2 Sheets—Sheet 1.

(No Model.)

# W. HIRST.

## QUICK ACTION TRIPLE VALVE.

No. 545,289. Patented Aug. 27, 1895.

Fig. 1.

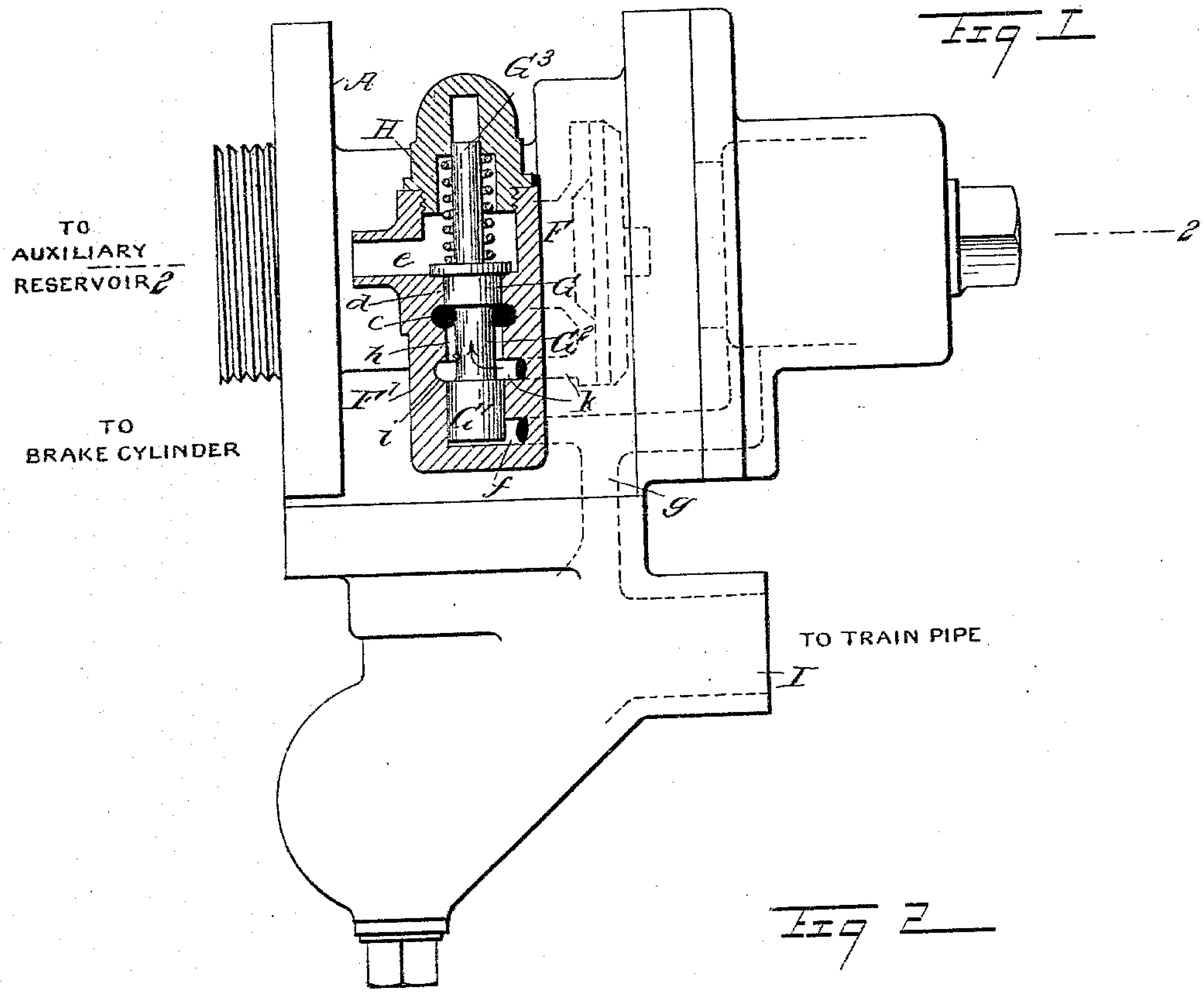
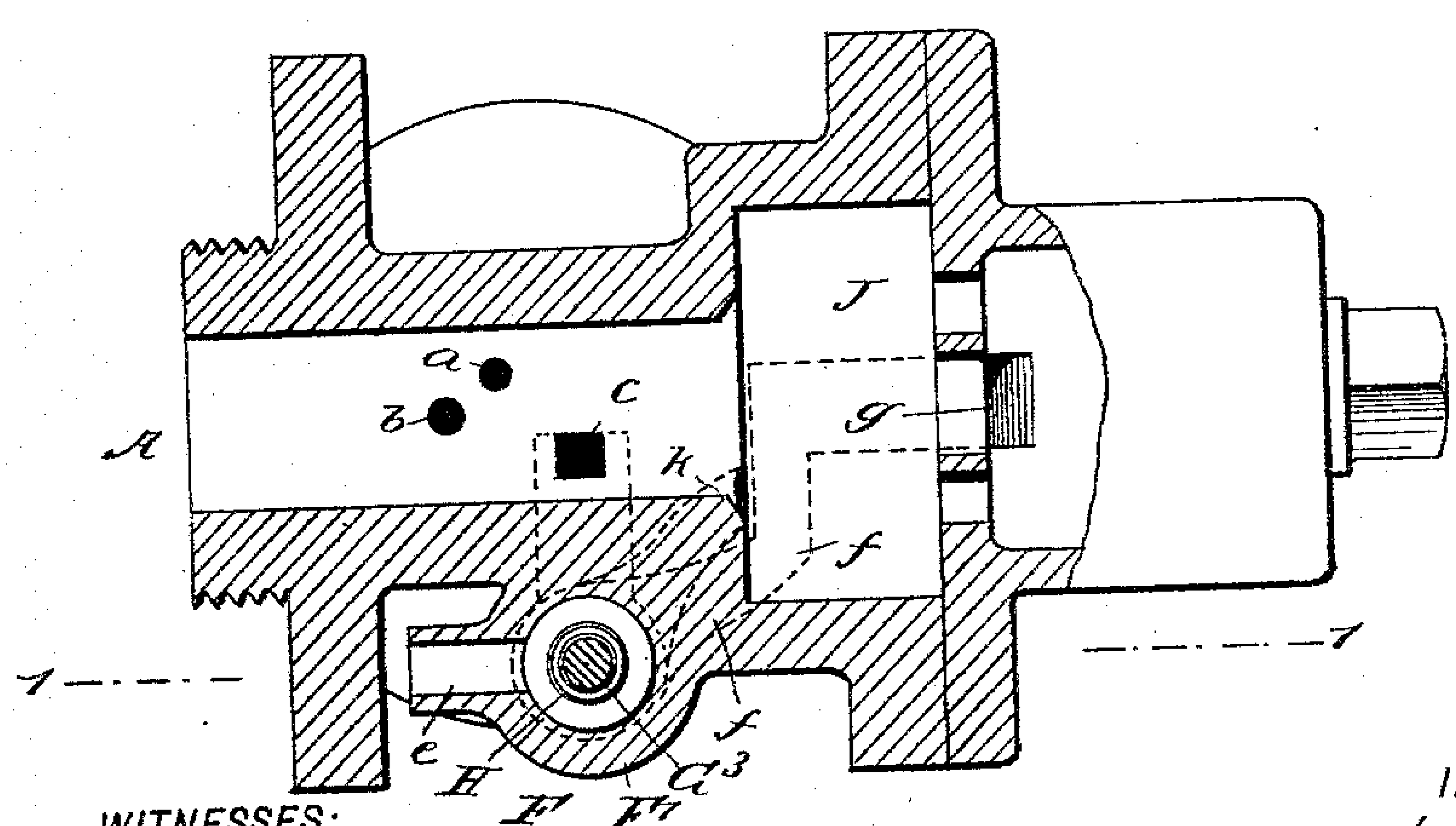



Fig. 2.



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(No Model.)

2 Sheets—Sheet 2.

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## QUICK ACTION TRIPLE VALVE.

No. 545,289.

Patented Aug. 27, 1895.

Fig 3

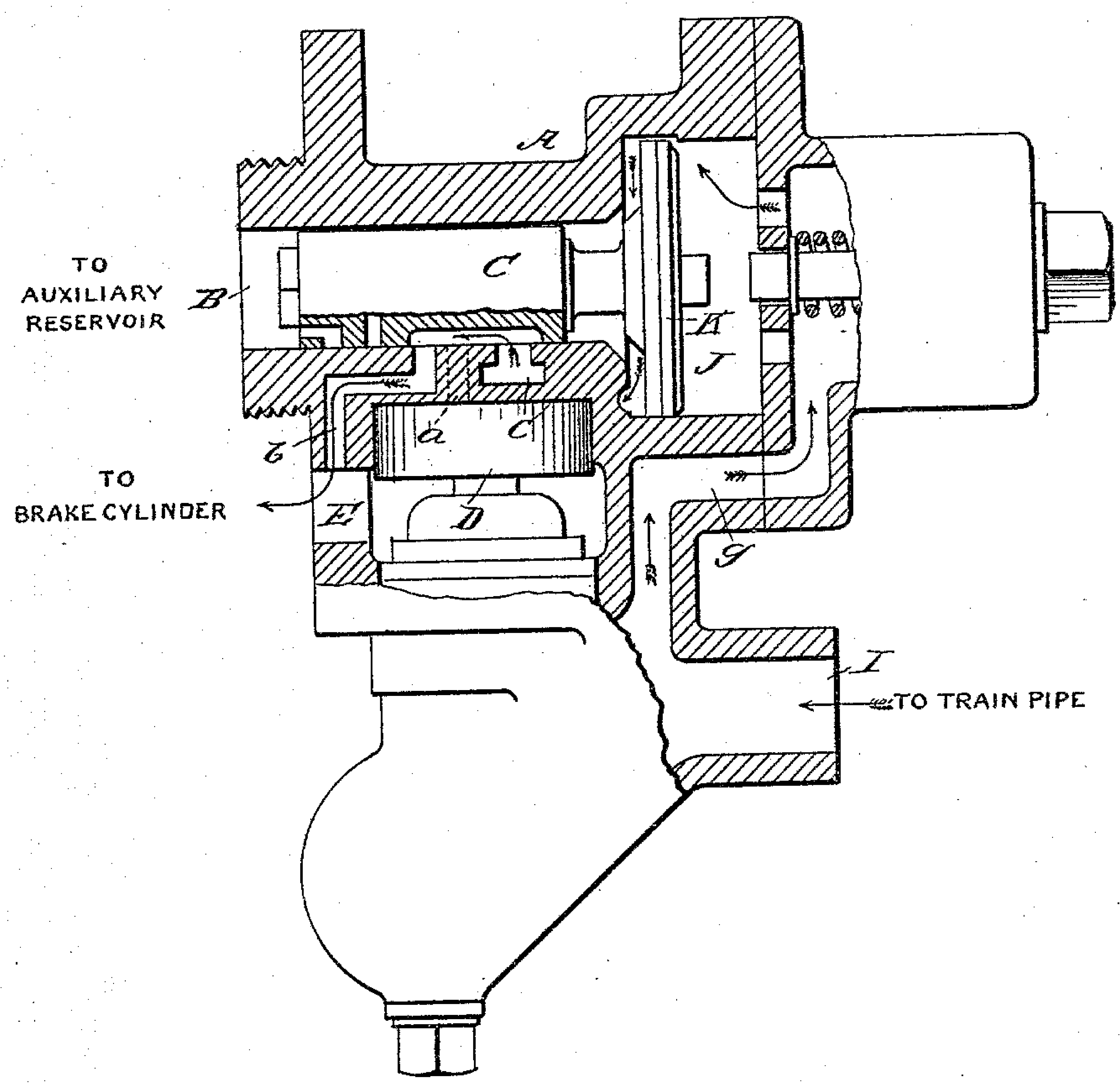
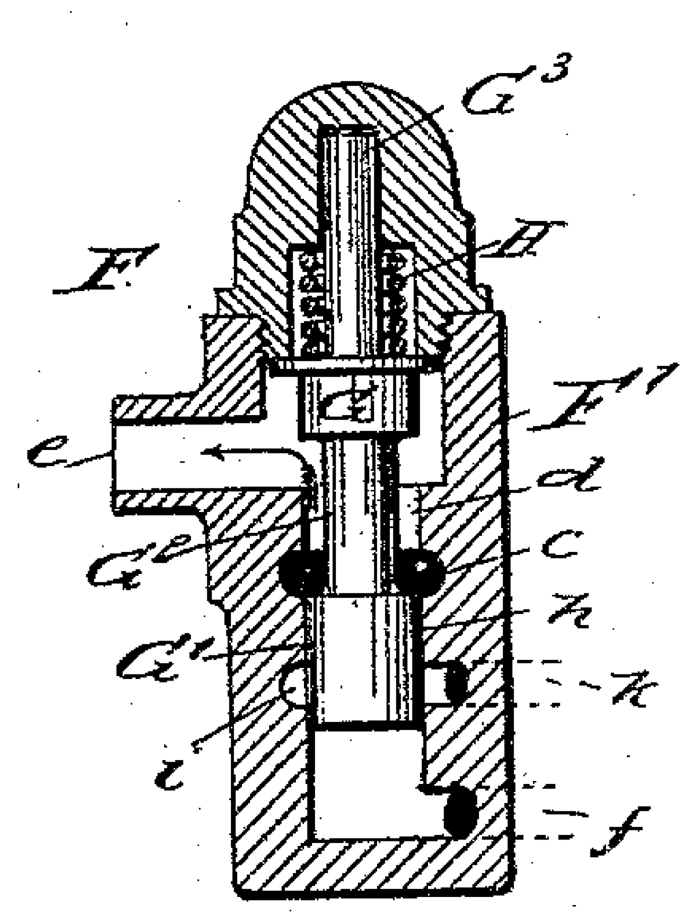



Fig 4

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# UNITED STATES PATENT OFFICE.

WILLIAM HIRST, OF TRENTON, NEW JERSEY.

## QUICK-ACTION TRIPLE VALVE.

SPECIFICATION forming part of Letters Patent No. 545,289, dated August 27, 1895.

Application filed September 20, 1894. Serial No. 523,656. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM HIRST, of Trenton, in the county of Mercer and State of New Jersey, have invented certain new and useful Improvements in Quick-Action Triple Valves, of which the following is a full, clear, and exact description.

The invention relates to fluid-pressure brakes; and its object is to provide certain new and useful improvements in quick-action triple valves whereby the pressure in the brake-cylinder is retained at all times up to the required full working pressure.

The invention consists principally in a retaining-valve in the form of a spring-pressed piston-valve and arranged in the triple-valve exhaust and normally held in an open position by pressure from the train-pipe, the said valve, on reduction of pressure in the train-pipe, connecting the triple-valve exhaust with a port leading to the main valve to establish communication between the auxiliary reservoir and the brake-cylinder.

The invention also consists of certain parts and details and combinations of the same, as will be fully described hereinafter, and then pointed out in the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar letters of reference indicate corresponding parts in all the figures.

Figure 1 is a side elevation of the improvement with parts in section. Fig. 2 is a sectional plan view of the same, on the line 2 2 of Fig. 1, with the slide-valve and piston of the triple valve omitted. Fig. 3 is a sectional side elevation of the improvement, and Fig. 4 is a sectional side elevation of the retaining-valve with its piston-valve in a different position from that shown in Fig. 1.

The triple-valve casing A is provided with the usual chamber B, connected with the auxiliary reservoir and containing a slide-valve C, operating over the ports *a*, *b*, and *c*, of which the port *a* leads to the chamber containing the emergency-valve piston D, and the port *b* leads to the passage E, connected with the brake-cylinder. (See Fig. 3.) The port *c* is the exhaust-port, and leads to the casing F′ of a retaining-valve F, the said casing forming part of the triple-valve casing A.

The retaining-valve F is provided with a piston-valve having the valve G, the piston G′, the stem $G^2$, for connecting the valve G with the piston G′, and from the upper end of the said valve G extends a stem $G^3$, on which is coiled a spring H for forcing the valve G to its seat *d*, as hereinafter more fully explained. The seat *d* is adapted to connect with the exhaust-port *c*, leading by the port *e* to the atmosphere at the time the piston-valve is in its normal position, as shown in Fig. 4. The lower end of the casing F′, containing the piston G′, is connected by a port *f* with the passage *g*, leading from the train-pipe chamber I to the cylinder J, containing the piston K, connected with the main valve C in the usual manner. Now, it will be seen that the train-pipe pressure can pass through the port *f*, to act on the piston G′ to force the latter into an uppermost normal position, (shown in Fig. 4,) to hold the valve G off its seat *d*, to connect the exhaust *c* with the atmosphere by the port *e*. The spring H is then compressed, and as soon as a reduction of pressure in the train-pipe takes place then the spring H forces the retaining piston-valve downward to move the valve G on its seat *d*—that is, into the position shown in Fig. 1.

In the valve-casing F′ of the retaining-valve F is arranged an annular chamber *h* for connecting the exhaust-port *c* with an annular chamber *i*, connected by a channel *k* with the cylinder J between the main valve C and piston K. (See dotted lines in Fig. 2.) This chamber *i* is closed by the piston G′ at the time the retaining-valve F is in an uppermost position, as shown in Fig. 4, so that communication between the ports *c* and *k* is cut off; but when a reduction of pressure takes place in the train-pipe and the port *c* is cut off from the port *e*, then the said exhaust-port *c* is in communication with the chamber *i* and passage *k*.

It is understood that in quick-action triple valves the brakes are applied by lowering the pressure in the train-pipe to cause the triple valve to automatically discharge a portion of the fluid under pressure from the auxiliary reservoir, and in emergencies from the auxiliary reservoir and train-pipe, into the brake-cylinder. As the pressure becomes reduced below that required to work the brakes, from leakage or other causes, and to apply the brakes with sufficient force, it is necessary to recharge the auxiliary reservoir, and the auxiliary reservoir, in the ordinary brake system, cannot be recharged automatically without the release of the brakes. Now, when the pressure in the auxiliary reservoir and train-pipe has been reduced below that required to apply the brakes with sufficient force, then the spring H forces the piston-valve G into a closed position, as shown in Fig. 1, so that the exhaust-port *c* is closed to the atmosphere and additional air is admitted from the auxiliary reservoir by the main valve C, passage *k*, chambers *i h*, and port *c*, under side of main valve C and port *b*, to the chamber E and brake-cylinder. Thus the triple valve becomes a passage for the air or fluid pressure from the auxiliary reservoir, through the main-valve chamber and the other ports described, to maintain a working pressure in the brake-cylinder. It is understood that the main valve C is in the release position when this takes place, by the pressure passing into the auxiliary reservoir from the train-pipe, as indicated by the arrows in Fig. 3. The normal pressure in the train-pipe is about seventy pounds, and when this pressure is reduced to apply the brakes then the air in the auxiliary reservoir expands into the brake-cylinder, so that an equal pressure, say, of fifty pounds, in both the auxiliary reservoir and the brake-cylinder, is obtained, and to this pressure or any other predetermined amount the spring H is set. Now, on a reduction of pressure, say, to forty pounds in the train-pipe, then the retaining-valve F closes, and in doing so the valve G first disconnects the ports *c* and *e*, and then the piston, moving into a lowermost position, connects the port *c* with the chamber *i* and channel *k*. It will be seen that as the spring H is at its utmost tension when compressed it begins to close at the pressure it is set to, (say fifty pounds,) and it reaches its lowermost position at forty pounds, so that the spring reaches a tension equal to ten pounds pressure per square inch between its highest and lowest point. Now, when the engineer applies pressure from the main reservoir to the train-pipe then the triple valve is moved into the release position shown in Fig. 3, to recharge the auxiliary reservoir. When it is desired to release the brakes, the full working pressure is admitted to the train-pipe, and as this pressure also extends into the passage *f* and is exerted against the piston G′ the latter is forced upward to cut off the chamber *i* and port *c*, and as the valve G is lifted off its seat *d* the ports *c* and *e* are again connected, thus restoring the ordinary working condition.

By reference to Fig. 3 it will be seen that the triple-valve piston is free to move in either direction, as only the friction caused by the pressure on the back of the valve C for holding the latter to its seat is to be overcome, and when the retaining-valve is in its lowermost position this friction will almost be overcome by the upward pressure on the under side of the valve through port *c*, and hence any slight difference in the pressure on the sides of piston K will move the latter in the direction of the lesser pressure. The spring H, however, exerts a pressure on the piston G′ equal to a pressure assumed as forty pounds, and hence will not commence to move into its uppermost position until that pressure is exerted on the piston G′. For example, we will assume it is required to maintain a constant working pressure of twenty pounds in the brake-cylinder, and when the engineer applies the brakes in the usual manner and the pressure in the auxiliary reservoir and train-pipe has fallen to, say, two pounds below the required pressure, then the engineer admits fluid under pressure from the main reservoir sufficient to restore the pressure in the train-pipe to the required pressure (twenty pounds) and to maintain it at that point. As soon as the pressure in the chamber J exceeds that in chamber B then the triple-valve piston K moves with the valve C into the release position, so that any pressure up to that at which the spring H is set can be maintained in the brake-cylinder by keeping up that pressure in the train-pipe.

It will be understood from the foregoing that any pressure can be had in the brake-cylinder up to that at which the spring H is set, which is assumed to be forty pounds, and the only limit to the pressure that can be admitted to the brake-cylinder through the retaining-valve is that at which the retaining-valve begins to rise.

It will further be seen that any pressure passing into port *c* (see Fig. 3) can also pass under the emergency-piston D, so that any pressure that may pass through port *a* to the upper side of the emergency-piston will be counter balanced by that passing through opening E to the under side. The emergency-valves are held to their seats by springs, so that no uncalled for action can take place by them.

Having thus fully described my invention, I claim as new and desire to secure by Letters Patent—

1. A quick action triple valve, provided with a retaining valve having a spring-pressed piston valve arranged in the triple valve exhaust, and normally held in an open position by pressure from the train pipe, the said valve on a reduction of pressure in the train pipe, connecting the triple valve exhaust port with a port leading to the main valve chamber, to connect the auxiliary reservoir with the brake cylinder, substantially as shown and described.

2. A quick action triple valve, provided with a retaining valve, comprising a casing into which opens the exhaust port of the triple valve, a spring-pressed piston valve arranged in the said casing, and adapted to connect the said exhaust port with the open air, or the said exhaust port with an air passage leading to the main slide valve chamber, substantially as shown and described.

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Witnesses:
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HENRY J. NICKLIN.