(No Model.)

3 Sheets—Sheet 1.

W. H. WARD.

TRAIN BRAKE FOR RAILWAY CARS.

No. 246,927. Patented Sept. 13, 1881.

Fig. 1.

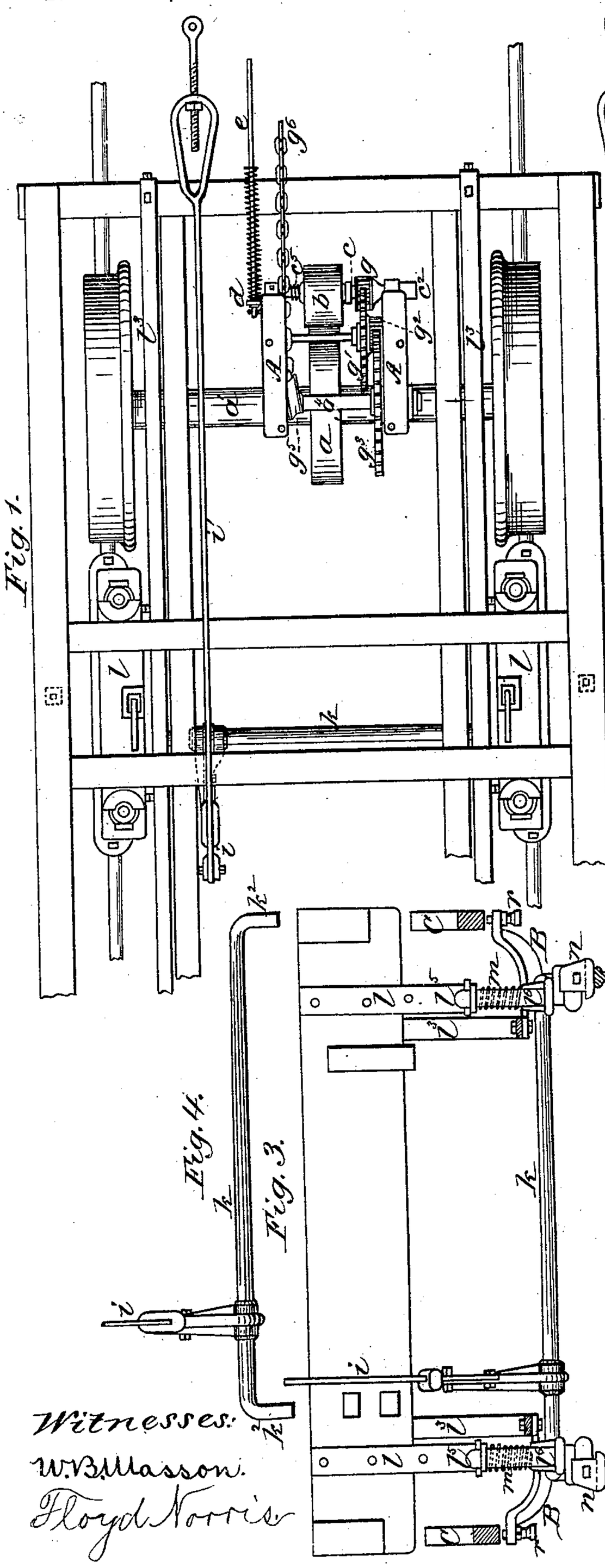

Fig. 2.

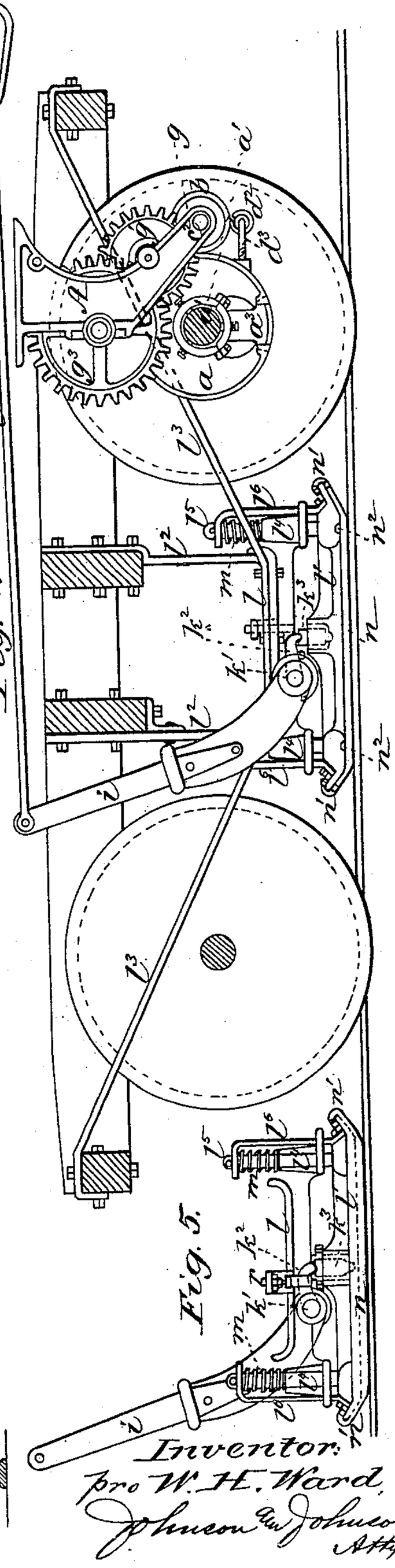

Fig. 4.

Fig. 3.

Fig. 5.

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(No Model.) 3 Sheets—Sheet 2.

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Fig. 6

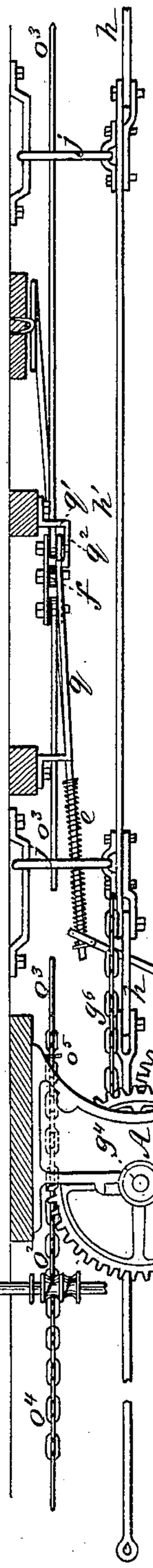

Fig. 12.

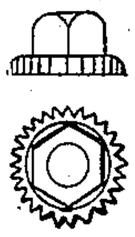

Fig. 11.

Fig. 14.

Fig. 7.

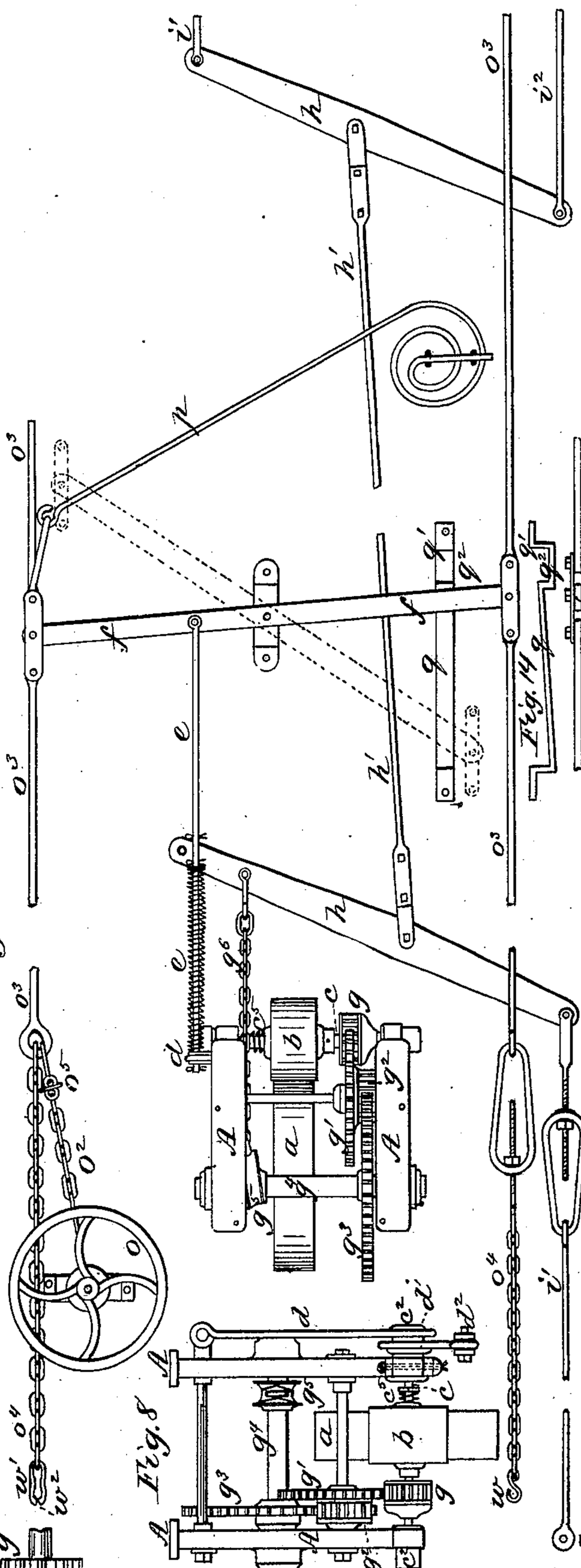

Fig. 13.

Fig. 9.

Fig. 10

Fig. 8

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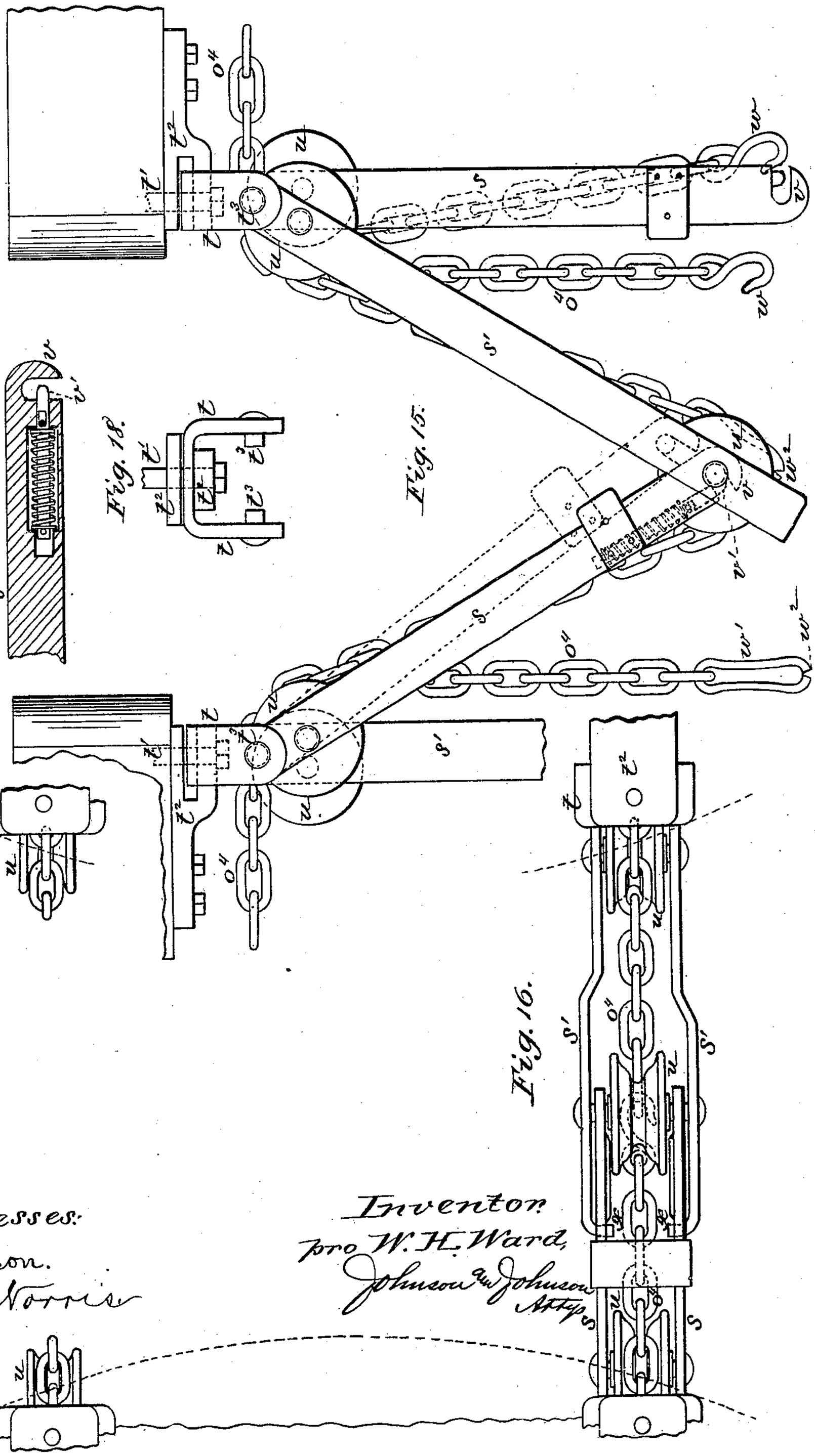

Witnesses:
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Floyd Norris

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UNITED STATES PATENT OFFICE.

WILLIAM H. WARD, OF PITTSBURG, PENNSYLVANIA.

TRAIN-BRAKE FOR RAILWAY-CARS.

SPECIFICATION forming part of Letters Patent No. 246,927, dated September 13, 1881.

Application filed February 14, 1881. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM HENRY WARD, a citizen of the United States, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented new and useful Improvements in Friction-Power Railway-Train Brakes, of which the following is a specification.

My invention is directed to improvements on the character of railway-car brakes in which the momentum and force of the train is utilized to stop itself by means of friction-power operated by the axles of the truck-wheels.

My invention embraces new combinations in which friction-power devices are adapted to operate and apply rail brake-shoes of each truck of the train, my object being to provide a brake mechanism which may be controlled by the engineer or train-brakeman to put the friction winding devices in action, and by the momentum of the train operate the brake-shoes by means of such friction-power. The brake-shoes are operated by pinch-toe lever-shafts adapted to exert a powerful force upon bearing-steps seated in the shoe-holders. The equalizing-bars of the axle-bearings are utilized for counteracting lost motion of the equalizer-springs in applying the brakes.

In connection with the friction-power rolls, the winding devices operated thereby, and the train-brake connections, means are employed by which, in the event of the accidental separation of the train, all the brakes of the separated portion will be automatically applied and locked in brake positions.

The train-brake connections are supported by pivoted hanging arms, which serve as stiff carriers for such connections between the cars to provide for train expansion and contraction and without lost motion in the brake-operating connections. These pivoted hanging arms are provided with a hook-connection adapted for automatic separation in the event of the accidental separation of the train; and in connection with such automatic separation of the carrying-arms for the brake-operating chains the latter are also provided with means for automatic separation between the cars upon the accidental separation of the train. In the event of such separation of the brake-connecting chains of the train, the force required to effect such separation applies the brakes and causes them to be automatically locked in brake force on the separated cars of the train, while the brakes of the forward part of the train are under the control of the engineer or train-brakeman. Provision is made for applying the brake force by hand on each car, or from the forward car, or by connections with the locomotive and the brakes thereof.

I have not shown herein the steam brake-operating connections for the locomotive and the tender, as such matter forms the subject of a separate application by me for a patent, in which a steam brake-cylinder is employed to operate the friction brake-applying mechanism embraced in this patent.

The brake-shoe carriers are adapted for vertical movement upon the brake-shoe frames, and are raised and held free of the rails when the brakes are off, and the brake-shoes are constructed specially for being applied to the rails by pinch-toe lever cross-shafts suitably supported by frames fixed to and depending from the truck-frames between the wheels.

Referring to the accompanying drawings, Figure 1 represents a top view of so much of a passenger-car truck as shows the frictional brake mechanism applied thereto; Fig. 2, a longitudinal section of the same, showing the brake-shoes of one of the trucks as applied to the rail; Fig. 3, a transverse section of the same. Fig. 4 represents in detail the operating-lever and its pinch-toe cross-shaft for operating the brake-shoes. Fig. 5 is an elevation of one of the rail brake-shoes, its frame, and operating-lever. Fig. 6 represents in elevation the brake-operating devices as attached to the bottom of the car-body. Fig. 7 is a top view of the parts shown in Fig. 6. Fig. 8 is a front elevation of the friction-rolls and their winding devices. Fig. 9 is a detail sectional elevation of the leading frictional roll, its adjustable friction-disk, its driving-gear, and anti-friction journal-roll bearings. Fig. 10 is a detail of the driving-gear pinion shown in Fig. 9. Fig. 11 is the spring-lever by which the leading friction-roll is put into and out of frictional power contact with the friction-driver. Fig. 12 is a ratchet lock-nut used in joining

and securing the brake-frame. Fig. 13 is a detail showing the stop on the chain of the hand-wheel brake-shaft to limit the winding of said chain on said shaft. Fig. 14 is the angle-stop for the operating-lever of the brake-connecting chain; Fig. 15, an enlarged elevation of the compensating-arms between cars and the brake connecting and operating chains in both connected and separated positions; Fig. 16, a top view of the same; Fig. 17, a detail sectional view of the hook-connecting end of one of the compensator-arms, and showing the spring-bolt retainer for the hook-connection of said compensator-arms; and Fig. 18 is a detail front view of one of the swivel-joint hangers for the compensator-arms.

Each car is provided with a friction brake-power device adapted to utilize the momentum force of the train to put in motion the brake-winding devices when the leading and driving friction-rolls are brought into frictional contact by the engineer or train-brakeman at pleasure, and such friction brake-power device operates the brake-shoes of each car of the train.

The driver-roll *a* of the friction device is secured upon one of the truck-wheel axles *a'* by means of set-screws, (shown in Fig. 6,) and is constructed with a dovetail section, a^3, which allows the friction-roll *a* to be dropped upon the shaft sidewise, and then secured by said section a^3 and drawn and clamped in position by the fastening-screws, giving to such frictional roll an unbroken circumferential surface.

The leading roll *b* of the friction device is mounted loosely upon a shaft, *c*, mounted by anti-friction roll-bearings *c'*, Fig. 9, in boxes c^2, which are secured in a frame, A, Fig. 6, depending from the bottom of the car-body or from suitable timbers of the car-truck, as may be found most advantageous. One end of said shaft *c* is adapted to have a sliding or vibrating movement, its box c^2 having capacity for sliding in a horizontal slot in the lower end of one of the side pieces of the frame A. This movable end of the shaft is operated by a spring-steel lever, *d*, Fig. 6, (shown in detail in Fig. 11,) which is provided with an eye, *d'*, to receive the box of said shaft, and is pivoted at its lower end, d^2, to an adjustable stud eye-pin, d^3, Figs. 2 and 6, the upper end of said spring-lever *d* having an eye through which a cushioned rod, *e*, passes and by which said spring-lever is connected to a brake-operating cross-lever, *f*, pivoted centrally beneath the car-body, as shown in Fig. 7. The leading friction-roll *b* is caused to rotate the shaft *c* by means of a friction-disk, c^3, Fig. 9, which is secured on said shaft by a key, and upon which shaft it can slide to bring its inner face, c^4, in frictional contact with the frictional side face of the friction-roll *b*, such frictional contact being maintained by a coil-spring, c^5, on the shaft *c* bearing against the hub of said disk. The pressure of this side friction force is regulated by screw-nuts c^6, Fig. 9, to give any degree of winding force required. The shaft *c* of the leading friction-roll *b* carries at its fixed end a pinion, *g*, the spaces between the teeth of which are open, as shown in Fig. 10, and which engages with and becomes the driver for a gear-wheel, *g'*, on the side of which is a pinion, g^2, which engages with and drives the brake-chain shaft wheel g^3, which is secured upon the brake-chain-winding shaft g^4, upon the other end of which is secured a chain-barrel, g^5, the chain g^6, Fig. 7, from which connects with one end of a brake evener-bar, *h*, Fig. 7, the other end of which connects with the brake-shoe-operating lever *i* of the truck upon which the brake mechanism is mounted, such connection being made by an adjustable rod-connection, *i'*, which is made adjustable for brake-shoe wear by a link and open-eye screw-rod shown in said figure and in Fig. 2. To simultaneously operate the brake-shoes of the other truck a similar evener-bar, *h*, is connected with the first evener-bar by a rod, *h'*, and this second evener-bar is connected by one end to the rod *i'* of the brake-shoe lever of the other truck, and its other end has a rod-and-chain connection, i^2, Fig. 7, with the hand brake-wheel-operating device at the other end of the car. These evener-bars *h* are suspended from the bottom of the car-body by sliding link-hangers *j*. (Shown in Fig. 6.)

The object of making the teeth of the pinions $g\,g^2$ of the brake-winding device open—that is, making the teeth-spaces open—is to prevent the teeth-spaces filling up with ice or other matter; and the object of providing the journal-bearings with anti-friction rolls *c'* is to avoid the use of the heavy lubricants in general use on railways, which, if used, freeze in cold weather, and would prevent the freedom of brake action.

Having described the friction brake-winding devices and their connections from the axle *a'* to the shoe-operating levers *i*, it now remains to describe the said levers and their connections for operating the brake-shoes.

The lever *i*, Figs. 1 and 2, is fixed upon a cross-shaft, *k*, the ends of which are secured in the brake-shoe frames *l* at *k'*, Figs. 2 and 5, outside of which frames said shaft ends are turned at angles to form pinch-toe levers k^2, Fig. 4, of equal length, and arranged to project horizontally, so as to extend over and bear upon step studs or bearings k^3, seated in sockets in the brake-shoe holder, so as to apply the pressure in the middle of its length and avoid friction. The upper end of such bearing-stud k^3 has freedom for an accommodating movement under the action of the pinch-toes k^2 of the lever-shaft *k*, and thus prevents friction in brake application.

The frame *l* of the brake-shoe holder *l'* is secured to the cross or bolster timbers of the truck-frame by a depending yoke-strap, l^2, Fig. 2, which is braced and additionally supported by a truss-bar, l^3, secured to the end cross-timbers of the truck. The brake-shoe frame *l* is fixed to the said yoke-strap and truss-bar l^2 l^3, and is formed with tubular ends l^4, through which pass the vertical supports l^5 of the brake-

shoe holder l', which latter is additionally supported by straps l^6, having their upper ends angled and made to embrace the upper ends of the shoe-holder supports l^5. Coil-springs m m are interposed between the tubular ends of the shoe-frame and the angle ends of the stops l^6, so as to exert an upward force for the purpose of freeing and maintaining the brake-shoes free of the rail when out of brake action.

The shoe-holder l' is formed with opposite upwardly-inclined ends, over which the shoe n proper is secured by hook ends n' n', said shoe being provided with a web on its outer side for strength and stiffness, and to prevent the hook ends from breaking. The ends of the shoe also incline upward to fit the inclined ends of its holder; and cross-ribs n^2 n^2, Fig. 2, are formed upon the upper side of the shoe to enter corresponding grooves in the bottom of the shoe-holder, so that the shoe can only be secured in place by sliding it sidewise upon the holder, and when so secured its hook ends and the cross-ribs serve to retain it in rigid locked position, while to prevent its lateral displacement from its holder it is secured by countersunk screw-bolts at its turned ends.

Having described the construction of the brake and its work parts and their connections from the axle friction-wheel a to the rail brake-shoe n, it now remains to show how to operate the same.

In Figs. 6 and 7 the usual brake hand-wheel o and its chain-winding shaft o' are shown as being connected with the brake connecting and operating chain o^2, that connects with the brake-operating rods o^3, which also embrace the engine or train operating chain-connections o^4, that lead to corresponding connecting-chains of its connecting car or cars. By turning the hand-wheel o the chain o^2 is wound up to a stop, o^5, (shown enlarged in Fig. 13,) and thus operates the pivoted cross-lever f by its rod-connection o^3 with said chain-connection o^2. The winding of the brake-chain connection o^2 through said cross-bar f operates the push-rod c, which in turn operates the spring-lever d and puts the friction-roll b into friction power contact with the axle friction-wheel a, from which motion and power are imparted to the brake-winding devices by which the brake-connecting chain is wound upon the chain-barrel g^5 on the shaft g^4. This winding action causes the chain-connected end of the evener-bar h to be drawn toward the winding-barrel, the centrally-connected rod h' forming a pivot for said cross evener-bar h, the movement of which causes said rod h' to travel and operate in a similar manner the second evener-bar, h, connected to the other end of said rod h', and thus operate simultaneously the brake-rods i' i', Figs. 2 and 7, and the brake-levers i of each truck connected with said rods. This action causes the cross-shafts k to be rocked so as to depress their pinch-toe ends k^2 and force them upon the bearing-studs k^3, through which the friction of the winding devices imparted to the chain-barrel is transferred to the shoe to bring a powerful bearing force upon the rail, and thus create a frictional sliding force to stop the train. It will be understood that so long as the friction devices are held in contact, brake application will be maintained. The separation of the friction-roll b from contact with the friction-wheel a, by unwinding of the chain-barrel g^5 by the hand-wheel o, releases the brake-shoes from brake action through the lifting action of the springs m.

By the action of a spring, p, Fig. 7, the cross evener-bar f, with its rod and chain connections, is brought back to the place of rest, as shown by dotted lines in said figures, whenever the hand winding-wheel is released.

When the hand-wheel chain is wound to the stop o^5 thereof the evener-bar f is brought into the position shown, beneath one end of which an angle-stop, q, is secured to the bottom of the car, as shown in Fig. 6, the function of which is to provide for automatic brake action in case of accidental train separation. In such event the chain o^4 being hooked to the connecting-chain of the forward car, and the couplings of the cars being separated, the space between them will widen and correspondingly draw the chain o^4 with its rod o^3, and swing the evener-bar f against the shoulder q' of the angle-bar q, and thus prevent any further movement of the chain o^4, at which the separation of the connecting-chain o^4 also takes place, and allows the end of the evener-bar that came against said stop q' to drop into the depression q^2, and thus form an automatic lock for retaining the friction-rolls in contact. While the friction-rolls are thus retained in contact and the pressure upon the brake-shoes is applied with increased force, such pressure tends to lift the car-body from the bolster-springs, and to prevent which the shoe-frames l are provided with upwardly and outwardly curved arms B, Fig. 3, on their outer sides, and extend to and beneath the axle equalizing-bars C, at which points they have set-screws r, which are so adjusted as to come in contact with said equalizers C C whenever the brakes are applied upon the rail, and thus prevent lost bolster-spring motion. It is now only necessary to complete the train-brake connections to describe the means for connecting the brake-chain operating connections, and provide for train expansion and contraction by a device which in railroading is called a "brake-connecting compensator," because its function is to compensate for train expansion and contraction. This compensator consists of metallic arms s s', Figs. 15 and 16, of peculiar construction, being swivel-jointed at their connection with the under side ends of the cars, each car having a pair of such arms at each end, and placed in line with the brake-operating connections. A pair of these arms constitutes the compensator, and they are of such construction as to have both a flexing and a swiveling joint. The swiveling joint is made by

an open angle-bar, *t*, pivoted by a bolt, *t'*, to an open iron retainer, t^2, secured to the under side of the car-body, so as to afford swiveling capacity to said angle-bar. The flexing connection is made by short rivets t^3, Fig. 18, passing through the lower ends of the swivel angle-bar *t*, and also through the upper ends of the arm-bars *s s'*, so as to allow the said arms to swing thereon in the direction of the brake-connections. These bar-arms are shown as being made of united bars, so as to provide for securing chain-sheaves *u* between them, but they may be of any suitable construction that will allow of the arrangement of such sheaves to admit the passage of the brake-chain connections o^4 over and under them. For this purpose the arm *s'* has such a sheave, *u*, near its upper and its lower end, while the arm *s* is provided with such a sheave only near its upper end. The sheave-pins are shouldered and riveted, so as to securely hold the bars in place. The side bars of the arm *s'* have a greater space between them at their lower half-length, so as to admit of the hooking and free pivotal connection of the lower end of the arm *s*, the bars of which terminate in hooks *v*, Figs. 15 and 17, adapted to hook over the pin of said lower sheave, *u*, the object of which is to afford a stiff connection for the passage of the chain between the cars without lost motion, and to afford a compensating action for train expansion and contraction.

To prevent the accidental separation of the hooked connection of the compensator, a spring-bolt, *v'*, Fig. 17, is attached to the arm *s*, and adapted to retain the hook *v* upon the sheave-pin in work position. The brake-operating chains o^4 are connected at the junction of the arms *s s'*, and such connection is made by a hook, *w*, hooking into the unwelded end w^2 of a spring-link, *w'*, the object of which is to have sufficient hook force connection to set the brakes of the train without separating the unwelded end of said spring-link; but in the event of the coupling of any of the cars of the train separating by accident or breaking of the coupling pin, link, &c., and causing the train to separate at such broken locality, then such separation brings the arms *s s'* of said compensator toward a horizontal line. In this action the lower extended ends of the bars of the arm *s'*, which are formed with inwardly-turned angle projections *x*, Fig. 16, come in contact with the under side of the side bars of the arm *s*, and lift and unhook the said arm as it approaches a horizontal line, and thus the arms become self-separating, leaving the tension of the brake-connections of the separated portion of the train upon the hooked brake-chain as the only existing connection of the said train separated section. As the train continues its separation at this point it tends to apply the brakes of the separated portion of the train to their full force until the chain and its brake-connections o^3 o^4, Figs. 6 and 7, bring the cross centrally-pivoted evener-bar *f* against the shoulder *q'* of the angle-stop *q*, when the separation of the brake-connecting chains o^4 takes place at the unwelded end of the spring-link *w'*, as already described.

This construction of brake devices and their through compensating chain and hook connections enables one person to operate simultaneously the brakes of the entire train from the forward car or from any part of the train rearward. To operate from the rear forward will necessitate the hooking together of the chain and compensator connections between the cars on the left-hand side of the train in addition to the right-hand-side train-brake connection, when the brakes of the entire train can be set from any part of the train—from the front, the rear, or from either side. The primary object, however, of the two side lines of brake-connections is to allow a proper operating connection with the forward car from the right-hand side moving forward.

I claim—

1. In a railway-car brake, the combination, with the brake-shoes and the pinch-toe operating-lever shaft, of bearing-studs k^3, seated in the movable shoe-holders and adapted to receive the brake-pressure force of the pinch-toe lever-shaft, substantially as described.

2. The operating-lever shaft *i k*, formed with pinch-toes k^2, in combination with studs loosely seated in sockets in the movable shoe-holders and having bearings therein, the said studs having end recesses to receive the pinch-toes of said lever, for operation substantially as described, for the purpose specified.

3. The combination, with the fixed brake-shoe frame *l*, provided with tubular ends l^4, of the brake-shoe holder provided with vertical guides and supports l^5, the angle-straps l^6, springs *m*, and the pinch-toe operating-lever shaft *i k*, secured in bearing in said fixed shoe-frame, substantially as described.

4. The brake-shoe *n*, provided with cross-ribs n^2 n^2 on its upper surface, and the shoe-holder *l'*, provided with cross-grooves on its under side corresponding with said cross-ribs, the said shoes having hook ends *n'*, overlapping the holder ends and secured thereto only at such ends, and adapted to be set laterally upon the holder with the ribs and grooves intermatching, as described, for the purpose specified.

5. The combination, with the brake-operating pinch-toe lever-shaft, bearing studs, and the brake-shoes, adapted to receive the brake-pressure force from said pinch-toes, substantially as described, of the arms B B of the shoe-frames *l*, the adjusting-screws *r r* in said arms, and the equalizer-bars C C of the axle journal-bearings, whereby said screws are adapted to come in contact with said equalizer-bars for the purpose of counteracting upward or lost motion of the equalizer-springs in applying the brakes, substantially as described.

6. The combination, in a friction power-brake, of the friction-rolls *a b*, the shaft *c*, and the fric-

tional disk c^3, with the spring-operating lever d, adjustably pivoted at its lower end, the cushioned push-rod e, the cross evener-bar f, the brake-operating connections, and the winding-gear of the friction device, substantially as described.

7. The combination, in a friction power-brake, of the friction-rolls a b, the friction-disk c^3, the winding mechanism, the spring-operating lever d and its connected evener-bar f, and the brake-operating connections, with the hand-wheel o and its winding-chain o^2, connecting with said evener-bar f, and having a stop, o^5, whereby the winding of the hand-wheel is limited in bringing the friction-rolls in pressure-contact, to bring into action the winding devices of the brake, by the rotation of the axle of the driving-roll a, substantially as described.

8. The combination, in a friction power-brake, of the friction-roll a b, the winding devices operated thereby, mechanism connecting the said roll b with the evener-bar f, and the train-brake-operating connections, with a fixed locking-stop, q^2, for said evener-bar, whereby the accidental sectional separation of the train will cause the said evener-bar to lock itself with said stop, substantially as described, for the purpose specified.

9. The compensating pivoted hanging arms s s', provided with chain-sheaves and pivoted to each end of the cars, one of said arms, s, terminating in a hook end, v, and adapted to be hooked with the arm s' and to be automatically separated at such hooked connection, whereby to form a stiff carrier for the chain-brake-operating connections, substantially as described.

10. The combination, with the compensating pivoted hanging arms s s', connected to the ends of the cars and adapted for automatic separation, substantially as described, with train-brake-operating connections, provided with means for being automatically separated between the cars of the train, substantially as described, for the purpose specified.

11. The combination, with the compensating pivoted hanging arms s s', connected to the cars and adapted for automatic separation, substantially as described, with the train-operating brake-chain connections o^4, connected between the cars at the connected ends of said arms by means of a hook, w, and an unwelded spring-link, w', substantially as described, for the purpose specified.

12. The pivoted hanging arms, constituting the compensating device between cars and having a hooked connection at their lower ends, one of said arms having a spring locking device, substantially as described, for the purpose specified.

13. The combination, with the pivoted arms s s', constituting the compensating device between cars, and hooked together at their lower ends, substantially as described, the said arm s' having inward-projecting ends x x, adapted to extend beneath the sides of the arm s, for the purpose of automatically effecting the separation of the hooked ends when the said arms approach a horizontal position, substantially as described.

14. The combination, in a railway-car brake, of the pivoted hanging arms s s', the shortest of which terminating in a hook, v, and the longest terminating in angle ends x x, whereby to effect their connection and automatic separation, with the train-operating brake-chain connections, provided with means whereby it is automatically separated between cars, in the manner and for the purpose specified.

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

W. H. WARD.

Witnesses:
A. E. H. JOHNSON,
J. W. HAMILTON JOHNSON.