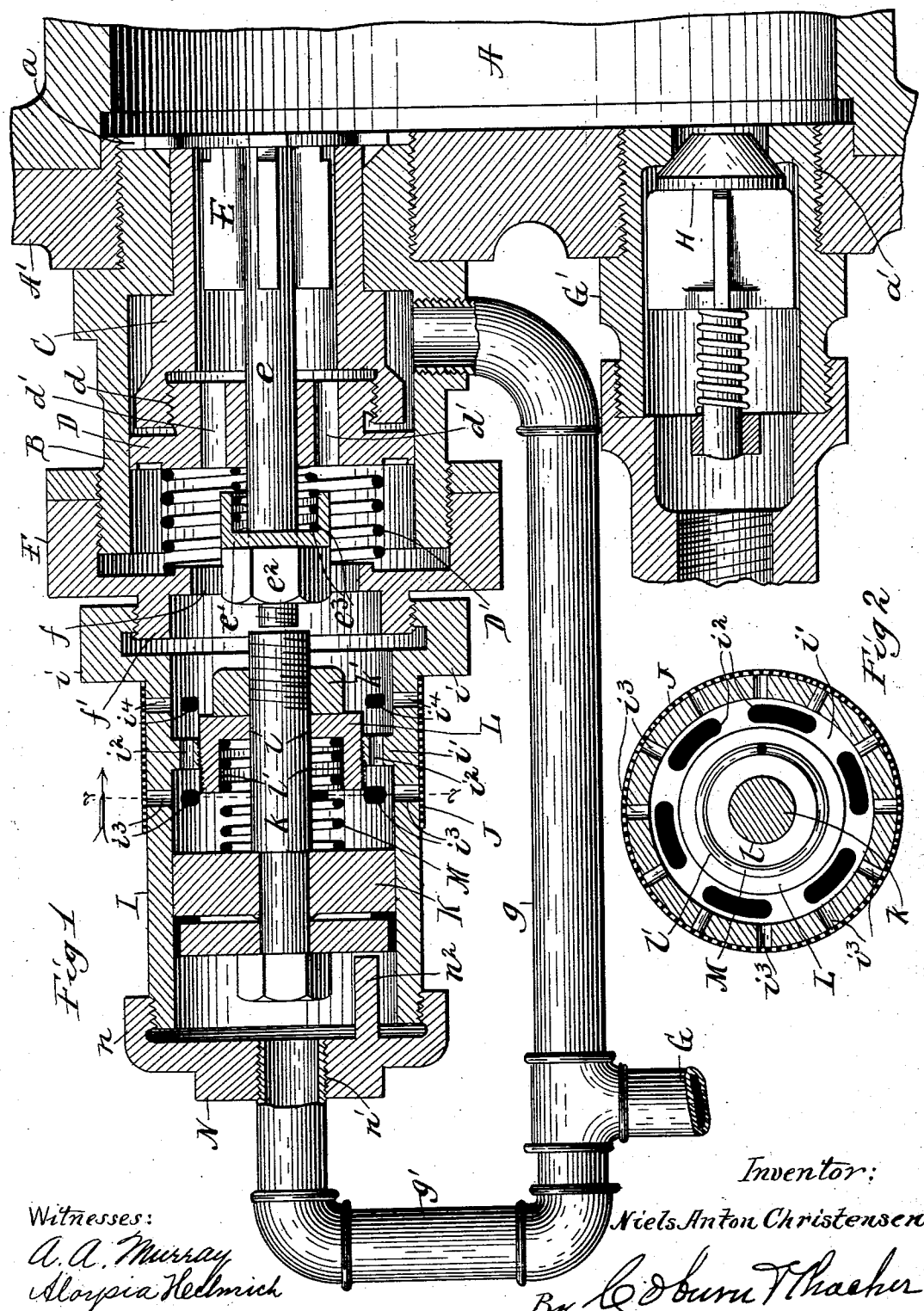
(No Model.)

N. A. CHRISTENSEN.

AIR PUMP VALVE.

No. 572,192. Patented Dec. 1, 1896.



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AIR-PUMP VALVE.

SPECIFICATION forming part of Letters Patent No. 572,192, dated December 1, 1896.

Application filed October 17, 1895. Serial No. 565,927. (No model.)

To all whom it may concern:

Be it known that I, NIELS ANTON CHRISTENSEN, a subject of the King of Denmark, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Pump-Valves for Air-Brakes, which are fully set forth in the following specification, reference being had to the accompanying drawings, in which—

Figure 1 represents a section of a valve embodying my invention, with a portion of the cylinder to which it is attached and the connecting-pipes in elevation; and Fig. 2, a cross-section taken on the line 2 2 of Fig. 1.

My invention relates to means for regulating the pressure in the air-reservoir, so that it cannot be carried beyond a certain degree.

The invention consists of a device actuated by pressure from the said air-reservoir when it reaches a certain point, whereby the suction-valve of the pump is unseated and the pump rendered inoperative to force air to the reservoir. This general result I have heretofore obtained by means described and shown in my prior application, Serial No. 467,158, filed March 22, 1893, and my present invention may be considered an improvement upon the said prior construction. In the prior invention the result mentioned above is effected by providing a movable seat for the suction-valve, which is drawn from the valve by devices actuated by air-pressure from the reservoir when the pressure force in the latter reaches a certain predetermined degree. In my present invention I effect this result by combining with this construction, in which a movable seat is drawn away from the valve, an additional construction by which the valve is by the same air-pressure from the reservoir moved away from its seat. These two devices coöperate with each other, the one moving the seat from the valve, the other moving the valve from the seat, resulting in an increared sensitiveness and quickness of action as compared with either one of the said devices taken alone.

In the drawings I have shown a construction embodying the two devices aforesaid and coöperating as suggested, and I will now describe in detail the construction and operation of this mechanism, and will then set forth more definitely in claims the particular improvements which I believe to be new and wish to secure by Letters Patent.

The main parts of the brake apparatus I have not shown, as generally speaking they are well known and may be of the type shown in my said prior application, or any other construction in which an air-pump, air-reservoir, and brake-cylinder suitably connected are employed as the main devices.

In the drawings, A represents the air-pump cylinder, only a small section being shown at the suction end thereof, and A′ the cylinder-head or back cap secured thereto, as usual, and provided with apertures $a\,a'$, the former for the suction-valve case B and the latter for the discharge-valve case. In the valve-case B there is mounted a movable bushing C, which is adapted to be moved lengthwise within the casing and forms the seat for the valve. A disk or piston D is fitted to the rear portion of the valve-case, which is in the shape of an enlarged circular chamber and is connected to the bushing by means of a threaded hub d. Apertures d' lead through this piston, connecting the rear portion of the valve-case with the interior of the bushing, thus providing air-passages through to the pump-cylinder. The suction-valve E is seated on the bushing, as described in my said prior application, and is provided with a stem e, which passes back through a central aperture in the piston D, and at its rear or outer end has a cup e' mounted thereon, which is held in place by a nut e^2, a weak spiral spring e^3 being arranged around the valve-stem between the piston D and the cup within which it is seated. The cap F at the outer end of the valve-case is applied thereto by threaded connection, and is provided with a large central opening f for the admission of air and an annular flange f', extending outward therefrom and threaded externally. A pipe G connects with the air-reservoir, only a short section of said pipe being shown, and a branch g thereof connects with the valve-case and leads into the latter, opening into an annular chamber around the rear portion of the bushing between the front portion of the valve-case and the piston D, which chamber is formed by an

enlargement of the main chamber of the valve-case in rear of the seat for the bushing. A spring D′ is arranged in the rear portion of the valve-case between the cap F and the piston D, which operates normally to hold the valve-seat up in working position. This spring is regulated to resist a certain force which is fixed at the pressure force desired in the air-reservoir, say thirty pounds, or any other working pressure that may be required. A valve-case G′ is set in the aperture a', within which is seated a discharge-valve H, and this case is connected by suitable pipe with the air-reservoir, so that by the normal action of the pump air is forced into and compressed in the latter; but as there is open communication between the air-reservoir and the annular space or chamber in front of the piston D there will always be an air-pressure in said annular space corresponding to that in the reservoir. Hence whenever the latter passes beyond the resisting force of the spring D′ it will force the piston D outward against the spring, thereby withdrawing the bushing from the valve, so that the latter is no longer seated, and the action of the pump will simply draw air into the cylinder and then drive it out past the unseated valve, thus keeping the pressure in the air-reservoir regular.

Thus far the mechanism and operation described and shown are substantially the same as set forth in my prior application, and therefore I have described it only in a general way, not entering into all the details of construction, which are fully set forth in the said application.

I will now describe the improvement to which my present invention especially relates, and which is designed to move the valve itself away from its seat, so that it cannot close, as in normal position, thereby effecting the same result described above. For this purpose I provide a cylindrical case I, which, as shown in the drawings, has a ring flange i, threaded suitably to be turned upon the threaded flange on the back cap F, thereby connecting the case I with the valve-case B. This end of the case I, I call the "front end," and a little distance within the case at this end thereof there is an internally-projecting flange or ring i', provided with a series of elongated apertures i^2 passing through it. In the exterior casing I there is also a series of apertures i^3, opening in front of the said perforated flange, and a similar series i^4 in rear of the latter, both of which extend around the casing and provide communication between the interior thereof and the outer atmosphere. These perforations provide for the admission of air to supply the pump, the air passing into the cylindrical casing I and thence directly into the valve-casing B, whence it finds its way to the pump-cylinder, as already described. To prevent the entrance of dirt, a perforated plate or other suitable screen J is placed upon the exterior of the casing I and incloses the perforated portion thereof. A piston K is fitted to this cylindrical case I, being arranged in the outer chamber thereof, or that portion outside or in rear of the ring flange. This piston is fixed to a stem k, which is extended forward and passes through a bearing L, the latter being a cup-shaped ring fitted to and threaded in the central opening within the flange i'. The piston-stem passes loosely through a central opening l in the back of the cup, and the cup l' of this bearing receives one end of a spring-coil M, which surrounds the stem of the piston and at its other end rests against the latter, the tension of the spring being regulated by a nut k', turned on the end of the piston-stem against the back of the bearing. These devices are arranged so that in normal position the extremity of the piston-stem will almost touch the extremity of the suction-valve stem, a very thin space being left between the two, as seen in Fig. 1. Obviously, then, a movement inward of the piston K will almost immediately bring its stem into contact with the stem of the suction-valve and drive the latter forward, thereby forcing the suction-valve from its seat and holding it away therefrom until the piston recedes. To effect this movement of the piston, the air-pipe G, leading from the air-reservoir, is provided with a second branch g', which leads to the back cap N of the piston-cylinder I. This cap is provided with a ring flange n, threaded to adapt it to be turned upon the outer end of the cylinder, and is also provided with a central opening n' for the reception of the pipe g'. On the inside of the cap there is a short arm n^2, extending forward into the cylinder and serving as a stop to limit the outward movement of the piston. Now it is obvious that this pipe connection provides for the direct admission of compressed air from the air-reservoir into the outer portion of the cylindrical case I, back of the piston K. The resistance-spring M is adjusted, as already explained, to counterbalance the normal pressure determined for the air-reservoir, so that under normal conditions the piston K will remain stationary; but if the pressure in the air-reservoir is increased the resistance-spring will of course be overcome. The piston K will then be driven forward. Its stem will almost immediately be brought up against the stem of the suction-valve, and the two will then be driven forward together, thereby forcing the suction-valve from its seat and retaining it in this position so long as excess pressure exists in the air-reservoir. During this time the action of the pump will simply draw air from the atmosphere into the pump-cylinder and force it out again through the same passage around the displaced suction-valve; but as soon as the pressure drops the piston K is moved back under the influence of the resistance-spring until finally it reaches normal position, when normal pressure is obtained. The pressure in the air-reservoir is therefore

regulated and maintained at a uniform point by this action.

As shown in the drawings, this device is arranged to act in conjunction with the piston connected to the valve-seat, whereby the latter is withdrawn from the valve, as already explained. In this arrangement shown the two devices coöperate, therefore, one pulling the seat away from the valve and the other pushing the valve away from the seat. This action is possible because the piston connected to the valve-case is free to slide on the valve-stem, and the spring-coil e^3 around said stem back of the piston is light and weak, not being sufficient to prevent the movement of the bushing in one direction and the valve-stem in the opposite direction under the influences mentioned; but it is not necessary that these two devices should be combined as described and shown. The device for forcing the suction-valve from its seat, as explaind above, may be used without the device for moving the seat away from the valve under extra pressure from the air-reservoir and is sufficient for this purpose used alone. I do not wish to be understood, therefore, as limiting my invention to the employment of the device for moving the suction-valve in connection with the device for moving the seat of the said valve, for I contemplate the application of the former without the latter and wish to be understood as including such construction within my invention.

I have already in my said prior application described and shown the sole application of the device for moving the valve-seat away from the valve, as herein shown and described, and this device alone is also effective for the purpose. I therefore wish to be understood as contemplating the employment of either of these devices singly or in conjunction, as shown in the drawings. When used together, as here shown and described, the operation is a little quicker and more sensitive than when one is used singly.

Having thus described my invention, what I claim to be new, and wish to secure by Letters Patent, is—

1. In air-brakes for cars, an air-pump cylinder, in combination with a suction-valve, movable seat for said valve, an air-reservoir connected with said pump-cylinder, mechanism for moving said valve-seat away from the valve, and mechanism for forcing the valve away from its seat positively, both mechanisms adapted to be operated when the pressure in the air-reservoir exceeds a certain limit, substantially as described.

2. In air-brakes for cars, a pump-cylinder, A, in combination with suction-valve case, B, connected therewith, movable bushing, C, mounted in said case, suction-valve, E, seated on said bushing and provided with stem, *e*, piston, D, fitted in a piston-chamber within said case and connected to the bushing, cylinder, I, connected to said valve-case, piston, K, mounted in said cylinder, I, and provided with stem, *k*, arranged to contact with the valve-stem, air-reservoir connected with the pump-cylinder, and pipe, G, leading from said reservoir and provided with branches, *g*, *g'*, connecting respectively with the valve-case and supplementary cylinder, substantially as described.

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