(No Model.)

G. WESTINGHOUSE, Jr.

Fluid Pressure Brake.

No. 235,922. **Patented Dec. 28, 1880.**

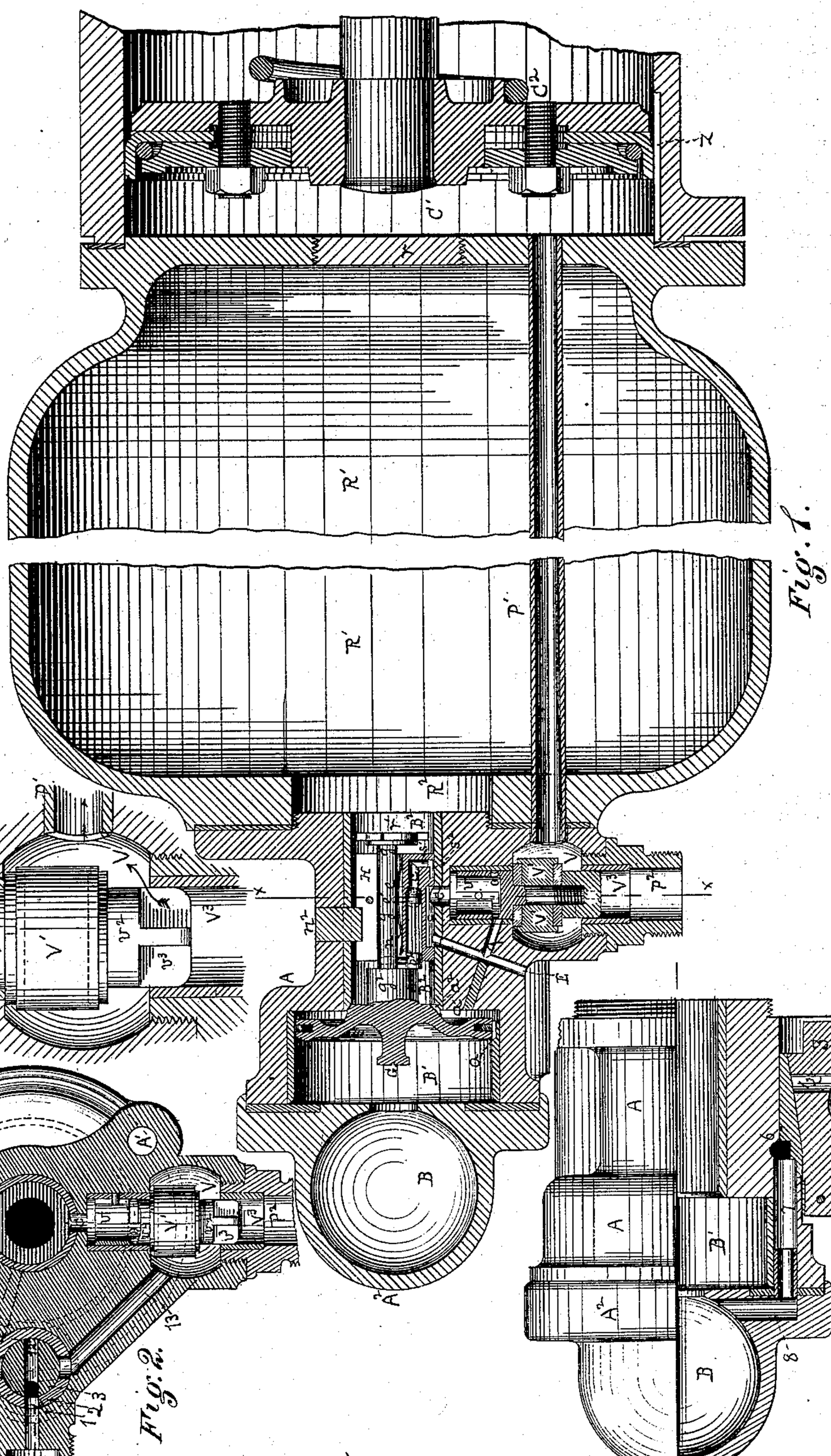

Fig. 1.

Fig. 2.

Fig. 4.

Fig. 3.

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FLUID-PRESSURE BRAKE.

SPECIFICATION forming part of Letters Patent No. 235,922, dated December 28, 1880.

Application filed November 15, 1880. (No model.)

To all whom it may concern:

Be it known that I, GEORGE WESTINGHOUSE, Jr., of Pittsburg, county of Allegheny, State of Pennsylvania, have invented or discovered a new and useful Improvement in Fluid-Pressure-Brake Apparatus; and I do hereby declare the following to be a full, clear, concise, and exact description thereof, reference being had to the accompanying drawings, making a part of this specification, in which—like letters indicating like parts—

Figure 1 is a sectional view of so much of a brake-cylinder, auxiliary reservoir, and air-regulating valve and connections as is necessary in order to illustrate my present invention. Fig. 2 is a cross-section in the plane of the line *x x*, Fig. 1. Fig. 3 is a section of one half of Fig. 2 in the plane of the zigzag line *x'* to the center, and an outside elevation of the other half, and Fig. 4 is an enlarged view of the double check-valve of Fig. 1. As the moving parts of the triple-valve device (above termed "air-regulating valve") are well known in the art, I have shown them only in Fig. 1.

My present invention relates to certain improvements in the construction and combination of appliances to be used in and as a part of fluid-pressure-brake apparatus for railway use, and while it is especially adapted for use in what is commonly known as "automatic-brake" apparatus, I also so construct it that it may be used in the non-automatic system of construction and operation—that is, where the fluid-pressure is conducted directly from the source or magazine of power to the brake-cylinder whenever the brakes are to be applied, and on the opening of a cock or valve by the engineer for that purpose. In the automatic system, on the other hand, the fluid-pressure is commonly conducted from the main reservoir or source of power, and stored in auxiliary reservoirs on the several cars, and a valve device, shifted by variations in the air pressure, is arranged in connection with the apparatus in such manner as that, on the accidental or intentional reduction of fluid-pressure in any of the conduit-pipes, a port will be opened from each auxiliary reservoir to a brake-cylinder.

In my present invention I unite in what may be termed a "single structure" the brake-cylinder, the auxiliary reservoir, and the valve apparatus employed for giving proper direction to the flow of the fluid-pressure, and thereby I greatly simplify the construction, make it more compact and at a less cost, and, by dispensing with numerous joints, lessen the liability of loss by leakage, as well as render it more durable; and by adding in the same combination another line of pipe with suitable connections, valve, and ports, I make provision for switching out or cutting off the automatic features, so that a car so fitted may be used with other cars having only the usual appliances for non-automatic operation, and all in a more simple manner than any described in my previous patents.

In the drawings, R' represents the auxiliary reservoir, and C' the brake-cylinder, made so as to be secured together end to end. The hole in the dividing wall or diaphragm, made for convenience in casting, is closed by a plug, *r*. Holes are also made in the end walls of the reservoir R', and a pipe, P', extends from one to the other, through which to convey the fluid-pressure to the brake-cylinder. The outer end of the pipe leads to a valve-chamber, V, and its use will presently be described. The outer end of the reservoir R' has also a large open port, R^2, and over this port is secured, by bolts through bolt-holes A', the valve-case A of what is commonly termed in the Westinghouse-brake system a "triple valve." This device, in consequence of various improvements, has practically ceased to be a triple valve; but as it is commonly known by that term the name may, for convenience, be retained. This device has substantially the construction and operation described in United States Patent granted to me October 14, 1879, No. 220,556, as illustrated in Fig. 4 thereof, except that, instead of having a side port and pipe-connection leading to the auxiliary reservoir, the open end of the valve-case is directly opposite to and opens into the port R^2, so that this communication is always open; also, the valve-stem *g*, having no end socket in which to be guided, as in the patent above named, is guided by a winged disk, *r'*, the wings of which play on the walls of the valve-chamber B^2. The other parts of this triple-valve device, so far as they are like those in the patent above named,

are similarly lettered, and by reference thereto their construction and operation will be readily understood; but instead of the leakage-port in that patent (lettered s^2) in the slide-valve H, I carry a groove (here indicated by the same letter) to the port s'; but the operation is not substantially changed thereby. Other devices described in said Patent No. 220,556, and not here shown, may be omitted or used, as preferred, so far as the same are suitable for use in this construction.

The cap A^2 of the triple-valve case contains a chamber, B, which opens into the piston-chamber B'. The line of pipe through which fluid-pressure is transmitted for the automatic operation of the apparatus is connected at P. From this point a line of ports leads first, at 1, Fig. 3, into a cock-case, 2, wherein is a plug, 3, having a notch or recess, 4, through which the fluid-pressure passes to a port, 5; thence into an annular chamber, 6; thence, by vertical and horizontal ports 7 and 8, into the chamber B. Through this line of ports fluid-pressure is introduced and let off, so as to operate the triple valve, as described in said Patent No. 220,556; but for the non-automatic operation of the brakes I connect the fluid-pressure conduit-pipe at P^2. It will now be seen that this pipe-connection opens into the valve-chamber V on one side, and that the triple valve opens into the same chamber on the other side. In order to cut off at pleasure one line or the other of air conduit or communication, I arrange in this chamber a double check-valve, V', which seats both ways. This double check-valve has a tubular extension, v, which slides like a piston inside the chamber V^2. From this chamber a side port, 9, leads to the escape-port E, or may lead directly to the atmosphere, and when these devices are in the position shown in Fig. 1, (which is the position for the non-automatic action,) a slit or port, u^2, in the tubular extension v registers with this side port through port u in the bush or lining of the chamber. Other ports, u', are also made in this tubular extension, for purposes presently to be explained. A pin, x, on which the tubular extension plays, by a slit, x', prevents the rotation of the extension. The opposite or outer end of the double-check-valve stem has a cylindrical part, v^2, which, when the valve is shifted outwardly, fills the adjacent end of the bore of the chamber V^3 as soon as the opposite or automatic port is opened, and outside of this is a winged stem, v^3.

Assuming now that the non-automatic system of operation is to be used, fluid-pressure, entering at the port P^2, shifts the double check-valve V' over to the position shown, so as to cut off the automatic feature from the line of communication. The fluid-pressure then passes, as indicated by the arrows, Fig. 4, into and along the pipe P', to the brake-cylinder C', and there does its work in the usual way. If, then, at the same time, either accidentally, by design, or in consequence of leakage, any comparatively small amount of fluid-pressure should come through the triple-valve ports into the tubular extension v, it will at once pass out by the ports 9 and E; but if it be desired to employ the automatic system of operation, the reservoir R' is charged, (if not already charged,) and on the reduction of the pressure in the brake-pipe the triple valve is shifted, so as to let the pressure pass from R' through the port R^2, shift the piston G and valve H, so as to uncover the port C, and thence through this latter port into the tubular extension v. As the port u is too small to provide for its escape, it acts to throw the double check-valve V' outward and close the non-automatic port. This brings the holes u' and slit u^2, made in the walls of the tubular extension v, outside the valve-seat at that end of the chamber, or, in other words, causes them to open into the valve-chamber V; and it will be observed that this end of the valve-stem has a cylindrical port, v^4, so that the ports u' u^2 are not uncovered until the cylindrical part v^2 on the other end of the valve shall have practically closed the non-automatic port. The fluid-pressure thus introduced passes by the pipe P' to the brake-cylinder, and also does its work in the usual way. The brakes may be released in the manner described in said Patent No. 220,556.

The apparatus thus described I propose to use either as automatic or as non-automatic, with a single line of pipe; or, what is still better, I propose to use two lines of pipe, and use either method of operation at pleasure, or sometimes one and sometimes the other. For holding a long passenger or freight train in check on a long downgrade, the non-automatic method of working is in some respects preferable, whereas for stopping purposes, particularly in an emergency, the automatic is much the better. Hence on roads in hilly or mountainous regions it is well to have both methods available, at the pleasure of the engineer, and in such use the automatic apparatus should always be kept charged and in a usable condition, so that it may be used or made available for an emergency stop, or in case of accident, as well as for ordinary stops, even while the non-automatic apparatus may be employed at intervals for certain purposes; but in case it should become necessary, as it sometimes does, to exhaust or discharge the compressed fluid-pressure from the brake-cylinder R', it may be done by the turning of the plug 3 (a handle, 10, being added for the purpose) so as to bring the port 12 into line with the ports 13 and 14, Fig. 2, the former of which is in communication with the valve-chamber V, and the latter of which opens to the outer air. This necessity may arise when a car is detached from the train, and by the escape of air from the brake-pipe the brakes are set and remain so.

It is also an important and novel characteristic or feature of my present apparatus that I provide for the discharge of the fluid-pressure

from all the auxiliary reservoirs of the train by the use of a higher or a mechanically more effective pressure through the non-automatic pipe. Thus, in case of the bursting or breakage of any of the fluid-pressure conduits of the automatic apparatus, (which may occur while the train is at a place or point on the line where repairs are almost practically impossible,) the pipe-valves throughout the train are shifted, and fluid-pressure then passes from each auxiliary reservoir to its brake-cylinder, and all the brakes are set. Of course they can be released in the manner already described; but I deem it better in such cases to discharge the fluid-pressure from the auxiliary reservoirs, so that the brakes cannot in any contingency again be reset by a new charge from such reservoirs. To this end I pump up, if need be, and transmit back through the non-automatic pipe, a pressure sufficient to shift each valve V′, as against the pressure to which it may be subject from its auxiliary reservoir, so as to cause the port or slit u^2 to register with the port u, and thereby allow all the pressure in all the auxiliary reservoirs to escape through ports 9 and E to the open air. This being done, the brakes may be released in the manner common in the working of the non-automatic brake, and the train may proceed, using then the latter apparatus for braking purposes until damages are repaired; but in the operation thus described the plug 3 is presumed to be absent, or, if present, to be closed as regards the ports 13 and 14.

The plug 3 may be used to cut off the automatic apparatus entirely, when desired, by setting it so as to cut off all the ports leading into or through the same.

In order to guard against the effects of the leakage of fluid-pressure into the brake-cylinder, (when it occurs,) I make a small groove, z, in the interior of the cylinder, past the piston C^2 when it is at the end of its back-stroke, or when the brakes are off; and I make this groove large enough to provide for the escape of so much fluid under pressure as is liable to leak into the cylinder, but so small that it cannot carry off an operative charge or quantity. As soon as the piston on its forward or outward stroke laps onto the outer end of the groove, the latter ceases to perform any function whatever.

In lieu of the specific form or construction of triple valve described, any other known form of device for regulating and governing the flow of fluid-pressure in a substantially like manner by the action of the fluid-pressure itself may be substituted without any substantial departure from the scope of the present invention, and such substitutes, performing a like function, I include within the term "triple valve," as hereinafter used; and, particularly, it may be stated that for some uses the triple valve may be arranged on one side of the reservoir R′, instead of at its end, both arrangements thereof being included herein, and like variation may be made in the arrangement of the brake-cylinder.

I claim herein as my invention—

1. In a fluid-pressure-brake apparatus, a triple valve, auxiliary reservoir, and brake-cylinder arranged end to end in a single structure, without interposed pipes to connect one to the next, substantially as set forth.

2. The combination of a brake-cylinder furnished with a piston moving therein, arranged on one end or side of a reservoir, a triple valve arranged on another end or side, and a pipe connecting the triple valve with the brake-cylinder, substantially as set forth.

3. A valve-chamber, V, containing a double check-valve, in combination, by port C and pipe P′, with triple valve, auxiliary reservoir, and brake-cylinder, substantially as set forth.

4. A double check-valve, V′, having a ported tubular extension, v, thereon, in combination, by ports C, E, and 9, with triple valve, substantially as set forth.

5. The double check-valve V′, having cylindrical extensions v^4 v^2 and ported tubular extension v, as a device for cutting off one of two different sets of fluid-pressure-brake apparatus while bringing the other into communication, substantially as set forth.

6. The cock and case having line of ports and passages 1, 4, 5, 6, 7, and 8, substantially as set forth.

7. The cock 3, in combination, by ports 12, 13, and 14, with chamber V and passages thence to auxiliary reservoir and brake-cylinder, substantially as set forth.

8. In a fluid-pressure-brake apparatus having automatic and non-automatic appliances and a pipe-connection for each, the method of discharging the fluid-pressure from the auxiliary reservoirs of the train, by charging through the non-automatic connection a pressure sufficient to shift a valve and open an escape-port communicating with each such reservoir, substantially as set forth.

In testimony whereof I have hereunto set my hand.

GEORGE WESTINGHOUSE, JR.

Witnesses:

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