its cylinder.

These objects and other advantageous ends I attain as hereinafter set forth; reference being had to the accompanying drawings, in which,

Fig. 1 is a longitudinal vertical section of a portion of a cylinder and certain of its associated parts, constructed in accordance with my invention; and
50

Fig. 2 is a longitudinal vertical section similar to Fig. 1 but illustrating a modified form of my device.

In the above drawings, 1 represents the
55 cylinder of the compressor having formed in its walls a cavity 2 constituting a water

jacket and formed with its otherwise open end counterbored to form an annular seat 3 for a safety head 4. The latter has an annular overhung portion normally held on
60 said seat by a relatively heavy spring 5 confined between its outer end and a cover 6 which is held to the cylinder by bolts 7.

The seat 3 is preferably formed with annular serrations and said head 4, which is
65 substantially cylindrical, extends into the cylinder, being internally threaded for the reception of an inwardly flanged sleeve 8 through whose flange are formed a series of inlet passages 9 and which has a flat
70 annular face forming a valve seat adjacent the lower ends of said passages. The flange of the sleeve 8 has a centrally threaded opening through which is threaded the stem 10 of a retaining member 11 including an
75 outwardly extended flange, preferably serrated, extending substantially parallel with but spaced away from the flat annular seat 12 of the sleeve 8. The stem 10 is rigidly held to the sleeve 8 by a nut 13 which in
80 turn is locked in position by a screw 14 extending partly in it and partly in the stem 10.

Mounted between the flange of the retaining member 11 and the seat 12 is an annular
85 valve 15 preferably made up of a series of thin, metallic laminations, spot welded or otherwise permanently connected and preferably held slightly above the serrated surface of the member 11 by springs 16 in the
90 latter. In this form of my invention an intake port 17 extends through the cylinder wall adjacent its outer or covered end so as open into the interior of the cover 6, and there is mounted between the spring 5 and
95 the outer ends of the elements 4 and 8 a suitable screen 18 to prevent passage of solid matter through the channels 9 into the cylinder. Also formed in the outer end of the cylinder wall is a discharge passage
100 19 opening into an annular port 20 concentric with the bore of the cylinder immediately adjacent the outer end of an annular valve seat 21, which is threaded into and has the same internal diameter as the body or
105 main portion of the cylinder.

The sleeve 8 also includes an outwardly extending flange 22 having a flat upper surface in the same plane as the adjacent flat end of said ring 21, from which it is spaced
110 to provide an annular opening 23 into the port 20. The flow through this opening or

passage is controlled by an annular valve 24, which, like the valve 15, is preferably made up of thin metallic laminations so that it is relatively light and therefore quiet in operation. Light springs 25 normally hold this valve on or tend to move it toward the seat provided by the ring 21 and the outwardly extending flange 22 of the member 8.

Any suitable imperforate piston 26 is mounted to reciprocate in the cylinder and has any desired number of packing rings 27 mounted in annular grooves and constructed in any suitable manner.

Under conditions of operation as the piston makes its inward or downward stroke in the cylinder, gaseous ammonia or other gas to be compressed is drawn in through the inlet passage 17, through the screen 18 and passages 9 into said cylinder, the valve 15 moving into the position shown in Fig. 1 to open said passages 9, while the valve 24 remains seated. On the return or outward stroke of the piston, the valve 15 at once closes and after the pressure in the cylinder has reached a sufficient magnitude, the compressed gas causes opening of the valve 24, after which it flows through the annular passage 23 into the port 20 and thence to the outlet 19.

If for any reason abnormal amounts of liquid enter the cylinder from the inlet passage 17 as the piston makes its inner stroke, there is obviously an abnormal pressure on the return stroke in view of the inability of such liquid to be quickly forced out of the cylinder. The safety head provided by the member 4 thereupon moves from its seat 3 against the pressure of the spring 5 so that this abnormal pressure is relieved, said head with its valves moving bodily into the cover 6 without damage to any of the parts and the liquid escaping into said cover around the valve 24 and between the overhung portion of the safety head and its seat 3.

It will be noted that this relief of liquid or gas under pressure takes place into the supply rather than the delivery side of the system or into the air, and as soon as such relief has occurred, the spring 5 returns the safety head to its normal position on its seat, permitting the valves and their associated parts to at once resume their normal operation. It is noted that the outer face of the piston is recessed so that it receives the depending part of the retaining member 11 and lower end of the sleeve 8, so that the clearance is reduced to a negligible amount.

In that form of my invention shown in Fig. 2, I provide a safety head 4 as in the other form of my invention, having its upper edge overhung and designed to cooperate with a serrated valve seat 3 formed by suitably counterboring the cylinder. Within the safety head I thread a sleeve 8^a retain-

ing it in place by a lock nut 30 which in turn is retained in its final position by a set screw 31. The sleeve 8^a is outwardly flanged as at 22 and the upper surface of this flange is engaged by a delivery valve 24 which also rests upon the seat ring 21.

In this case, however, the annular port 20 communicating with the delivery or outlet passage 19, has a series of passages 32 formed in the safety head and in the sleeve 8^a leading into the space within the said safety head and to the interior of the cover 6. The overhung portion of the safety head is held to its seat 3 by a spring 5^a which, while relatively strong, is by no means as heavy as that in the other form of my invention. Delivery passages from the interior of the cylinder are formed in the closed end of the sleeve 8^a as indicated at 33. These are arranged in a circular series so as to be simultaneously closed by an annular laminated valve 34 mounted within said sleeve and limited as to its movement by the flanged head of a retaining member 11^a threaded into said sleeve and extending over, though spaced away, from said valve.

In this case the piston 26^a is designed to uncover an inlet port 35 leading from a supply passage 36 in the cylinder wall, after it has approached the lower end of its inward stroke. In order, however, to diminish the work required to move said piston inwardly, I provide in its wall a longitudinally extending port 37 communicating through a passage 38 with a cavity 39 in its upper end. This cavity has threaded concentrically into it a valve seat 40 for an upwardly opening valve 41 normally held closed by gravity and having an outwardly flanged cap 43 threaded into its lower end so as to limit its degree of opening.

Mounted within this valve is a downwardly opening secondary valve 44 normally held closed by a relatively stiff spring 42. Openings 45 are provided in the cap 43 so that as the piston begins its downward stroke the exhaustion of the space above it will permit gas from the supply side of the system to enter the passage 36 and flow through the ports 35 and 37 into the passage 38, into the cavity 39 of the piston and thence through the holes 45, the valve 41 moving upwardly to permit this gas to enter the upper part of the cylinder. After completing a portion of its downward stroke, the port 37 is cut off from the inlet port 35, the pressure being decreased above the piston as this continues to move downwardly until its upper end finally uncovers said inlet port 35.

The gas from the supply side of the system is now free to flow into the partial vacuum which has been formed in the cylinder, whereupon the outward stroke of the piston first cuts off the supply port 35 and thereafter compresses the gas in the cylinder

until it raises the valves 23 and 34, allowing the gas to flow into the outlet passage 19. As before, if liquid is drawn into or trapped in the cylinder, the safety head 4 moves 5 bodily upward from its seat 3, permitting the fluid under high pressure to escape into the delivery side of the system. At the same time, opening of the valve 44 also permits the escape of liquid into the cavity 10 39 of the piston and thence through the passage 38 and ports 37 and 35 into the supply side of the system.

I claim:

1. The combination in a compressor of a 15 cylinder having intake and delivery ports; a cover for the outer end of the cylinder; a safety head cutting off the cylinder from the interior of the cover and including a valve portion; a spring between the cover 20 and the head normally holding the latter seated; and a valve in the safety head normally cutting off the cylinder from the delivery port, the latter being operatively associated with said intake port when said 25 safety head is subjected to abnormal pressures.

2. The combination in a compressor of a cylinder having intake and delivery ports; a cover for the outer end of the cylinder; 30 two annular valve seats in the cylinder; a safety head including a valve portion engaging one of said seats and normally cutting off the cylinder from the interior of the cover; a spring normally holding the safety 35 head on its seat; with a valve operative between the safety head and the second valve seat for controlling the flow of fluid from the cylinder to the delivery port.

3. The combination in a compressor of a 40 cylinder having an annular valve seat adjacent its outer end; a hollow cover normally closing said outer end; a sleeve structure extending into the cylinder and having an annular overhung portion engaging the annu- 45 lar valve seat to constitute a safety head; a relatively heavy spring between the cover and said head to normally hold the latter seated; with an annular valve movable with the safety head for controlling the flow of 50 fluid between the cylinder and an outlet port, said last-mentioned valve having a seat in the cylinder.

4. The combination in a compressor of a cylinder having inlet and outlet ports and 55 including an annular valve seat; a safety valve for the cylinder; a spring normally holding said safety valve to said seat; and a valve carried by and movable with the safety valve for controlling the flow of fluid 60 between the cylinder and the outlet port, said safety valve being so positioned as to permit a fluid under pressure to escape from said cylinder into said inlet port.

5. The combination in a compressor of a 65 cylinder having inlet and outlet ports and

formed with an annular valve seat; a safety valve for said seat interposed between the main portion of the cylinder and the inlet port and having a passage into the cylinder; a spring normally holding said safety valve 70 to the seat; a valve carried by the safety valve for controlling the flow of fluid through the passage therein; and a second valve also carried by the safety valve for controlling the fluid flow from the cylinder 75 to the outlet port.

6. The combination of a cylinder having an inlet port opening into it adjacent its outer end and also having an outlet port; a hollow cover for the outer end of the 80 cylinder; a safety head seated in the cylinder between the inlet port and the body of the cylinder; a spring acting between the cover and the safety head; a valve controlling the flow of fluid from the inlet through 85 the safety head; and a second valve carried by the safety head for controlling the fluid flow from the cylinder to the outlet port.

7. The combination in a compressor of a cylinder having an annular valve seat re- 90 movably mounted therein; a spring controlled safety head for the cylinder having a seat portion concentric with but spaced away from the cylinder valve seat; and an 95 annular valve operative between the safety head and the valve seat of the cylinder to control the flow of fluid between the cylinder and the outlet port thereof.

8. The combination in a compressor of a cylinder; a spring actuated safety valve 100 normally closing the outer end thereof; and two substantially concentric, annular valves carried by the safety valve for respectively controlling the inlet and the outlet of fluid.

9. The combination in a compressor of a 105 cylinder having two substantially concentric valve seats and formed with inlet and outlet ports; a safety head; a relatively heavy spring normally holding said safety head in engagement with one of said seats; 110 an annular valve operative between a portion of the safety head and the second cylinder valve seat for controlling the flow of fluid between the cylinder and the outlet 115 port; with a second valve for controlling the flow of fluid between the inlet port and the cylinder.

10. The combination in a compressor of a cylinder having an annular valve seat adja- 120 cent one end and formed with inlet and outlet ports; a safety head consisting of a sleeve-like structure having an outwardly extending flange for cooperation with said valve seat; an outwardly flanged sleeve 125 threaded into said safety head; and an annular valve carried by the flanged portion of said sleeve for controlling the flow of fluid between the cylinder and the outlet port.

11. The combination in a compressor of 130

a cylinder having an annular valve seat adjacent one end and formed with inlet and outlet ports; a safety head consisting of a sleeve-like structure having an outwardly extending flange for cooperation with said valve seat; an outwardly flanged sleeve threaded into said safety head; an annular valve carried by the flanged portion of said second sleeve for controlling the flow of fluid between the cylinder and the outlet port, there being passages through said sleeve into the cylinder; and a second annular valve for controlling the flow of fluid through said passages from the inlet port to the cylinder.

12. The combination in a compressor of a cylinder having inlet and outlet ports; a safety head therefor; and an annular laminated valve structure carried by the safety head and having a seat in said cylinder, whereby the flow of fluid between the cylinder and the outlet port may be controlled.

13. The combination in a compressor of a cylinder having inlet and outlet ports; a safety head for the cylinder; and two substantially concentric annular laminated

valves carried by the safety head for respectively controlling the flow of fluid between the cylinder and the inlet and outlet ports.

14. The combination in a compressor of a cylinder having inlet and outlet ports; a hollow cover for the outer end of the cylinder having its interior in communication with the inlet port; a safety head in the cylinder having passages therethrough; a spring between the safety head and the cover; a screen for the passages of the safety head held in place by the spring; a valve for controlling the flow of fluid through said safety head from the inlet port; and a second valve for controlling the flow of fluid from the cylinder to the outlet port.

15. The combination in a compressor of a cylinder having an inlet and an outlet; a spring controlled safety head for the cylinder positioned to permit fluid under abnormal pressure to escape from the cylinder into the inlet port; and valves for controlling the normal flow of fluid between said ports and said cylinder.

JOSEPH F. WINKLER.