

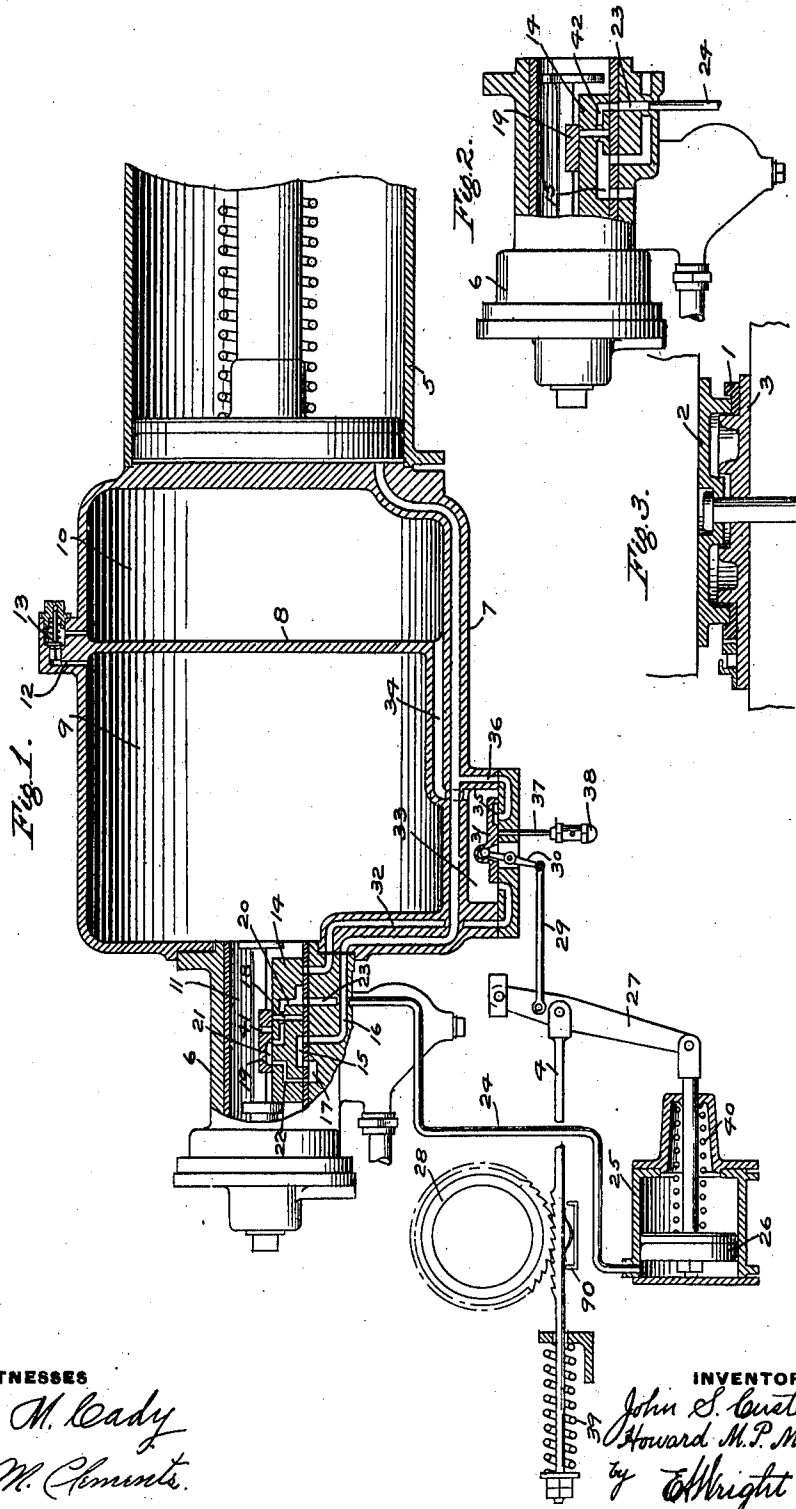
J. S. CUSTER & H. M. P. MURPHY.
LOAD BRAKE DEVICE.

APPLICATION FILED JULY 10, 1908.

988,696.

Patented Apr. 4, 1911.

6 SHEETS—SHEET 1.



WITNESSES

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A. M. Clements.

INVENTORS

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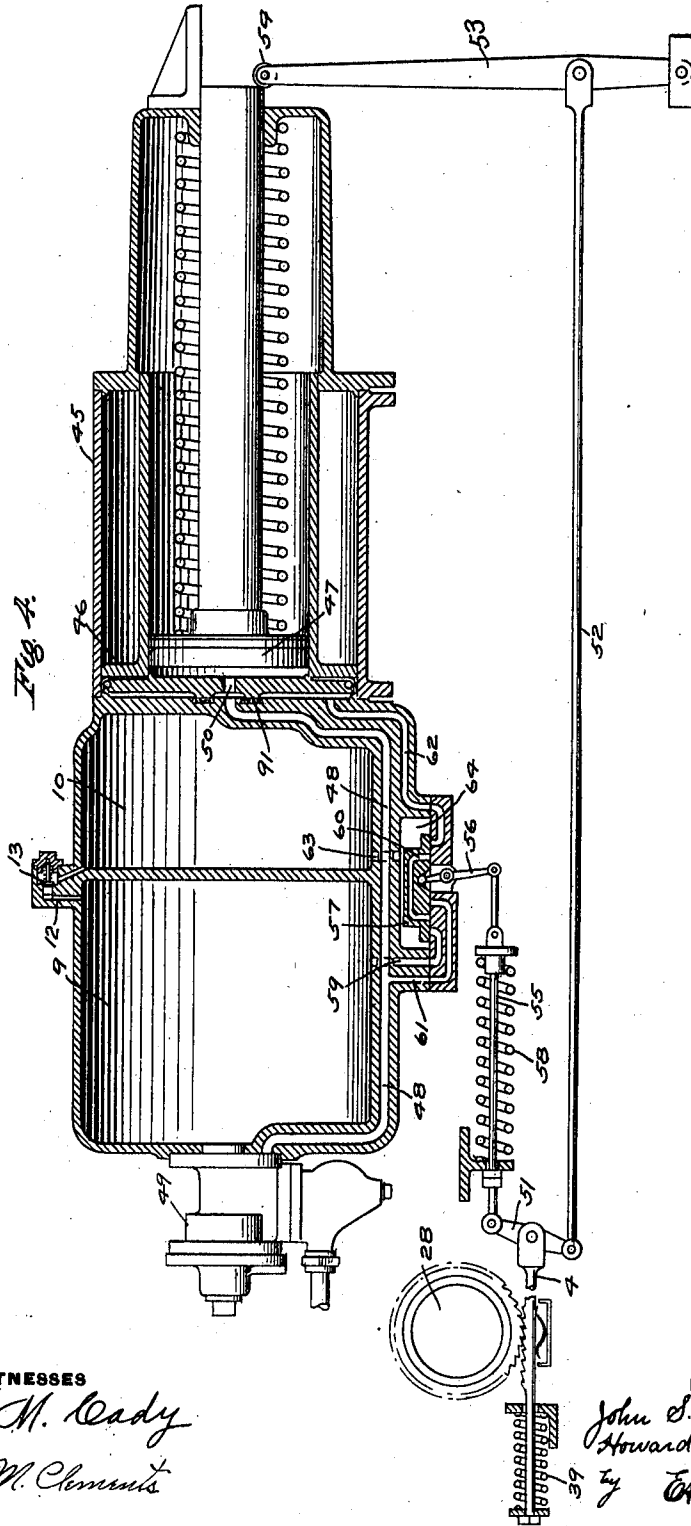
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5 SHEETS—SHEET 2.



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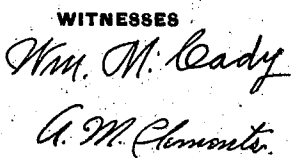
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5 SHEETS—SHEET 3.



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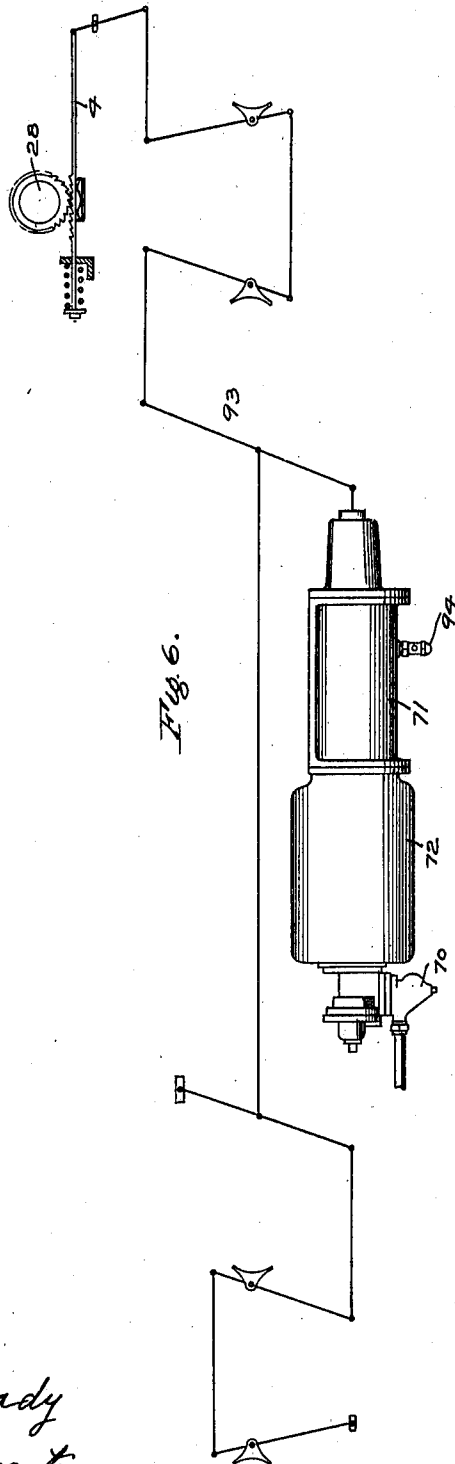
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5 SHEETS—SHEET 4.



WITNESSES

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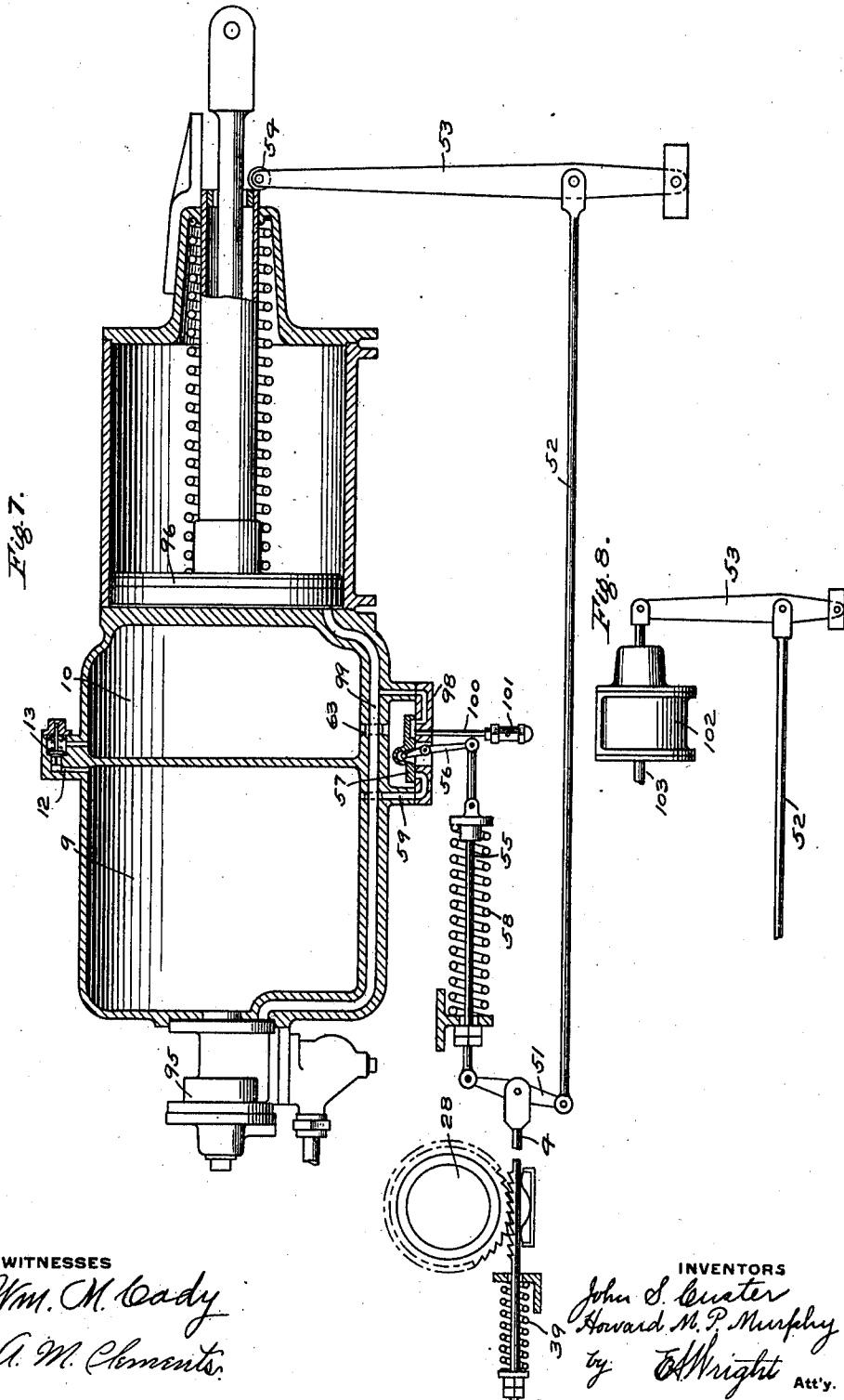
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5 SHEETS—SHEET 5.



WITNESSES

Wm. M. Cady
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UNITED STATES PATENT OFFICE.

JOHN S. CUSTER, OF PITTSBURG, AND HOWARD M. P. MURPHY, OF EDGEWOOD, PENNSYLVANIA, ASSIGNORS TO THE WESTINGHOUSE AIR BRAKE COMPANY, OF PITTSBURG, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

LOAD-BRAKE DEVICE.

988,696.

Specification of Letters Patent.

Patented Apr. 4, 1911.

Application filed July 10, 1908. Serial No. 442,968.

To all whom it may concern:

Be it known that we, JOHN S. CUSTER and HOWARD M. P. MURPHY, citizens of the United States, residents of Pittsburg and Edgewood, respectively, in the county of Allegheny and State of Pennsylvania, have invented new and useful Improvements in Load-Brake Devices, of which the following is a specification.

This invention relates to railway brakes, and more particularly to apparatus for regulating the degree of braking power on the car according to the load carried.

Various devices have heretofore been devised for automatically regulating the braking power in proportion to the load on the car, in which the vertical movement of the car on its supporting springs due to a change in the weight of the load is employed to actuate mechanism adapted to control the relative amount of braking power available, under the particular condition of load. While an automatic device of this character is very desirable in that the same operates without manual attention, a serious objection has been found with prior devices dependent for operation upon the movement of the car upon its supporting springs by reason of the uncertainty of action arising from the fact that the car is continually subject to jolting or swaying movements from side to side in passing over uneven rail sections or on curves, thereby oftentimes inadvertently actuating the braking power regulating mechanism, so as to interfere with the proper action thereof, and furthermore, there is the tendency of the supporting springs to take a permanent set, which necessitates readjustment of the apparatus accordingly.

The principal object of our invention is to provide an improved device for automatically regulating the braking power according to the load which is adapted to operate independently of the movement of the car body on its springs relative to the trucks.

In carrying out the invention, we contemplate employing a friction mechanism subject to the weight of the load of the car and adapted to govern the mechanism which regulates the braking power.

In the accompanying drawings; Figure 1

is a view with the principal parts of the apparatus in section, showing one type of mechanism for regulating the braking power according to the load, with our improvements applied thereto; Fig. 2 a part sectional view of a triple valve device which may be employed with the construction shown in Fig. 1, showing the controlling ports governed by the main slide valve; Fig. 3 a central sectional view of a preferred construction of the friction mechanism; Fig. 4 a view of another type of braking power regulating mechanism with our invention applied thereto and showing the parts mainly in section; Fig. 5 a view of still another type of braking power regulating mechanism, with our improvements applied thereto; Fig. 6 another type similarly equipped; Fig. 7 another construction of braking power regulating mechanism in part section with our invention applied thereto; and Fig. 8 a view of a fluid pressure controlled device for actuating the braking power regulating mechanism, which may be employed in place of the mechanically actuated device shown in Fig. 7.

The friction mechanism which we employ for governing the braking power regulating mechanism preferably comprises a friction plate 1, such as shown in section in Fig. 3 of the drawings, adapted to be interposed between the body center plate 2 of the car and the truck center plate 3. The friction plate 1 is provided on its periphery with teeth which are adapted to cooperate with teeth on an operating rod 4 as shown in Fig. 1. It will now be seen that in order to shift the rod 4 it is necessary to turn the friction plate 1 between the center plates 2 and 3, and since the amount of frictional resistance to the movement of the friction plate is dependent on the weight of the car body and the load carried by the car, it is evident that the amount of force necessary to shift the rod 4 is dependent on the load of the car.

In Fig. 1 is illustrated a construction with our improvements applied comprising a brake cylinder 5, triple valve device 6 and a two volume auxiliary reservoir 7 which contains a partition wall 8 dividing the auxiliary reservoir into two reservoirs 9 and 10. The reservoir chamber 9 is open to the valve

chamber 11 of the triple valve in the usual way and a passage 12 establishes communication from chamber 9 to chamber 10 so that the chamber 10 may be charged with fluid under pressure by flow from chamber 9, a check valve 13 being interposed in the passage 12 to prevent back flow of air from chamber 10 to chamber 9. The main slide valve 14 of the triple valve is provided with exhaust cavity 15 adapted to connect brake cylinder port 16 with exhaust port 17 in normal release position and supply port 18 controlled by the usual graduating valve 19 and adapted to register in service application position with the brake cylinder port 16. In addition, a through port 20 is provided in the main slide valve, which in release position registers with a port 23 and is connected by a cavity 21 in the graduating valve 19 with a through port 22 in the main slide valve, opening to exhaust port 17. Port 23 communicates with a pipe 24, leading to a piston cylinder 25, containing a piston 26. The piston 26 is operatively connected to a lever 27 fulcrumed at one end and intermediately connected to the rod 4, which, as hereinbefore described, is connected to a friction mechanism 28. Attached to the lever 27 is a link 29 for operating a lever 30 connected to a valve 31. Said valve controls a port 32 leading to the seat of the main slide valve 14, and is contained in a valve chamber 33 in open communication through a passage 34 with auxiliary reservoir chamber 10. The valve 31 is also provided with a cavity 35 for connecting a port 36, opening to brake cylinder passage 7, with passage 37, leading to a safety valve 38.

Rod 4 is provided with a coil spring 39, the inner end of which is held rigid by the car, so that the resistance of the spring tends to maintain the rod and its connection at the left. Said rod may be provided with a spring device 40 adapted to press and maintain the teeth of the rod 4 into engagement with the teeth of the friction plate 1. A coil spring 40 also acts on the piston 26 and tends to shift the piston to its release position.

When an application of the brakes is made, the triple valve parts shift to service position, in which the usual connections are made for supplying air from the auxiliary reservoir to the brake cylinder, and with the present construction a port 41 in the graduating valve 19 registers with the port 20 as said valve moves relatively to the main slide valve, and thus air from the auxiliary reservoir chamber 9 is admitted to the port 23 and pipe 24, thence flowing to one side of the piston 26. If the car is light, the fluid pressure applied to the piston 26 is sufficient to shift the same and through the rod 4 turn the friction plate 1 between the center plates.

This movement causes the valve 31 to be shifted toward the left, closing the port 32 and connecting the brake cylinder passage 36, through cavity 35, with safety valve passage 37. Reservoir chamber 10 is thus cut off from communication with passage 32, so that with the main slide valve in service position and port 32 uncovered, no air is supplied from the reservoir chamber 10.

The supply port 18 having opened communication to the valve chamber 11 and reservoir chamber 9, air is supplied to the brake cylinder and the graduating valve moves back to close port 20 upon equalization of train pipe and auxiliary reservoir pressure in the usual manner. The brake cylinder pressure may be increased as usual by making further reductions in train pipe pressure.

It will be noted that as the graduating valve 19 controls the admission of fluid under pressure to the piston cylinder 25, the movement of valve to lap position after a service application also cuts off communication to the piston cylinder, thus if there should happen to be a leak in the cylinder, no air can escape from the auxiliary reservoir. The valve 31 also connects the brake cylinder passage 36 with the safety valve 38, so as to limit the maximum pressure in the brake cylinder when the car is light to a predetermined amount. It should also be noted that the movement of the graduating valve relative to the main valve in making an application of the brakes causes the port 41 therein to register with port 20 and air is consequently first admitted to piston chamber 25 before the main slide valve moves to cause the brake cylinder supply port 18 to register with the brake cylinder port 16, so that the movement of the braking power regulating apparatus to light load position is insured before the brake is applied.

When the car is loaded and the brakes are applied, the frictional resistance of the friction plate 1 is such that the fluid pressure admitted to the piston cylinder 25 is not sufficient to actuate the rod 4 against the increased resistance of the friction plate, so that said valve remains in its right hand position in which the port 32 is open to the valve chamber 33 and the reservoir chamber 10. As a consequence, reservoir chambers 9 and 10 are connected as one reservoir for supplying air to the brake cylinder and a correspondingly higher brake cylinder pressure is thus obtained. If desired, the port 23 leading to the piston cylinder 25 may be controlled directly by the main slide valve, as shown in Fig. 2, in which case the usual exhaust cavity 15 in the main slide valve may be provided with a port extension 42, which is adapted to register with port 23 in normal release position, the port 23 being uncovered when the main slide valve moves out to service position. This construction,

however, permits the auxiliary reservoir to remain in open communication with the piston cylinder 25 throughout an application of the brakes, so that air is liable to be lost, should a leak occur in the piston cylinder.

When the brakes are released, air is vented from the piston 26 through pipe 24, port 20, cavity 21, and port 22 to the exhaust port 17, so that the piston is returned to release position by its spring 40. The spring 39 also acts to return the parts to release position, the teeth in the rod 4 being yieldingly held into engagement with the teeth on the friction plate 1 by means of a spring device 90, so as to permit the return movement of the rod 4 by reason of the teeth on the rod slipping by the teeth on the friction plate.

The construction just described normally maintains the regulating mechanism in the load position, and the parts are then shifted to light position in applying the brakes, if the car is light. An important feature of our invention will also be noted in this construction, in the employment of a brake cylinder of large size and a reservoir volume when the reservoirs 9 and 10 are combined, so related to the brake cylinder volume, that the usual brake cylinder pressures for given reductions in train pipe pressure will be obtained, then, when the cars are running light, with only one reservoir chamber connected, it will be seen that the flexibility of the brake is retained. That is to say, since the reservoir volume is small compared with the brake cylinder volume, gradual increases in brake cylinder pressure may be obtained by gradual reductions in train pipe pressure.

In the construction illustrated in Fig. 4, the regulating mechanism is normally maintained in light load position and is only actuated where the car is loaded in applying the brakes. In this construction a brake cylinder 45 is provided, containing a large brake piston 46 and within the large piston is contained a small brake piston 47. The brake cylinder passage 48 leads from the triple valve device 49 to the small piston 47, a port 50 being provided through the large piston 46 to permit air to pass to the small piston.

In order to prevent leakage to the large piston when air is supplied to the small piston, a seat ring 91 may be provided on the large piston, surrounding the port 50 and making a tight joint when the large piston is in its normal release position.

The rod 4 of the friction mechanism is connected in this construction with a lever 51 having one end pivotally connected to an actuating rod 52 and the opposite end to a rod 55. The rod 52 is pivoted to a fulcrumed lever 53, provided at one end with a roller 54 adapted to bear upon and be actuated by the piston stem of the piston 47 when the brakes are applied. The rod 55

is connected to a valve actuating lever 56, which is connected to a valve 57, and surrounding the rod 55 is a coil spring 58 having one of its ends rigidly held to the car so as to resist the movement of the rod 55 and valve 57 in one direction.

The valve 57 normally closes a port 59, leading to the reservoir chamber 9 and has a cavity 60 adapted in the load position of the parts to connect a port 61 leading from the brake cylinder passage 48 with a port 62, leading to one side of the large brake piston 46.

A port 63 establishes communication from the reservoir chamber 10 to the valve chamber 64 of the valve 57, so that in the load position communication is open from the reservoir chamber 10, through the port 59 to the reservoir chamber 9.

With the car light, upon making an application of the brakes, air is admitted through the brake cylinder passage 48 to the small brake piston 47, thereby shifting same outwardly. The lever 53 is thereupon operated to pull the rod 52 toward the right. The spring 58 is of sufficient resistance so that when the car is light the frictional resistance of the friction plate is less than the resistance of the spring, and consequently the pull on rod 52 merely turns the friction plate between the center plates without moving the valve actuating rod 55. It will thus be seen that with a light car air is supplied only to the small brake cylinder and from the single reservoir chamber 9, so that the maximum braking power is limited accordingly.

When the car is loaded, the frictional resistance of the friction plate exceeds the resistance of spring 58, so that upon making an application of the brakes, the spring 58 is compressed, the lever 51 turning about the pivot connection to rod 4 as a fulcrum and the valve 57 is thereby shifted, establishing communication from reservoir chamber 10 through passage 63, valve chamber 64, and port 59 to the reservoir chamber 9. The cavity 60 in the valve 57 also connects port 62 with port 61, so that the brake cylinder passage from the triple valve is now open to the large brake piston 46. It will thus be seen that the brakes are applied on loaded cars with greater proportionate force, due to the larger brake piston, the auxiliary reservoir capacity being correspondingly increased by the addition of the volume of the reservoir chamber 10.

In Fig. 5 of the drawings, our improvements are shown applied to a brake apparatus in which the braking power is varied for light and load by changing the brake lever ratio. This construction comprises the usual triple valve device 70, brake cylinder 71, and auxiliary reservoir 72, the brake piston stem 73 being connected to a lever 74 fulcrumed at its opposite end and having a shiftable

connection with the brake operating rod 75, which is preferably provided with a toothed pivot wheel 76 adapted to engage teeth on the lever 74. The inner end of the lever 75 extends loosely through an opening in one end of a rod 77, the other end of which is pivoted to a rocker arm 78 which is connected to an operating rod 79. The rod 79 is connected to one end of a lever 80, the opposite end of the lever being connected to a rod 81 which has a pivotal connection with an operating lever 82 adapted to be actuated by the movement of the brake piston rod 73. At an intermediate point on the lever 80 the friction plate operating rod 4 is connected. In the operation of this construction, when an application of the brakes is made with the car light, as the brake piston moves out the lever 82 actuates the rod 81, but as the rod 79 is provided with a spring 83 having a resistance which is greater than the resistance of the friction plate to turning when the car is light, the rod 79 remains inactive while the rod 4 and the friction plate are actuated. When the car is loaded, however, the frictional resistance of the friction mechanism exceeds the resistance of the spring 83, so that the rod 79 is actuated and thereby the rod 77, which shifts the brake lever 75, whereby the fulcrum point of lever 74 with respect to lever 75 is changed and the brakes are accordingly applied with greater power due to the increased leverage. When the brakes are released, the parts are carried back to light position by the action of the springs 83 and 39, as will be clearly understood.

In Fig. 6 of the drawings the construction is such that the friction mechanism acts directly on the brake system of levers and accordingly the usual brake cylinder 71, auxiliary reservoir 72, and triple valve 70 are shown with the brake cylinder piston connected up to a system of brake levers 93 indicated diagrammatically. The rod 4 of the friction mechanism is operatively connected into the system of brake levers so as to receive the thrust when the brakes are applied. It will now be clear that where the cars are light, the apparatus may be adjusted, so that when the brakes are applied the friction plate 1 is turned by the rod 4. As a result of this, the brake cylinder piston necessarily travels farther to apply the brake shoes to the wheels, and so with a certain reduction in train pipe pressure causing a given amount of fluid to be supplied from the auxiliary reservoir to the brake cylinder, the brake cylinder pressure is lessened according to the greater brake cylinder volume to be supplied. If the car is loaded when the brakes are applied, the friction plate 1 correspondingly resists movement of the rod 4, so that the piston travel is correspondingly limited and the brake cylinder pressure for

a given train pipe reduction is thus increased. With this construction it will be noted that the braking power is automatically adjusted to whatever load there is on the car varying from full load to light cars, as distinguished from those devices in which there are only two positions of adjustment, one for light and the other for fully loaded cars.

With the construction shown in Fig. 6, a slack adjuster adapted to maintain the brake shoes at a uniform distance from the wheels in release position of the parts may be employed. In this manner the piston travel may be maintained constant so far as the wear of the brake shoes on the wheels is concerned.

A safety or blow down valve 94 may be inserted in the brake cylinder at an outer point in the travel of the brake piston, so that on light cars, where the brake piston travels out beyond the safety valve port, the maximum brake cylinder pressure may be limited to a predetermined amount as desired.

In Fig. 7 the friction regulating mechanism is connected up similarly to that shown in Fig. 4, but in this case a single brake piston 96 is employed and the control valve 57 in its light load position is adapted, through a cavity 97, to connect port 98 leading to the brake cylinder passage 99 with port 100 leading to the safety valve 101. In making brake applications with a light car the valve 57 remains in its light position, in which the brake cylinder is connected with the safety valve and the reservoir chamber 10 is cut off. When the car is loaded the resistance of the spring 58 is less than the frictional resistance of the friction plate, so that the spring is compressed and the valve 57 is shifted to the load position in which the safety valve is cut off and the reservoir chamber 10 is connected to the reservoir chamber 9. Instead of actuating the rod 52 by means of the lever 53 and the brake piston stem, the lever 53 may be connected to a small auxiliary piston contained in a cylinder 102, as illustrated in Fig. 8, air being supplied to the cylinder when applying the brakes, as by connecting pipe 103 from same to the brake cylinder passage 99.

Instead of supplying air to the cylinder 102 from the brake cylinder when the brakes are applied, the cylinder may be supplied with air from the brake system, as by connecting the cylinder to the train pipe or the auxiliary reservoir. It will then be seen that upon connecting up a car in a train and charging the brake system with air the piston in cylinder 102 is moved out and the braking power regulating mechanism is adjusted thereby according as the car is light or loaded.

The fluid pressure of the brake system on one side of the cylinder piston may be op-

posed by a spring of a resistance equal to say forty pounds in pressure per square inch on the piston, so that reduction in train pipe or auxiliary reservoir pressures such as occasioned in making applications of the brakes will not permit the piston to move. But when the car is disconnected from its source of fluid pressure supply the fluid pressure bleeds down to less than forty pounds and the cylinder piston moves inwardly, so that upon again charging the brake system of the car, the piston is moved out and the braking power regulating mechanism is adjusted accordingly to the light or loaded condition of the car.

It will now be apparent that our improvements may be applied to a variety of constructions in connection with light and load brakes, and that the friction mechanism constitutes a very simple device which is not affected by movements of the car on the supporting springs, so that a more efficient and reliable device is provided.

Having now described our invention, what we claim as new and desire to secure by Letters Patent is:—

1. In a railway brake apparatus, a friction mechanism having a resistance corresponding to the weight of the load on the car for governing the amount of braking power according as the car is light or loaded.

2. In a fluid pressure brake apparatus, the combination with a brake cylinder, of a friction mechanism having a resistance corresponding to the weight of the load on the car, and means governed by the action of the friction mechanism for controlling the brake cylinder pressure.

3. In a fluid pressure brake apparatus, the combination with a brake cylinder, of a friction mechanism having a resistance adapted to vary according to the weight of the load on the car, means tending to actuate the friction mechanism upon applying the brakes, and means governed by the action of the friction mechanism for regulating the brake cylinder pressure.

4. In a railway brake apparatus, a regulating device for controlling the amount of braking power, and a friction mechanism having a resistance adapted to vary according to the weight of the load on the car for governing said regulating device.

5. In a railway brake apparatus, a friction mechanism having a resistance to movement adapted to vary according to the weight of the load on the car, means tending to actuate the friction mechanism upon applying the brakes, and a regulating device governed by the action of the friction mechanism for controlling the amount of braking power.

6. In a railway brake apparatus, a friction device adapted to be interposed between the car body and the truck and subject to the weight of the load on the car and means

governed by said friction device for regulating the braking power.

7. In a railway brake apparatus, a friction plate adapted to be interposed between the truck and body center plates of a car and having a resistance to movement corresponding with the weight of the load on the car and means governed by said friction plate for regulating the braking power.

8. In a railway brake apparatus, a friction mechanism having a resistance to movement adapted to vary according to the weight of the load on the car, a resistance means, and a braking power regulating device governed according to the opposing resistances of said friction mechanism and the resistance means.

9. In a railway brake apparatus, a friction mechanism having a resistance corresponding to the weight of the load on the car, a yielding resistance means, and a braking power regulating device subject to the opposing resistances of said friction mechanism and yielding resistance means and adapted to be actuated upon the resistance of the friction mechanism exceeding that of the yielding resistance means.

10. In a fluid pressure brake apparatus, a friction mechanism having a resistance corresponding to the weight of the load on the car, braking power regulating means governed by said friction mechanism and means operating according to the fluid pressure in the brake system for actuating said regulating means.

11. In a fluid pressure brake apparatus, a friction mechanism having a resistance corresponding to the weight of the load on the car, braking power regulating means governed by said friction mechanism and normally maintained in light position, and means operating upon charging the brake system with fluid under pressure when the car is loaded to shift said regulating mechanism to the loaded position.

12. In a fluid pressure brake, the combination with means for regulating the braking power according to the weight of the load on the car, of a large capacity brake cylinder and two reservoirs the combined volumes of which correspond with said brake cylinder so as to permit of a gradual application of the brakes upon a slight reduction in train pipe pressure in applying the brakes upon a loaded car, one of said reservoirs being adapted to be cut out in light load braking, thereby maintaining the flexibility of the brake on both light and loaded cars.

13. In a fluid pressure brake apparatus, the combination with a brake cylinder, of a friction mechanism having a resistance to movement adapted to vary according to the weight of the load on the car, a braking power regulating device governed by said friction mechanism and means adapted to

be supplied with fluid under pressure upon applying the brakes to actuate said braking power regulating device.

14. In a fluid pressure brake, the combination with a brake cylinder, of a friction mechanism having a movable member whose resistance to movement is adapted to vary according to the load on the car and means governed by said friction mechanism for determining the relative degree of braking power according as the car is light or loaded.

15. A load brake apparatus comprising a device for varying the braking power and a friction mechanism subject to the load on the car for governing the action of said device.

16. A load brake apparatus comprising instrumentalities for varying the braking power, a friction mechanism whose resistance to movement is adapted to be governed according to the load on the car, and means controlled by the action of said friction mechanism for effecting the operation of said instrumentalities.

17. A load brake apparatus comprising a device for varying the braking power, a frictional resistance mechanism subject to

the load on the car, a counter-resistance mechanism, and means subject to the opposing effects of said resistance mechanisms for controlling the operation of said device.

18. In a fluid pressure brake apparatus, the combination with a brake cylinder, of a friction mechanism whose resistance to movement is governed by the load on the car, a device for regulating the braking power, and means dependent on the action of said friction mechanism and operated by fluid under pressure in applying the brakes for controlling said braking power regulating device.

19. A load brake apparatus comprising a device for regulating the braking power and a resistance means having a variable resistance according to the load on the car for controlling the action of said braking power regulating device.

In testimony whereof we have hereunto set our hands.

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Witnesses:

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