(No Model.)

P. SYNNESTVEDT.

TRIPLE VALVE MECHANISM.

No. 504,139. Patented Aug. 29, 1893.

Fig 1.

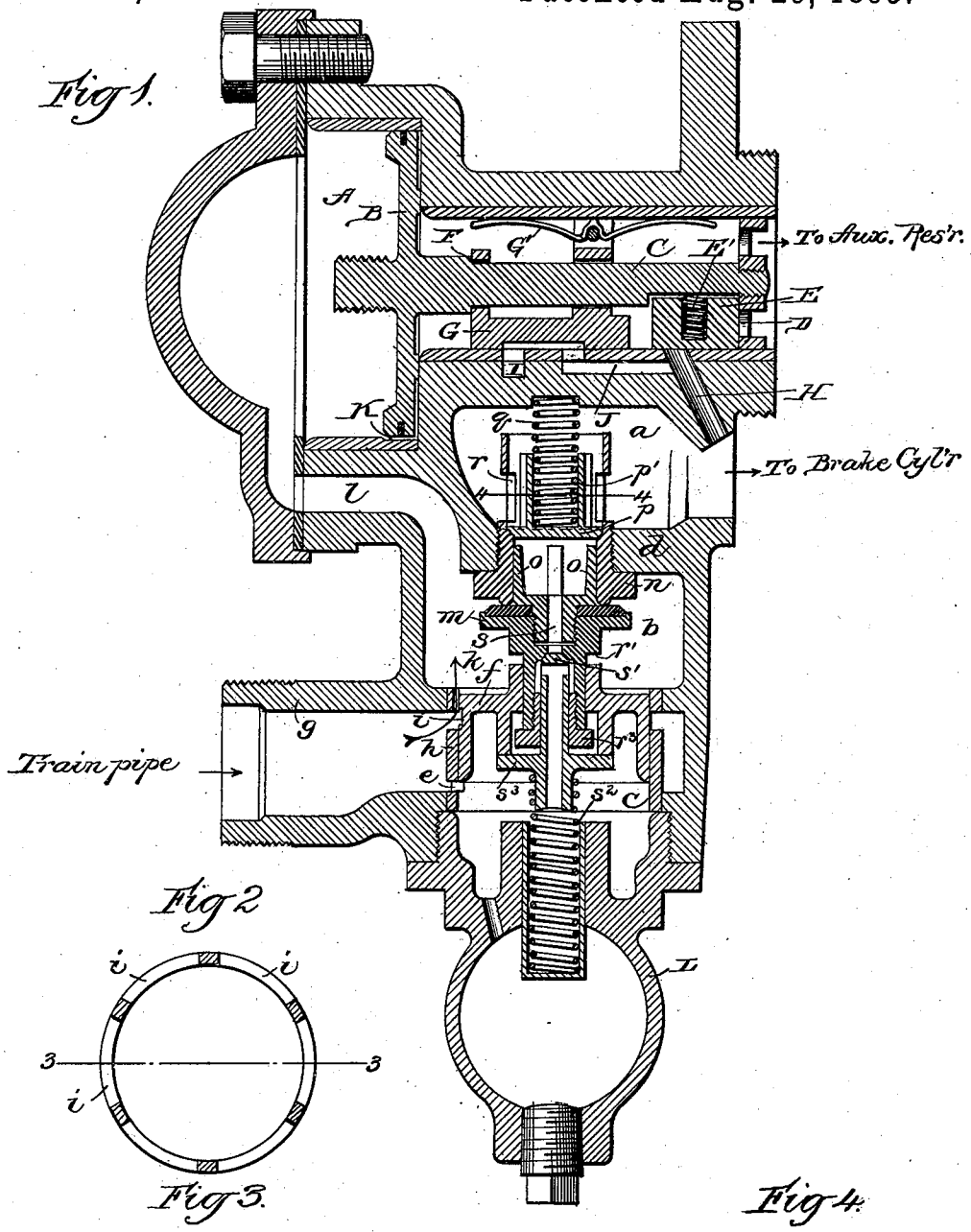


Fig 2

Fig 3.

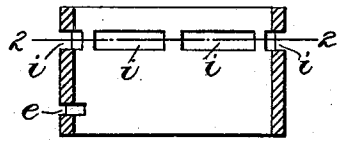
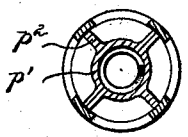


Fig 4.



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UNITED STATES PATENT OFFICE.

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TRIPLE-VALVE MECHANISM.

SPECIFICATION forming part of Letters Patent No. 504,139, dated August 29, 1893.

Application filed January 24, 1893. Serial No. 459,568. (No model.)

To all whom it may concern:

Be it known that I, PAUL SYNNESTVEDT, a citizen of the United States, residing in the city of Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Triple-Valve Mechanism, of which the following is a specification, reference being had to the accompanying drawings.

This invention relates to improvements in triple-valve mechanisms, but more especially relates to the emergency-valve ordinarily employed in connection with the triple-valve for permitting the direct application of the train-pipe pressure to the brake-cylinder without the necessity for the air traversing the usual passages through the triple-valve.

My invention has for its prime object to dispense with a number of parts heretofore found necessary, more especially the check or puppet-valves guarding the passages, and thereby materially simplifying the construction and operation of the valve as a whole and at the same time securing positive and certain action of the valve under all conditions.

Another object is to have the piston of the emergency-valve located in the passage connecting the train-pipe with the main piston cavity and controlling ports in said passage in such manner as to be influenced and operated by the changes of pressure in the train-pipe to the end that whenever a sudden or excessive reduction of the pressure in the train-pipe occurs the piston will instantly open the emergency-valve covering a port connecting the passage in which the piston is located, and consequently the train-pipe, directly with the brake-cylinder, while under all ordinary and gradual reductions of the pressure in the train-pipe the emergency valve piston will remain unaffected thereby.

A further object of my invention is to have the emergency valve, the piston and the check-valve therefor of novel construction and so arranged as to not only insure the perfect working thereof, but also to afford a ready means of access to any of the operating parts thereof for the purpose of repair or inspection with a minimum loss of time and labor.

These and other objects hereinafter set forth are accomplished by the devices illustrated in the accompanying drawings, in which—

Figure 1 represents a central vertical section through a triple-valve embodying my invention, with the parts in "release" position; Fig. 2, a detailed horizontal section of the bushing of the emergency-valve piston chamber; Fig. 3, a vertical section thereof on the line 3, 3, of Fig. 2; and Fig. 4, a detailed section on the line 4, 4, of Fig. 1.

Similar letters of reference indicate the same parts in the several figures of the drawings.

My valve in its general mode of operation is identical with the valve described and claimed in the application of James T. Hayden, filed April 9, 1892, Serial No. 428,551, being particularly designed as an improvement thereon whereby the construction of the valve is rendered more simple, the employment of a check-valve in the passage connecting the train-pipe with the main piston chamber is dispensed with and the cost of construction of the valve is greatly reduced, while the valve as a whole is rendered more prompt and certain in its operation.

Referring by letter to the accompanying drawings: A indicates the main piston cavity in the upper part of the triple-valve casing, and B, the main piston working therein provided with a piston-rod C upon the opposite end of which is secured a spider or star-shaped nut D, the office of which is to guide the piston-rod in its movements and serve as a means for confining the slide-valve E in position between the under side of the piston-rod, which is recessed for its reception, and the lower wall of the valve-chamber.

Between the valve E and a shoulder F near the forward end of the piston-rod, is located the main slide-valve G having a loose connection with the piston-rod so that it may have lost motion upon the initial movement of the piston in either direction, this valve, as well as the valve E, being held to its seat by a spring-tension obtained in any suitable manner, such as the coiled spring E′ socketed in the valve E and bearing against the under side of the piston-rod, and the flat spring G′ confined between the upper wall of the valve-chamber

and the pin or projection on the valve G. The valve-chamber has open communication with the auxiliary reservoir as usual, while the casing has the port H connecting the valve-chamber with the brake-cylinder, the exhaust port I leading to the outer atmosphere and the passage J connecting the ports H and I when the slide-valve is in its normal position. The port H is controlled by the small valve E while the port and passage I—J are controlled by the main slide-valve. The usual leak passage K is provided to permit the air to pass the main piston B when the latter is seated so as to supply the auxiliary reservoir with train-pipe pressure. The air pressure being equal on each side of the main piston, when the pressure in the train-pipe is reduced by the usual manipulation of the engineer's valve, the main piston will be caused to move forward, carrying with it first the valve E and then the main valve G until the passage J and exhaust port I are closed and the port H almost immediately thereafter opened, permitting the air to escape from the auxiliary reservoir to the brake-cylinder so as to apply the brakes. Upon a restoration of the pressure in the train-pipe, the main piston will be caused to move backward to its original position first closing the port H with the valve E and afterward opening up communication between the passage J and the exhaust port I through the main valve G, thus exhausting the brake-cylinder through ports H, I, and passage J, and releasing the brakes. This is the usual operation of graduation valve mechanism and so far as relates to my present invention this operation may be accomplished by any desired mechanism, that herein shown and described being included merely for the purpose of illustration and a better understanding of my invention.

Below the graduation-valve mechanism just described are three chambers *a*, *b* and *c*, which I will designate respectively the brake-cylinder chamber, the emergency-valve chamber and the emergency-piston chamber, the two former being separated by a diaphragm *d* having a port therein, while the emergency-valve piston forms the principal division between the chambers *b* and *c*, the latter of which has open communication, through a port *e* when the emergency-valve piston *f* is in its normal position, with the train-pipe which is attached to a threaded boss *g* in the usual manner. The emergency-valve piston *f* works in a bushing *h* having the ports *i* and *e* therein near the upper and lower ends thereof respectively, while at one side the bushing is provided with an additional port *k* leading from the port *i* past the piston into the emergency-valve chamber *b*, the latter being connected by a passage *l* with the main piston-cavity. It will thus be seen that the air from the train-pipe will not pass continuously through the port *k* up to the graduating-valve mechanism only, which it is primarily intended to operate, but also through the port *e* into the emergency-piston chamber *c* so as to balance the pressure upon the upper side of the said piston.

The emergency-valve *m* is indirectly seated on the diaphragm *d*, normally closing the port therein, through the intermediary of a cage *n* screwed into said diaphragm and having a generally cylindrical form, being open at both ends. Into the lower end project the wings or arms *o* of the valve *m*, which serve as a guide therefor, while in the opposite end thereof works a puppet or check-valve *p* confined upon its seat near the center of the bushing by a coiled spring *q* bearing against the upper wall of the chamber *a*. The check-valve *p* has a hollow stem *p'* into which the spring *q* fits, and is also provided with radial arms or wings p^2 which serve to guide and center the valve within the cage, as more clearly shown in Fig. 4 the latter being provided with openings *r* in the side walls thereof, affording a more ready means of escape for the air from the cage.

The emergency-valve has a loose connection with the emergency-piston *f*, that is to say, a connection permitting lost motion between the valve and piston, which connection may be secured in any suitable manner, such as by sleeving the piston upon the stem of the valve and confining such sleeved portion between a shoulder *r'* on the valve-stem and a headed bushing r^2 screwed into the end of the valve-stem. The emergency-valve is also provided with a central port *s* normally closed by a hollow stem-valve *s'* working through the bushing r^2 in the hollow stem of the valve *m* and held to its seat by a coiled spring s^2 confined between a flange or shoulder s^3 on the stem-valve and the bottom of a socket in the piston-chamber *c* provided for its reception. As the shoulder s^3 has a bearing against the piston *f*, and through the stem-valve *s'*, against its seat in the valve *m*, the coiled spring s^2 subserves the three-fold function of assisting the air to retain the valves *s'* and *m* upon their seats and the piston *f* in its normal elevated position.

The operation of this emergency-valve mechanism is as follows: Upon a sudden or excessive reduction of the pressure in the train-pipe, the air in the piston cavity *c* will be exhausted much more quickly than the air from the emergency-valve chamber *b* and the main piston-chamber A connected therewith because of the difference in the sizes of their respective ports *e* and *k* and, consequently, the emergency-piston *f* will be instantly depressed against the tension of the spring s^2 first closing the port *e* leading into the piston-chamber, and then immediately after, jerking the emergency-valve off of its seat and simultaneously therewith opening up the ports *i*, thus affording open and direct passage for the air from the train-pipe through the emergency-valve chamber and the brake-cylinder chamber to the brake-cylinder, the air in its passage lifting the check-valve *p* off

of its seat. It will be observed, however, that incidental to the operation just described, the first action of the piston, during the closing of the port *e*, is to unseat the stem-valve *s'*, thereby permitting the complete exhaustion of the chamber *c* through the hollow stem of the said valve and the central port of the emergency-valve, and the emergency valve will be forced down to its lowermost position the instant it is unseated, (so as to close the port *s* by reseating on the valve *s'*) by the air pressure on the upper side thereof. The emergency-piston *f*, however, does not have an air-tight fit in the bushing of its cavity but has simply a sliding fit so that the air gradually works past said piston from the chamber *b* into the chamber *c* and thus restores the piston to a state of equilibrium as to the air pressure on its opposite faces, so that the instant the pressure in the train-pipe is equalized with the pressure in the brake-cylinder the coiled spring s^2 will lift the piston and thus restore all of the parts to their original positions as shown in the drawings. The action of such a device is direct, positive and certain under all conditions, for the tension of the coiled spring s^2, which under ordinary conditions works in conjunction with the air pressure from the train-pipe, can be so nicely adjusted that the emergency-piston will be kept at all times under such a perfect counterbalance that the emergency-valve will not be opened by ordinary reductions of the pressure in the train-pipe and yet will act promptly and efficiently upon a sudden or excessive reduction thereof.

The construction and arrangement of the emergency-valve and its co-operating parts within the casing of the triple-valve possess advantages of great benefit in the practical use of these devices, enabling the ready and quick removal or adjustment of any of the parts for any purpose, and giving access to all parts thereof without unnecessary displacement, the parts being so connected in groups that danger of loss of the members thereof is reduced to the minimum. For instance, the cap L in the lower end of the valve-casing, and closing the piston cavity by a screw-thread connection, is of sufficiently greater diameter than the piston to permit of the withdrawal of the latter when the cap is removed while the emergency-valve is so connected with its piston, as before described, that it cannot become detached therefrom. After these parts are removed the cage *n* carrying the check-valve *p* and the seat for the emergency-valve may also be removed, as it is, in turn, of less diameter than the piston cavity and as all of these devices are constructed on the same center line the replacement thereof may be easily and expeditiously effected. Another advantage of the construction of these devices upon the same center is the great economy effected in the manufacture thereof, as the parts do not have to be separately and specially fitted to do their conjoint work.

It will be noted that the main difference between this invention and that described in the Hayden application before referred to, is that the emergency-piston performs the double work of controlling the passage from the train-pipe to the emergency-valve chamber and also the port to its own chamber, thus dispensing with the employment of the check-valve which is a necessary part of the Hayden construction, my emergency-piston being located in the passage connecting not only the train-pipe with the main piston-cavity but also connecting the train-pipe with the emergency-valve chamber, whereas, in the Hayden device the emergency-piston is located in a branch passage so that the air does not have to pass the emergency-piston in order to reach either the emergency-valve chamber or the main piston-cavity, which is a necessity with my invention in which the emergency-piston controls the quantity of air passing through such passage and, so far as I am aware, I am the first to have the emergency-piston located in the passage connecting the train-pipe with the emergency-valve chamber and, consequently, with the brake-cylinder.

What I claim as new, and desire to secure by Letters Patent, is as follows:

1. In a triple-valve mechanism, the combination with an emergency-valve controlling the direct passage from the train-pipe to the brake-cylinder, of a piston loosely connected with and operating said valve and located in said passage connecting the train-pipe with the brake-cylinder, substantially as described.

2. In a triple-valve mechanism, the combination with an emergency-valve controlling the direct passage from the train-pipe to the brake-cylinder, of a piston loosely connected with and operating said valve and located in the passage connecting the train-pipe with the brake-cylinder at a point between the emergency-valve and the train-pipe connection, substantially as described.

3. In a triple-valve mechanism, the combination with an emergency-valve controlling the direct passage from the train-pipe to the brake-cylinder, of a piston loosely connected with and operating said valve and located in the passage connecting the train-pipe with the brake-cylinder, and a chamber below said piston provided with a supply port said piston controlling both the passage in which it is located and the supply port to said chamber, substantially as described.

4. In a triple-valve mechanism, the combination with an emergency valve controlling the direct passage from the train-pipe to the brake-cylinder, of a piston loosely connected with and operating said valve and located in the passage connecting the train-pipe with the brake-cylinder, a chamber below said piston provided with a supply and exhaust port said emergency-piston controlling the supply-

port to its chamber, and a valve controlling the exhaust port of said chamber, substantially as described.

5. In a triple-valve mechanism, the combination with an emergency-valve controlling the direct passage from the train-pipe to the brake-cylinder, of a piston loosely connected with and operating said valve and located in the passage connecting the train-pipe with the brake-cylinder, a chamber below said piston provided with a supply and exhaust port said emergency-piston controlling the supply-port to its chamber, and a valve operated by said piston and controlling the exhaust port of said chamber, substantially as described.

6. In a triple-valve mechanism, the combination with an emergency-valve controlling the direct passage from the train-pipe to the brake-cylinder, of a piston loosely connected with and operating said valve and located in the passage connecting the train-pipe with the brake-cylinder, a chamber below said piston provided with a supply and exhaust port said emergency-piston controlling the supply-port to the chamber, an exhaust port for said chamber extending through the piston and emergency-valve, and a valve for said port actuated by the piston, substantially as described.

7. In a triple-valve mechanism, the combination with the casing provided with the brake-cylinder chamber and an emergency-valve chamber separated by a diaphragm, and an emergency-valve located in the last mentioned chamber, of a cylindrical cage fitting a perforation in said diaphragm and affording a seat for said emergency-valve at one end and a spring-actuated check-valve working in the opposite end of said cage, substantially as described.

8. In a triple-valve mechanism the combination with a casing provided with the chambers a, b separated by the diaphragm d, and the emergency-valve m of the cage n, the check valve p having the cylindrical body p' and the wings p'', coiled spring q and the perforations r in said cage, substantially as described.

9. In a triple-valve mechanism, the combination with a casing provided with the upper brake-cylinder chamber, the middle emergency-valve chamber and the lower emergency-piston chamber, located respectively one above the other, the lower piston chamber being closed by a removable cap of greater diameter than said chamber, of the emergency-piston working in the lower chamber, the emergency-valve working in the middle chamber and of less diameter than the emergency-piston, and the cage affording a seat for the emergency-valve and carrying a check-valve working in the upper chamber, said cage being of less diameter than the emergency piston, whereby all of said mechanism may be removed from the casing through the opening closed by the cap thereof, substantially as described.

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