No. 752,976. PATENTED FEB. 23, 1904.

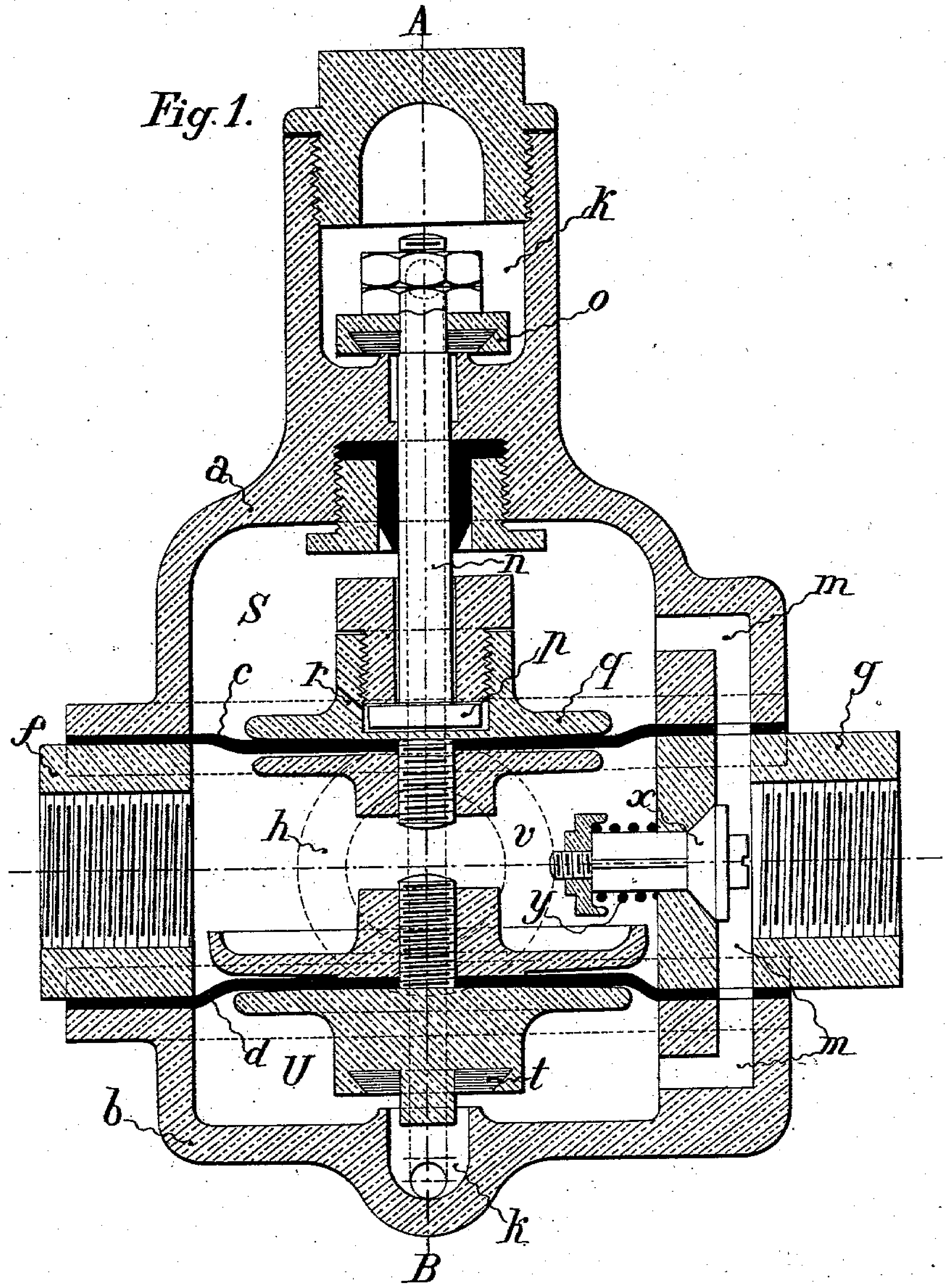
G. HOUPLAIN.

DISTRIBUTING VALVE FOR COMPRESSED AIR BRAKES.

APPLICATION FILED SEPT. 18, 1902.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1.



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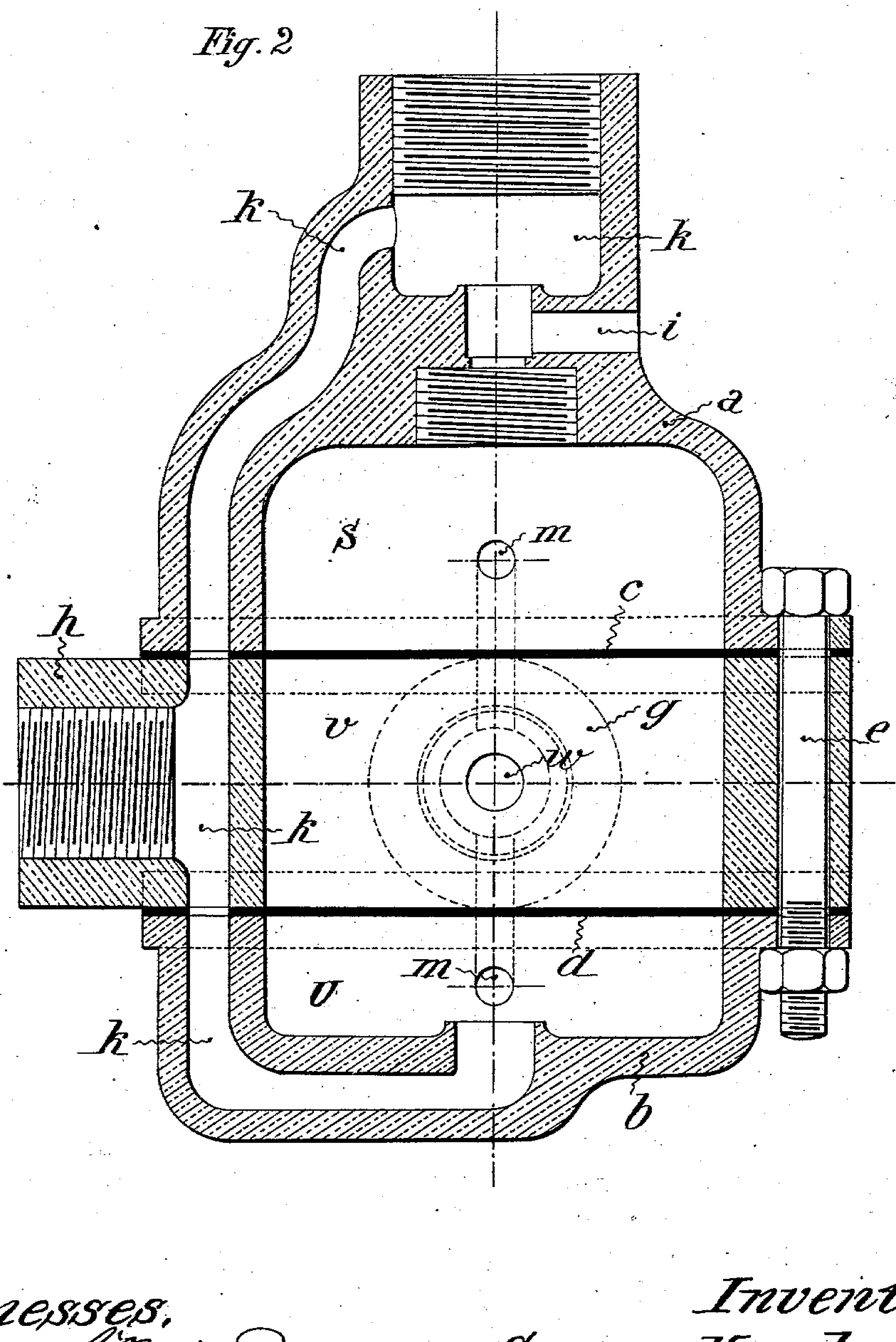
NO MODEL. 2 SHEETS—SHEET 2.

Fig. 2



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UNITED STATES PATENT OFFICE.

GEORGES HOUPLAIN, OF PARIS, FRANCE.

DISTRIBUTING-VALVE FOR COMPRESSED-AIR BRAKES.

SPECIFICATION forming part of Letters Patent No. 752,976, dated February 23, 1904.

Application filed September 18, 1902. Serial No. 123,924. (No model.)

To all whom it may concern:

Be it known that I, Georges Houplain, engineer, a citizen of France, residing at Paris, France, have invented certain new and useful Improvements in Distributing-Valves for Compressed-Air Brakes, of which the following is a specification.

This invention relates to an improved distributing-valve for brakes worked by elastic fluids.

Distributing-valves at present employed, and more particularly the Westinghouse triple valve, present series objections. They are not capable of regulation—that is to say, they do not allow of the braking effort being graduated at will, either during the braking action or during the loosening of the brakes. Furthermore, as the piston of these distributing-valves is subjected on the one side to the pressure from the main or train pipe and on the other side to the pressure existing in the auxiliary reservoir and in the brake-cylinder (which communicate during the application of the brakes) it is necessary in order to effect the full application of the brakes on all the coaches that the lowering of pressure in the main or train pipe be higher than the expansion of the air from the reservoir in these cylinders, and which expansion increases with the wear of the brake-blocks. If, for example, the auxiliary reservoir contain twenty-five liters and the brake-cylinder five liters with new brake-blocks and ten liters with worn brake-blocks and if the service-pressure be five kilos, the pressure will not be more than three kilos six hundred grams during the braking, the expansion will therefore be one kilo four hundred grams, and the lowering of pressure effected in the main or train pipe by the engineman must exceed one kilo four hundred grams. Without this the coaches would not all be braked, which would produce violent shocks between the couplings. These distributing-valves are also such that during the removal of the brakes they establish communication between the auxiliary reservoir of each coach and the main or train pipe. The result therefore naturally is undue slowness in the removal of the brakes, as the compressed air introduced into the main or train pipe raises not only the pressure of the air in the main or train pipe, but also that in the auxiliary reservoirs of those coaches on which the brakes are first slackened. Lastly, a train provided with these distributing-valves cannot slacken its speed without being braked as for a complete stoppage, as it is impossible to effect throughout all the coaches a moderate braking, and if the engineman wishes to start afresh he is obliged to wait until the slackening of all the brakes is completed, as without this he exposes himself to the risk of a rupture of the couplings, owing to the fact that the tail end of the train is still braked, while the application of brakes at the head end of the train has taken place. The distributing-valve forming the subject of the present invention obviates these objections: First, it allows of the braking effort being graduated at will while tightening up. This arises, first, from the fact that there is an independent piston for each function of the distributing-valve—viz., one piston for controlling the communication between the auxiliary reservoir and the brake-cylinder and another piston for controlling communication between the brake-cylinder and the atmosphere—and then from the fact that during the tightening up of the brakes there exists always a constant ratio between the air-pressures of the auxiliary reservoir and the main or train pipe. It is therefore possible to impart to the first of these pistons various movements in both directions, which cannot be done with the Westinghouse triple valve. Hence it follows that with my improved distributing-valve the pressure in the brake-cylinder can be caused to rise progressively up to its maximum (which varies with each coach) by progressively lowering the pressure in the main or train pipe. Second, it allows of the brakes being removed at will without having to fill the auxiliary reservoirs. This result is obtained, on the one hand, by means of the arrangement of a special piston for the removal of the brakes and, on the other hand, by means of a slight difference between the air-pressure in the auxiliary reservoirs and the main or train pipe. During normal running this difference of pressure allows of a margin in which the brake-releasing piston can be caused to work without acting on the other parts of the distributing-valve, and so release all the brakes without sending air into the auxiliary reservoirs, whence a greater rapidity in taking off the brakes.

In order that my invention may be readily understood, I will describe the same fully with reference to the annexed drawings, wherein—

Figure 1 is a vertical axial section of the apparatus; and Fig. 2, a section on the line A B of Fig. 1, the pistons having been removed.

The body or casing of my improved distributing-valve, hereinafter called "distributer," consists of an upper part *a*, carrying the valve for the release of the brakes, a lower part *b*, carrying the valve for putting on the brakes, and an intermediate part arranged between the preceding ones, two diaphragms *c* and *d* or pistons furnished with rings being interposed. These three parts are securely connected together by means of a series of bolts *e*, arranged around the apparatus. The intermediate part is provided with three radially-arranged tubular extensions, that marked *f* connecting the distributer to the main or train pipe, that marked *g* connecting it to the auxiliary reservoir, and that marked *h* putting the apparatus into communication with the brake-cylinder. The part *a* is formed with a port *i*, through which the distributer communicates with the atmosphere.

In each of the three parts of the distributer two passages *k* and *m* are formed and are so arranged as to correspond with each other when the three parts are in place. The diaphragms *c* and *d* are perforated in the straight portion of these passages.

To the diaphragm *c* is connected the stem *n* of a valve *o*, which is capable of establishing or intercepting communication between the passage *k* and the port *i*. The head *p* of said stem *n* is free to move slightly in the piece *q*, which connects it to the diaphragm *c* and which is provided with a hole *r* for causing the chamber in which the head *p* is located to communicate with the chamber S, situate above the diaphragm *c*.

The diaphragm *d* carries a valve *t*, capable of establishing or intercepting communication between the passage *k* and the chamber U, situate below this diaphragm.

The chamber *v*, comprised between the two diaphragms *c* and *d* and into which opens the tubular extension *f*, coming from the main or train pipe, communicates with the passage *m* and extension *g*, which latter leads to the auxiliary reservoir by means of an orifice *w*, closed by a valve *x*, which is kept constantly on its seat by a spring *y*.

The following is the working of my improved distributer: During the normal running of the train the service-pressure in the main or train pipe prevails in the chamber *v*. This pressure forces the valve *x* to open, so allowing the air from the main or train pipe to fill the auxiliary reservoir, as well as the chambers S and U, through the passage *m*. So soon as the pressure of the air contained in the reservoir and in the chambers S and U has become equal to the service-pressure less the amount equivalent to the tension of the spring *y* the valve *x* recloses. For instance, if the power of the spring *y* be equal to about three hundred grams and if the service-pressure in the main or train pipe be five kilograms the normal pressure in the reservoir and in the chambers S and U will be only four kilos seven hundred grams. In these conditions the valve *o* rises and the valve *t* closes. In this way the brake-cylinder communicates with the atmosphere through the passage *k* and port *i*. So long as the pressure in the main or train pipe is higher than four kilos seven hundred grams no movement will be produced in the apparatus; but immediately the pressure in the main or train pipe falls below four kilos seven hundred grams the diaphragms *c* and *d* approach each other, the valve *o* will close and shut off the brake-cylinder from the atmosphere, while the valve *t* will rise and will put the brake-cylinder *h* into communication with the auxiliary reservoir through the passages *k* and *m*. The air contained in the reservoir *g* and in the chambers S and U will expand in the brake-cylinder *h* until its pressure becomes very slightly lower than the pressure which at this moment prevails in the chamber *v*. Thereupon the diaphragm *d* will be lowered, and the valve *t* will cut off communication between the brake-cylinder and the auxiliary reservoir; but the diaphragm *c* will remain lowered, as the differences of the pressures which are exerted on the two surfaces being very slight the pressure of the air contained in the brake-cylinder is exerted through the passage *k* on the valve *o* and keeps it down on its seat. The valve *t* will therefore establish communication between the auxiliary reservoir and the cylinder when the pressure in the passage is lower than four kilos seven hundred grams, and if the engineman desires to effect a slight application of the brakes he regulates, for instance, the pressure in the main or train pipe to substantially four kilos six hundred grams and will by such action supply the brake-cylinder with an amount of air equal to the volume contained in the auxiliary reservoir multiplied by one hundred grams. This regulation will occur on all of the coaches, and a simultaneous application of the brakes will thus be obtained. The application of the brakes can be gradual, as required, by varying the air-pressure in the main or train pipe. To take off the brakes it will be sufficient to return the air to the main or train pipe. The pressure will increase in the chamber *v* and will be higher than that in the chambers S and U. When this difference is sufficient to open the valve *o*, the removal of the brakes will take place.

I will now consider some different cases which might arise.

First. In the case of a moderate application of the brakes the pressure in the auxiliary reservoirs is practically the same as in the main or train pipe. Hence for all the vehicles the force which holds down the valve *o* is therefore that of the pressure of the air in the cylinders, as the surface of the valve *o* is very small relatively to that of the diaphragm *c*. The removal of the brakes will be simultaneous on all the vehicles.

Second. In the case of strong application of the brakes the pressure in the auxiliary reservoirs differs with every carriage. The removal of the brakes will therefore not be absolutely simultaneous; but by reason of the spring *y*, which is adjusted therefor, the removal of the brakes will take place more rapidly than with other distributing-valves, as the air sent into the main or train pipe cannot enter the auxiliary reservoirs until the resistance of the spring has been overcome. Again, after having commenced the removal of the brakes I can by further exhausting a little of the air in the main or train pipe keep up any desired brake-power. The brake will therefore be regulatable both at the time of putting on or of taking off.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim, while reserving to myself the right to introduce therein all modifications capable of facilitating the working of the same, is—

A distributing-valve mechanism for fluid-pressure railway-brakes comprising a piston for establishing communication between the auxiliary reservoir and the brake-cylinder, a piston for establishing communication between the brake-cylinder and the atmosphere, a chamber between the said pistons, and a spring-controlled valve in said chamber for regulating the passage of air from the train-pipe to the auxiliary cylinder.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

GEORGES HOUPLAIN.

Witnesses:

EDWARD P. MACLEAN,

ALFRED FREY.