(No Model.)

H. C. JOHNSON.

HYDRAULIC ELEVATOR APPARATUS.

No. 564,620. Patented July 28, 1896.

Fig. 1.

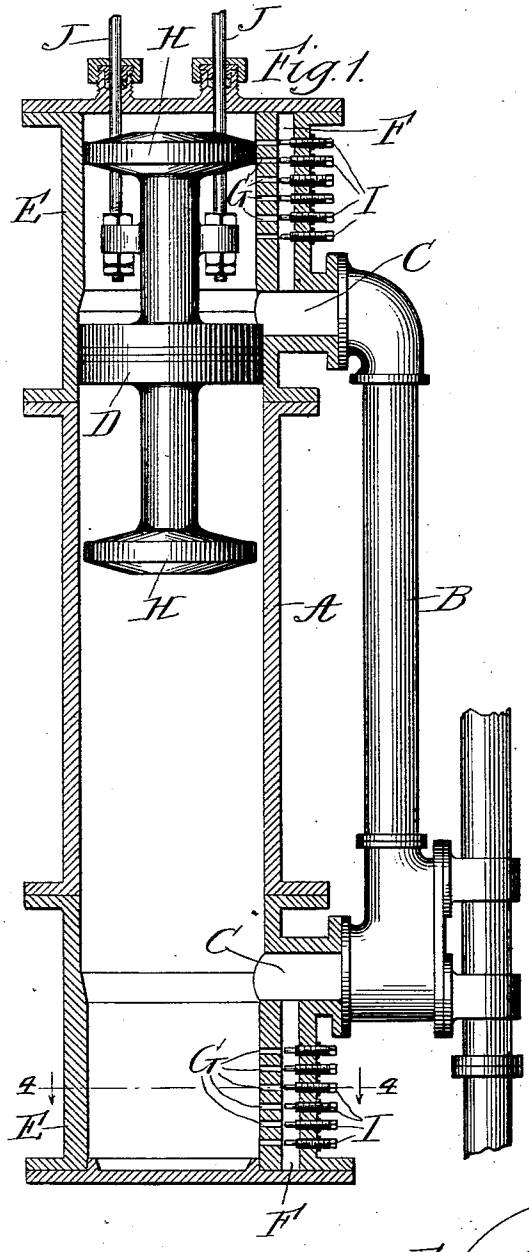


Fig. 2.

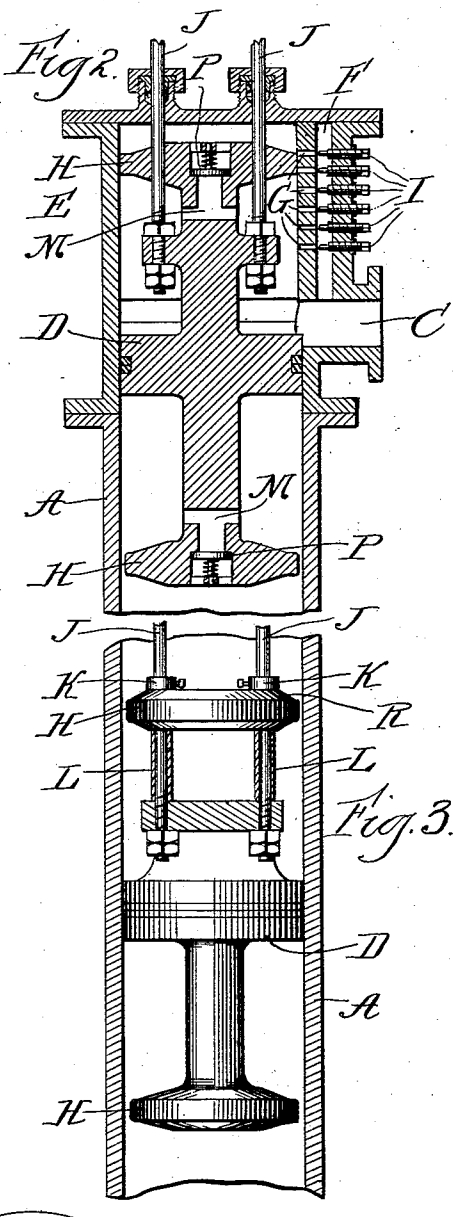
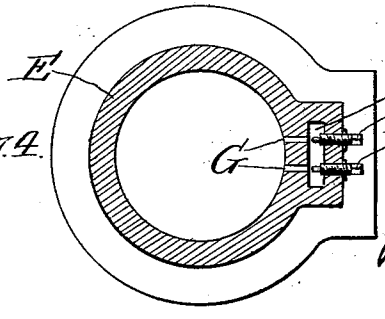


Fig. 3.

Fig. 4.



Witnesses
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UNITED STATES PATENT OFFICE.

HENRY C. JOHNSON, OF CHICAGO, ILLINOIS.

HYDRAULIC-ELEVATOR APPARATUS.

SPECIFICATION forming part of Letters Patent No. 564,620, dated July 28, 1896.

Application filed January 2, 1895. Serial No. 533,663. (No model.)

To all whom it may concern:

Be it known that I, HENRY C. JOHNSON, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented new and useful Improvements in Hydraulic-Elevator Apparatus, of which the following is a specification.

This invention relates to hydraulic-elevator apparatus, and is designed as an improvement upon the construction set forth in Patent No. 523,242, dated July 17, 1894, to H. R. Smith, and also the application of H. R. Smith for automatic stop for elevators, Serial No. 524,270, filed September 24, 1894.

The object of the invention is to provide a novel and useful construction and arrangement for first retarding and finally cushioning the main operating-piston at each limit of its stroke.

The invention consists, substantially, in the details of construction, combinations, location, and relative arrangement of parts, as will be more fully hereinafter described, as shown in the accompanying drawings, and finally set forth in the appended claims.

Reference is had to the accompanying drawings, and to the several views and reference signs appearing thereon, and wherein—

Figure 1 is a view, partly in side elevation and partly in central longitudinal section, of an apparatus embodying my invention. Fig. 2 is a detail view in central longitudinal section, showing a slightly-modified form of construction, one of the auxiliary pistons being shown of the same size as the main piston and the other of smaller size than the main piston. Fig. 3 is a detail view, parts in longitudinal section and parts in side elevation, illustrating the manner of mounting the cushioning-piston. Fig. 4 is a transverse sectional view through the cushioning-cylinder, showing a slightly-modified form of the invention.

The same reference sign is used to designate the same part wherever it occurs throughout the several views.

In the drawings, reference sign A designates the main cylinder; B, the circulating-pipe; C, the ports, and D the main piston.

Mounted upon the head of main cylinder A, or, as in the case of said application before mentioned, cast solidly therewith and forming part thereof, is an auxiliary cylinder-chamber E. This auxiliary chamber may be of the same internal diameter as main cylinder A, as shown in Fig. 2, or, and preferably, the diameter of this auxiliary chamber may be smaller than the diameter of the main cylinder A, as shown in Fig. 1, for a purpose presently to be described. Adjacent to said auxiliary chamber is a passage-way F, communicating with the source of fluid supply for operating the main piston D, and also communicating through a series of openings G with the interior of said auxiliary chamber. On opposite sides of the main piston D, I provide the auxiliary piston H, adapted when the main piston approaches the limit of its travel to enter the auxiliary chambers E. In the construction shown in Fig. 1, and preferably, the auxiliary pistons H are of a diameter to fit snugly in the auxiliary chambers E, and hence are of a slightly smaller external diameter than the main piston D, for a purpose which will presently appear.

By the construction above described it will be understood that when the main piston D approaches the limit of its travel the auxiliary piston H will enter the chamber E, and hence by cutting off or preventing the exhaust of the fluid contained in said chamber through the port C said fluid is forced to pass through the series of openings G, and as the openings G are successively closed by the auxiliary piston proceeding to the end of the auxiliary cylinder it will be seen that the main piston is first retarded and finally cushioned. In practice I locate the auxiliary chamber E beyond the opening of the port C to the main cylinder A.

By suitably regulating the area of the openings G the resistance to the exhaust of the fluid through said openings may be adjusted, and hence the resistance opposing or retarding the movement of auxiliary piston H in the chamber E may be controlled. In order to provide a simple and convenient arrangement for regulating the area of the openings G, I tap a series of screw-threaded plugs I through the side of the casting forming the passage F, having their inner ends arranged adjacent to the series of openings G, and by suitably adjusting the plugs I the area of said openings G from the auxiliary chamber into the pas-

sage F may be suitably regulated and adjusted. It will be also seen by the construction described, the area of opening of each aperture G may be independently adjusted. If desired, the passage F may be enlarged and a double series of openings G and plugs I may be employed, as shown, for instance, in Fig. 4.

In order to provide a simple construction whereby the distance between the main piston D and the auxiliary piston H may be adjusted and regulated, in order to limit, vary, or alter the length of stroke of the main piston, I may, if desired, detachably secure the piston-rods J in any suitable manner to the main piston and removably mount the auxiliary pistons H thereon, securing said auxiliary pistons between the collars K (see Fig. 3) or any other suitable device, and interpose removable sleeves L between said auxiliary piston and main piston in any suitable manner. By removing said sleeves L and inserting others of a different length the distance between the pistons D and pistons H may be simply and effectually regulated.

In order to prevent the auxiliary piston from forming a vacuum in the space between said piston and the head of the auxiliary chamber or cylinder at the beginning of stroke of the main piston, which vacuum would resist the ready and easy withdrawal of said piston from its chamber, and hence, in order to facilitate the rapid starting of the main piston, I may provide at any suitable location a suitable passage M, (see Fig. 2,) and any suitably-arranged valve device P, adapted to be seated when said piston is moving in a direction to enter its cushion-chamber E, but to be unseated when the fluid is admitted to the main cylinder to start said piston in the opposite direction, as shown.

In the practical operation of a hydraulic-elevator apparatus of the class herein described, when the main operating-piston approaches the limit of its stroke, that is, when the elevator-car approaches the limit of its travel, the control-valve is operated to cut off the supply of operating fluid from the main cylinder. The effect of this is to at once decrease the speed of travel of the piston and of the car, because the impelling force of said piston is removed. If it were possible to provide a sufficient space, the movement of the piston would be arrested in course of time by this cutting off of the operating fluid. It is important, however, to effect this stoppage rapidly and in a manner to avoid injury of the piston by coming in contact with the head of the cylinder, and also to stop the movement of the main piston before it passes the inlet port at the head of the cylinder, toward which it is traveling.

In the construction above described it will be observed that the auxiliary pistons H enter the auxiliary chamber E at a decreasing rate of travel, and also that from the construction described the passage of the auxiliary piston into its chamber is opposed by a controllable resistance, thus effecting what is accomplished in the patent and application before mentioned by a constantly-increasing resistance, since the area of the openings G may be so regulated independently of each other as to readily control the rapidity of the exhaust from the auxiliary cylinder, and hence secure controllable resistance between the head of the cylinder or auxiliary chamber and the auxiliary piston H, and this I consider a most important feature of my invention. The amount of adjustment of plugs I, in order to secure this result under any given or desired condition, may be readily and easily ascertained by any one skilled in the art to which this invention relates.

Many variations and alterations in the details of construction may be made without departing from the spirit or scope of my invention. I do not desire, therefore, to be restricted to the specific details shown and described.

By constructing the auxiliary piston H of smaller external diameter than that of the main piston I provide a construction wherein the operating fluid can readily pass to the main piston D and wherein the main work of operating the car will be performed by said piston. The operation of my invention is as follows: When the main piston approaches the limit of its travel, the auxiliary piston H passes the port C and enters chamber E, it being understood that said chamber E is filled with fluid by reason of it being in free communication with the source of fluid supply through port C. After said auxiliary piston enters chamber E the body of fluid contained therein is cut off from exhaust through port C, except through passages G, and hence the passage of said auxiliary piston into said chamber is immediately opposed by the resistance due to the reduced rapidity of exhaust offered to the passage of the fluid contained in the said chamber through the small openings G into said passage F and to port C and circulating-pipe B. By suitably regulating the area of openings G the rapidity of discharge of the fluid therethrough may be so regulated that the resistance to the passage of said auxiliary piston retards its travel and finally cushions said piston, and hence stops the car without imparting jar thereto.

I may, if desired, bevel the face of the auxiliary pistons H, as shown at R, Fig. 3, in order to facilitate the easy insertion of the same into the auxiliary cylinder E.

Having now fully ascertained the nature and object of my invention and a form of apparatus embodying the same, and having explained the function, mode of operation, and principle of the same, what I claim as new, and desire to secure by Letters Patent of the United States, is—

1. In an elevator apparatus, and in combination with a main operating-cylinder pro-

vided with the usual supply and exhaust ports, an auxiliary cylinder having a series of openings therein communicating with a port of the main cylinder, and means for regulating the area of said openings; as and for the purpose set forth.

2. In an elevator apparatus and in combination with a main operating-cylinder provided with the usual supply and exhaust ports, an auxiliary cylinder in free communication with a port-opening of said main cylinder, and means for regulating the area of opening of said communication; as and for the purpose set forth.

3. In an elevator apparatus, and in combination with a main operating-cylinder, provided with the usual supply and exhaust ports, an auxiliary cylinder arranged adjacent to the end of said main cylinder and beyond the supply and exhaust port thereof, and communicating with said port through a series of openings, and means for adjusting the area of said openings; as and for the purpose set forth.

4. In an elevator apparatus a main cylinder and piston, said cylinder provided with the usual supply and exhaust ports an auxiliary cylinder arranged adjacent to the head of said main cylinder and beyond said supply and exhaust port, and communicating with the supply or exhaust port of the main cylinder through a series of openings, and an auxiliary piston carried by said main piston, and adapted to enter said auxiliary cylinder and to cut off said cylinder from said port except through said series of openings, and means for regulating the area of said openings; as and for the purpose set forth.

5. In an elevator apparatus, a main cylinder and piston, said main cylinder provided with the usual supply and exhaust ports, an auxiliary piston carried by said main piston, an auxiliary cylinder arranged adjacent to the head of said main cylinder, and beyond the supply and exhaust port thereof, a passage-way adjacent to said auxiliary cylinder communicating with the source of fluid supply to said main cylinder, a series of passages or openings communicating from said auxiliary cylinder to said passage-way, and means for regulating the area of opening of said passages or openings; as and for the purpose set forth.

6. In an elevator apparatus a main cylinder and piston, said main cylinder provided with the usual supply and exhaust ports, an auxiliary piston carried by said main piston, an auxiliary cylinder adapted to receive said auxiliary piston, arranged adjacent to the end of said main cylinder and beyond the port thereof, a chamber arranged adjacent to said auxiliary cylinder and in free communication with the supply and exhaust port of said main cylinder, a series of openings from said auxiliary cylinder to said chamber and means for adjusting the area of said openings; as and for the purposes set forth.

7. In an elevator apparatus, a main cylinder and piston, said main piston provided with the usual supply and exhaust ports, an auxiliary piston carried by said main piston, an auxiliary cylinder adapted to receive said auxiliary piston, and arranged adjacent to the end of said main cylinder and beyond the supply and exhaust port thereof, a passage-way formed adjacent to said auxiliary cylinder and freely communicating with the main cylinder-port, a series of openings between said auxiliary cylinder and said passage-way, and means for adjusting the area of said openings, comprising a series of adjustable screw-plugs, as and for the purpose set forth.

8. In an elevator apparatus, a main cylinder and piston, piston-rods connected to said main piston, removable sleeves carried by said piston-rods, and an auxiliary piston also mounted on said piston-rods, and means for removably clamping said auxiliary pistons upon said sleeves, as and for the purpose set forth.

9. In an elevator apparatus a main cylinder and piston, an auxiliary piston carried by said main piston, an auxiliary cylinder arranged to receive said auxiliary piston, whereby the movement of said main piston is arrested, a passage formed in said auxiliary piston, a check-valve arranged therein and adapted to be seated when said auxiliary piston is moved in a direction to enter said auxiliary cylinder, and to be unseated when said piston is moved in the opposite direction, whereby the initial movement of said main piston is not opposed by said auxiliary piston; as and for the purpose set forth.

In witness whereof I have hereunto set my hand this 22d day of December, 1894.

HENRY C. JOHNSON.

In presence of—
M. I. CAVANAGH,
S. E. DARBY.