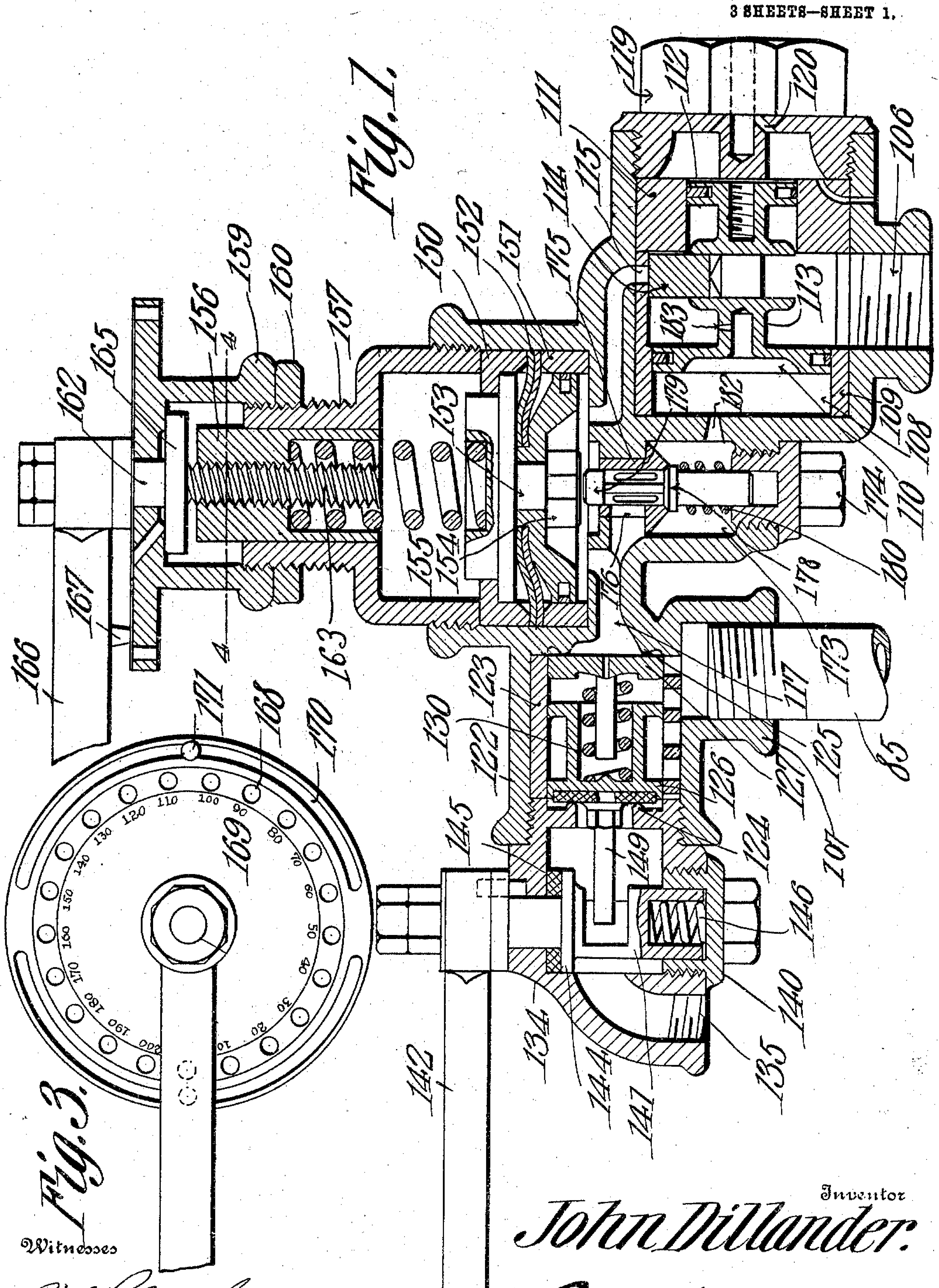
J. DILLANDER.

ENGINE VALVE.

APPLICATION FILED SEPT. 23, 1908.

966,810. Patented Aug. 9, 1910.

3 SHEETS—SHEET 1.



Witnesses

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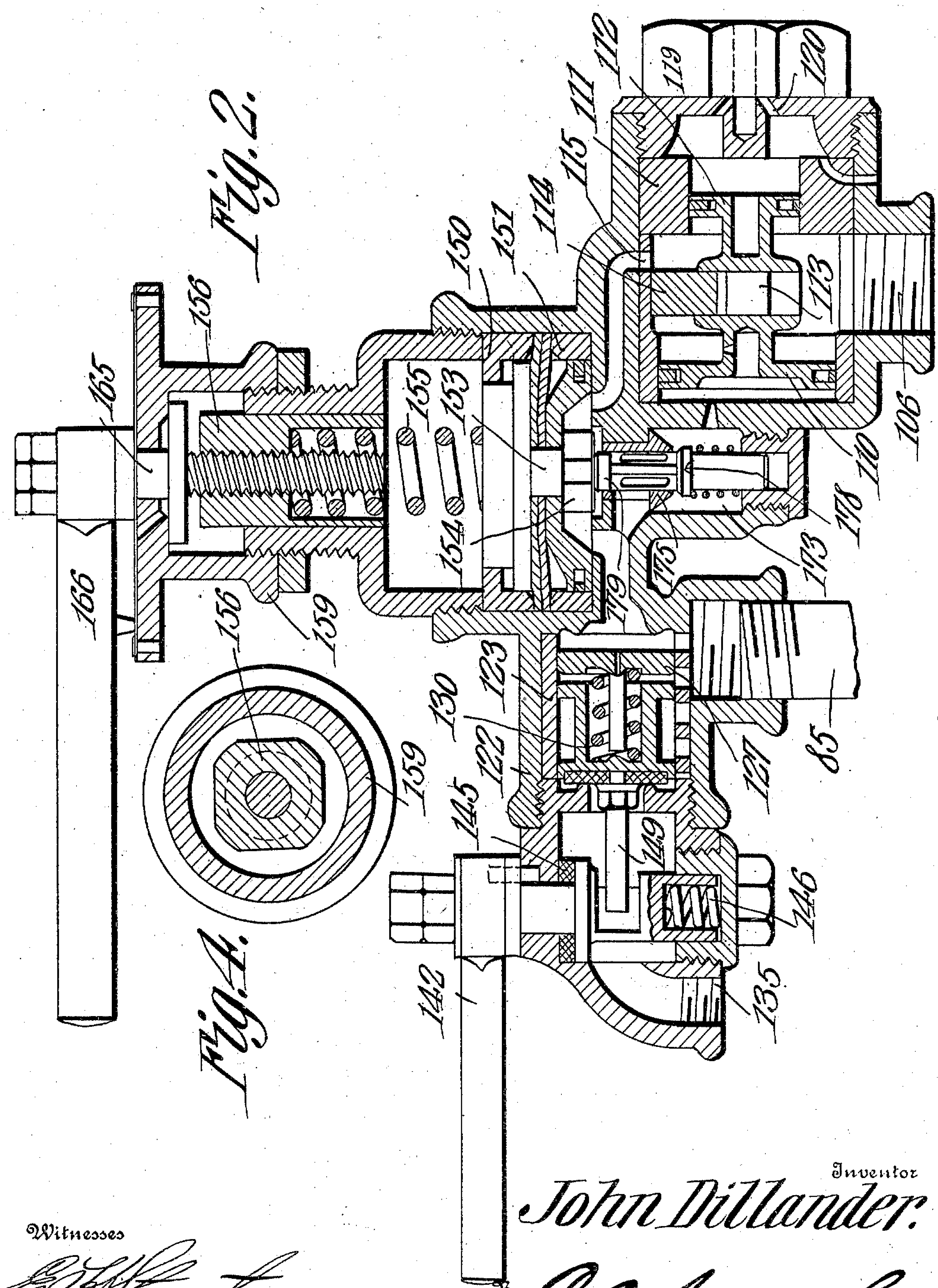

Fig. 2.

Fig. 4.

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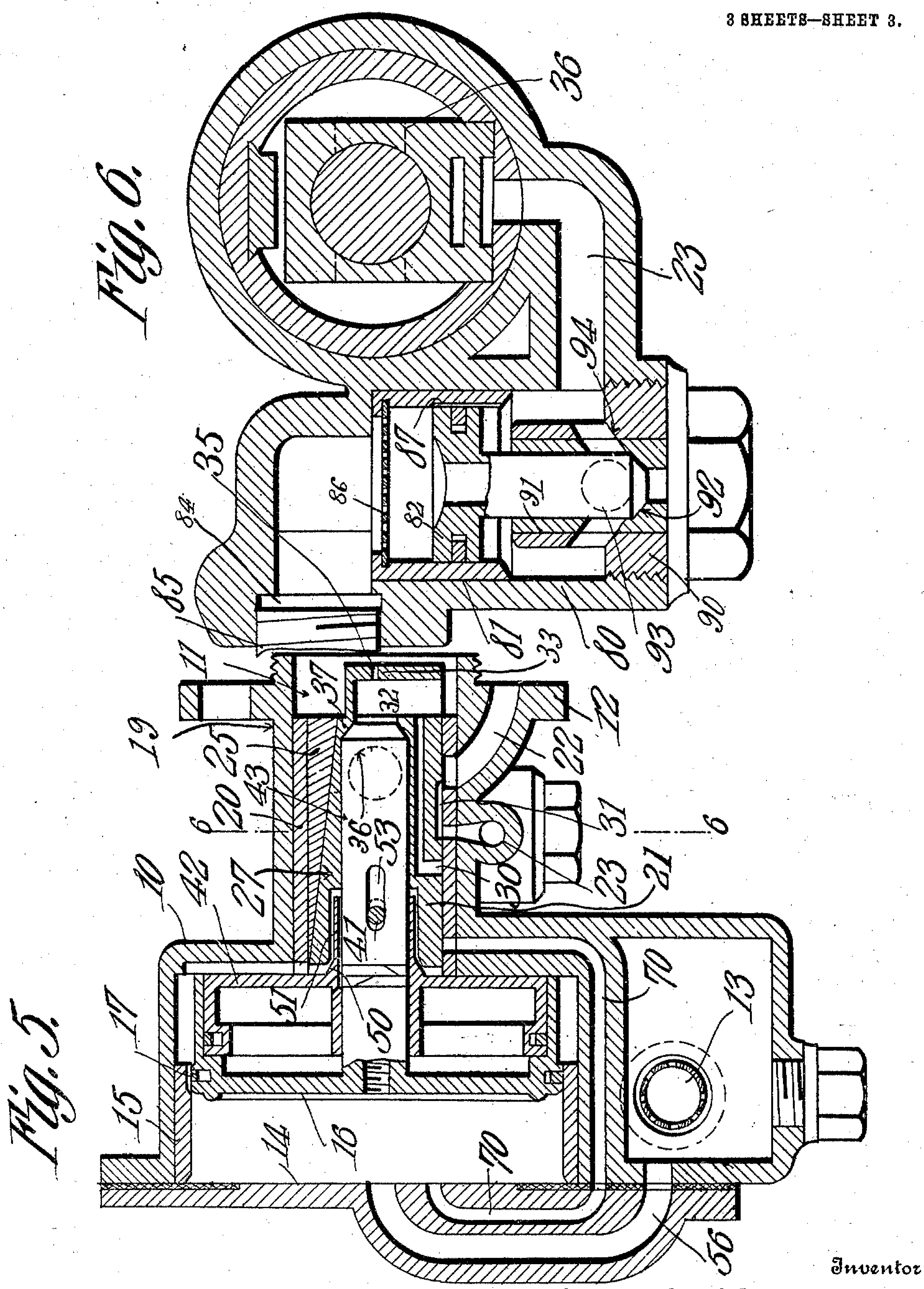

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UNITED STATES PATENT OFFICE.

JOHN DILLANDER, OF TEMPLE, TEXAS.

ENGINE-VALVE.

966,810. Specification of Letters Patent. **Patented Aug. 9, 1910.**

Application filed September 23, 1908. Serial No. 454,314.

To all whom it may concern:

Be it known that I, JOHN DILLANDER, a citizen of the United States, residing at Temple, in the county of Bell and State of Texas, have invented a new and useful Engine-Valve, of which the following is a specification.

This invention relates to air brake systems.

The principal object of the invention is to provide a governing or controlling valve whereby air may be sent through a train pipe from a main reservoir on the locomotive for the purpose of applying the brakes.

In the two air brake systems now in general use air is allowed to flow from the main reservoir on the locomotive through the engineer's brake valve to the train pipe, and thence to the several triple valves on the cars, the air being allowed to flow into auxiliary reservoirs which are normally charged with sufficient air to make one or more applications of the brake. The train pipe pressure is usually very high and the triple valves are actuated for the purpose of securing a graduated or emergency service by reducing the train pipe pressure, this being usually accomplished by turning the engineer's brake valve to the service or emergency position and allowing the pressure in the train pipe to reduce to the required point.

In carrying out the present invention the ordinary braking mechanism may be entirely dispensed with or the present device may be used as an auxiliary, but in either case a pipe is run the entire length of the train and is connected in any suitable manner to the braking devices. At the front end of this pipe is arranged the automatic controller forming the subject of the present invention, and this may be adjusted by the engineer for the purpose of sending a stream of air through the pipe under any desired pressure. In other words, the system is a straight air system and the brakes may be applied under any pressure desired.

A further object of the invention is to provide an automatic controller placed in the train pipe and so arranged that when once adjusted by the engineer it will maintain any predetermined pressure in the pipe without regard to the leakage at any of the air hose connections or other points.

With these and other objects in view, as will more fully hereinafter appear, the invention consists in certain novel features of construction and arrangement of parts, hereinafter fully described, illustrated in the accompanying drawings, and particularly pointed out in the appended claims, it being understood that various changes in the form, proportions, size and minor details of the structure may be made without departing from the spirit or sacrificing any of the advantages of the invention.

In the accompanying drawings:—Figure 1 is a sectional elevation of an automatic governing valve constructed in accordance with the invention. Fig. 2 is a similar view of the valve in open position. Fig. 3 is a plan view of the top of the valve casing. Fig. 4 is a detail sectional view on the line 4—4 of Fig. 1. Fig. 5 is a sectional view of a novel form of triple valve which may be used in connection with the governing valve. Fig. 6 is a transverse section of the retaining valve on the line 6—6 of Fig. 5.

Similar numerals of reference are employed to indicate corresponding parts throughout the several figures of the drawings.

The main casing 105 is connected at 106 to the main reservoir on the locomotive, and at 107 is connected to the straight air pipe 85.

At the lower right hand side of the casing is a cylinder 108 having a bushing 109 in which fits a piston 110. The cylinder also contains a bushing 111 in which slides a piston 112, the two pistons 110 and 112 being permanently connected together by a stem 113 which carries a valve 114 controlling a port 115. The air entering at 106 from the main reservoir operates on both pistons, but as the piston 110 is of much greater area than the piston 112, the two pistons will be carried to the left and the valve 114 will be moved to open position, allowing the air to flow through the port 115 from whence it passes in a rather indirect path to a port 117 and thence through the connection 107 to the straight air pipe 85. The outer end of the cylinder 108 is closed by a plug 119 and ports 120 are provided through the plug for the purpose of allowing the free flow of atmospheric air into and from the outer end of the cylinder, so that the outer face of the small piston 112 is exposed only to the normal or atmospheric pressure.

At the left hand side of the main casing is a cylinder 122 containing a perforated bushing 123, and at the opposite end portions of the bushing are valve seats 124 and 125 which are engaged by a pair of check valves 126 and 127, said valves being normally pressed in the directions of their seats by a helical compression spring 130. The resistance of this spring must be overcome by the air pressure passing from port 117 to the pipe 85, and this may be readily accomplished, the spring being a comparatively light one, so that air may be allowed to flow from the automatic governor to said pipe 85. At the extreme outer end of the cylinder 122 is arranged a small casing 134 having an exhaust port 135, and the opposite end of the casing has a threaded nipple which screws into the threaded end of the cylinder 122 and serves partly as a means for holding the bushing 123 in position within the cylinder, while the seat 124 is formed on an annular flange extending inward from the wall of the casing.

The lower portion of the wall of the casing 134 has a threaded opening for the reception of a plug 140 that is provided with a central recess for the reception of the lower end of a cylindrical stem 141 that passes up through an opening formed in the casing and is provided with a suitable operating handle 142. This stem is provided with a flange or collar 144 that is forced against a packing ring 145 by means of a coiled compression spring 146 seated in a recess at the bottom of the stem, this construction serving partly for the purpose of preventing leakage. The stem 141 is partly cut away at one side to form a flat face. This flat face of the stem is arranged to engage a valve operating rod 149 carried by the valve 126 and by turning the stem, the flat face of the latter may be forced against the end of the rod, thereby moving the latter in the direction of its length and opening the valve slightly for the purpose of allowing pressure to exhaust from the straight air pipe 85 through to the main exhaust port 135.

In the upper central portion of the casing 105 is a cylindrical chamber containing two bushings 150 and 151 between which is clamped the outer edge of a yieldable diaphragm 152. This diaphragm is carried by a two part piston 153, the upper section of which is guided within the bushing 150, while the lower section is guided within the bushing 151, and the two parts of the piston are permanently secured together by a nut 154. The top of the upper section of the piston 153 is recessed to receive the lower end of a spring 155, the upper end of said spring being housed in a recess formed in the lower face of a vertically movable nut 156 that is guided in an opening formed in the reduced neck of the upper section 157 of the cylinder. The periphery of the neck is threaded for the reception of a cap piece 159 which may be screwed down into place and locked by a nut 160.

The central portion of the cap 159 is provided with an opening for the passage of a stem 162, the lower portion of which has a quick pitch screw thread 163 fitting the threads of the nut 156. Near the upper portion of the stem is an enlarged flange 165 that bears against the inner face of the cap and receives the thrust of the nut, and the spring 155. To the extreme upper end of the stem 162 is secured an operating handle 166 having a detent 167 which may be readily shifted, and allowed to remain in any one of a series of shallow depressions 168 that are formed in an indicating disk 169 adjustably secured to the top of the cap.

The disk is provided with a series of depressions 168 and opposite each is a mark indicating the pressure sent from the main reservoir through pipe 85 to the brake cylinder. In the present instance any pressure from ten pounds to two hundred may be thus transmitted. The indicating disk is provided with two long arcuate slots 170 for the passage of a pair of securing screws 171. This is for the purpose of permitting adjustment of the indicating disk to the zero point of the spring, and is of considerable importance in that it thereby avoids the necessity of employing springs of precisely the same length and capacity. In other words, it is merely necessary to introduce a spring of approximately the right length and strength and then turn the handle 166 until the spring begins to resist further movement of the nut 156. The indicating disk is then turned until the zero mark is under the handle and said disk is then locked in place. This construction provides also for such adjustment as may be necessary to compensate for fatigue in the spring.

Arranged in axial alinement with and below the diaphragm 152 is a chamber 173, the lower end of which is closed by a plug 174. At the top of the chamber is a bushing 175 through which extends a port 176, in communication with the port 117, and at the base of the bushing is a seat for a valve 178 that is carried by a vertically movable stem 179 normally forced upward by a spring 180. The upper end of the valve stem is arranged immediately below the nut 154, and on downward movement of the latter the valve will be forced away from its seat so as to place the chamber 173 in communication with the port 117.

The chamber 173 is in communication with the left hand end of the cylinder 109 through a small port 182 and this end of the cylinder is in communication with the central portion of said cylinder through a small port 183, so that under all circumstances the main reservoir pressure may flow through the ports 183 and 182 to the left hand end of the cylinder, and the chamber 173 and as the area of the piston 110 exposed to pressure at the left hand end of the cylinder is greater than the exposed area at the opposite side, the piston will always be moved to position to maintain the valve 114 in closed position.

If the engineer desires to send twenty pounds pressure to the different brake cylinders, he turns the handle 166 until it is opposite the indicating mark 20 on the dial. This forces down the nut 156 and the movement is transmitted through the spring 155 to the piston and diaphragm, forcing the latter downward and nut 154 engages the stem 179 of the valve 178, thereby forcing the latter to open position and allowing the air to exhaust from the left hand end of the cylinder 108 through the port 182 to chamber 173, and port 176 to port 117, opening the check valve 127 and passing through the connection 107 to the pipe 85. The superior pressure from the main reservoir then acting on the right hand face of the piston 110 will force the latter to the left, moving the valve 114 to open position and allowing free passage of the main reservoir air through the port 115 and port 117 to the connection 85, the pressure being reduced at the check valve 127. The flow continues until the whole of the pipe 85 and all of the brake cylinders have been filled with air under twenty pounds pressure, and then this same pressure acting below the piston 153 will counter-balance the action of the spring 155 and compress the same to the extent of twenty pounds, thereby raising the piston and the nut 154 clear of the upper end of the stem 179, so that the valve 178 is free to close and prevent further passage of air from the left hand end of the cylinder 109. The main reservoir pressure will then continue to flow through the ports 183 and 182 until the pressure at the left of the piston 110 is sufficient to force it back to the closed position and the parts will then reassume normal position, while retaining twenty pounds pressure in the straight air pipe 85 and in the brake cylinder. Should the engineer desire to increase this pressure he moves the handle 166 to the desired point, for instance, until it is opposite the thirty, forty, fifty, or other mark, and thus forces the piston and diaphragm 152 downward until the valve 178 is again moved to open position and the same operation takes place until the back pressure in the straight air pipe equals the resistance offered by the spring and moves the spring upward for the purpose of permitting closing movement of the valve 178. In either instance the reduction of pressure at the brake cylinder or cylinders through any leakage in the train pipes will reduce the pressure that is acting to compress the spring 155, and the spring in expanding will again open the valve 178, so that sufficient air will pass through from the main reservoir to supply that lost by leakage, and this pressure may be maintained in the brake cylinders automatically and without regard to any leakage at the hose or other connections.

With a construction of this kind it is possible for the engineer in traveling down grade to maintain any desired degree of pressure in the brake cylinder independently of the automatic brake, and if the motion of the train is not checked quickly enough he may increase the pressure, or if the stoppage is too abrupt he may release the pressure by turning the handle 142. Aside from this, when the train has been brought to a full stop, it is not absolutely necessary to empty the brake cylinder before starting a second time. By manipulating the handle 142, the pressure in the several cylinders may be gradually reduced until the train starts and some pressure may still be maintained in the brake cylinders so that all of the air is not lost and work of the pump is thus materially reduced. It is possible, furthermore, to secure adequate braking effect by long continued application of air under comparatively slight pressure without the necessity of carrying the extremely high pressure, such as is now considered necessary on passenger service, these high pressures being very dangerous owing to the liability of bursting of the hose connections and consequent application of the brakes while the train is running at full speed.

In the description thus far, no mention has been made of any particular construction of triple valve, or other mechanism.

In order to arrive at a clearer understanding of the use and advantages of the invention, reference may now be made to Figs. 5 and 6, which illustrate, respectively, a peculiar form of triple valve and retaining valve which may be used in connection with the automatic valve, and which furthermore, are adapted for use in connection with an ordinary air brake system where continuous pressure is maintained in the train pipe, as practiced, for instance, in the Westinghouse, and New York systems. This triple valve is shown, described and claimed in another application filed by me Sept. 23, 1908 under Serial No. 454,313.

10 indicates a casing provided with the usual auxiliary reservoir connection 11 and brake cylinder connection 12, and at the lower part of the main portion of the casing is a conection 13 for the usual train pipe. The main body of the casing is bored out to form a cylinder 14 which contains a bushing 15, and in the bushing is mounted the main piston 16, the latter being arranged to uncover a feed groove 17 when in the full release position shown in Fig. 5, so that air may flow through to the auxiliary reservoir in the usual manner. The rear portion of the casing is in the form of a cylinder 19 which contains a bushing 20. The lower portion of the bushing is grooved out and faced to form a valve seat 21. In this valve seat are two ports 22 and 23, the port 22 leading to the brake cylinder, and the port 23 to the exhaust, or in the present instance, to the retaining valve connection shown in Fig. 6. This retaining valve, as will be hereinafter described, is for the purpose of holding the pressure in the brake cylinder when the triple valve is in full release position. It is also utilized for the purpose of retaining within the cylinder any pre-determined pressure of air, and for permitting alteration in the brake pressure. The upper portion of the bushing 20 is provided with a dove-tailed groove for the reception of a correspondingly shaped wedge block 25 that is adapted to form a stop to limit excessive inward movement of the main valve 27. The valve is in the form of a generally rectangular block, the upper face of which is inclined to correspond to the inclination of the lower face of the wedge block 25. In the lower portion of this valve are three ports 30, 31 and 32, the port 31 being in the form of a cavity through which the brake cylinder may exhaust to the port 23, while the other ports 30 and 32 are in communication with each other, and are utilized in the admission of air to the brake cylinder, the port 30 coming into play only during an emergency application. The larger port 32 of the valve opens at the bottom of said valve and the rear wall of said port is provided with a small opening or port 33 through which auxiliary reservoir pressure may pass on both service and emergency reductions. The valve is further provided with a longitudinal bore 35 which communicates through lateral ports 36 with the open space at the side of the valve. At the inner end of the bore is a tapered seat 37 which is arranged to be engaged by a stem 43, carried by the main piston. The rear side of the main casing is drilled out to receive an equalizing piston 42 which carries a pin 41 the pin passing through the rearwardly extending hollow hub of said piston, and the stem 43 and valve 27 being both provided with slots for the passage of the pin.

When parts are in the position shown in Fig. 5 the valve is in full release position with the brake cylinder in communication with the port 23 and the feed groove 17 is open so that air may freely pass from the train pipe connection 13 through the cylinder 14 to the equalizing piston. When a service reduction is made by movement of the usual engineer's brake valve to service position the piston 16 makes a full stroke and comes into contact with the wall of the cylinder at the extreme left, while the piston 42 is slightly retarded, owing to its connection with the valve and the frictional resistance offered by said valve. This will place the port 32 in communication with the brake cylinder port 22 and allow auxiliary reservoir pressure to pass to the brake cylinder. On an emergency reduction both pistons 16 and 42 move quickly to the left, and the port 30 is brought opposite a port 70 allowing air from the train pipe to pass to the brake cylinder, as well as permitting auxiliary reservoir pressure to pass to said brake cylinder. After either application of the brakes it is impossible to move the triple valve to auxiliary reservoir recharging position without also removing it to release position and this is a common fault of all commercial triple valves.

In carrying out the present invention, or rather in applying a triple valve in a straight air system, a retaining valve of the type shown in Fig. 6 is employed. At one side of the main valve casing, and preferably formed integral with, is a cylinder 80 having a bushing 81 in which is mounted a piston 82. The upper end of the casing communicates through a lateral port 84 with the pipe 85 that communicates with the automatic governor on the engine. A small strainer 86 is preferably introduced at the top of the bushing to prevent the entrance of dirt, and at the sides of the bushing is formed a small leakage groove 87. The lower end of the cylinder communicates with the port 23 constituting the exhaust of the triple valve, so that the piston 82 will be raised by the pressure of air escaping from the brake cylinder, and will be forced downward by the pressure of air entering through the pipe 85, as well as by its own weight. The lower end of the cylinder is threaded and receives a plug 90. This plug is centrally bored and provided with a bushing 91 in which is formed a tapered valve seat 92 for the reception of a valve stem 93 that is carried by the piston 82. The bore of the bushing communicates with the interior of the cylinder through lateral ports 94. If there is no pressure in the pipe 85, the exhaust passing from the brake cylinder to the ports 23 will raise the piston 82 and the air will escape through the ports 94 and the bore of the plug 90 to the outer air, thus releasing the brakes, but if the engineer wishes to retain the brake cylinder pressure he forces air through the pipe 85 by properly adjusting the automatic governor so as to hold the piston 82 down in place and thus prevent the escape of air from the brake cylinder, even after the triple valve has been moved to release position.

In general practice, it is usually found desirable to make either a service or emergency application by means of the automatic braking mechanism and after this has been made and the movement of the train partially checked, the automatic governor is set to retain the pressure which the engineer desires to hold in the brake cylinders. The engineer may then move the usual engineer's brake valve to release or running position and bring the triple valve to such position as to exhaust the brake cylinder. In exhausting, however, the air will pass under the piston of the retaining valve and will tend to raise the same, but will meet the pressure previously sent through the pipe 85 and which is then acting on the upper side of the piston of the retaining valve. If the brake cylinder pressure is superior the piston will be raised and brake cylinder air will escape to the atmosphere until the parts have been balanced, while the pressure in the brake cylinder will then remain exactly that which was sent by the engineer through the pipe 85, or if the engineer wishes to maintain a braking pressure greater than that which was in the brake cylinders, this greater pressure operating on top of the pistons of the retaining valves will hold the same down and the pressure will feed through the leakage ports around said pistons and enter the brake cylinders in the manner previously described in order to increase the brake cylinder pressure to the required point.

What is claimed is:—

1. In air brake systems, a controller casing having means for connecting the same to a compressed air reservoir and a straight air pipe, a primary valve for controlling the admission of air from the reservoir to the casing, a piston operating said valve, said piston being normally exposed on both sides to reservoir pressure and having another piston of less area attached to and spaced therefrom and exposed on one side to reservoir pressure and on the other side to atmospheric pressure, a secondary valve in constant communication with the compressed air inlet to the casing and acting to relieve the pressure on one side of the first named piston, and manually controllable means acting directly on said secondary valve for operating the same at will and at any time to cause the operation of the primary valve.

2. In an air brake system, a casing having means for connecting the same to a compressed air reservoir and a straight air pipe, a controlling valve in the casing, means for causing the operation of the controlling valve at will to charge the straight air pipe to chosen variable degrees, an automatic means for rendering said valve responsive to fluctuation of any established pressure in the straight air pipe, and a separate means in the casing for reducing the pressure in said pipe at will to either operative or inoperative amounts.

3. In air brakes, a compressed air reservoir, a straight air pipe, a casing with which both the reservoir and pipe communicate, a primary valve controlling the admission of air from the reservoir to the casing, an operating piston for said valve, said piston being normally exposed on both sides to reservoir pressure, a secondary valve for relieving the pressure on one side of said piston and thereby permitting opening of the primary valve, a spring closed valve tending to prevent the passage of air from the casing to the pipe, a cylinder arranged within the casing, a pair of bushings arranged in the cylinder, a diaphragm clamped between said bushings, pistons mounted in the bushings and rigidly connected to the central portion of the diaphragm, said pistons being arranged to operate the secondary valve, a spring tending to move said pistons to valve opening position, a recessed nut operating on one end of said spring, and means for turning the nut to vary the stress of the spring.

4. In air brake systems, a casing provided with connections for a compressed air reservoir and a straight air pipe, respectively, a differential valve in constant communication with the air reservoir connection, and housed in said casing, a conduit leading from the differential valve and controlled thereby and extending to the straight air connection another conduit within the casing leading from the differential valve and communicating with the straight air connection, a valve in said last named conduit, an elastically constrained member responsive to air coming from the reservoir and adapted to engage the last named valve, and manually adjustable means for regulating the elastically constrained member.

5. In air brake systems, a casing provided with connections for a compressed air reservoir and a straight air pipe respectively, a differential valve in constant communication with the air reservoir connection, a conduit leading from the differential valve and controlled thereby and extending to the straight air connection, another conduit leading from the differential valve and communicating with the straight air connection, a valve for said last named conduit, an elastically constrained member responsive to air coming

from the reservoir and adapted to engage the last named valve, manually adjustable means for regulating the elastically constrained member, and manually operable means for opening the straight air pipe to the atmosphere, the several parts being respectively in and carried by the casing.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

JOHN DILLANDER.

Witnesses:

CHAS. O. JONES,

F. L. DENISON.