No. 733,838. PATENTED JULY 14, 1903.

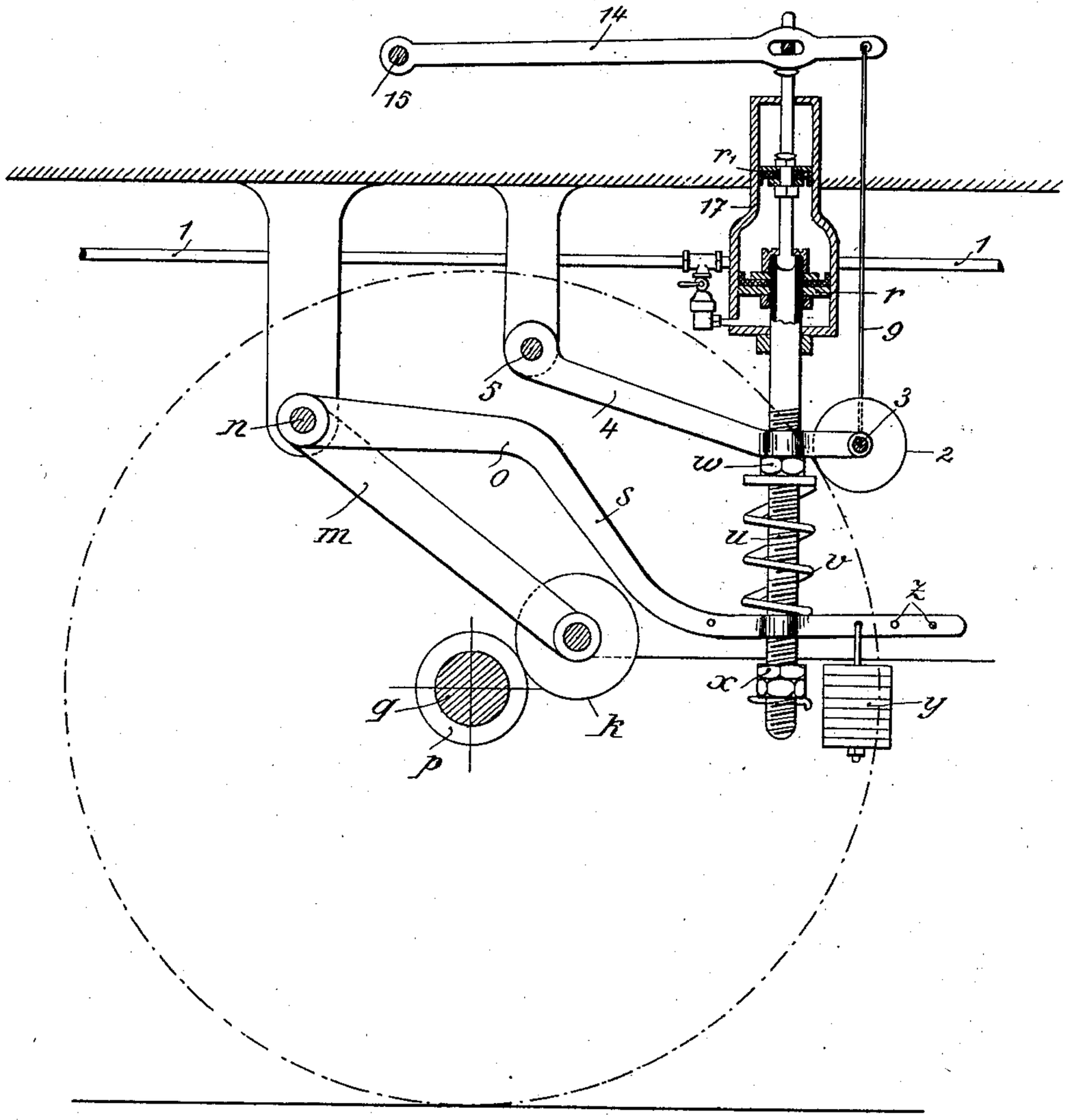
P. HALLOT.

RAILWAY BRAKE.

APPLICATION FILED DEC. 19, 1901.

NO MODEL. 5 SHEETS—SHEET 1.

Fig. 1




Witnesses:
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N. L. Bogan

Inventor
Paul Hallot
By James L. Norris.
Atty.

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NO MODEL. 5 SHEETS—SHEET 2.

Fig 2

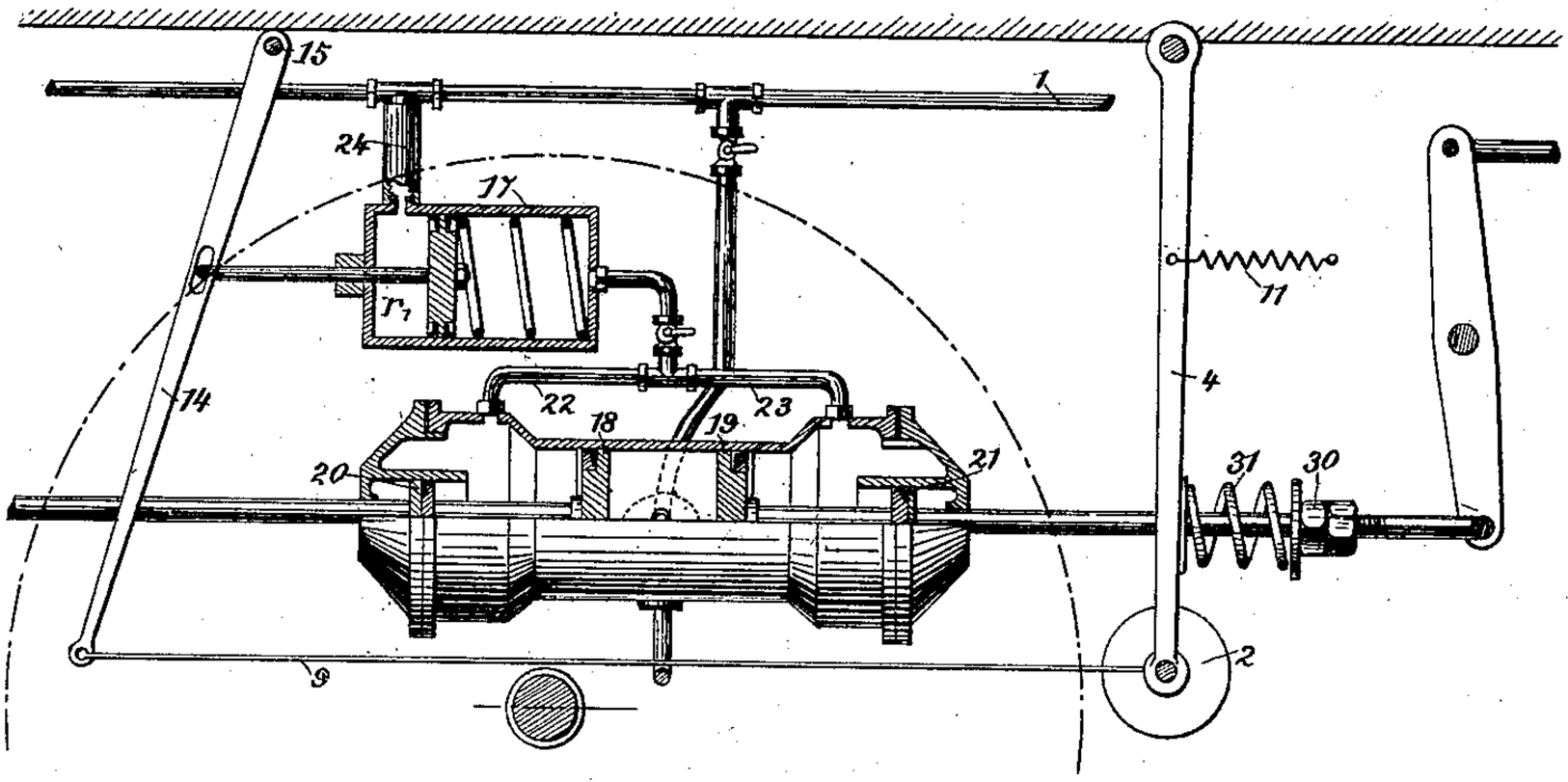
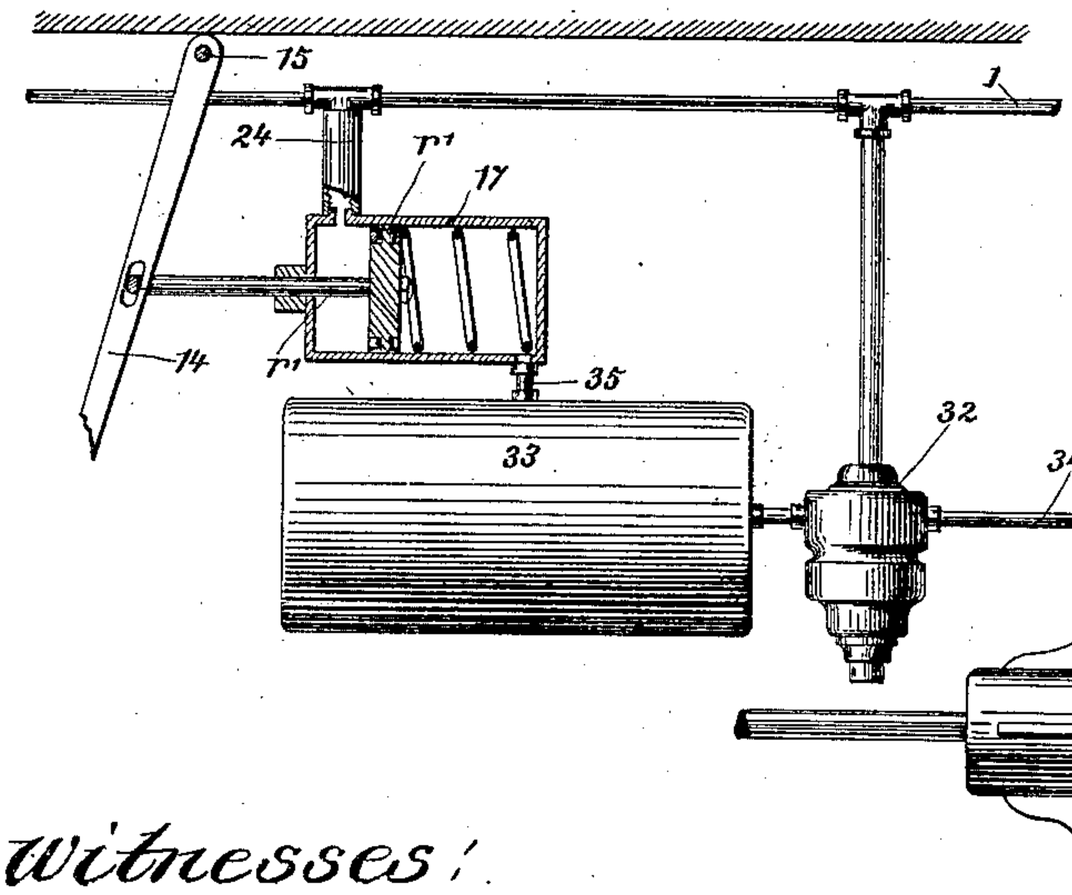
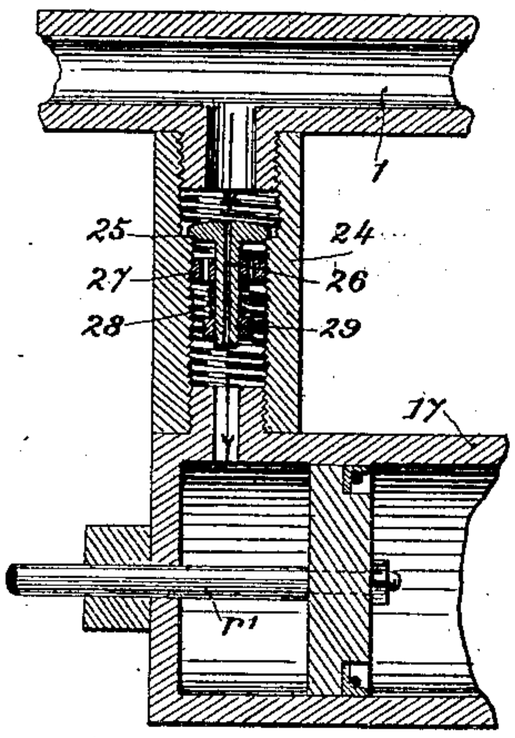
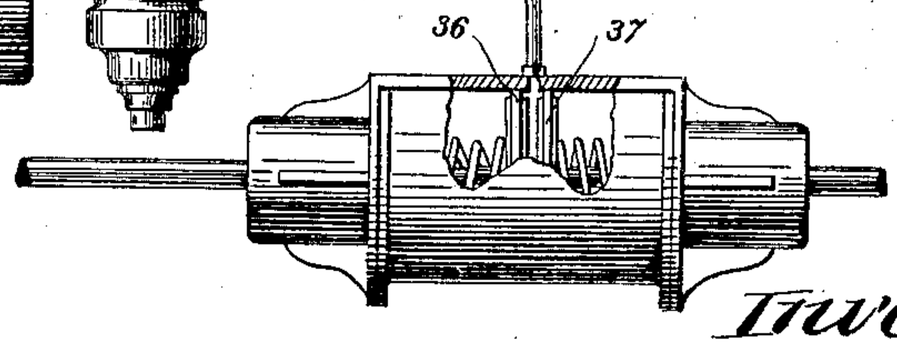



Fig 3

Fig 4

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NO MODEL. 5 SHEETS—SHEET 3.

Fig. 5

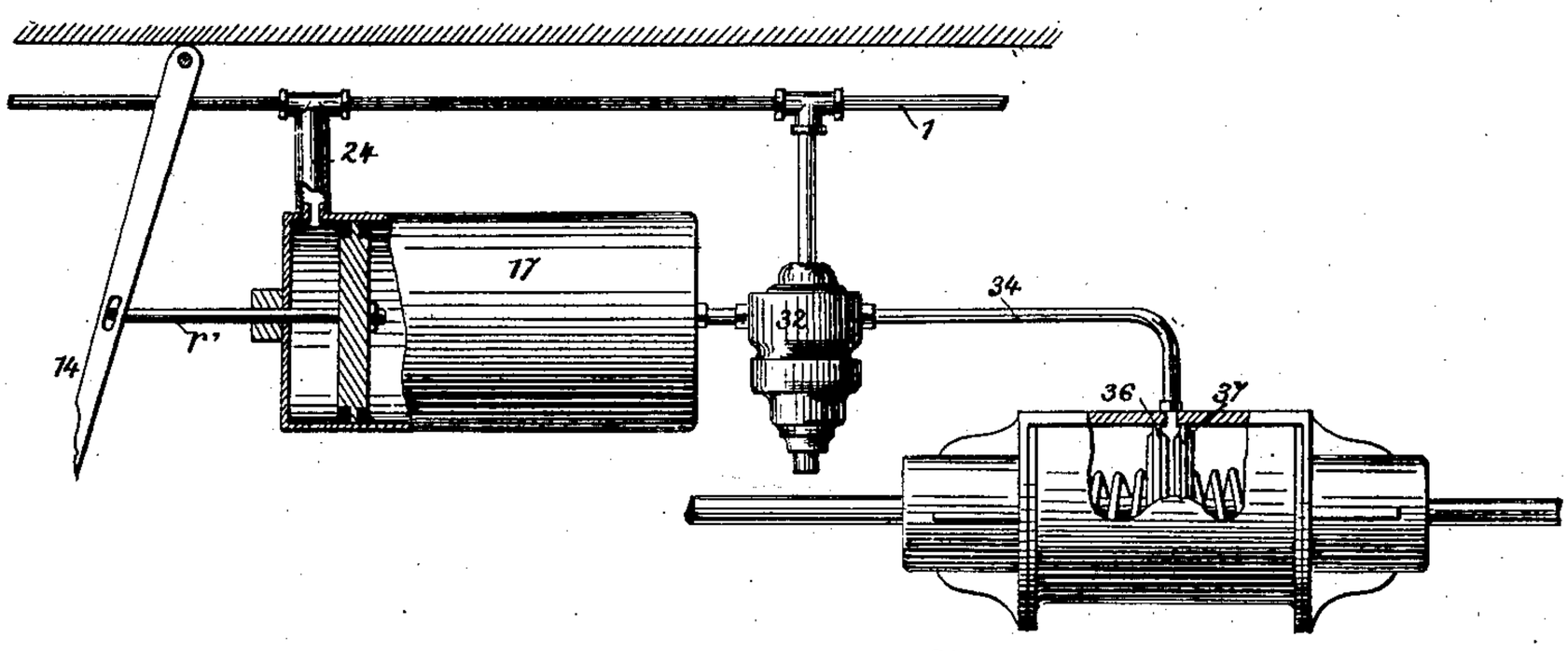



Fig. 6a

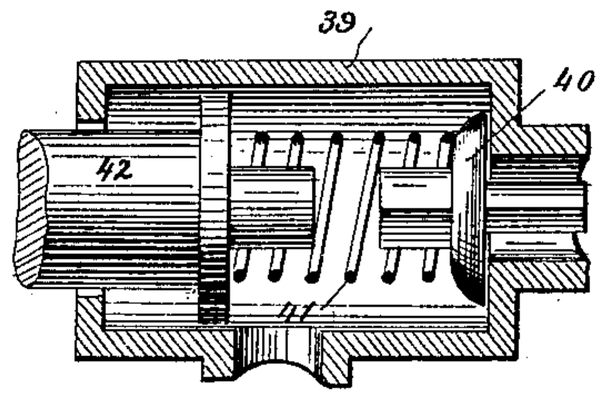
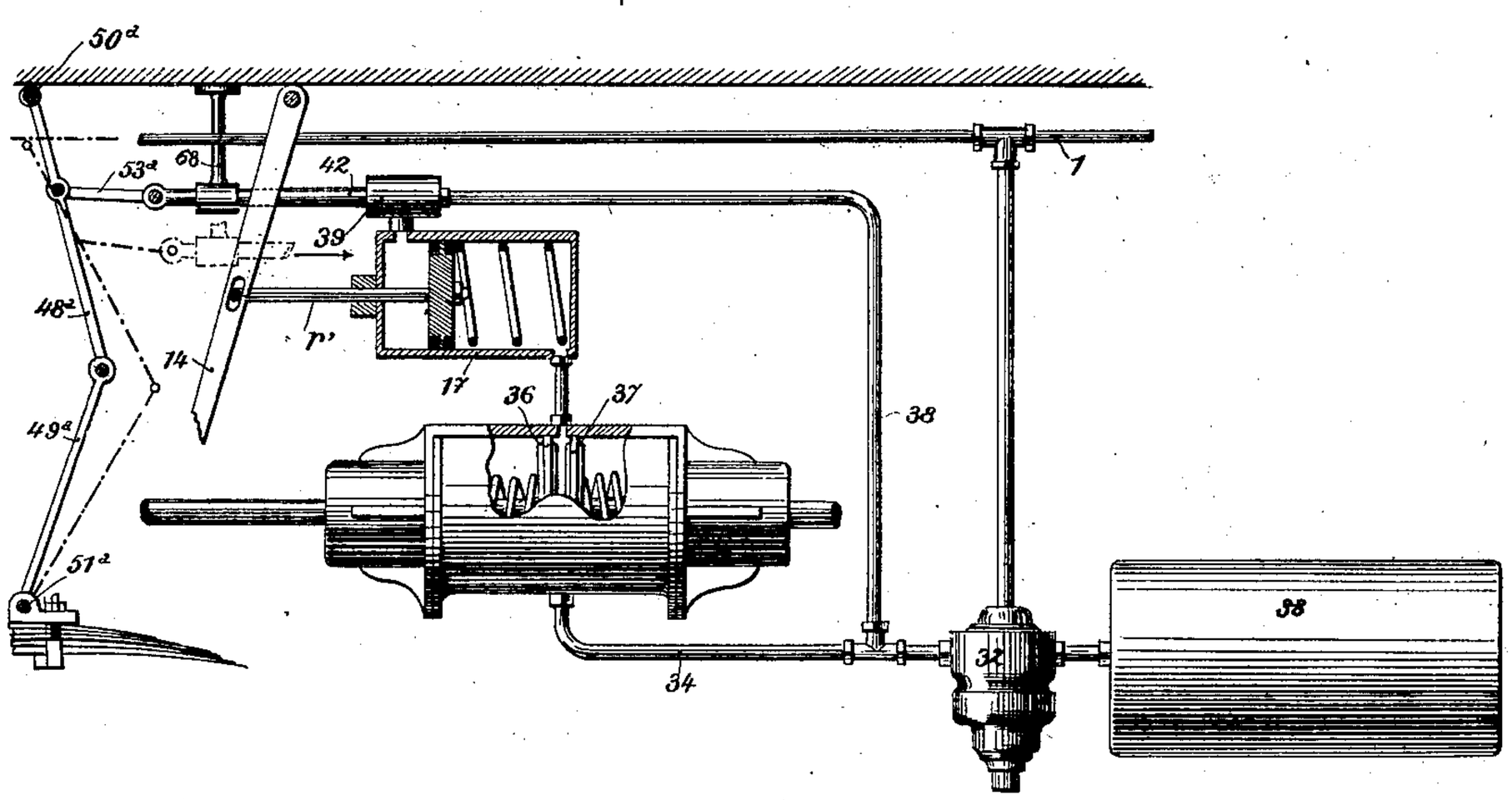



Fig. 6

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NO MODEL. 5 SHEETS—SHEET 4.

Fig. 7

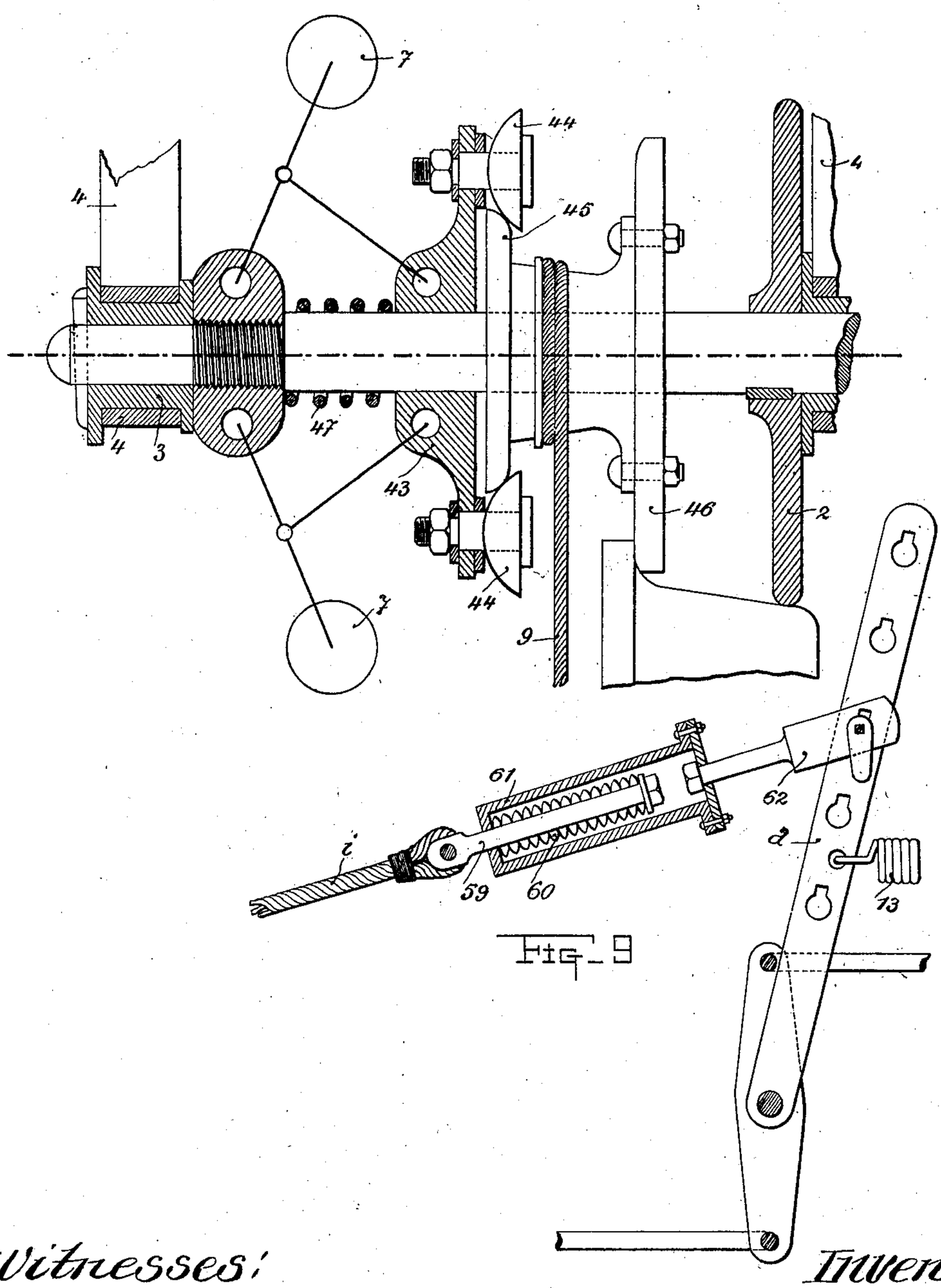


Fig. 9

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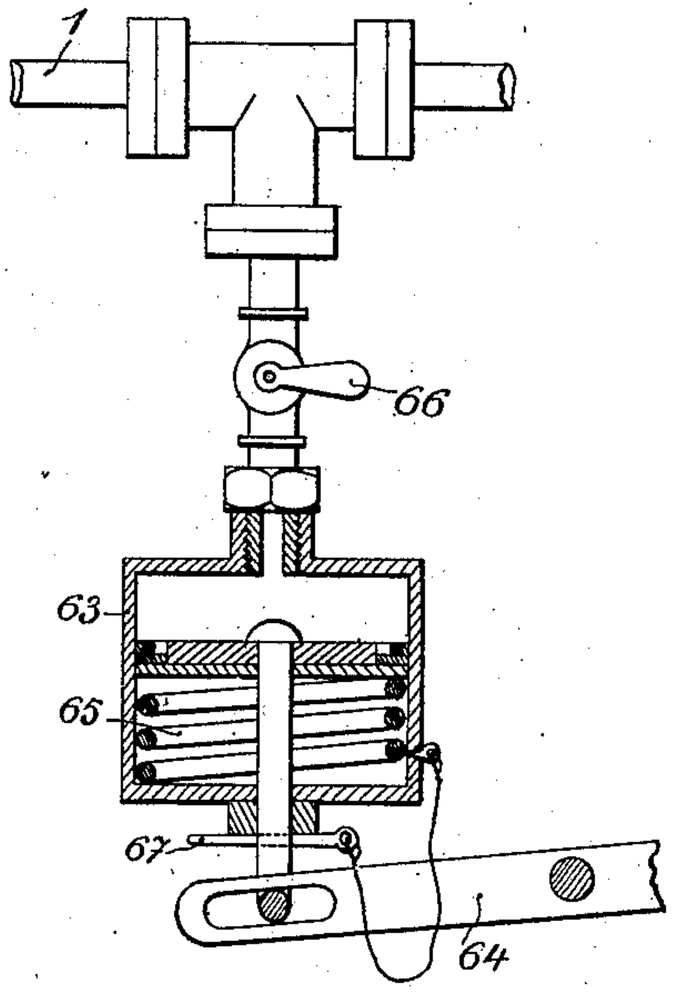
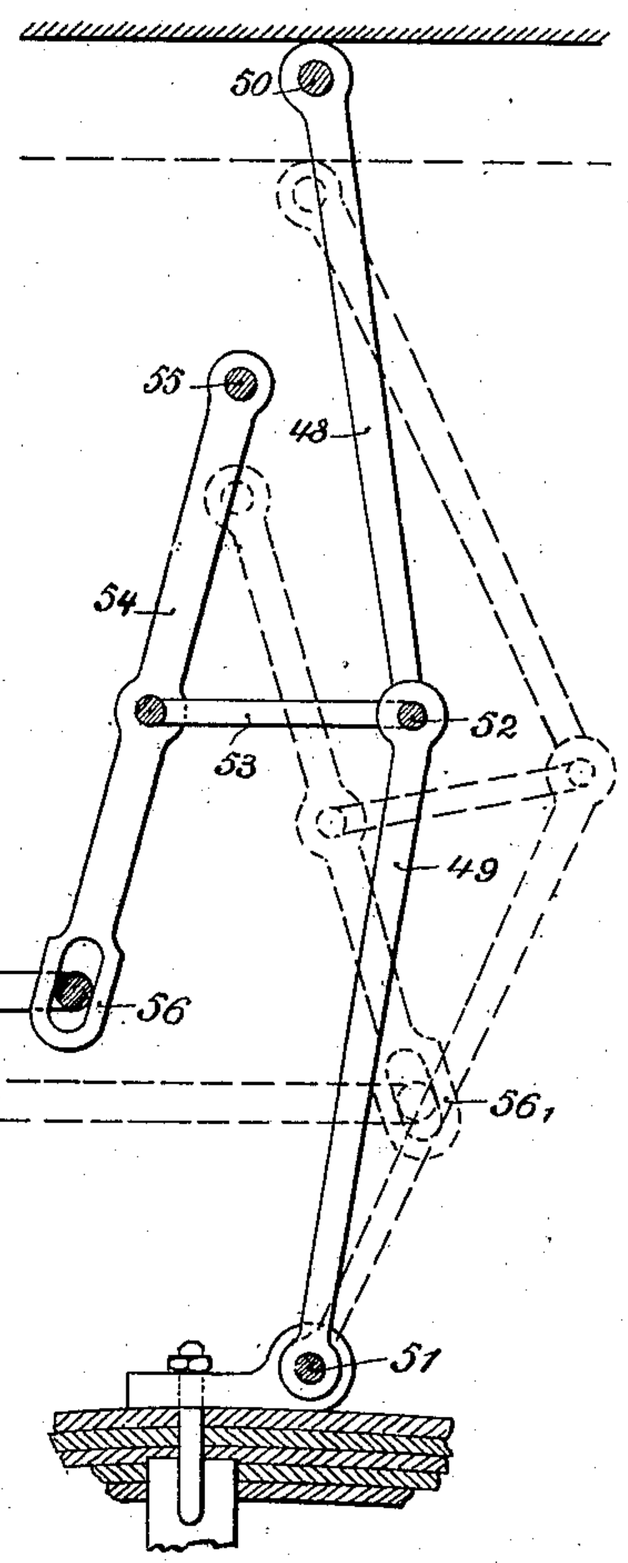
NO MODEL. 5 SHEETS—SHEET 5.

Fig. 10



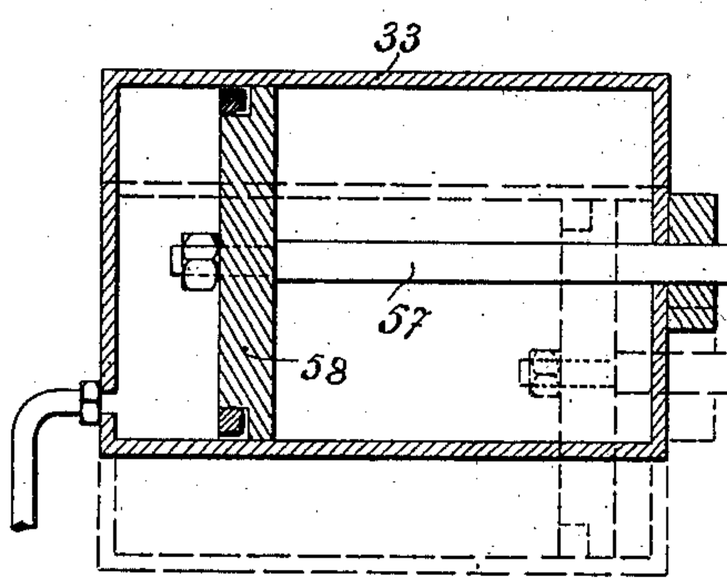




Fig. 8

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No. 733,838. Patented July 14, 1903.

# UNITED STATES PATENT OFFICE.

PAUL HALLOT, OF VINCENNES, NEAR PARIS, FRANCE.

## RAILWAY-BRAKE.

SPECIFICATION forming part of Letters Patent No. 733,838, dated July 14, 1903.

Application filed December 19, 1901. Serial No. 86,600. (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, near Paris, France, have invented certain new and useful Improvements in Railway-Brakes, of which the following is a specification.

This invention relates to certain improvements in or relating to the brake described in Patent No. 689,716, granted to me December 24, 1901; and it has for its object to simplify such brake and render it applicable to the compressed-air brakes now in use, such as those of Westinghouse, Wenger, &c.

In the annexed drawings, Figure 1 shows an elevation of the working parts of the simplified brake. Figs. 2 and 3 show the application to differential brakes, (Wenger type.) Figs. 4 to 6 show the application to brakes having distributing-valves, (Westinghouse type.) Fig. 6ª is a sectional view, on an enlarged scale, of the adjustable back-pressure valve shown in Fig. 6. Figs. 7 to 10 show details of the mechanism.

The same characters of reference indicate the same parts as in the drawings filed with the aforesaid prior specification.

The levers *s* and *o* are in the present invention combined in one, which carries the counterweight *y*, and the rod *u* is in one with the rod of the piston *r*, operating in the recuperating-cylinder 17. Within said cylinder 17 is also arranged a piston *r'*. The two pistons *r r'* are of different area, the cup-leathers of which face each other. The rod of the piston *r* is hollow and that of the piston *r'* can slide within it, so that the two pistons can approach or separate from each other to a predetermined extent.

By reducing the pressure in the main conduit 1 the pressure of the air confined between the two pistons *r* and *r'* causes the descent of the rod *u*, which by means of the spring *v* presses upon the lever *s*, and consequently upon the friction-roller *k*. When the rod *u* has descended to a sufficient extent, it brings the roller 2 into contact with the tire of the wheel and throws into action the multiplying apparatus or gear, which exerts a pull on the rope 9, and consequently imparts an oscillating movement to the lever 14 upon its axis 15. The piston *r'* descends and compresses the air which is above the piston *r*, and hence increases the pressure of the roller *k* upon the sleeve *p* until the skidding of the wheels is about to take place. At this moment the preponderating action of the multiplying apparatus ceases and the piston *r'* returns to its initial position. As will be seen, this apparatus, while comprising fewer parts than that shown in Patent No. 689,716, effects exactly the same purpose.

It is obvious that the recuperating-cylinder 17, in which the piston *r'* works, might be absolutely independent of the brake-cylinder proper. It could be placed anywhere else, provided it were connected with said brake-cylinder by suitable piping. This naturally leads to a very simple modification, which applied to the systems of compressed-air brakes already in use will give them one of the principal advantages of the brake described in the Patent No. 689,716, above referred to—namely, the increase of the power of the brake up to the skidding of the wheels by the brake-blocks and the automatic reduction of this power as soon as the skidding is about to take place. Fig. 2 represents this application to direct-acting brakes. (Wenger, Schleiffer, Carpenter, &c.) It is known that in these systems the compressed air from the main conduit 1 enters between the two pistons 18 and 19, lifts their cup-leathers, and acts upon the small pistons 20 and 21 on the other side, causing them to recede from each other. The brakes are then released or taken off. When a decrease of pressure takes place between the pistons 18 and 19, the compressed air confined between the pistons 18 and 20 on the one side and 19 and 21 on the other side causes the pistons to approach each other and apply the brakes. As seen in Fig. 2, the recuperating-cylinder 17 communicates, by means of the pipes 22 and 23, with the spaces in which the preponderating action of the air is exerted at the moment of applying the brakes and by means of the valve 24 with the main conduit 1. Fig. 3 shows this valve on a larger scale. The valve-head 25 is provided with a passage 26 and slides in a screw-plug 27, which is itself perforated. A spring 28 bears against the nut 29, which is screwed upon the valve-spindle and keeps the valve closed so long as the pressure behind the pis-

ton $r'$ has not attained a certain degree higher than the pressure in the main conduit.

At the moment of applying the brakes the piston is moved toward the right, because the roller 2 is brought into contact with the wheel by means of the nuts 30, fixed on the controlling-rod of the brake-gear, through the medium of a strong spring 31. The forward motion of the piston $r'$, considerably facilitated by its rear surface being always in communication with the conduit 1 by means of the passage 26, forces the compressed air behind the pistons 18 and 19 and increases the power of the grip of the brake until the moment when the wheels being about to be skidded the multiplying apparatus ceases to act. The pressure which then acts upon the right-hand surface of the piston $r'$ becoming preponderant returns it to its normal position. The expansion which takes place causes a diminution in the braking power. The compressed air from the main conduit which filled the cylinder 17 is returned to this conduit through the valve 24, the head of which for this purpose rises from its seating to the required extent.

Fig. 4 shows the arrangement of parts adapted for the same purpose to brakes provided with distributing-valves. (Westinghouse, &c.) It is well known that in these systems a distributer 32 alternately establishes communication between the main conduit 1 and the auxiliary reservoir 33, between the reservoir and the brake-cylinder by the pipe 34, and between the brake-cylinder and the atmosphere by a special port in the distributer. The recuperating-cylinder 17 communicates, on the one hand, with the auxiliary reservoir 33 by the union 35 and, on the other hand, with the main conduit 1 by the valve 24.

To apply the brakes, the compressed-air reservoir 33 is caused to communicate through the distributer 32 with the spaces between the two pistons 36 and 37, the recession of which effects the braking. The multiplying apparatus or gear is put into action, as in Fig. 2. The piston $r'$ moving to the right compresses the air in the reservoir 33, and consequently increases the pressure on the pistons 36 and 37 until at the moment when the skidding is about to take place the effect ceases upon the piston $r'$, which returns to its initial position, causing a diminution of the braking power.

Fig. 5 shows a simplified arrangement in which the recuperating-cylinder 17 is sufficiently large to replace the auxiliary reservoir 33. No change is necessary, provided the passage 26 in the valve 24 be very much reduced in area, so that at the moment of taking off the brakes the pressure of air in the cylinder 17 does not increase too rapidly in order that the distributer may take up the desired position. Fig. 6 represents a similar arrangement applied to brakes having rapid-action distributers, in which in case of emergency stoppages the decrease of pressure is accelerated by reason of the main conduit being put in communication with the brake-cylinder. In the case of Fig. 6 the air from the main conduit 1, moreover, expands in the recuperating-cylinder 17, which further accelerates the decrease of pressure and increases the rapidity of the braking. The back face of the recuperating-piston $r'$ is connected with the main conduit by means of the distributing-valve 32 through the pipe 38, which contains a retaining or releasing valve 39. (Shown on a larger scale by Fig. 6[a].) The valve 40 is forced upon its seating by a spring 41, which is supported against a movable abutment-piece 42, the position of which is regulated according to the load of the vehicle in such a manner that the difficulty of opening the valve 40 increases as the load is greater. In Fig. 6 the abutment-piece 42 is suspended from the frame of the vehicle by the bracket 68 and is pivotally connected at its outer end to a link $53^a$. The latter is connected to the upper of a pair of toggle-links $48^a$ $49^a$. The link $48^a$ is pivoted on an axis $50^a$, fixed to the frame of the vehicle, and the link $48^a$ is pivoted to an axis $51^a$, fixed to the axle of the vehicle. At the time of a moderate application of the brakes the distributing-valve 32 cuts off communication with the main conduit 1, so that the action of the recuperating-piston $r'$ is *nil*, because it drives back to the reservoir 33 the air which it had borrowed from it at the commencement; but for an emergency stoppage the recuperating-cylinder is put in communication with main conduit, which fills it with compressed air not derived from the reservoir 33, and then its action is felt. The retaining-valve 39 continues to regulate the action of the recuperating-cylinder according to the load of the vehicle, because if the valve 40 is fully open the recuperating-piston does not act, as it is obvious that if the valve 40 is open the piston in the cylinder 17 when going to the right draws into valve 40 the same quantity of compressed air that it expels between pistons 36 37 through tubes 34 and 38; but if the valve 40 were hermetically closed the recuperating-piston would have its maximum of action. Thus it is easy to see that between these two limits the recuperating-piston acts according to the position of the movable abutment-piece 42, regulated according to the load.

These improvements introduced in brakes having distributing-valves have the great advantage of rendering them moderable or gradual both in the putting on and the taking off of the brakes. In fact, the progressive variations of the pressure in the main conduit 1, Figs. 1 to 5, are insufficient to influence the distributing-valve at the time that they cause the action of the recuperating-piston $r'$, (the back face of which communicates with the conduit 1,) to vary in the same direction. On the other hand, once the equilibrium is established on the two faces of the recuperating-piston $r'$ in a moderate application of

the brakes on a gradient any acceleration in the speed of the train will have the effect of increasing the power of the multiplying apparatus, and therefore the action of the recuperator and the pressure on the brake-blocks. This apparatus therefore behaves as an automatic speed-regulator at the time of a moderate application of the brakes on a gradient.

By regulating the distributing-valve 32, the brake-gear, or controlling-rods, &c., so that the braking power shall be comparatively feeble at the time of a moderate application of the brakes and by giving, on the other hand, great power to the multiplying-gear and to the recuperator-piston $r'$ the brake-blocks can be applied with any degree of force.

Fig. 7 completes the arrangement indicated in the aforesaid specification for the multiplying apparatus or gear. In order to increase the degree of the strain that the rope 9 can undergo without giving an appreciably increased weight to the balls 7, the boss 43 of the multiplying apparatus carries rollers 44 in contact with a drum 45, upon which is fixed the end of the rope 9. This drum carries at its other end a friction-roller 46, adapted to come into contact with the flange of the wheel, a spring 47 normally keeping said roller off the flange of the wheel. Under these conditions when the roller 2 is thrown into contact with the wheel the shaft 3 is thereby rotated, the multiplying apparatus comes into action, and the boss 43, drum 45, and roller 46 are together moved toward the left by the action of the centrifugal balls 7, that turn with the axle 3, taking up the position represented in Fig. 7. The flange of the wheel in turn rotates the roller 46, which effects the winding up of the rope.

Fig. 8 shows the arrangement which enables the automatic regulation of the action of the brakes to be effected according to the load of the vehicle. This arrangement comprises two toggle-links 48 and 49, pivoted, respectively, on an axis 50, fixed to the frame, and to an axis 51, fixed to the axle of the vehicle. Their junction 52 is connected by a rod 53 to a lever 54, pivoting about the axis 55. When the vehicle is loaded, the frame and attachments descend to an extent proportional to the load. All the levers shown in full lines, Fig. 8, then occupy the positions indicated in dotted lines. It is thus seen that the end 56 of the lever 54 moves to 56′ after having moved parallel to the rail-track so much the more as the load on the vehicle is the greater. This displacement can advantageously be utilized in many ways, so as to automatically proportion the power of the brake to the load of the vehicle. For instance, a counterweight $y$ (shown in Fig. 1) can be connected to the end 56 and so obtain an automatic sliding of the counterweight upon the lever $s$. A compression-spring might also be interposed between the end 56 and the movable abutment-piece 42, Fig. 6, so as to automatically load the spring 41. The arrangement shown in Fig. 8 consists in connecting the end 56 to the rod 57 of a piston 58, which works in the auxiliary reservoir 33, the capacity of this reservoir being in this way increased with the load, which reduces to the corresponding extent the expansion at the moment of braking.

Fig. 9 shows an elastic fastening-tackle which is more simple than that described in Patent No. 689,716. The rope $i$ terminates in a bolt 59, upon the washer of which bear strong springs contained in a cylinder 61, attached to the lever $a$ by a link 62. This link 62 is connected with the lever at a point so much the farther from the axis of the lever $a$ as the vehicle is the more heavily loaded.

In Patent No. 689,716, before referred to, claim is made for the arrangement on each vehicle of a sand-distributer, which is automatically put in action in case of emergency stoppages only by means of any part of the mechanism taking up a particular position when the pressure is fully reduced. This arrangement is difficult to employ in brakes of the type shown in Figs. 2 and 4, because all the parts therein are always in the same position and only the pressure on the pistons varies. Fig. 10 shows a simple device whereby the sand-distributer under each carriage can be simultaneously brought into action when the decrease of pressure taking place in the main conduit has reached a certain degree. It consists of a small cylinder 63, communicating with the main conduit 1 and containing a piston connected to the lever 64, which controls the action of the sand-distributer. A spring 65 raises the piston and opens the sand-distributer when the pressure in the conduit 1 falls to the degree for which the power of the said spring has been calculated. By means of a cock 66 and pin 67 the action of the distributer may be arrested.

What I claim is—

1. In a fluid-pressure railway-brake for vehicles, mechanism adapted to be brought into frictional contact with a movable part of said vehicle, means for temporarily increasing the frictional engagement between said mechanism and the said movable part of said vehicle and then automatically reducing said frictional engagement, and means operated by the weight of the load of the vehicle for automatically regulating the frictional contact between said mechanism and the movable part of said vehicle.

2. In a fluid-pressure railway-brake, mechanism adapted to be brought into frictional contact with a movable part of said vehicle, a recuperating-cylinder, means arranged in said cylinder for operating said mechanism, and a multiplying-gear connected with and operating said means and adapted to temporarily increase the frictional engagement of the said mechanism with the said movable part of said vehicle and then automatically reducing said frictional engagement.

3. In a fluid-pressure railway-brake, mechanism adapted to be brought into frictional contact with a movable part of a vehicle, a recuperating-cylinder, means arranged in said cylinder for operating said mechanism, a multiplying-gear connected with and operating said means and adapted to temporarily increase the frictional engagement of the said mechanism with the said movable part of the vehicle and then automatically reducing said frictional engagement, and means operated by the weight of the load of the vehicle for automatically regulating the frictional contact of said mechanism with the said movable part of said vehicle.

4. In a fluid-pressure railway-brake, a recuperating-cylinder, a main conduit, means for connecting the cylinder to said conduit, braking means adapted to frictionally engage a movable part of a vehicle, fluid-pressure-operated means in said cylinder connected with said braking means for operating it, and means connected with the fluid-pressure-operated means within the cylinder for increasing the power of the braking mechanism and then automatically reducing said power.

5. In a fluid-pressure railway-brake, a recuperating-cylinder, a main conduit, means for connecting the cylinder to said conduit, braking means adapted to frictionally engage a movable part of the said vehicle, fluid-pressure-operated means in said cylinder connected with said braking means for operating it, means connected with the fluid-pressure-operated means within the cylinder for increasing the power of the braking mechanism and then automatically reducing said power, and means operated by the weight of the load of the vehicle for automatically regulating the power of the braking means.

6. In a fluid-pressure railway-brake for vehicles, a recuperating-cylinder, a piston arranged therein, a main conduit, means for establishing communication between the said cylinder and said conduit at the rear face of said piston, a braking mechanism connected with said piston and operated thereby, said braking mechanism adapted to frictionally engage a movable part of the said vehicle, and means connected with the said piston for temporarily increasing the braking power of said mechanism and then automatically reducing the said power.

7. In a fluid-pressure railway-brake for vehicles, a recuperating-cylinder, a piston arranged therein, a main conduit, means for establishing communication between the said cylinder and said conduit at the rear face of said piston, a braking mechanism connected with said piston and operated thereby, said braking mechanism adapted to frictionally engage a movable part of the said vehicle, means connected with the said piston for temporarily increasing the braking power of said mechanism and then automatically reducing the said power, and means operated by the load of the vehicle for automatically regulating the braking power of said mechanism.

8. In a fluid-pressure railway-brake for vehicles, a braking mechanism adapted to be brought into frictional contact with a movable part of said vehicle, a multiplying-gear connected with said mechanism for temporarily increasing the braking power thereof and then automatically reducing said power, means for controlling the said gear, and means operated by the weight of the load of the vehicle for automatically regulating the braking power of said mechanism.

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

PAUL HALLOT.

Witnesses:
EDWARD P. MACLEAN,
ALFRED FREY.