No. 733,195. PATENTED JULY 7, 1903.

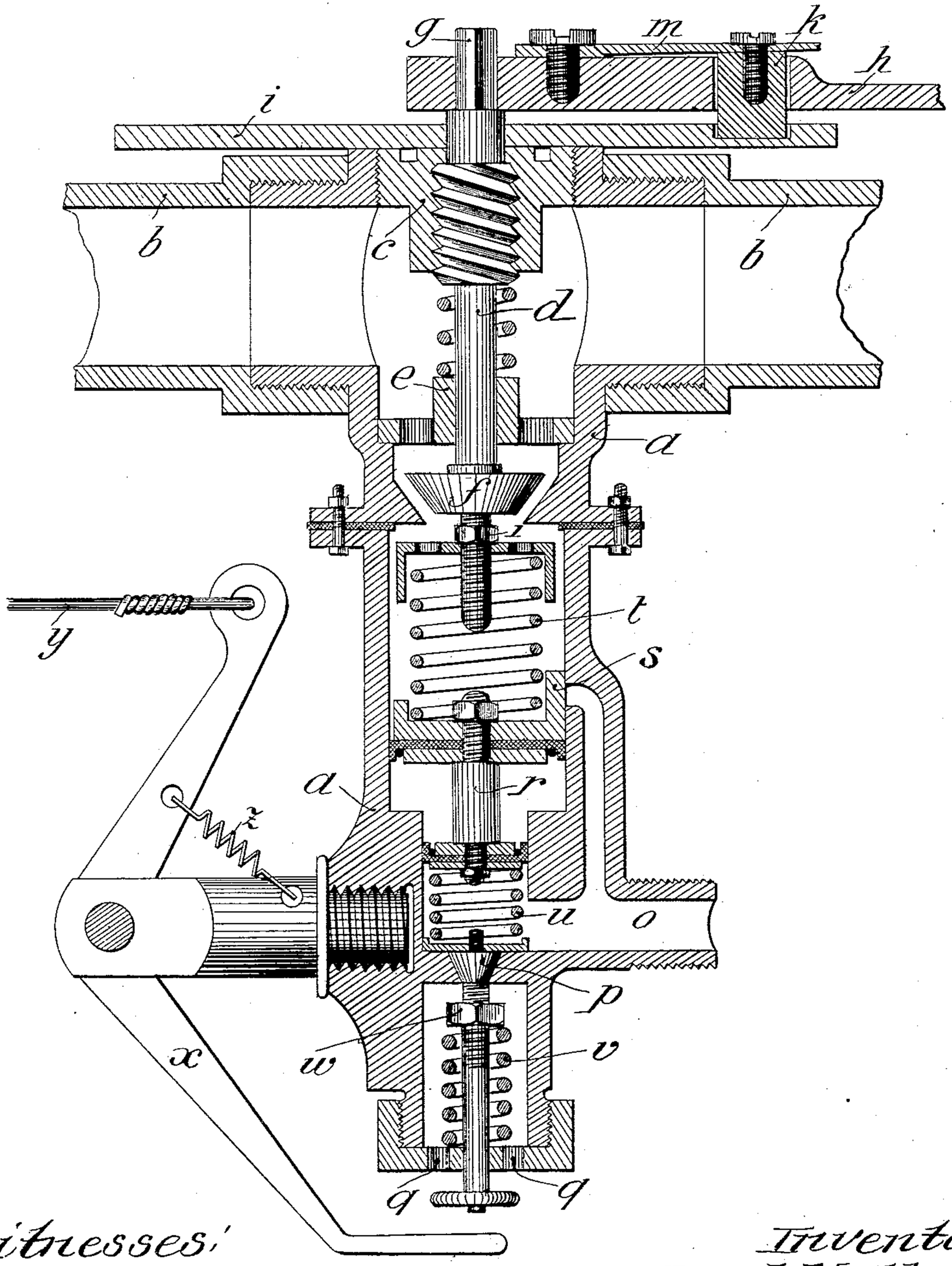
P. HALLOT.

RAILWAY BRAKE.

APPLICATION FILED JULY 18, 1901.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1



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NO MODEL. 2 SHEETS—SHEET 2.

FIG. 2.

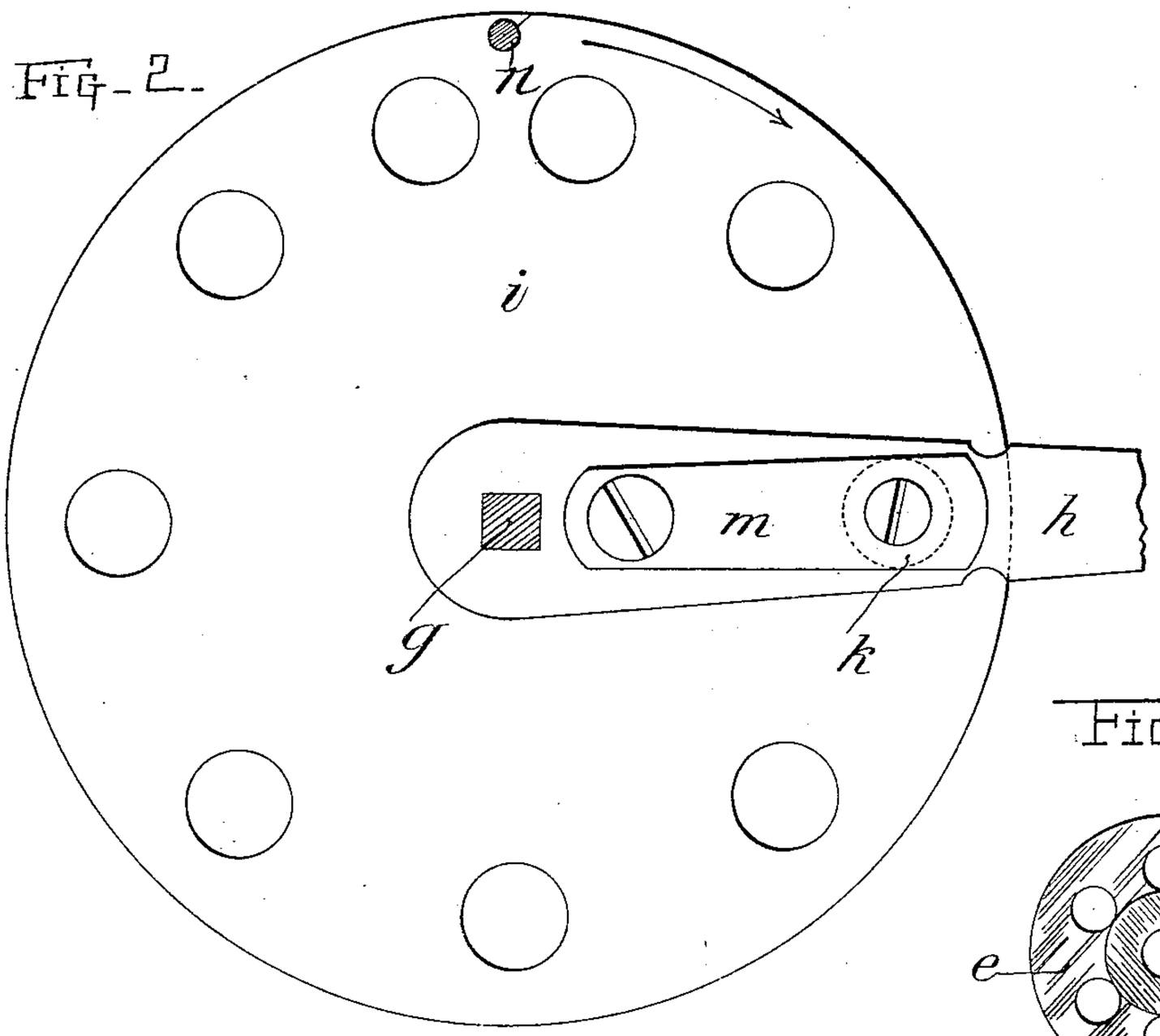


FIG. 3

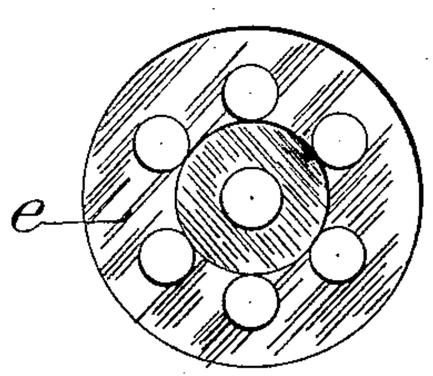
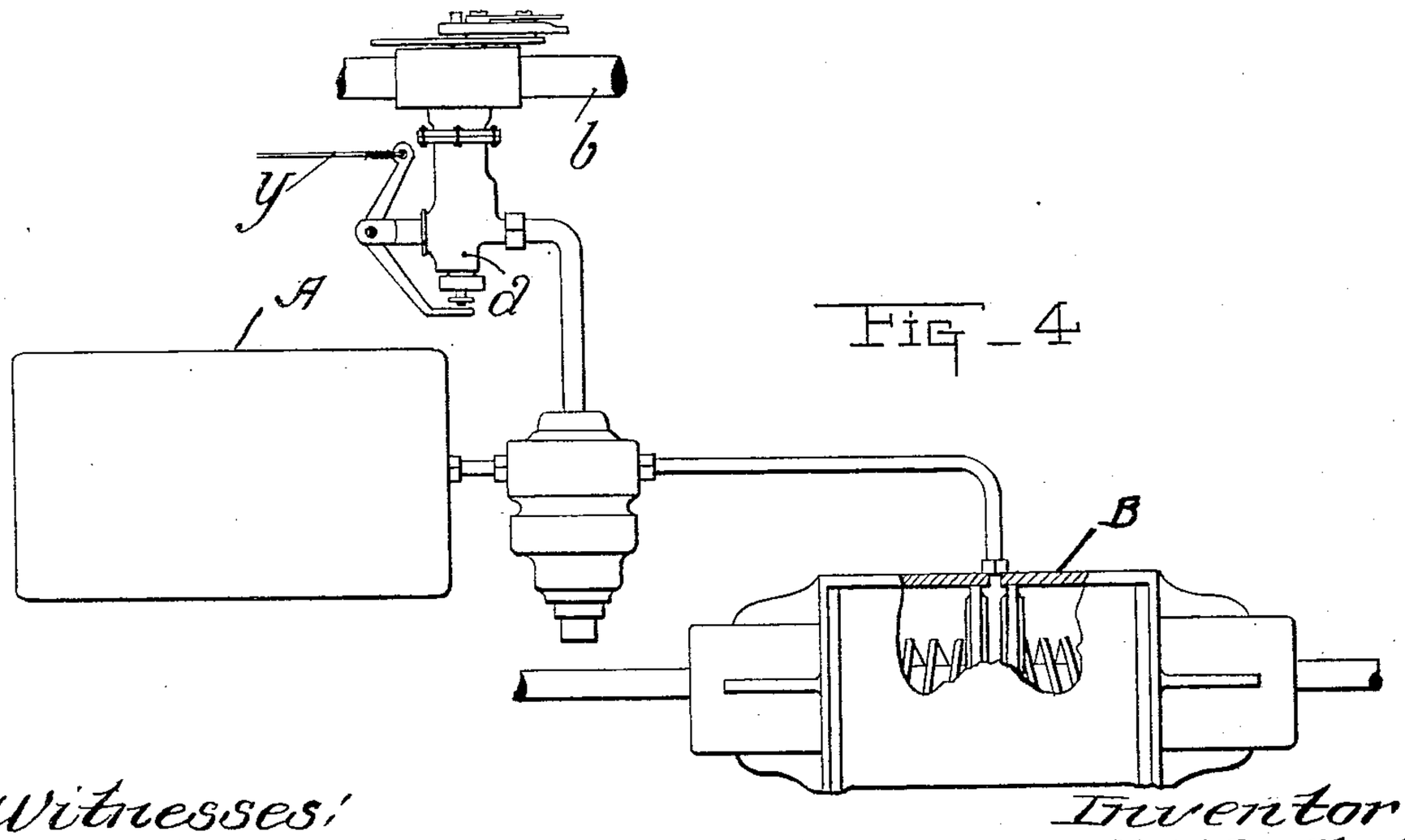


FIG. 4



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UNITED STATES PATENT OFFICE.

PAUL HALLOT, OF VINCENNES, FRANCE.

RAILWAY-BRAKE.

SPECIFICATION forming part of Letters Patent No. 733,195, dated July 7, 1903.

Application filed July 18, 1901. Serial No. 68,840. (No model.)

To all whom it may concern:

Be it known that I, PAUL HALLOT, engineer, a citizen of France, residing at 79 Rue de Fontenay, Vincennes, France, have invented certain new and useful Improvements in Railway-Brakes, of which the following is a specification.

This invention relates to an apparatus adapted for use in connection with air-brakes in which the brake-blocks are applied by a decrease of the pressure in the main pipe and the brake-cylinder and which is further adapted to be located on each coach provided with a brake between the main pipe and the cylinder.

The object of this apparatus is to regulate the admission of the air into the cylinder for each coach according to the place which the coach occupies in the train and of subsequently allowing the air to escape at the right moment and in the desired proportions.

The apparatus of this kind at present in use comprise a movable device or piece which is set in action automatically by the fall in pressure and the working of which varies, therefore, with the pressure at the moment and with the extent of the reduction in pressure. These apparatus are unable to work at all if a grain of sand should get between the movable valve and its seating, or if they become frozen, or from wear of the parts, &c. In any case they only work at a considerable reduction in pressure, and they cannot be adjusted or regulated.

In the annexed drawings, Figure 1 is a section taken through the axis of the apparatus. Fig. 2 is a plan of the upper part thereof. Fig. 3 shows in plan a detail of the apparatus. Fig. 4 shows an elevation of the pressure-regulating mechanism communicating with the train-pipe, the brake-cylinder, and the auxiliary air-reservoir.

The apparatus consists of a metal box or casing *a*, formed in two parts to facilitate its being put together. The upper part is provided with two unions, so that the apparatus may be interposed in the main pipe *b*, and it is closed by a screw-plug *c*, through which passes a strong screw *d*, which is guided by the centering-ring *e*. (Shown in plan in Fig. 3.) The spindle of the screw *d* is furnished near one end with a conical head *f*, and the other end terminates in a square portion *g*, which allows of the screw being turned by means of a hand-lever *h*. The thread of the screw *d* and the angle of the valve-cone *f* are so proportioned and adjusted that a rotation of three hundred and fifty degrees completely closes the passage between the two portions of the box or casing *a*. To partially close this passage to certain strictly fixed and invariable degrees, according as the apparatus is located more or less closely to the source of the pressure reduction, it is sufficient to place the hand-lever *h* in an intermediate position and to keep it there. For this purpose said hand-lever can be moved over a plate *i*, Fig. 2, provided with depressions or notches, into which a plug *k*, actuated by a spring *m*, enters. A stop *n* prevents the hand-lever making a complete revolution.

The lower part of the apparatus communicates, by means of the passage *o*, with the cylinder in which the fall of pressure takes place and with the atmosphere through the valve *p* and the orifices *q*. In this lower part is a movable differential piston *r*, the cup-leathers of which face each other, and the area of the two piston-heads is in proper ratio, which depends upon the type of brake. In the following description it is assumed that the ratio is equal to six. The larger head of the differential piston *r* carries a slide-valve *s* for closing the communication between the passage *o* and the upper part of the apparatus. A spring *t* is inserted between the valve-cone *f* and this larger head, the power of said spring being the greater the farther the screw *d* is lowered. Furthermore, its initial tension may be adjusted at will by means of the nut *l*. Another spring *u* is inserted between the smaller head of the piston *r* and the valve *p* and tends to keep the said valve closed. A third spring *v* tends constantly to raise the valve *p* with a force which can be adjusted by turning the nut *w*. By means of the cranked lever *x* this valve *p* can be opened, and thereby bring about a reduction of pressure in the cylinder by a simple pull on the rope *y*, the spring *z* serving to restore the lever *x* to its normal position. This being so, we will now consider the apparatus in the position shown in Fig. 1. If the main pipe be charged, the differential piston *r* descends

and allows the air to enter the lateral passage *o*, the cylinder, and the space between the two heads of the piston *r*, thereby pressing out their cup-leathers. The air gains admission to the space between the two heads of the piston *r* through the leather cap of the lower piston. At this moment an equal pressure of air exists on the four faces of the two piston-heads, which are therefore in equilibrium, and the differential piston *r* rises under the preponderating action of the spring *u*, at the same time cutting off communication between the main conduit *b* and the passage *o*. The sensitiveness of the piston-rod is determined by the friction of its leathers along the walls of the cylinder and also by the tension of the springs *t u v*. The initial sensitiveness of the differential piston *r* is, for example, set at three hundred grams. This sensitiveness will be diminished by the partial rotation of the hand-lever *h*, it being assumed, for example, that the position of said lever *h*, Fig. 2, corresponds to an overcharge of the valve of one hundred grams, the result being that the differential piston *r* will only commence to move under a variation in pressure of four hundred grams. It is assumed that the force for imparting a movement to the piston notwithstanding the friction corresponds to a reduction of three hundred grams in the main pipe and that the force for imparting a movement to the piston, notwithstanding the tension of the springs, is one hundred grams, so, therefore, is obtained the said four hundred grams that are necessary to impart a movement to the piston. As long as pressure in the main pipe is greater than three thousand six hundred (four thousand minus four hundred) the piston *r* rests immovable. Assuming that, as a rule, the pressure in the main conduit or piping *b* is four thousand grams and that a slight reduction in pressure takes place therein—two hundred grams, for example—nothing will take place in the apparatus, and any further reduction in pressure can even be made without any result so long as it does not exceed four hundred grams; but as soon as the pressure in the main conduit becomes reduced to three thousand six hundred grams the differential piston *r* will be raised by reason of the excess of pressure of four hundred grams on the lower face of this piston. The spring *u* will expand, and the valve *p* will open under the action of the spring *v*, which has become preponderant. The air in the cylinder will therefore escape rapidly into the atmosphere until the reduction of pressure under the smaller piston-head becomes equal to six times four hundred grams, since the said piston-head is six times smaller than the larger one, and when the pressure in the cylinder has fallen to sixteen hundred grams the differential *r* (between the pistons of which always exists the initial pressure of four thousand grams) will no longer be influenced except by the action of the springs *t*, *u*, and *v*. If, for instance, a force of four hundred grams be necessary to reclose the valve *p*, it is clear that the differential piston will not descend, and this closure will only be effected when the pressure in the cylinder has fallen to twelve hundred grams. The apparatus will assume the position shown in Fig. 1, with the following pressures: three thousand six hundred in the main conduit or piping *b*, four thousand between the heads of the pistons *r*, twelve hundred in the passage *o* and the cylinder. This considerable fall in pressure in the cylinder results in a very great braking power, and this power is obtained by a simple reducing in pressure of four hundred grams in the main conduit or piping. To moderate this power in case the engineman deems it too considerable, it is only necessary to slightly increase the pressure in the main conduit *b*, this increase of pressure causing the differential piston to fall and to open the port in the passage *o*. The braking power can therefore be diminished gradually until complete removal of the brakes, if necessary, while recharging simultaneously the main conduit.

The advantages of this system are obvious, as it allows of the braking of a train under theoretical conditions, viz:

First. The quickest possible application of the maximum pressure upon the brake-blocks.

Second. The gradual diminution of the pressure, so as to avoid the skidding of the wheels, which would take place by reason of the coefficient of friction between the brake-blocks and the tire of the wheel increasing with the decrease in the rate of rotation of the wheel. The coefficient of friction between the brake-blocks and the tire of the wheel increases with the time of application; the longer the blocks are applied the greater the coefficient. If, therefore, the pressure was not decreased on the blocks, the wheels would rapidly be skidded.

Third. The very rapid removal of the brakes, so as to avoid rupture of couplings.

In the system which has just been described the "taking off" of the brakes only requires the introduction of a very small quantity of air into the main conduit, for even in extreme cases (emergency stoppages) the pressure to be reinstated in the conduit for taking off the brakes is at most four hundred grams.

This apparatus renders it possible by the simple setting of the hand-lever *h* at the desired place to retard the action of the head brakes in order to obtain simultaneousness of application of all the brakes of the train. The position of the valve *f* is set by means of the hand-lever *h*, as heretofore set forth. (See Fig. 2 of the drawings.) The operation of the piston is as follows: When the pressure in the main pipe is four thousand, this pressure is the same in the whole apparatus, as heretofore set forth. When the pressure is, for example, three thousand eight hundred in the main pipe, the reduction of two hundred grams seeks to raise the piston *r;* but this is

not sufficient to overcome the friction of the leathers and the tension of the springs, as hereinbefore set forth. The piston will only undergo motion when the reduction of pressure attains three hundred grams. When the pressure in the main pipe falls to three thousand six hundred, the piston *r* rises, as heretofore set forth. The pressure in the main pipe is never allowed to fall below three thousand six hundred. When it increases, the piston falls, uncovers the passage *o*, and the air from the main or train pipes fills the brake-cylinder until equilibrium is again attained. For the head coaches the valve *f* almost completely closes the passage between the two portions of the apparatus, at the same time overcharging the differential piston *r* and the valve *p;* but for the tail coaches said passage is fully open and the sensitiveness of the differential device is at the maximum. By all these means combined the braking of the tail coaches is thus facilitated and that of the head coaches is retarded.

As seen, the screw-spindle *d* is rigid. It is adjusted at the time of making up the train, according to its place therein, and from that moment it remains stationary whatever the pressure in the main conduit and the reduction in pressure caused therein. The initial sensitiveness of the differential piston *r* may be adjusted at will by the nuts *w* and *l*, so as to effect the comparability of the apparatuses, without which the subsequent adjustment by setting the hand-lever *h* would be deceptive. This setting has the effect of causing the degree of this sensitiveness to vary, according to the place of the apparatus on the train.

In Fig. 4 is shown the pressure-regulating-valve mechanism connected to the train-pipe *b* and communicating with the auxiliary reservoir A and the brake-cylinder B.

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

1. In a fluid-pressure railway-brake, the combination with the train-pipe and the cylinder in which the lowering of pressure is to be effected, of a regulating mechanism communicating with said pipe and adapted to retard the action of the head brakes relatively to that of the tail brakes and thus effecting the simultaneous action of all the brakes of the train, a screw-threaded valve-stem connected with and adapted to adjust said mechanism to obtain the aforesaid operation, and a lever for controlling the said stem.

2. In a fluid-pressure railway-brake, a pressure-reducing mechanism communicating with the main pipe and with the cylinder in which the lowering of pressure is to be effected, said mechanism comprising in its construction an adjustable means for cutting off communication between the upper and lower portions of said pressure-reducing mechanism, a slide-valve for cutting off communication between said mechanism and said cylinder, a differential piston for operating said slide-valve, and means for cutting off communication between said mechanism and the atmosphere.

3. A pressure-regulating mechanism for railway-brakes comprising in its construction, a conical head for regulating the supply of air from the train-pipe, a slide-valve, a differential piston carrying the slide-valve, an exhaust-valve, means for operating the exhaust-valve, and means for fixedly adjusting the conical head.

4. A pressure-regulating mechanism for railway-brakes comprising in its construction a conical adjustable head for regulating the supply of air from the train-pipe, a slide-valve, a differential piston carrying the slide-valve, springs for connecting the slide-valve to the said head, an exhaust-valve, means for operating the exhaust-valve, and means for adjusting the conical head.

5. In a fluid-pressure railway-brake, a pressure-regulating mechanism communicating with the train-pipe and with the cylinder in which the lowering of pressure is to be effected, said pressure-regulating mechanism provided with a differential piston whose cup-leathers face each other so as always to preserve between the two heads of the piston the maximum pressure for the purpose of effecting the braking, an adjustable valve-stem, an upper and lower spring for controlling the sensitiveness of the piston, and means for operating the said stem.

6. A pressure-regulating mechanism for railway-brakes comprising in its construction a casing, a conical head operating in the casing and adapted to regulate the supply of air from the train-pipe, means connected to said head for fixedly adjusting it, a slide-valve, a differential piston carrying the said valve, a spring interposed between said means and valve, an exhaust-valve, a spring interposed between the piston and said exhaust-valve, and means for operating the exhaust-valve.

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

PAUL HALLOT.

Witnesses:
ALFRED FREY,
EDWARD P. MACLEAN.