No. 775,141. PATENTED NOV. 15, 1904.

G. E. HOUPLAIN.

COMPRESSED AIR BRAKE.

APPLICATION FILED JUNE 14, 1904.

NO MODEL.

Fig. 1

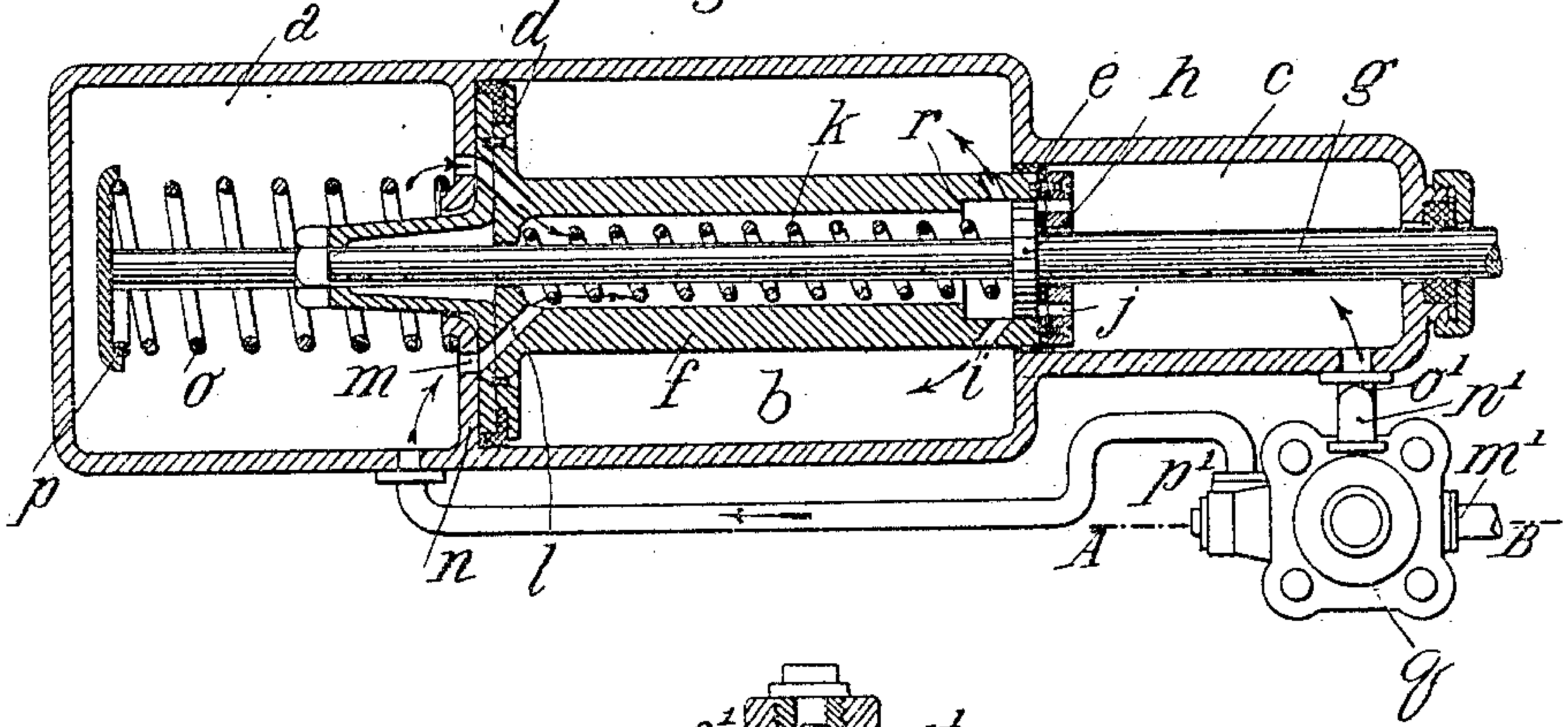


Fig. 2

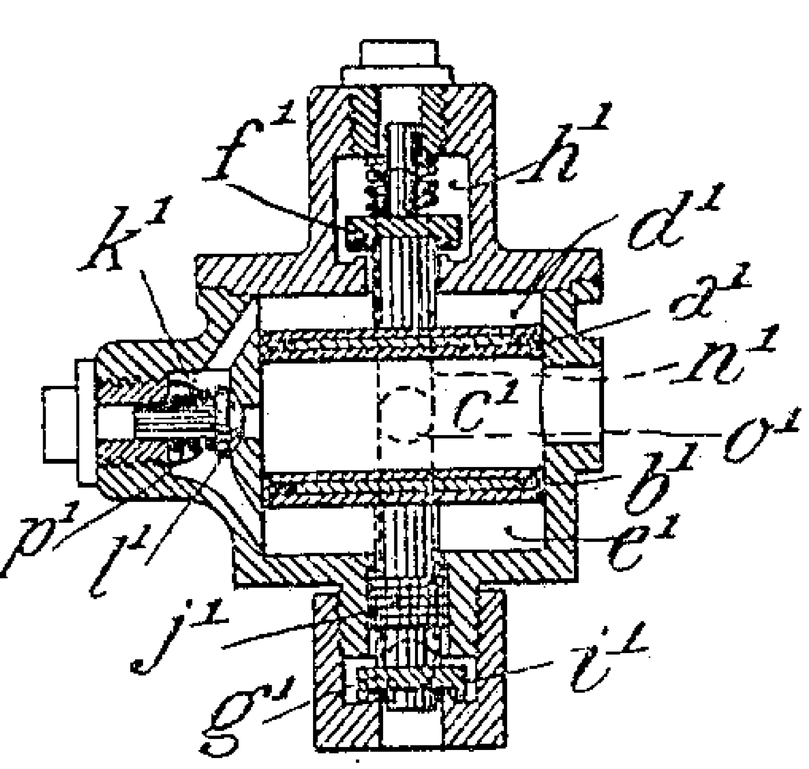


Fig. 3

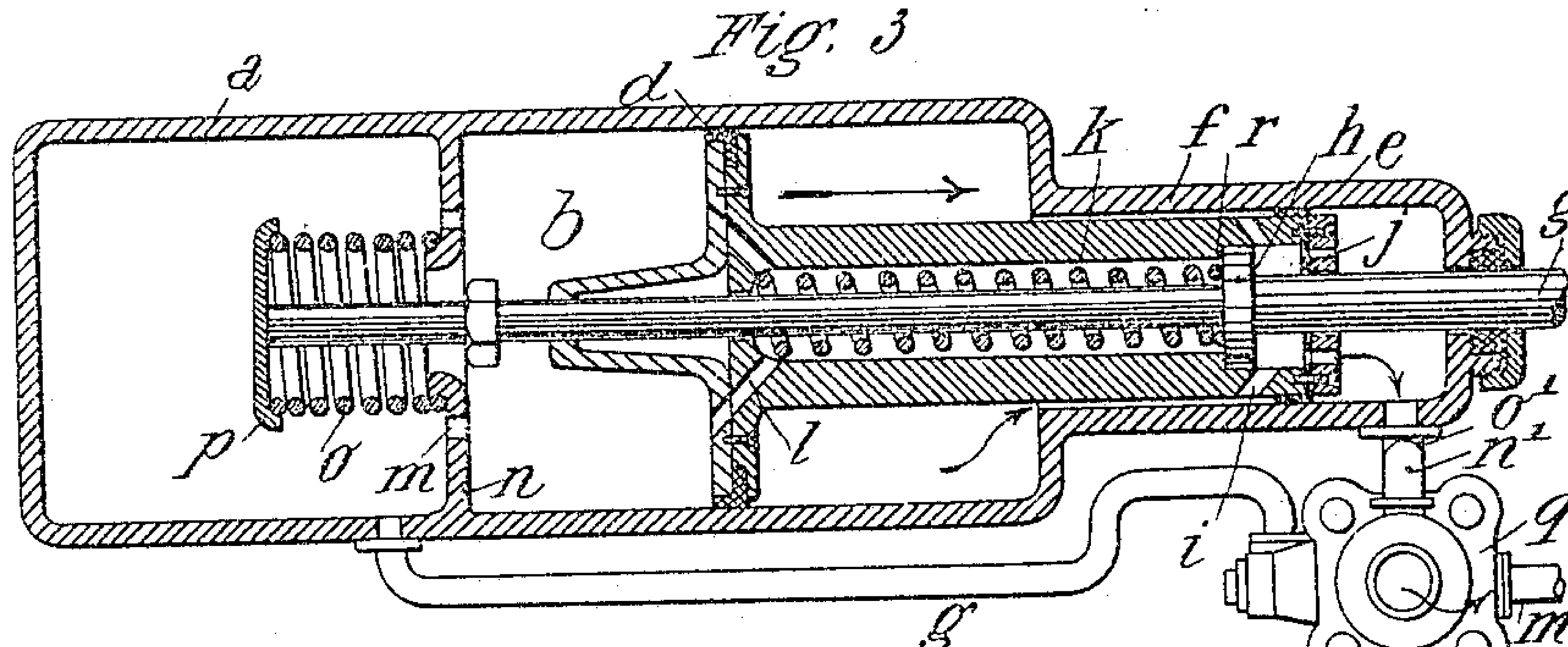
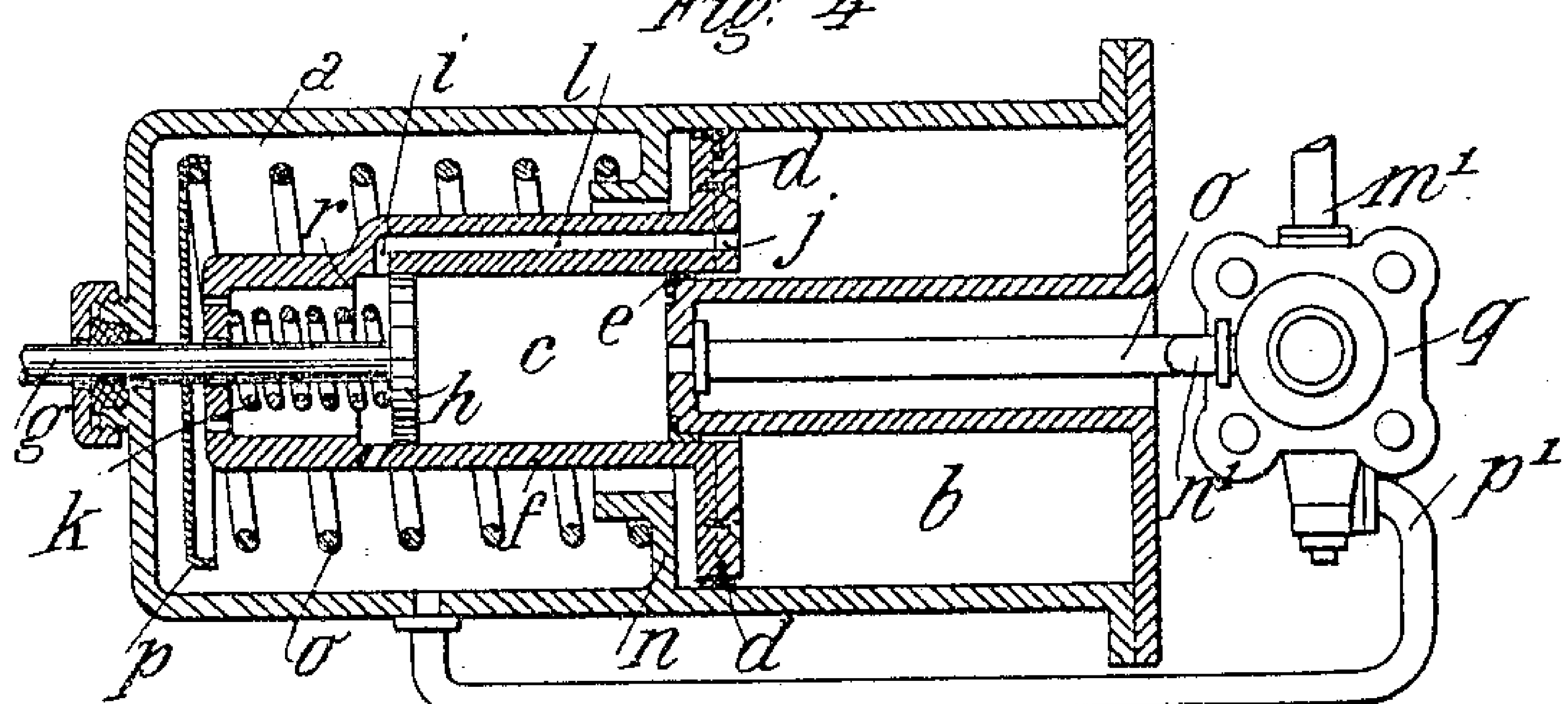


Fig. 4



WITNESSES:

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No. 775,141. Patented November 15, 1904.

UNITED STATES PATENT OFFICE.

GEORGES EMILE HOUPLAIN, OF PARIS, FRANCE, ASSIGNOR TO THE FIRM OF SOCIÉTÉ GENERALE DES FREINS LIPKOWSKI, OF PARIS, FRANCE.

COMPRESSED-AIR BRAKE.

SPECIFICATION forming part of Letters Patent No. 775,141, dated November 15, 1904.

Application filed June 14, 1904. Serial No. 212,520. (No model.)

To all whom it may concern:

Be it known that I, GEORGES EMILE HOUPLAIN, engineer, a citizen of the Republic of France, residing in Paris, France, have invented certain Improvements in Compressed-Air Brakes, (for which I have obtained a French patent, December 3, 1903, No. 337,286,) of which the following is a specification.

This invention relates to improvements in compressed-air brakes of the Lipkowski type, in which the application of the brakes is effected in two phases, the first bringing the shoes into contact with the wheels, and the second producing the "braking," properly so called. In the brakes of this type as hitherto constructed the diminution of pressure which it is necessary to produce between the two phases should be sufficiently slow to permit the appliance which is termed the "reducer" to act, and this is not always the case with a speedy application. In addition, during the transference of the air the pressure of the large cylinder increases relatively to that of the reservoir, which is prejudicial to the efficient operation of the brake. Finally, the method of operation necessitates when the release takes place a considerable time for filling the train-pipe at a pressure equal to that of the reservoirs.

The improvements which form the subject of this invention are mainly directed, first, to decreasing the value of the reduction of pressure in the general or train pipe for producing the application of the brakes; second, to producing automatically a reduction of pressure in the large cylinder only when the reducer has completely acted; third, to hasten the release, the air-pressure in the auxiliary reservoir being always less than that of the air in the train-pipe.

As before, the brake as a whole comprises a pump, a main reservoir, an operating-cock, a train-pipe running beneath all the vehicles, a cylinder with reducer, an auxiliary reservoir, a distributer, &c.; but the description explanatory of the drawings refers only to the distributer and the cylinder.

In the drawings, Figure 1 is a longitudinal section through the cylinder, the distributer, with its connections, being shown in external elevation. Fig. 2 is a vertical section through the distributer on the line A B of Fig. 1. Fig. 3 shows the cylinder during the period of application of the brakes. Fig. 4 shows a modification in which the apparatus acts with the traction instead of with the thrust.

The cylinder, Fig. 1, is subdivided into three parts—the auxiliary reservoir *a*, the large cylinder *b*, and the reducer *c*. A piston *d* is arranged in the large cylinder. Another cylinder is provided in the interior. These two pistons are rigid with a sleeve *f*, through which passes a rod *g*, provided with a small piston *h*, working opposite small orifices *i* and *j*, formed, respectively, in the sleeve and in the piston *e*. The small piston *h* is submitted to the action of a spring *k*, surrounding the rod *g* and bearing upon the bottom of the sleeve, at the end of which the piston *d* is situated. Passages *l* are formed in the piston *d* and correspond with orifices *m*, formed in a partition *n*, when the said piston comes into contact with this latter. The contact in question takes place under the influence of a spring *o*, surrounding the rod *g* and comprised in the part forming the auxiliary reservoir, between a disk *p*, fixed to the said rod, and the partition *n*.

The distributer comprises, Fig. 2, a box in which are mounted two pistons *a'* and *b'*, subdividing it into three compartments *c'*, *d'*, and *e'*. These two pistons are respectively connected with valves *f'* and *g'*, arranged in chambers *h'* and *i'*, provided with suitable seats. The chamber *h'* communicates whens the valve *f'* is lifted with the compartment *d'*, while the chamber *i'* is in communication in the same conditions with the atmosphere. The valve *g'* of this latter chamber is combined with a small piston *j'*, while the valve *f'* is submitted to the action of an antagonistic spring. The compartments *d'* and *e'* are in communication, by means of suitable passages, with a third chamber *k'*, opening into the compartment *e'* by the intermediary of a valve *l'*, submitted to the action of an antagonistic spring. The central compartment *c'* is in communication, by means of a tubular socket m', with the train-pipe. The chambers h' and i' are connected one with the other by means of a conduit n' (dotted lines, Fig. 2) and with the reducer by means of the socket o', and the chamber k' is connected with the auxiliary reservoir by the socket p'. All these connections are shown in Fig. 1, in which the distributer is represented in external elevation and marked q. The air from the train-pipe despatched into the distributer first of all enters the compartment c', displaces the pistons d' and e', with their valves f' and g', into the position represented in Fig. 2, lifts the valve l', and by means of the connections and communications already referred to becomes distributed in the auxiliary reservoir a and in the compartments d' and e' and the chambers h' and i' at the same time that it reaches the reducer c. In the brake-cylinder the air passes from the auxiliary reservoir a into the large cylinder b, passing through the orifices, Fig. 1, and when this is the case the valve l' closes automatically under the influence of its spring. It follows that the air contained in the auxiliary reservoir, the large cylinder, and the reducer is at the same pressure under normal conditions and that the pistons d and e are brought to the bottom of their respective cylinders by the spring o. On the other hand, when this is so the pistons a' and b' of the distributer occupy the position indicated in Fig. 2, because the pressure in the compartment c' is greater than that of the compartments d' and e'. The valve f' is normally lifted and the valve g' normally applied to its seat, closing the exhaust to the atmosphere.

In order to apply the brakes, the driver produces a reduction of pressure of an adequate amount in the train-pipe, with the following result: Under the influence of this reduction of pressure the pistons approach each other. In the first place the valve f', owing to its spring, is applied upon its seat and interrupts the communication between the reservoir and the reducer. Then the valve g' leaves its seat and permits the air to escape from the reducer into the atmosphere. The result of this exhaust is, having regard to the difference of area of the pistons d and e and by reason of the pressure which is then exerted upon the rear face of the larger piston d, that the whole system is displaced in the direction indicated by the arrow, Fig. 3, so that the brake-shoes are brought into contact with the wheels. At this moment, as the pressure diminishes more and more in the reducer, the effort of application of the brakes against the wheels gradually increases, and as the spring k is adjusted so as to correspond with a pressure slightly less than that which the air exerts upon the reducer a time comes when this spring is compressed and when the piston h becomes applied to the shoulder r and prevents the air of the auxiliary reservoir from passing into the large cylinder b. At this moment the communication between the large cylinder and the auxiliary reservoir by way of the passages i is interrupted, and, on the other hand, the air of the large cylinder passes through the passages j into the reducer c, Fig. 3. The air of the reservoir a then undergoes a slight expansion, owing to the elongation of the connecting-rods, and the piston b' of the distributer, Fig. 2, resumes its position, moves, and applies the valve g' upon its seat. The piston a' does not move, owing to the action of its antagonistic spring. A fresh diminution of pressure in the train-pipe again produces the displacement of the piston b', and the air escapes from the large cylinder. It is therefore apparent that the degree of application of the brake is capable of regulation.

In order to effect the release, the train-conduit is filled with air, and when the pressure in the conduit is equal to that of the reservoir the two pistons a' and b' separate one from the other, the piston b' moving first. The air of the auxiliary reservoir a becomes distributed in the two cylinders b and c, and, owing to the spring o, the pistons d and e are brought to the end of their stroke, Fig. 1. In addition to this, owing to the valve l', Fig. 2, and its antagonistic spring, the air despatched into the train-pipe does not become distributed in the auxiliary reservoirs, and by reason of this the speed of braking is increased.

The foregoing shows that the braking is effected uninterruptedly and that the release takes place more rapidly, owing to the fact that the air-pressure in the auxiliary reservoir and the cylinder is lower than that of the train-pipe. In the transfer of air from the large cylinder to the reservoir there is no excess pressure.

In the arrangement which has been described the apparatus is considered as acting with the thrust. In cases in which it is desired to act by tractive effort the arrangement represented in Fig. 4 would be adopted. In this arrangement the parts corresponding to those shown in Figs. 1, 2, and 3 are indicated by the same letters.

I claim as my invention—

1. Air-brake apparatus, comprising an auxiliary reservoir, a brake-cylinder normally connected therewith, a reducer-cylinder, a brake-rod, and piston, and a distribution-valve, and means adapted to be operated upon the movement of the brake-rod and piston for cutting off the auxiliary reservoir from the brake-cylinder.

2. Air-brake apparatus, comprising an auxiliary reservoir, a brake-cylinder, a piston within the cylinder and ports between reservoir and cylinder, a reducer-cylinder and piston therein, a brake-rod adapted to have a slight independent motion with relation to the piston and carrying means for shutting off the

aforesaid ports, upon the movement of the piston and rod a predetermined distance, and a distribution-valve.

3. An air-brake apparatus, comprising an auxiliary reservoir, brake-cylinder, and reducer-cylinder, a piston of two diameters fitting into both cylinders, a brake-rod movable to a limited extent with relation to the piston, ports in the piston communicating between the brake-cylinder and auxiliary reservoir and other ports communicating between brake and reducer cylinders, means carried by said brake-rod to control the communication of the brake-cylinder with either the reservoir or reducer-cylinder and a distribution-valve.

4. An air-brake apparatus, comprising an auxiliary reservoir, a brake-cylinder and a reducer-cylinder, a piston and brake-rod, said piston having two sets of ports, communicating one between the brake-cylinder and reservoir and one between the two cylinders, a valve mechanism carried by the rod, and means for allowing the rod a limited motion independent of the piston in combination with a distribution-valve.

5. An air-brake apparatus, comprising an auxiliary reservoir, a brake-cylinder and a reducer-cylinder, a piston and brake-rod, said piston having two sets of ports, communicating one between the brake-cylinder and reservoir and one between the two cylinders, a valve mechanism carried by the rod, and means for allowing the rod a limited motion independent of the piston, in combination with a valve having a chamber for the entrance of the train-pipe, two opposed pistons in the said chamber, a pipe from the reservoir to behind each piston, a spring-pressed valve operated by one piston and communicating with the reducer-cylinder, a valve for the other piston adapted to connect said reducer-cylinder with an exhaust and a valve adapted by pressure from the train-pipe to open from the space between the pistons to behind the pistons.

6. An air-brake apparatus, comprising an auxiliary reservoir, a brake-cylinder continuation thereof, and a reducer-cylinder, a piston of two diameters and a hollow connecting-trunk, an enlarged chamber in one end of said hollow trunk, two sets of ports from said chamber, leading, one set to the brake-cylinder, and one to the reducer-cylinder, a brake-rod carrying a disk within said enlarged chamber, spring to normally hold the disk so as to cut off communication between the two cylinders, said disk adapted to be displaced to close the other set of ports to the reservoir but to open them to the reducer, a distribution-valve having a train-pipe connection, a connection to the reducer and a connection to the auxiliary reservoir.

7. An air-brake apparatus, comprising an auxiliary reservoir, a brake-cylinder continuation thereof, and a reducer-cylinder, a piston having two diameters and a hollow connecting-trunk, an enlarged chamber in one end of said hollow trunk, two sets of ports from said chamber leading, one set to the brake-cylinder, and one to the reducer-cylinder, a brake-rod carrying a disk within said enlarged chamber, spring to normally hold the disk so as to cut off communication between the two cylinders, said disk adapted to be displaced to close the other set of ports to the reservoir but to open them to the reducer, in combination with a valve having a chamber for the entrance of the train-pipe, two opposed pistons in said chamber, a pipe from the reservoir to behind each piston, a spring-pressed valve operated by one piston and communicating with the reducer-cylinder, a valve for the other piston adapted to connect said reducer-cylinder with an exhaust and a valve adapted by pressure from the train-pipe to open from the space between the pistons to behind the pistons.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

GEORGES EMILE HOUPLAIN.

Witnesses:

LEVI CRANE KENT,

HANSON C. COXE.