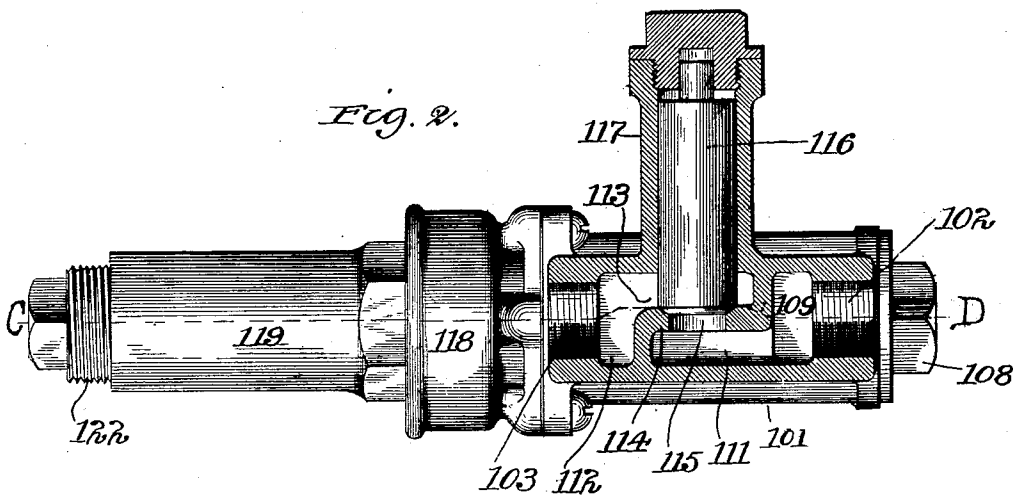
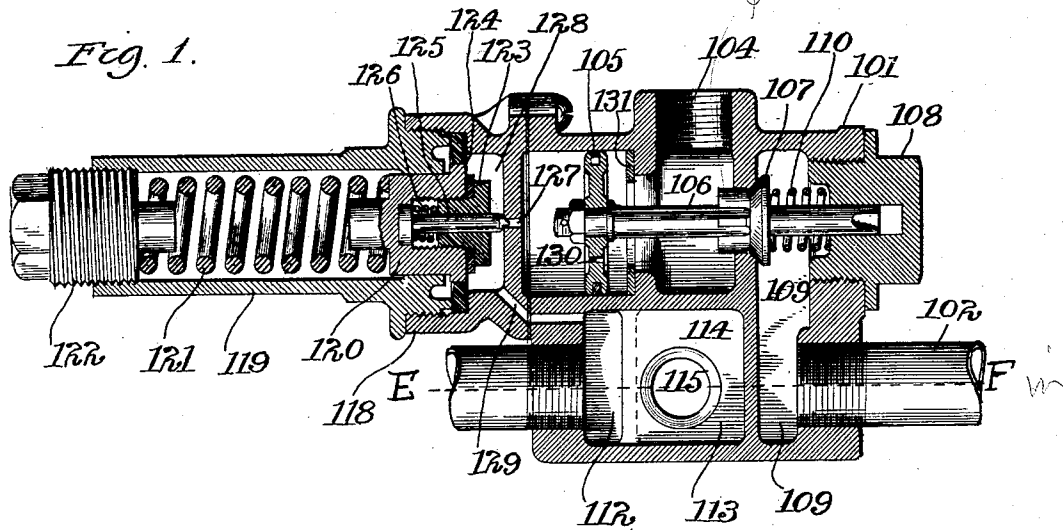


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N. A. CHRISTENSEN.
AUTOMATIC GOVERNOR FOR FLUID COMPRESSORS.
APPLICATION FILED NOV. 20, 1899.

NO MODEL.



Witnesses:

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UNITED STATES PATENT OFFICE.

NIELS ANTON CHRISTENSEN, OF MILWAUKEE, WISCONSIN.

AUTOMATIC GOVERNOR FOR FLUID-COMPRESSORS.

SPECIFICATION forming part of Letters Patent No. 738,161, dated September 8, 1903.

Application filed November 20, 1899. Serial No. 737,645. (No model.)

To all whom it may concern:

Be it known that I, NIELS ANTON CHRISTENSEN, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented a certain new and useful Automatic Governor for Fluid-Compressors, of which the following is a specification.

My invention relates generally to governors for continuously or practically continuously operated fluid-compressors whose function is to automatically open the delivery-pipe of the compressor to the atmosphere whenever the reservoir-pressure has reached maximum, and it relates more particularly to governors for that class of compressors known as "axle-driven" compressors such as employed on street-cars and the like, where the compressor is always working when the car is in motion.

The object of my invention is to provide a simple construction of the governor proper, the check-valve and vent-valve, which constitute the mechanism for the desired purpose, and to combine all of these mechanisms in compact form and into immediate juxtaposition in practically a single casing or device. Moreover, my governor is so constructed as to be independent of the compressor and its usual suction and discharge valves.

In the drawings, Figure 1 is a section of the entire device, taken on line C D of Fig. 2; and Fig. 2 an elevation of my device with a part of the casing in section, such section being taken on the line E F of Fig. 1.

The valve-casing 101 has a connection 102 with the usual delivery-pipe of the compressor, a connection 103 leading to the ordinary reservoir, and an exhaust-port 104 to atmosphere, which exhaust may, if desired, be connected with an ordinary muffler. (Not shown.) Within the casing is a chamber in which moves a movable abutment which, as shown, consists of a piston 105, having a stem 106, carrying and actuating a vent-valve 107 and guided at its outer end in a nut 108. A chamber or passage 109 communicates between the connection 102 and the exhaust-port 104 when the valve 107 is open; but such valve is normally held seated by a spring 110. As shown in Fig. 2, the chamber 109 is L-shaped in cross-section and has a longitudinal portion 111. The chamber 112, having a longitudinal portion 113 similar to chamber

109, but reversed, is provided in the casing and communicates with the reservoir. In the dividing wall or partition 114 between chambers 111 and 113 is a port 115, governed by the check-valve 116, which, as shown, is in the form of a cylinder reciprocable in a hollow cylindrical extension 117 of the casing and having its extreme inner end normally seated to close said port. The chambers just described form a connection through the casing between the compressor and the reservoir, and the same is governed by the check-valve. This check-valve permits the pressure to enter the reservoir from the delivery-pipe of the compressor, but prevents its return.

A cup or casing 118 is secured to the casing 101 by bolts or otherwise and is adapted to close the open end of the chamber in which the piston 105 travels. Into the open end of this cup is screwed a tube or hollow stem 119, in which moves a piston-like head 120, normally inwardly pressed by a spring 121, whose tension may be adjusted by a nut 122, screwing into the top of the stem. This head 120 has a central opening into which screws a plug 123, which secures the head to a diaphragm 124, clamped between the tube and casing 101. The needle-valve 125 passes through this plug, and its head is held against the bottom of the cavity in the piston-like head by a spring 126. This needle-valve is actuated by the movable abutment, which in this particular case is shown as a diaphragm, and governs a port 127, extending through the bottom of the cup and communicating with the space above the piston 105 and the diaphragm-chamber 128, which latter in turn communicates with the reservoir through a passage 129.

In operation, assuming that the reservoir is not charged and the compressor is working, compressed air will be delivered through connection 102 directly through the casing and past the check-valve and finally into the reservoir. The reservoir-pressure is present in chamber 128; but the needle-valve will remain closed on account of the spring tension against its movable abutment, which tension is adjusted to resist pressure to a predetermined amount. The vent-valve is also closed, owing to the tension of its spring 110, which

is able to seat this valve because its piston 105 is exposed on both faces to atmospheric pressure by reason of the small leak-groove 130, extending through the piston.

5 The charging of the reservoir will continue so long as the compressor is working and until the predetermined pressure is exceeded, whereupon such excess pressure will be exerted upon the diaphragm to lift the needle-
10 valve from its seat and to thereby admit reservoir-pressure to the space above the piston 105, causing it to travel outward to the seat 131 and open the vent-valve. As the check-valve is at this time closed, the air from the
15 delivery-pipe of the compressor will be vented to the atmosphere, and the compressor will therefore work without compression. The leak-groove 130 being quite small will not interfere with the operation of the piston, and
20 after the needle-valve has closed the pressure above the piston 105 will be exhausted through such groove, and the spring 110 will thereupon seat the vent-valve. The compressor is now free to charge the reservoir, whose pressure
25 may by this time have been reduced by the application of the brakes in case it is used in such a system. The same operation of the governor occurs when the reservoir-pressure again reaches maximum.

30 In my device the needle-valve is thus actuated by a movable abutment and is normally positively seated, the reservoir-pressure not pressing on the under side of the valve, but rather in a contrary direction, tend-
35 ing to seat it, the fluid-pressure on the abutment being overcome by the spring under normal conditions. Also the piston-chamber has an exhaust-outlet and a communication with the delivery-pipe of the compressor,
40 which communication is governed by the vent-valve, so that the pressure passes through and is exhausted from the piston-chamber, and such fluid-pressure assists in closing the vent-valve, which is openable only against
45 fluid-pressure and the spring tension. Furthermore, the actuating-piston is normally not exposed on either face to any pressure above atmospheric pressure—that is, while the compressor is discharging air into the
50 reservoir—and after opening the vent-valve such piston is forced against the seat, which keeps it tight against leakage through the piston-packing rings, and the only leak then occurring is through the small leak-groove,
55 which is practically inappreciable.

It is essential that the excess reservoir-pressure admitted to the abutment of the vent-valve should be permitted to leak off, and it is to be understood that any manner or means
60 whereby this result is attained is comprehended within the meaning and scope of my invention. Obviously advantage may be taken of the leakage above alluded to through the packing-rings, except when the piston
65 was seated, in case such a seat was used and such leakage alone might be relied on, the seat being dispensed with, although the leak

groove or port might perhaps permit of better regulation of the speed of leakage.

My device is extremely advantageous by 70 reason of its compact form and the combination practically in one casing or device of the check-valve, vent-valve, and governor proper. Moreover, by my invention all the mechanisms thus brought into immediate juxtaposition are extremely simple in construction,
75 rendering the operation positive and reliable, the parts are brought into small compass, and, further, the use of connecting-pipes is dispensed with. 80

Although I have described more or less precise forms and details of construction, I do not intend to be understood as limiting myself thereto, as I contemplate changes in form, the proportion of parts, and the substitution
85 of equivalents as circumstances may suggest or render expedient and without departing from the spirit of my invention.

I claim—

1. An automatic governor device for fluid- 90 compressors comprising a casing having a check-valved main passage between the compressor and reservoir with a branch or vent passage from said main passage on the compressor side of the check-valve to atmosphere, 95 a vent-valve in said casing governing such vent-passage, said casing also having a chamber or cylinder, a movable abutment in such chamber to operate the vent-valve, and exposed to excess reservoir-pressure when automatically admitted, automatic means located in said casing for releasing such admitted pressure, a second casing secured to the first casing and having a port-provided end forming a removable cylinder-head for said cylinder, said second casing having a chamber communicating with a branch passage in the first casing leading from the main passage on the reservoir side of the check-valve, and a fluid-pressure-actuated valve located in the chamber of such second casing and governing said port. 100 105 110

2. An automatic governor device for fluid-compressors comprising a casing having a direct connection with the compressor and with the reservoir and also having an exhaust- 115 port to atmosphere, a passage extending through the casing between such connections and also communicating with such exhaust-port, a movable abutment-actuated vent- 120 valve in the same casing and governing the exhaust-port, said abutment being normally exposed on both sides to atmospheric pressure, a check-valve governing the communication between the reservoir and compressor through 125 such passage, and a movable abutment-actuated valve device for admitting excess reservoir-pressure to the abutment of the vent-valve and arranged in immediate juxtaposition with said casing. 13

3. A fluid-compressor governor device comprising a casing having a check-valve main passage extending through the casing and communicating with the compressor and the

reservoir, said casing having an exhaust or vent port communicating with said passage on the compressor side of the check-valve and also having a cylinder or chamber communicating with the exhaust-port, a vent-valve governing said port, a movable abutment actuating said valve and normally exposed on both sides to atmospheric pressure, said abutment being exposed to pressure when the reservoir-pressure exceeds maximum, automatic means for releasing such pressure, all the aforesaid parts and passages being in the same casing, a governor actuated by excess reservoir-pressure and adapted to admit such pressure against the abutment, and a second casing containing said governor and secured rigidly to the first casing to form substantially a single casing containing all the aforesaid parts and passages.

4. A fluid-compressor governor device comprising a casing having passing therethrough a passage between the compressor and the reservoir, a check-valve arranged within such casing to control such passage, such casing having a chamber with a vent-port communicating with such passage, and a port to the atmosphere, a vent-valve governing the vent-port, a movable abutment normally unexposed to pressure operating in such chamber and actuating the vent-valve and a valve device bodily connected with said casing and adapted to admit excess reservoir-pressure to said abutment.

5. A fluid-compressor governor device comprising a casing having passing therethrough a passage between the compressor and a reservoir, a check-valve within such casing to control the passage, the casing containing a chamber having a vent-port communicating with such passage, and a port to atmosphere, a vent-valve governing the vent-port, a movable abutment operating in such chamber to actuate the vent-valve and provided with a leakage-groove passage through itself to keep both faces of such abutment normally exposed to atmospheric pressure, and a valve device adapted to admit excess reservoir-pressure to said abutment.

6. A fluid-compressor governor device comprising a check-valved passage or connection between a reservoir and the compressor, a casing having a chamber with an exhaust-port and with a vent-port communicating with said passage, a vent-valve governing the vent-port, a movable abutment operating in such chamber to actuate the vent-valve and having a leakage-groove to keep both faces of such abutment normally exposed to atmospheric pressure, and means for admitting excess reservoir-pressure to said abutment.

7. A vent-valve device for compressors comprising a casing having a check-valve-governed passage communicating between the delivery-pipe of the compressor and a reservoir, and also having a movable abutment-chamber and an outlet-chamber with communication with such abutment-chamber,

with the atmosphere and through a vent-port with said passage on the compressor side of the check-valve, a vent-valve governing said port, and a movable abutment in said abutment-chamber for actuating said vent-valve and normally exposed on both sides to atmospheric pressure.

8. A fluid-compressor governor device comprising a casing having a check-valved passage or connection between a reservoir and the compressor and also having a chamber, with an exhaust-opening and a vent-port communicating with such passage, a movable abutment in such chamber normally exposed on both sides to atmospheric pressure and having a stem, a vent-valve arranged on the stem intermediate of its length to govern such port, a hollow plug 108 screwing into the side of the casing and forming a guide for the end of the stem, and means for admitting excess reservoir-pressure in the chamber above the abutment to operate the vent-valve.

9. A fluid-compressor governor device comprising a casing having passing therethrough a passage between the compressor and the reservoir, a check-valve arranged within the casing to control such passage, such casing having a chamber with a vent-port communicating with such passage, and a port to the atmosphere, a spring-pressed vent-valve governing the vent-port and normally exposed on one face to pressure from the compressor to assist in closing it and on the other face to atmospheric pressure, a piston having a leak and operating in such chamber to actuate the vent-valve, a seat on which the piston seats when it opens the vent-valve and means for admitting excess reservoir-pressure to operate the piston.

10. The combination of a casing having a connection 102 with the delivery-pipe of a compressor, a connection 103 with a reservoir, a piston-chamber with an exhaust-opening 104, such casing having chambers 109 and 111 communicating with connection 102 and chambers 112 and 113 communicating with connection 102, a check-valve 116 governing port 115 between chambers 111 and 113, a vent-valve 107 governing a port between the piston-chambers and chamber 109, a piston in the piston-chamber for actuating the vent-valve and exposed to pressure only when the reservoir-pressure reaches or exceeds maximum, said piston-chamber having an admission-port 127 and an abutment-actuated needle-valve 125 governing such port 127 for admitting excess reservoir-air to operate the piston and vent-valve and automatic means for exhausting that air admitted by the needle-valve against said abutment.

11. The combination of a casing having a passage extending through the casing and communicating between the compressor and a reservoir, a check-valve within such casing for governing such passage, a fluid-pressure-actuated vent-valve device within the same casing and comprising a piston 105 movable

in a chamber in such casing and provided
with a leaking-groove 130 to keep both faces
of such piston exposed to atmospheric pres-
sure, a valve-stem 106, a vent-valve 107 on
5 such stem and governing a port between the
piston-chamber and said passage, such cham-
ber having an opening to atmosphere on one
side of the piston and also a supply-port on
the other side, and a governor proper com-
prising a movable abutment in intermediate
10 juxtaposition to said casing and exposed on
one side to reservoir-pressure, and a needle-
valve connected thereto and governing said
supply-port.
15 12. The combination, with a compressor and
its delivery-pipe having a vent to atmosphere,
of a vent-valve normally closing such vent, a
movable abutment actuating such valve and
normally exposed on both sides to atmos-
20 pheric pressure, means for admitting pres-
sure against one side of such abutment when
the pressure in the delivery-pipe reaches or
exceeds a predetermined degree and means
for permitting such admitted pressure to leak
25 to the other side of the abutment and escape
to atmosphere.

13. The combination, with a compressor and
its delivery-pipe having a vent to atmosphere,
of a vent-valve normally closing such vent, a
movable abutment for actuating such valve 30
and exposed on one side to atmospheric pres-
sure at all times and having provision for the
slow leakage of pressure admitted to the other
side so that both sides are normally exposed
to atmospheric pressure and means for ad- 35
mitting pressure against such abutment when
a maximum degree of pressure has been de-
veloped by the compressor.

14. The combination, with a compressor and
its delivery-pipe having a vent to atmosphere, 40
of a vent-valve normally closing such vent, a
piston actuating such valve and permitting a
slow leak of pressure admitted to it, such pis-
ton being thereby normally exposed on both
sides to atmospheric pressure and valve mech- 45
anism admitting pressure to the piston to
open the valve when the compressor has de-
veloped a predetermined degree of pressure.

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Witnesses:

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