(No Model.) 2 Sheets—Sheet 1.

C. T. BROWN.

RELIEF VALVE FOR AUTOMATIC AIR BRAKES.

No. 389,193. Patented Sept. 11, 1888.

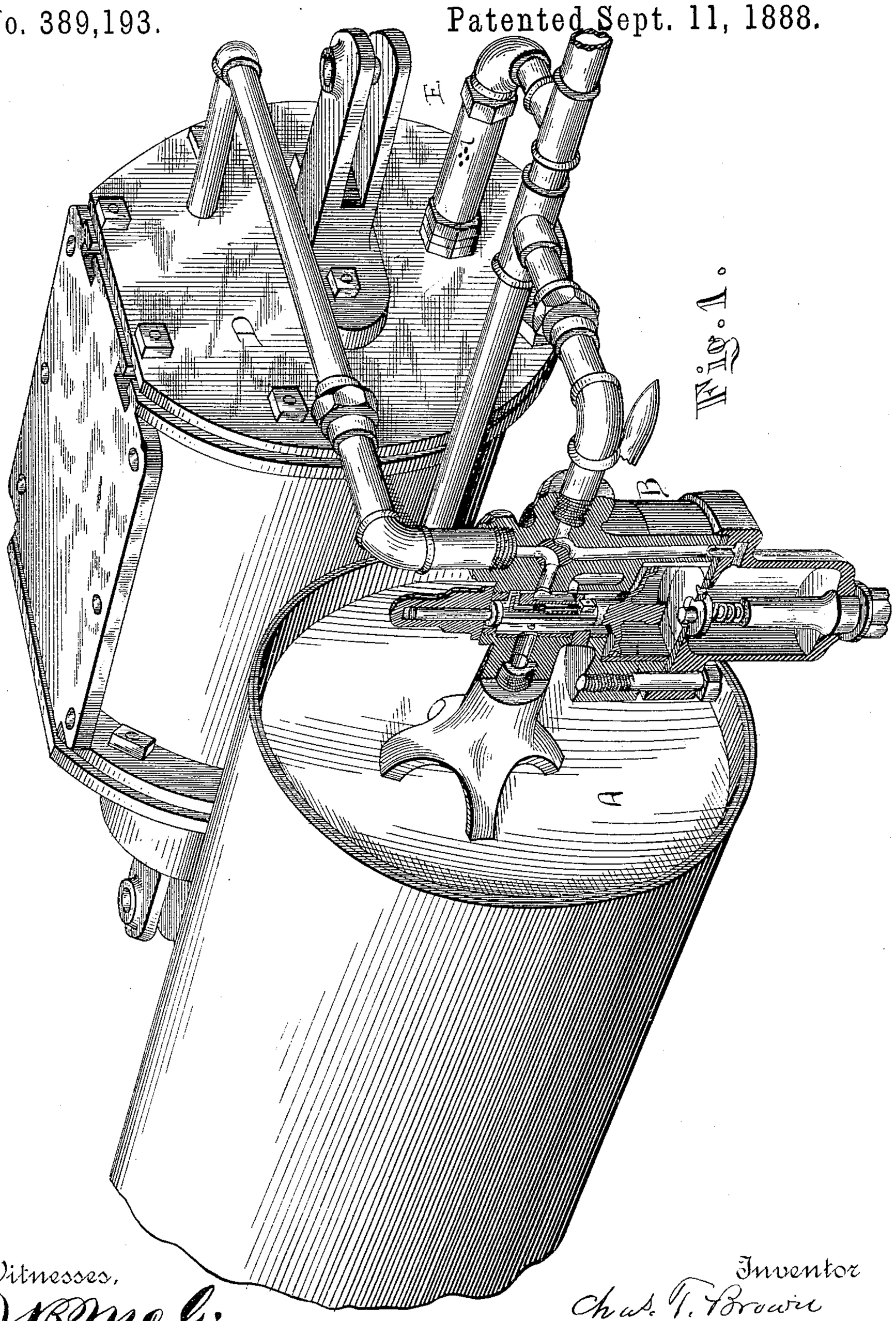

Fig. 1.

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(No Model.) 2 Sheets—Sheet 2.

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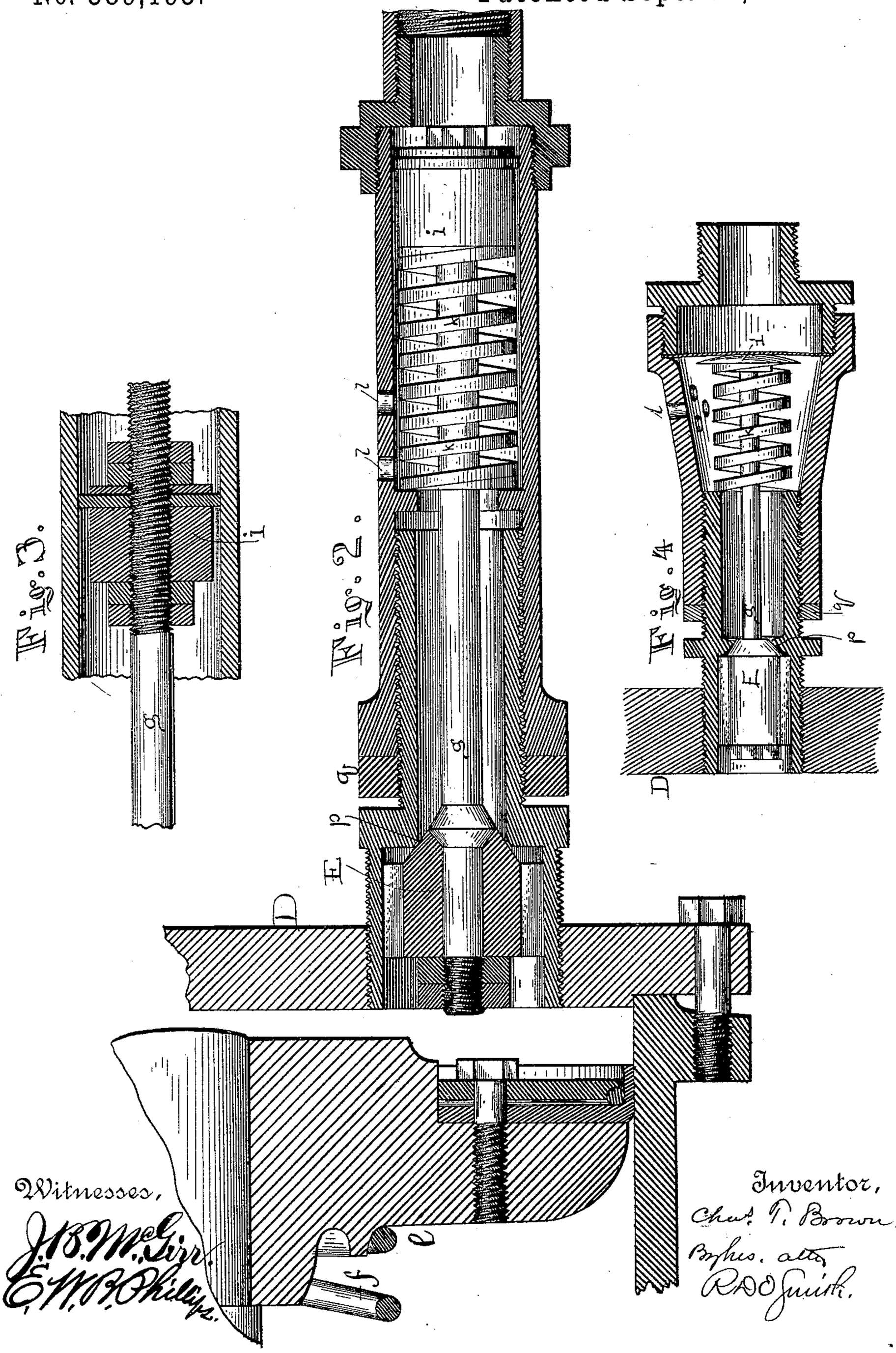

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UNITED STATES PATENT OFFICE.

CHARLES T. BROWN, OF INDIANAPOLIS, INDIANA.

RELIEF-VALVE FOR AUTOMATIC AIR-BRAKES.

SPECIFICATION forming part of Letters Patent No. 389,193, dated September 11, 1888.

Application filed September 3, 1887. Serial No. 248,712. (No model.)

To all whom it may concern:

Be it known that I, CHARLES T. BROWN, of Indianapolis, Marion county, Indiana, have invented new and useful Improvements in Air-Brakes for Railway-Cars; and I do declare that the following is a full and accurate description of the same.

In order to render the invention clear, I will first briefly describe the present air-brake apparatus, or one of them, most largely in use.

The air-compressing pump is located upon the engine and is under the immediate control of the engineer. Air is compressed into a main accumulator or receiver, and from that it is distributed through suitable train or air pipes, *c*, to an auxiliary receiver, A, under each car of the train. The triple valve B is placed in said air-pipe. Its office is to permit the air under pressure to enter slowly into said auxiliary reservoir until the pressure therein equals the pressure in the main receiver. Upon any diminution of pressure in the conducting-pipe *c*, the then superior back-pressure in the auxiliary reservoir A will cause the triple valve to open and admit air to flow from said auxiliary into the air-brake cylinder to operate the brake. To produce this effect, a valve is placed in said air-pipe convenient to the hand of the engineer, whereby the communication with the main reservoir is cut off at the same moment that it opens an escape for air within said pipe between the triple valve and the engineer's valve. Escape of air from the air-pipe *c* relieves pressure therein and sets up back-pressure in said auxiliary reservoir, and the triple valve is thereby actuated, as set forth. The engineer usually moves his valve slowly, so as not to permit sudden movement of the triple valve; but sometimes he fails to be sufficiently skillful or sufficiently cautious, and sometimes the escape of air from the pipe is the result of accident. Sometimes also, by reason of improper working of the pump governor, or other cause, the engineer suffers the air to be forced into the reservoir with a pressure too high, so that when the brake is operated it will be with too much pressure of the brake-shoes and arrest of the revolution of the wheels. This is highly objectionable, because the tread of the wheel is flattened by sliding on the rail, and the wheel rapidly spoils after that; also, when the brakes have all been set and it is desired to let them off, air is let into the air-pipe *c* under reservoir-pressure; but it frequently happens, from the length of the train and other causes, that the triple valves do not act with desirable promptness in releasing and discharging the brake-cylinders.

My invention has for its object to prevent the objectionable results arising from over-pressure or tardy release by providing a simple attachment which can be applied conveniently and at small cost to brake-cylinders now in use, and which will be very sensitive, prompt, and efficient in action.

Figure 1 is a perspective view of an auxiliary reservoir and the brake-cylinder with the triple valve and the connecting-pipes having my invention applied. Fig. 2 is a longitudinal section of my automatic relief-valve. Figs. 3 and 4 represent modifications.

D is the brake-cylinder, having within it a piston, *e*, and retracting-spring *f*, which tends to force said piston toward one end of the cylinder, and thereby retract the brakes. When air under pressure is admitted behind said piston, the spring is overcome and the brakes are forced against the wheels.

My relief-valve E opens inward as to the cylinder, and is applied to the brake-cylinder by boring through the head of the same and by screwing therein the end of the valve-case, as shown in Fig. 2. The outer end of the valve-case connects with the air-pipe *c*, as shown in Fig. 1, and is subjected to air-pipe pressure.

Pressure within the cylinder tends to close the valve E, and pressure within the air-pipe tends to open it; but said valve may be adjusted to balance between these two forces at any desired pressure, and will then stand open when the preponderance of pressure is in the air-pipe, and will stand closed when the preponderance of pressure is in the cylinder. When open, it provides free escape for air which enters the cylinder from the auxiliary reservoir under too great pressure, and said escape continues until the pressure has run down to the desired standard, and therefore renders it impossible to apply to the brake pressure sufficient to lock the wheels and make them slide.

The valve E fits a proper seat, *p*, in the valve-case, and is provided with wing-guides to keep it straight and allow free passage for air past it when open. The valve-stem *g* is rigidly attached at one end to said valve, and at the other end it is provided with a piston, *i*, which may be sliding or diaphragm, Fig. 2, 3, or 4, and is subjected to air-pipe pressure, which tends to keep the valve off its seat, while cylinder-pressure, if there is any, tends to close it upon its seat. In order to make these forces balance at different pressures, as desired, the valve is made with smaller area than the piston, and a spring, *k*, is applied to resist the movement of the piston, so that, supposing the valve and piston to be subjected to the same pressure, the smaller effect on the valve may be made up by the tension of the spring, so as to balance the larger effect on the piston. For instance, suppose the valve and piston areas to be as four to five, and the tension of the spring to be one. The valve and piston will balance when the tension of the spring equals one-fifth the air-pressure, and by varying the tension of the spring the valve and piston may be made to balance at a high or low pressure, as desired.

The valve-case is provided with holes *l* for the escape of air which passes the valve.

It will be understood that the structure shown and particularly alluded to may be greatly varied without changing its principle of operation or the effects produced.

The spring *k* may be constructed with a definite tension, and the valve-case and piston-rod may be designed so that said spring will when in place be subjected to a certain standard pressure, adapted to the standard air-pressure preferred; but no change can then be made in said standard without removing the spring and putting others in place. I therefore prefer a structure which will permit a change of spring-tension whenever desired. This may be accomplished in a variety of ways well known to mechanics—as, for instance, that shown in Fig. 3; but in my experiments I have found it convenient to make the change in tension without taking the apparatus apart, and have therefore made the case in two parts screwed together, as at *m*, and therefore easy to shorten or lengthen. One part has the spring-shoulder *n* and the other part has the valve-seat. As the valve-stem is not extensible, it follows that to increase the distance between the spring-shoulder and valve seat will increase the tension of the spring. A jam-nut, *q*, serves to prevent unintentional change in the relative position of the two parts of the valve-case.

The operation is as follows: Suppose the desirable pressure in the auxiliary reservoir to be eighty pounds per inch, but that the actual pressure in air-pipe and auxiliary has accumulated to one hundred pounds per inch. There would then be an excess of twenty pounds on the piston *n*, and the valve would remain open if air at one hundred pounds were admitted to the brake-cylinder until the air-pipe and auxiliary pressure has run down to eighty pounds, at which point the valve and piston will balance, and the valve will close the instant the air-pipe pressure falls below eighty pounds. When it is desired to let off the brakes, it is frequently found that the "triple" valve, by reason of its delicacy and liability to obstruction by slight causes, does not work promptly and the brakes are not quickly released. This difficulty is overcome by my valve, which is forced open immediately, when the air-pipe is filled again at maximum pressure and the cylinder exhausts independent of the triple valve.

Having described my invention, I claim—

1. In an automatic air-brake apparatus, the combination, with the brake-cylinder, the auxiliary reservoir, the triple valve, and the main air-supply pipe, of a valve-case having a valve-seat and applied to and communicating with said cylinder, a valve in said casing and opening inwardly into the brake cylinder, a piston of larger area than the valve and connected positively and moving with the same in said case, a spring for moving the piston and valve to close the latter, and a pipe or air-duct connecting the said air-supply pipe with the valve-case on the outer side of the piston, substantially as described.

2. In an automatic air-brake apparatus for railway-cars, and in connection with the brake-cylinder thereof, the auxiliary reservoir, and the triple valve, a valve, E, arranged to open inwardly as to said cylinder, a spring arranged to close said valve upon its seat, and a piston in line with and secured rigidly to said valve, and a connection with the air or train pipe communicating with the latter between the triple valve and the engineer's valve, whereby when the air-pressure in said train-pipe exceeds the standard maximum pressure for the brake-cylinder said valve will be kept open, for the purpose set forth.

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Witnesses:
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