

(No Model.)

4 Sheets—Sheet 1.

J. S. BADIA.

APPARATUS FOR OPERATING CAR BRAKES.

No. 325,474.

Patented Sept. 1, 1885.

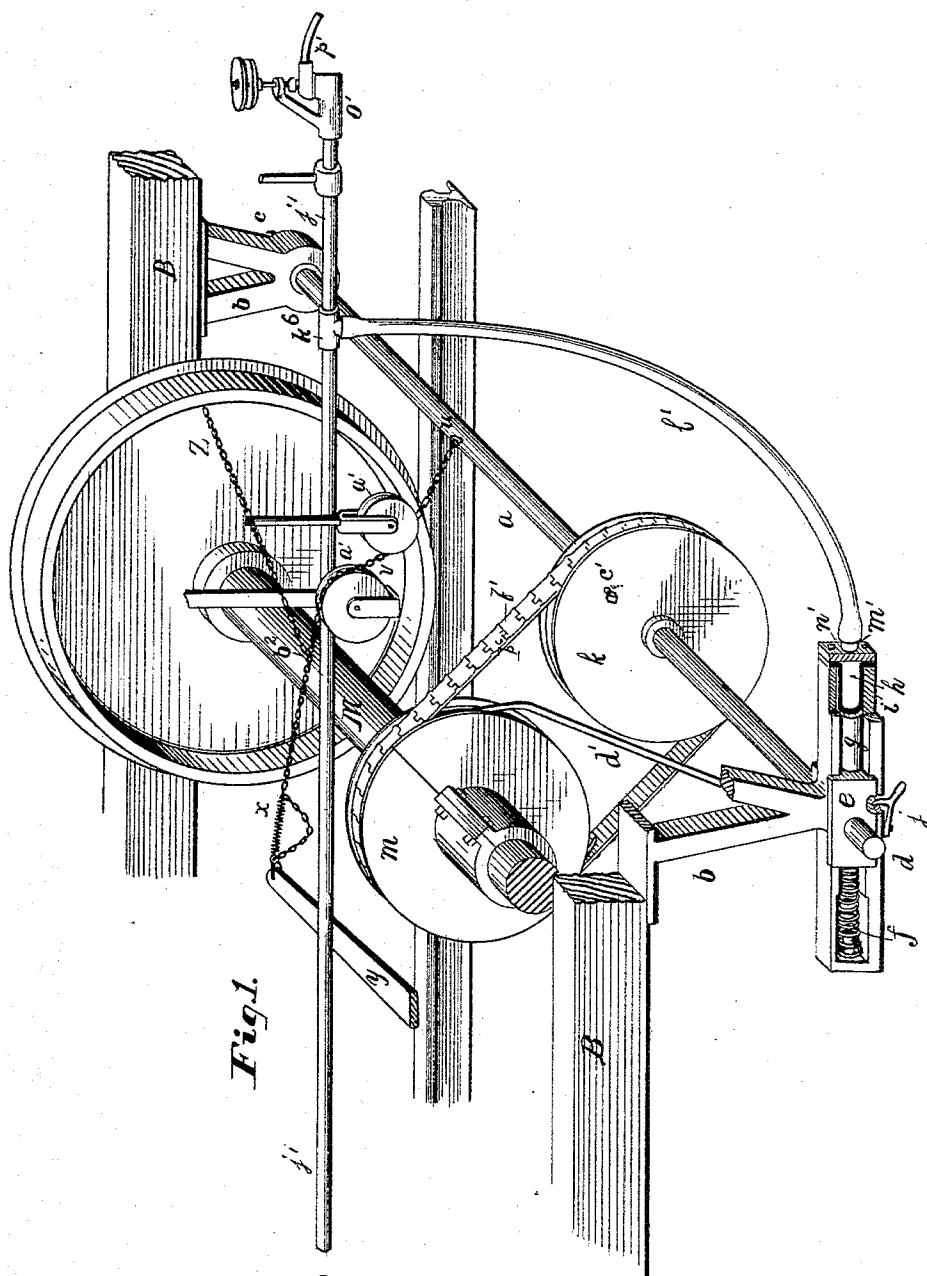


Fig. 1.

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(No Model.)

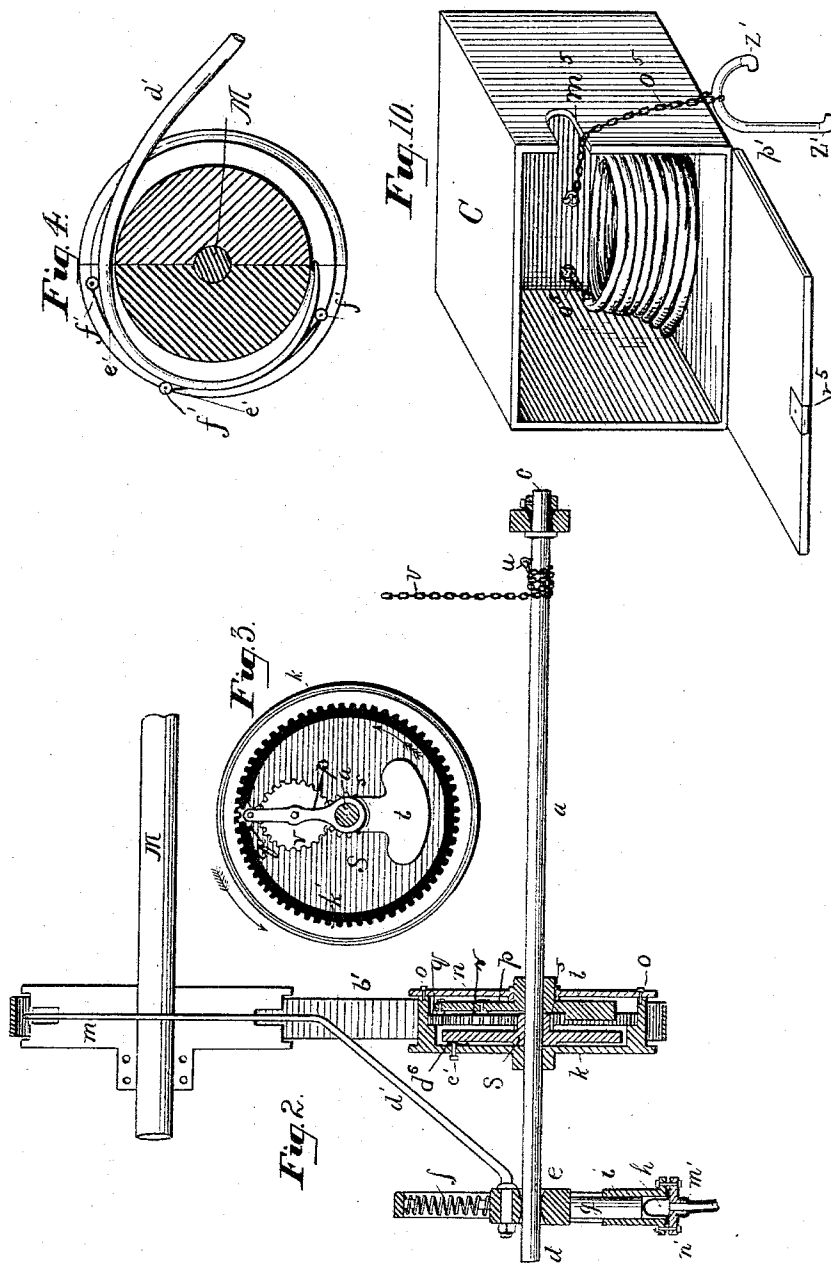
4 Sheets—Sheet 2.

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Fig. 6.

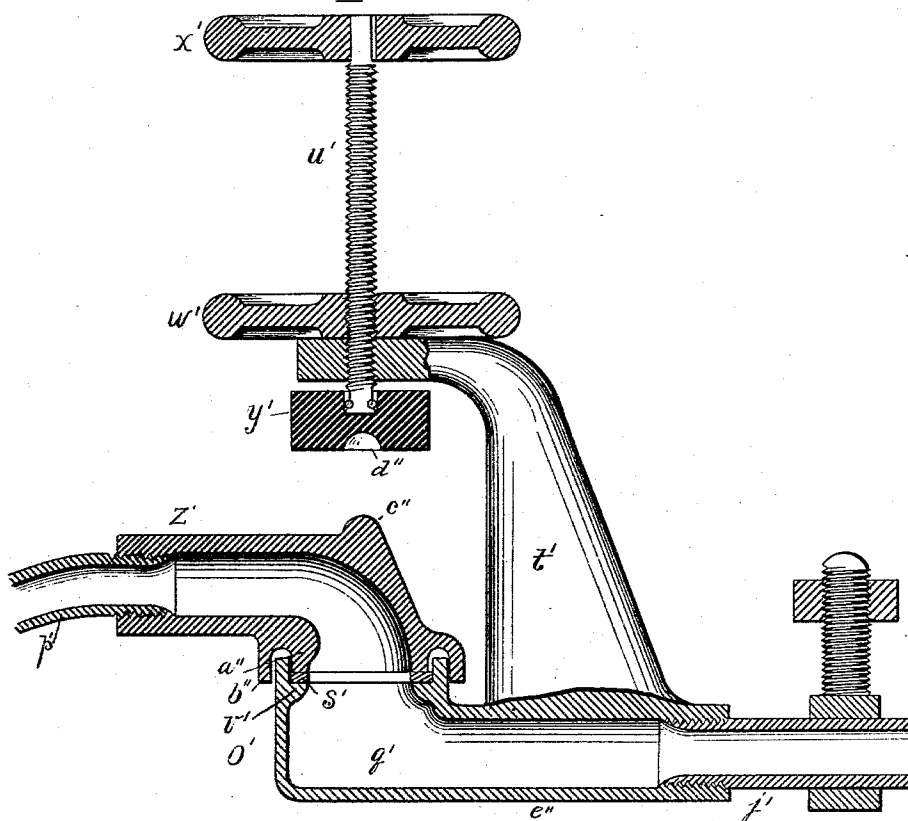
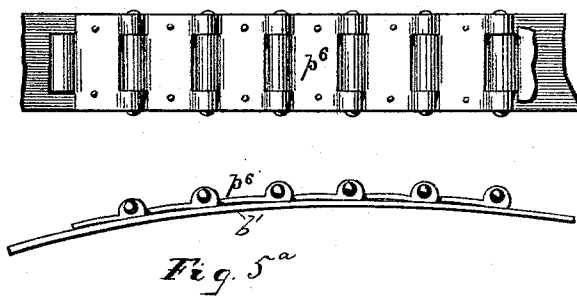


Fig. 5.



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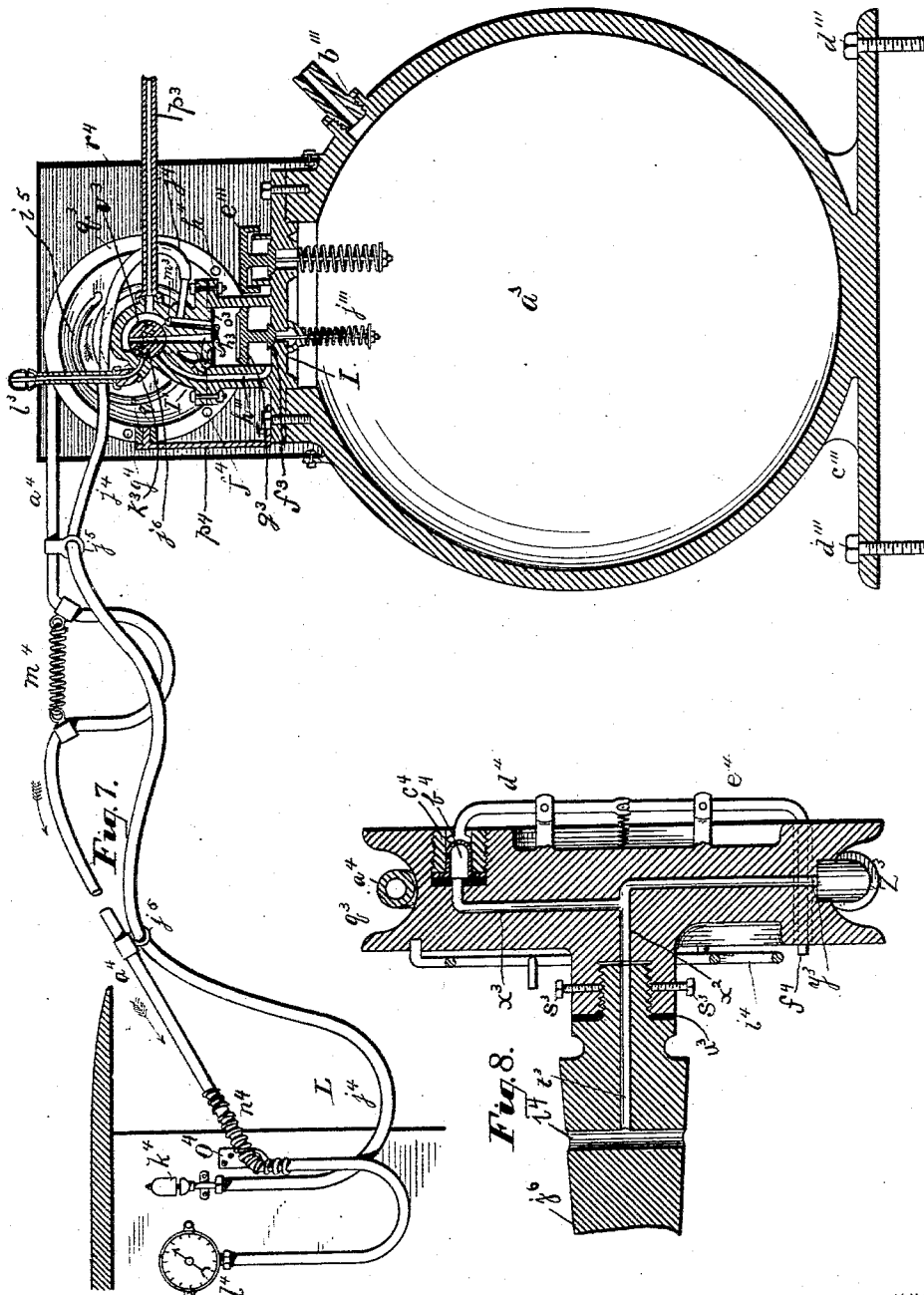
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UNITED STATES PATENT OFFICE.

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APPARATUS FOR OPERATING CAR-BRAKES.

SPECIFICATION forming part of Letters Patent No. 325,474, dated September 1, 1885.

Application filed January 13, 1885. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH S. BADIA, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Apparatus for Operating Car-Brakes; and I do hereby declare the following to be a full, clear, and exact description of the invention, reference being had to the accompanying drawings, which form part of this specification, in which—

Figure 1 is a perspective of part of apparatus on car-truck. Fig. 2 is a plan partly in section. Fig. 3 is an elevation, partly in section, of brake-pulley. Fig. 4 is a section of axle-pulley. Fig. 5 is a plan, and Fig. 5^a a side elevation, of chain belt. Fig. 6 is a vertical section of coupling. Fig. 7 is an elevation, partly in section, of accumulator and appurtenant parts. Fig. 8 is a vertical section of accumulator-pulley, and Fig. 10 a perspective of detail.

My invention has for its object to provide means whereby the momentum of cars will be utilized to put on the brakes whenever necessary, as hereinafter specified, and whereby the brakes will be released or thrown off by the direct action of compressed air or equivalent pressure, such as steam.

A further object of my invention is to provide means whereby, whenever the brakes are put on, except by the direct action of the engineer, an alarm-whistle will be sounded in the engineer's cab.

A still further object of my invention is to provide means whereby, whenever the brakes are applied, an alarm will be sounded as a notification to the train-hands.

My invention consists in the peculiar construction and combination of parts, herein after described and specifically claimed.

In carrying my invention into effect I provide upon the locomotive or its tender an air-accumulator which is worked by an air-pump, so as to obtain a volume of compressed air therein. From this accumulator there proceeds a pipe which leads to brake-controlling devices attached to the trucks of the cars, said devices being so constructed that the brake will be released or thrown off when the air-pressure or steam is applied or brought into effect. Proceeding from this accumulator

there are three other pipes, one of which connects with a whistle in the engineer's cab, that is sounded when the brakes are thrown on by the brakeman or accidentally, the other pipe leading to a pressure-gage, by the aid of which the engineer can apply the pressure to any extent desired and thereby regulate the extent of friction of the brake or the force of the same, such air-pressure being opposed to the spring which brings into play the mechanism which operates to brake the car by the momentum of the same. The third pipe leads to an exhaust-whistle on the accumulator, that sounds when the brakes are applied normally, or by the engineer's hand. Attached to each truck is a shaft, to which is secured one end of a chain, the other end of which is attached to the lever that moves the brake-beam. When this shaft is caused to rotate in either direction, the chain is wound up and the brakes thrown on and applied, and, conversely, when the said shaft rotates in the opposite direction to the one in which the chain is wound the brakes are released. To produce the necessary rotation for throwing on the brake the shaft is made laterally movable on one end, and is provided with a pulley having a belt that passes over another pulley fast on one of the axles of the car-truck, so that said pulleys can be moved apart a sufficient distance to tighten the belt enough to cause it to transmit motion from the axle to the shaft in order to rotate the latter and cause the brakes to be thrown on. Normally the pulleys on the shaft and on the axle are so near together that the belt running over them will be slack or out of contact with the axle-pulley, and will not, therefore, transmit any motion. To provide for communicating the lateral movement of the shaft so as to increase the distance between its pulley and the axle-pulley, and thereby to render the belt operative, said shaft is pivotally secured at one end and connected with a sliding box at the other. Said box is connected with a cylinder having communication with the pipe that leads from the air-accumulator, whereby when air-pressure is applied to said cylinder a piston or plug in the latter will be moved against the box, forcing the latter in one direction against the resistance of a coiled spring, and when such pressure is relieved the spring will produce

a reverse motion of said box. The pulley on the shaft is loose and has an internal annular gear which meshes with gear carried on an arm fast on the shaft. It has also a fly-wheel
5 with pinion, to which motion is imparted from the gear on the arm when said pulley is caused to rotate from the axle-pulley by means of the belt. Should said axle-pulley cease to revolve, as it may do by such a powerful appli-
10 cation of the brake as will cause the car-wheels to slide, the fly-wheel will continue to revolve, causing, by means of the gear, a reversal of motion of the arm that is fast on the shaft, thereby throwing off the brake, relieving
15 the friction of the brake-shoes against the car-wheels, and, by allowing freedom of rotation to said wheels, stopping the sliding of the latter.

I will now proceed to describe in detail the
20 several parts which constitute my invention.

Referring to Figs. 1 and 2 of the drawings, *a* represents a shaft supported in hangers *bb* attached to the timbers *B* of a car-truck. The end *c* of said shaft has a shoulder inside of its
25 journal and a collar outside to hold it in place, the journal being loose to permit the shaft a lateral motion of two or three inches at its other end, *d*. The end *d* is also journaled loosely in a sliding box, *e*, fitted in its hanger
30 *b*, and held in place by means of a coiled spring, *f*, at one end, a plug, *g*, resting or pushing against its other end. The plug *g* is free to slide forwardly and backwardly in a cylinder, *i*, when air-pressure is applied to
35 or released from the inside of a flanged rubber thimble or cap, *h*, pushing the box *e* and compressing the spring *f* in one case, or vice versa. A spring-catch, *j*, with a handle, as shown, serves to hold the box *e* fast against
40 the spring *f* when said box is forced by hand-power applied to the end *d* of the shaft *a*, and the toe of said catch reaches the recess provided for that purpose. On the shaft *a* there is a flanged loose pulley, *k*, which is con-
45 nected to a pulley, *m*, on the car-wheel axle *M* by the chained belt *b'*. The pulley *k* has an internal angular gear, *k'*, and is closed by a plate, *n*, made fast by screws *o o*, said plate forming also one flange of the pulley and a
50 bearing for the latter on the hub of an arm, *p*, which is made fast to the shaft *a*. This arm, which is inside the pulley *k*, carries a pinion, *q*, that meshes with the annular gear *k'* and with an intermediate wheel, *r*, whereby
55 motion is transmitted through a pinion, *s*, on the hub thereof to a fly-wheel, *S*, loose on the shaft *a*. A screw, *c'*, bears against a spring or shoe, *d''*, that bears against the fly-wheel *S* to produce friction or resistance to motion. A
60 counterpoise, *t*, is provided to balance the weight of the arm *p*. The pulley *k*, though free to rotate, cannot slide laterally, as it is maintained in place by the hubs of the arm *p* and fly-wheel *S*, as shown in Fig. 2.

Fastened on the shaft *a* is a ring, *u*, to which is attached one end of a chain, *v*, the other end of said chain being secured to a lever, *Y*,

that operates the brake-beam carrying the shoes that bear against the car-wheels, said beam and shoes not being shown in the draw-
70 ings, as they may be of any ordinary or suitable construction. Guide-pulleys *a'* *a'* are shown for the chain *v*. A strong spring, *X*, holds one part of the chain *v* loose, as shown, or allows slack thereto for a purpose hereinafter
75 to be explained. A chain, *Z*, is connected at *b''* to the chain *v* and also connects with the spindle or shaft of a hand-brake, which is not shown in the drawings, as it is or may be that which is usually employed. The pulley *m* on
80 the wheel-axle *M* is made in two halves or hemispherical sections and is fastened by means of bolts in its flanged hub, as shown. This pulley has a deep groove in its periphery to accommodate freely a curved rod, *d'*, (shown
85 in Figs. 1, 2, and 4,) one end of said rod being secured to the sliding box *e*, its other end embracing the pulley *m*. Three light springs, *e'*, each carrying a small roll, *f'*, are secured
90 to the rod *d'* and form anti-friction supports for the belt *b'*. Said belt *b'* is made of suitable material, such as leather, and is plated or covered externally with a metallic chain, *p''*,
95 secured by rivets or wire. The purpose of the chain is to keep the belt from stretching, though I do not confine myself to such chain, as the same effect can be accomplished by
100 other means, as, for example, with a flat wire rope or with belts having wire interwoven.

In Fig. 1 *j'* is an iron pipe running the length
100 of the car and fastened in any convenient place. Said pipe connects by means of a coupling, *k''*, with a flexible pipe, *l'*, that has its other end, *m'*, made fast to the head *n'* of the cylinder *i*, so that when air-pressure is applied
105 through said pipes the rubber thimble *h*, made fast and air-tight by the head *n'*, expands, pushing forward the plug *g* and the sliding box *e*, thereby compressing the spring *f*, said box carrying with it the end *d* of the shaft *a*
110 and the rod *d'*. At each end of the iron pipe *j'* are couplings *o'*, which serve, along with flexible pipes *p'*, to connect the pipes *j'* together, forming a continuous connection from end to end of the train of cars. The coupling
115 *o'*, as shown in section in Fig. 6, consists of a casting, preferably of steel, having two elbows. One of these elbows, *q'*, is screwed to the end of the pipe *j'*, as shown, and has a flat seat,
120 *v'*, on which a rubber washer, *s'*, is glued. Said coupling is formed with a bent arm, *t'*, which serves as a bearing or nut for a screw, *u'*, having two hand-wheels, *w'* *x'*, and an adjustable block, *y'*. The hand-wheel *x'* is secured fast to the screw *u'*, while the hand-
125 wheel *w'* serves as a lock-nut for said screw. An elbow, *Z'*, fast to the flexible connecting-pipe *p'* forms a counterpart of the coupling and is provided with a seat, *a''*, resting on the rubber washer *s'*, and an external flange, *b''*,
130 to protect the said seat from injury. The top of the elbow *Z'* has a projection, *c''*, situated in the center of the seat, so that when the screw *u'* is screwed down the cavity *d''* of the

block y' fits and presses on it, making the joint of the two elbows or coupling perfectly air-tight. The couplings q' on both ends of the pipe j' are alike, and so are the couplings Z' at the ends of the connecting-pipe p' , so that no trouble is experienced in uniting and disconnecting.

When the elbow q' of the last car in the train has no connection to make, the screw u' is turned down till the block y' , taking the place of the elbow Z' , rests on the seat, serving as a plug-valve to close the end of the air-pipe. The elbows q' can be provided with a cock, should this be necessary.

In Fig. 7 a^3 is a cast-steel reservoir or accumulator for air. Said accumulator is preferably of cylindrical form, having a flat base, e''' , with screws d''' to make it fast in a convenient place on the tender of the locomotive. Said accumulator is connected by means of a pipe, b''' , with an air-compressing pump, whereby it is supplied with air at a high pressure. This pump is not shown in the drawings, as it is of well-known construction and can be operated in connection with the feed-pump of the locomotive or located on the tender, taking motion from one of the axles of the latter.

At e''' is shown a safety-valve, which also serves to maintain the pressure constant in the accumulator, and f^3 is a pressure-regulating valve to supply with a constant but lower pressure the air for the pipes of the brake-controlling mechanism. Said valve f^3 has a spring, j''' , on its stem, and a head or piston of larger area, g^3 , fitting rather loosely in the cylinder or body of the valve, as shown, between the heads or valves f^3 and g^3 .

In the wall of the cylinder or valve body there is a port or way, h''' , and in the center of the cap of the cylinder or valve body there is another port, i^3 , which, as well as the port h''' , communicates alternately with the way i^3 of the cock j^6 .

The cylinder-cover I' is provided inside with a flat rubber seat, o^3 , for the check-valve g^3 , and with a fulcrum for the lever n^3 , which operates the valve m^3 , as shown. From the cock j^6 there leads a way or hollow stem, k^3 , which connects the cock j^6 by a suitable pipe with a whistle, l^3 . In said cap I' , which is also the casing of the cock j^6 , there is a curved way, v^3 , connecting alternately with the three ways or ports, h''' , i^3 , and k^3 , and from which leads a pipe, p^3 , that connects with the pipes j' and p' , whereby the air-pressure is conducted along the train to operate the brake-controlling mechanism. Instead of employing a handle to operate the cock j^6 this latter is provided with a grooved pulley, q^3 , which, as seen in Fig. 8, is screwed to the stem of the cock j^6 and made fast by set-screws s^3 , a washer, u^3 , being provided, as shown, to make the joint air-tight. From the way i^3 in the cock j^6 there proceeds a central passage, t^3 , which registers with a central passage, x^3 , in the pulley q^3 . From this passage there extend two branch passages, x^3 and y^3 , the latter reaching the

groove in the periphery of the pulley and communicating with a hollow elbow, z^3 , to which is attached the flexible tube a^4 . (Shown in Fig. 7.) The other branch, x^3 , leads to a cavity in the side of the pulley, in which is located a flanged rubber cap, b^4 , held tight in place by the nut c^4 , fitted in said cavity. The rubber cap, its flange being held fast, is free to expand outwardly inside the nut, its shape and manner of working being the same as that of the nipple h in Fig. 1. When air-pressure is applied inside of said cap b^4 , its outward expansion communicates motion to the bent lever d^4 , which in turn communicates motion to the bent lever e^4 , whose bent end f^4 passes through the pulley, projecting therefrom on the opposite side, and forming a pin which, abutting intermittently against the prop p^4 , operates to limit the rotation of the pulley. When air-pressure is applied inside the cap b^4 , it causes the pin f^4 to be withdrawn. The pulley q^3 is provided besides with two rigid pins or stops, g^4 and h^4 , and a volute spring, i^3 , which connects the pulley with the casing of the cock j^6 and tends to produce a rotation of said cock in the direction of the arrow, such tendency to rotation being resisted or restrained by the flexible tube a^4 .

The small valve m^3 and its way afford communication with the curved way v^3 and with the flexible pipe j^4 , so that when said valve is open the air-pressure can pass through the said pipe to the alarm-whistle k^4 in the cab of the locomotive. The pipe j^4 is suspended, on its way to the locomotive, to the pipe a^4 by means of hangers j^5 . The flexible pipe a^4 has one end attached to the pulley q^3 through the medium of the elbow z^3 , its other end being coupled to a pressure-gage, l^4 , beside the whistle k^4 in the cab L of the locomotive. Said pipe a^4 is formed or provided with corrugations n^4 , to secure its being held upon a bracket, o^4 , whereby it is maintained in proper tension. A prop or standard, p^4 , is fastened to the top of the accumulator and forms a detent for the pins or stops g^4 f^4 h^4 , said prop having cushions q^4 to prevent injury to said stops from concussion. A casing, r^4 , is provided to form a protecting-cover for the parts.

Fig. 10 represents an iron box, C , with a lock, r^5 , which is put at each end of a car to form a receptacle for the connecting-pipes when not in use. Each such box should be provided with two pipes, one a short one and the other a long one, the former to connect two cars directly and the latter to connect two cars and pass over an intervening car unprovided with my appliances for operating the brake. Each connection-pipe is by a chain, o^5 , having one end secured inside the box, the latter having an opening, m^5 , for the passage of the chain when the connection is in use and the box locked. The object of the box is to avoid loss of the connection-pipe, or changes from one car to another, as well as to secure safety when the cars are standing in yards or other unwatched places.

Having now fully described the construction of the various parts which constitute my apparatus, the operation of the same is as follows: As seen in Fig. 1, it is assumed that air or steam pressure has been established in the pipes p , j , and l . The air-pressure expands the rubber thimble or cap h , which in turn pushes the plug g and the latter the box e against the spring f , which spring yields so that the end d of the shaft a , being carried by the said box e , brings the pulleys k and m nearer together, thus giving slack to the chain belt b , the latter being at the same time separated or lifted from said pulley m by means of the rod d' , which rod moves, as already described, with said box e . In this condition of affairs the brake-shoes keep aloof from the car-wheels as long as the air-pressure is maintained in the pipes. If, now, the air in the connection-pipes is exhausted, the operation is reversed, the end d of the shaft a is moved back by the pressure of the spring f , and the bent end of the rod d' sinks into the deep groove in the pulley m , the belt b being thereby tightened and permitted to come into operative contact with the periphery of the pulley beyond the groove in which the bent end of the rod d' rests. Motion is thereupon transmitted from the car-wheel axle M through the medium of the pulley m and belt b to the pulley k . The latter is loose on its shaft, but, by reason of its inside gearing, imparts a very rapid motion to the fly-wheel S , thereby producing a strong resistance, which forces the arm p together with the shaft a to turn around, thus winding the chain v on the shaft a and so applying the brake with pressure up to the point where the tension of the chain v , pulling the shaft a , overpowers the spring f and brings the pulleys m k closer together, whereupon the belt begins to slip, holding from this moment the pressure of the brake substantially constant.

Should the air-pressure be relieved to such an extent as to allow the spring f to produce too great a tension of the belt b , so that the wheels of the car would begin to slide, the mechanism will automatically regulate itself to correct the sliding as follows: If the car-wheels slide, the pulleys m and k will necessarily cease to rotate, and in such case the momentum of the fly-wheel S , through the medium of the gearing, almost instantaneously carries the arm p backward, and, by rotating the shaft a , gives slack to the chain v and so releases the brake, whereupon the car-wheels will revolve. Should the wheels slide again, the loosening operation is repeated, thus maintaining the pressure of the brake just below the point of sliding. If, when the described mechanism is free to operate the brake—that is, when there is no air or steam pressure established through the connection-pipes—the car should be moving very slowly, said mechanism will not affect the brake, owing to the very slight resistance to motion opposed by the fly-wheel S , such resistance not being suf-

ficient to carry the arm p around; but should the speed of the car increase a little said arm will be turned and the brake applied, as already explained.

If, instead of entirely releasing the pressure in the connecting-pipe upon applying the brake, some slight pressure be maintained within such pipe, the brakes will be thrown on with a power within certain limits proportionate to the pressure remaining in the pipe, so that the engineer can regulate at will the power of the brake by duly governing or controlling the pressure used, having for his guidance and assistance the gage l' , Fig. 7, which shows constantly what the pressure in the pipes is. This is accomplished in the following manner: The pressure remaining in the pipe neutralizes in part the power of the spring f , wherefore the chain v , pulling the shaft a , loosens the belt b before the limit of full power is reached, thus aiding the pressure remaining in the pipe, which pressure is also being exerted against the spring f . When pressure is applied through the pipe-connections to release the brakes, the spring x , held, as shown, on the chain v , pulls upon the latter and the shaft a , making said shaft unwind the chain until it gets loose.

In case the brake-operating mechanism or connection-pipes should be out of order they can be rendered instantly inoperative by manually pulling the end d of the shaft a toward the spring f until the box e is engaged by the spring-catch j , the latter holding said box in this position and keeping the belt b loose. In whatever direction the car may move the brake-operating mechanism is effective, and a short or a long motion of the brake-lever y does not interfere with the perfect working of the apparatus.

The usual hand-brake on the car may be operated to move the lever y , as usual, through the medium of the chain Z , which is connected at b^2 to chain v , and such operation may be coincident with that of the other mechanism described, as the parts do not interfere with one another, and when operated together mutually assist to the production of the same result.

The operation of the accumulator to apply or release the pressure through the pipe and to give the alarm when necessary is as follows: The pipe a' , serving as a rope, is pulled by the engineer in the cab and made fast to the bracket or hanger o' , when the pin g' of the pulley q' rests against the prop or detent p' , the coupling between the tender and the locomotive being at the same time in state of tension, so that when both locomotive and tender come close together the pipe a' becomes loose or slack, and the pulley q' is turned back by the spring v' . The position of the parts shown in Fig. 7 is maintained constantly while the train is running under normal conditions, the cock j' being in communication with the way v' and the pipe p' , leading to the pipes p' j' l' . Now, should the train

break apart the result is as follows: The compressed air or steam in the pipes escapes at the point where the rupture takes place and where the train is divided, so that the piston-valve g^3 , having a constantly lowering pressure on its upper side, is forced by the pressure on the other side to move forwardly or upwardly until it abuts against the seat o^3 , shutting off completely the communication between the accumulator and the pipes, thus avoiding the emptying of the latter. The valve head g^3 reaches the seat o^3 because its larger surface secures a pressure that overcomes the spring j''' , which controls the smaller valve f^3 and keeps it to its seat. When the valve g^3 is pushed forward, it meets and strikes the lever n^3 , opening the valve m^3 , and thus allowing free communication between the pipes p^3 and j^4 , directing the still remaining compressed air or steam in the connections to the whistle k^4 and causing the latter to sound an alarm, which warns the engineer that an accident has occurred. The gage l^4 also indicates a lowering of pressure, and thereby communicates an additional warning. At the same time the brakes of every car in the train (except wild cars, if any) are applied, as the pressure which was restraining the brake mechanism is decreased. Thus the loose section of the train is forced to stop if on a level or to move at a very slow speed if going down grade. If the train cannot be recoupled, or the loose section added to the forward part of the train, the last car of such forward part has the rear end of its connection closed by its own plug-valve, so that the air-pressure can be applied as before. If a brakeman should want to apply the brakes, he has only to loosen the pipe-couplings of any car and allow the air to escape, whereupon the brakes are applied and the alarm sounded to the engineer by the whistle k^4 , which is accomplished in the same manner as when the train accidentally breaks apart. Should some of the connections get loose, or great leakage occur from an unexpected cause during the running of the train, the operation described in the two cases just mentioned is performed, so that whenever the brakes are applied except by the engineer, he is immediately notified of the fact by an alarm sounded on the whistle in his cab.

Should the train be running at a high speed and meet another train coming in another direction on the same track, (the engineer not having sufficient time to reverse and attend his engine in so short and critical a moment,) the mechanism described will automatically apply the brakes in the following manner: As soon as the engineer reverses his engine, the latter and its tender come close together, and the pipe a^4 becomes loose or slack. The pulley q^2 is thereupon turned in the direction of the arrow until the stop h^4 reaches the point q^4 , when the cock j^6 opens connection between the pipe p^3 and way k^4 , thus exhausting all the air in the pipes through the whistle l^4 , so that the brakes are automatically applied instantly

and at the same time an alarm sounded for the notification of the train-hands. In the case aforesaid, as in any other where the engineer slacks his engine, whether to stop or merely to decrease speed, the brakes apply themselves unless the engineer takes the pipe a^4 in his hand and regulates the power by bringing down the air-pressure to a convenient point.

After the brakes have been applied, whether to stop the train or otherwise, in order to release them again the engineer has only to start the engine forward, when the locomotive and tender become separated, owing to the play of the coupling, as stated, and therefore the engine, pulling the pipe a^4 , turns back the pulley q^2 , but not to the primitive position shown in Fig. 7, because it is stopped before reaching that point by the now protruding pin f^4 , which takes the place occupied by the pin g^4 in Fig. 7, and so brings the cock j^6 in position to connect the way h^3 with p^3 , in which case the valve f^3 opens, letting the air pass to the pipes until the proper pressure therein is secured. (The piston-valve has now no action, because the way i^3 is closed.) The stop f^4 is in the meantime receding into the pulley q^2 , and recedes altogether when the proper pressure is reached, thus releasing the pulley q^2 , which is then free to turn and does turn to its primitive position, being drawn thereto by the action of the spring m^4 . This arrangement is very necessary, as if the way h^3 were in constant communication with the pipes, in case of leakage all the air in the accumulator would escape and the brakes would not be applied so soon.

Instead of compressed air, steam from the boiler of the locomotive can be used, in which case the accumulator a''' and air-compressing pump can be dispensed with, using only the specified parts on top of the accumulator connected to said boiler by means of a pipe.

What I claim as my invention is as follows:

1. In car-brake apparatus, the combination of a shaft, a , pivotally supported at one end and capable of lateral movement at the other end, with supports b b , a laterally-movable block, c , spring f , cylinder i , piston or plug g , and expanding cap or nipple h , whereby when air-pressure is applied inside said cap said shaft will be moved in one direction against the resistance of said spring, and when such pressure is relieved it will be moved in the opposite direction, substantially as shown and described.

2. In car-brake apparatus, the combination, with a car-wheel axle and a pulley fast thereon, of a shaft, a , a pulley, k , thereon, and a belt, b' , passing over both of said pulleys, said shaft being laterally movable so as to cause said belt to be tightened when the shaft is moved in one direction and to be loosened when moved in the opposite direction, substantially as shown and described.

3. In car-brake apparatus, the combination, with a laterally-movable shaft, a , journaled in a sliding box, c , and supported in a hanger,

b, of a spring-catch, *f*, for holding said block in position, substantially as shown and described.

4. In car-brake apparatus, the combination, with a car-axle, *M*, of a flanged pulley, *m*, having a peripheral groove, a laterally-movable shaft, *a*, a sliding box, *e*, a rod, *d'*, secured to and moving with said box, a belt, *b'*, and a loose pulley, *k*, on said shaft, whereby when said shaft is moved in the direction necessary to loosen said belt said rod will hold the belt out of contact with the pulley *m*, and when said shaft is moved in the contrary direction said rod will retire into the groove in said pulley and permit contact of the belt with said pulley, substantially as shown and described.

5. In car-brake apparatus, the combination, with a grooved pulley, *m*, and belt *b'*, of springs *e'*, and anti-friction rollers *f'*, substantially as and for the purpose set forth.

6. In car-brake apparatus, the combination, with a pulley, *m*, on the car-axle *M*, and a shaft, *a*, carrying a loose pulley, *k*, said pulleys being connected by a belt, *b'*, and said shaft being laterally movable by means of pressure and a spring, of pipes for communicating or conveying pressure thereto from an air-reservoir or steam-boiler, substantially as shown and described.

7. In car-brake apparatus, the combination, with a laterally-movable shaft, *a*, and a brake-operating lever, *y*, of a connecting chain, *v*, with spring *X*, for maintaining tension in said chain to loosen the brake when relieved of pressure, substantially as shown and described.

8. In car-brake apparatus, the combination, with a laterally-movable shaft, *a*, of a loose pulley, *k*, having internal gear, *k'*, an arm, *p*, fast on said shaft and carrying gear-wheels *q* *v*, and a fly-wheel, *S*, having a pinion on its hub, the said fly-wheel being loose on the shaft *a*, whereby when the pulley *k* is caused to rotate it will impart a rapid motion to said fly-wheel, the latter by its resistance to motion carrying the arm *p* and shaft *a* around, thereby winding the brake-chain, substantially as and for the purpose set forth.

9. In combination with the pulley *k*, having the internally-located fly-wheel *S*, the friction-brake for said fly-wheel consisting of spring *d''* and screw *c'*, substantially as shown and described.

10. In car-brake apparatus comprising pipes for applying pressure for the purposes specified, the combination, with said pipe, of an air-accumulator, *a'''*, having an inlet, *b'''*, and an outlet-valve, *f''*, the body of said valve

having three passages or ports, *h'''*, *i''*, and *m''*, communicating with a cock, *j''*, which communicates alternately with the brake-pipes *p''*, with a pipe, *k''*, that connects with a whistle, *l''*, and a pipe, *j''*, that connects with another whistle, *k''*, substantially as shown and described.

11. In car-brake apparatus, the combination, with an accumulator or compressed-air reservoir, *a'''*, of the valve *f''*, having enlarged head *g''*, cap or casing *I'*, rubber washer *o''*, lever *n''*, and valve *m''*, substantially as shown and described.

12. In a car-brake apparatus, the combination, with an air accumulator or reservoir, *a'''*, of the cap *I*, having valve *f''*, and cock casing or shell *I'*, having the three ways or ports and a curved way, *v''*, with the cock *j''*, substantially as shown and described.

13. In a car-brake apparatus, the combination, with a cock, *j''*, which controls the application of the air-pressure, and which has a transverse port or way and a longitudinal port communicating therewith, of a pulley, *q'*, secured to said cock, said pulley having a central opening or port which communicates with the longitudinal port of the cock and two branches leading therefrom, one of said branches connecting with a hollow elbow, *z''*, which connects with a hollow pipe or tube which is in communication with the pressure-gauge *l'*, the other branch leading to a socket in the pulley, in which is fitted a rubber thimble or flanged cap which abuts against the end of a lever, *d''*, connected with another lever, *e''*, whose end is bent and passes through the pulley, forming a movable stop, *f''*, substantially as shown and described.

14. In car-brake apparatus, the combination, with a cock, *j''*, which controls the air-pressure or regulates the same, of a pulley, *q''*, secured thereto, a volute spring, *i''*, attached to said pulley, a movable stop, *f''*, rigid stops *g''* *h''*, a flexible tube, *a''*, having a tension-spring, *m''*, and corrugations *n''*, and a hanger or bracket, *o''*, substantially as shown and described.

15. In combination with mechanism for actuating car-brakes, whistles for notifying the engineer and train-hands, respectively, when the brakes are applied, substantially as shown and described.

In testimony that I claim the foregoing I have hereunto set my hand this 5th day of January, 1885.

JOSEPH S. BADIA.

Witnesses:

LISLE STOKES,
WILL H. POWELL.