3 Sheets--Sheet 1.

G. EN-EARL.

Automatic Railroad Car-Brakes.

No. 139,557. Patented June 3, 1873.

Fig. 1.

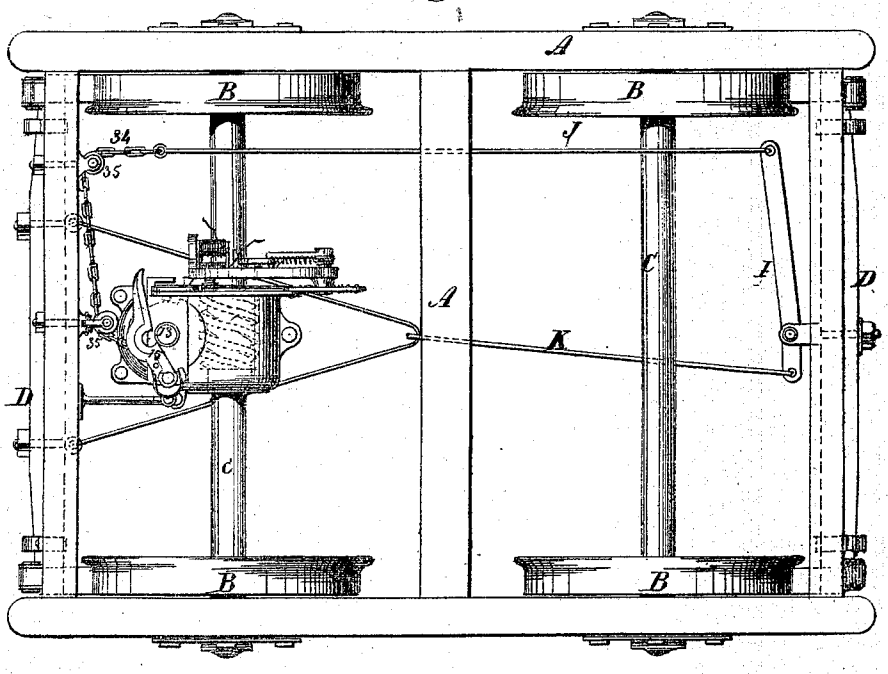
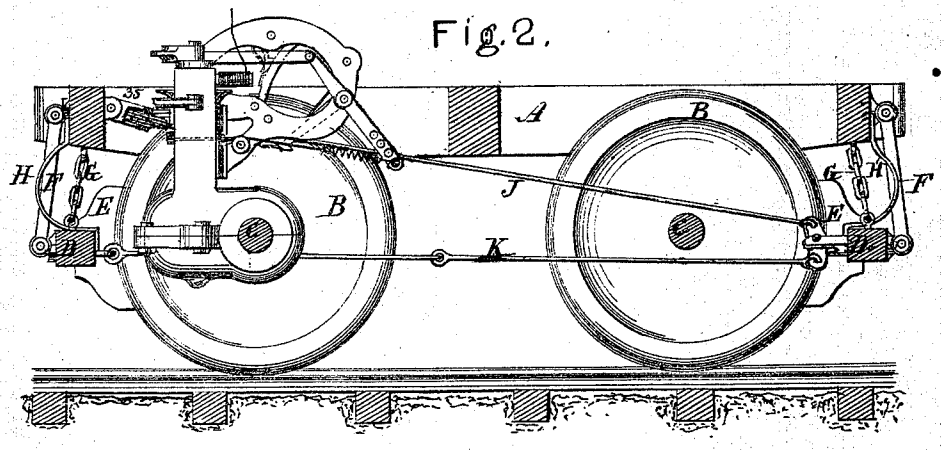


Fig. 2.



Witnesses.

Jas. L. Ewin

Walter Allen

Inventor.

Geo. En-Earl

By Knight Bros

Attorneys

3 Sheets--Sheet 2.

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Fig. 3.

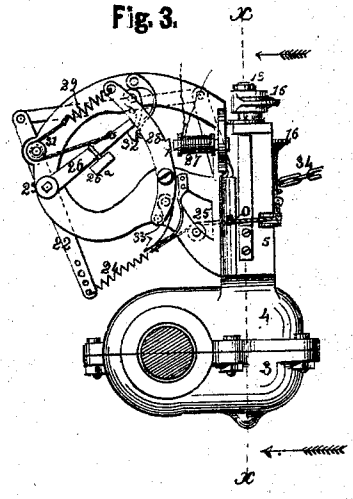


Fig. 4.

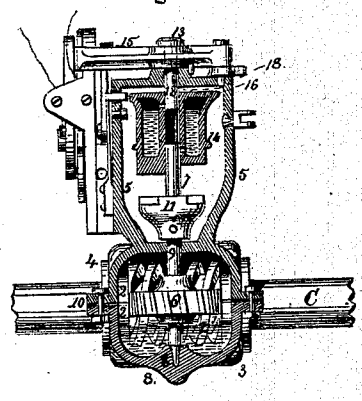


Fig. 5.

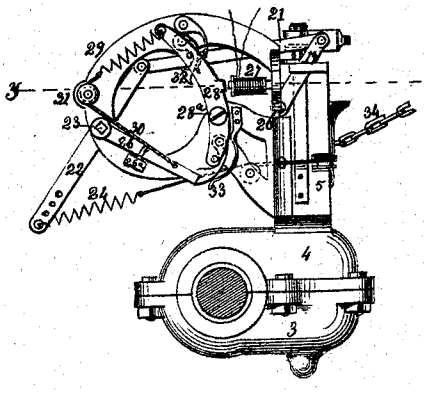


Fig. 6.

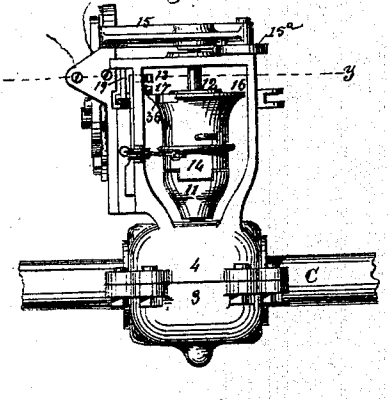


Fig. 8.

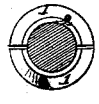
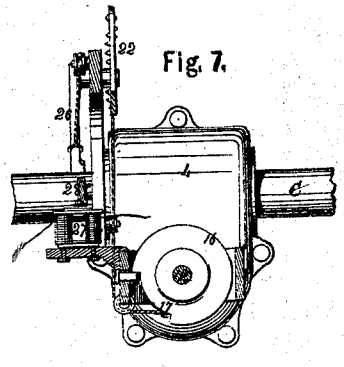


Fig. 7.



Witnesses.

Jas. L. Ewin

Walter Allen

Inventor.

Geo. En. Earl

By Knight Bros

Attorneys

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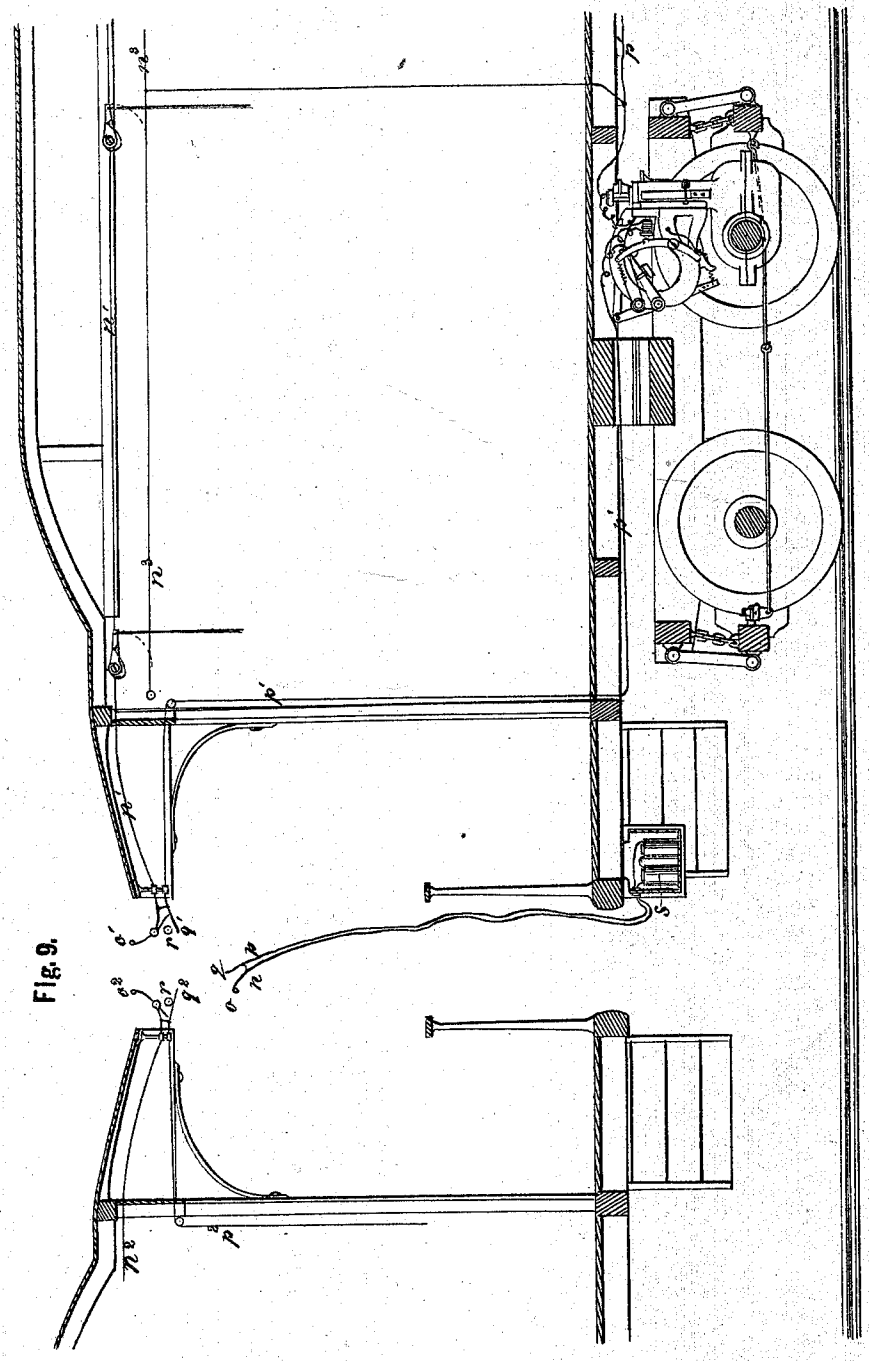

Fig. 9.

Witnesses.

Jas. L. Ewin

Walter Allen

Inventor

Geo. En-Earl

By Knight Bros

Attorneys

UNITED STATES PATENT OFFICE.

GEORGE EN-EARL, OF BOSTON, MASSACHUSETTS, ASSIGNOR TO "THE AUTOMATIC CAR-BRAKE MANUFACTURING COMPANY," OF NEW YORK, N. Y.

IMPROVEMENT IN AUTOMATIC RAILROAD-CAR BRAKES.

Specification forming part of Letters Patent No. **139,557**, dated June 3, 1873; application filed September 20, 1872.

To all whom it may concern:

Be it known that I, GEORGE EN-EARL, of Boston, in the county of Suffolk and State of Massachusetts, have invented an Improved Automatic Brake for Railway Cars, of which the following is a specification:

My invention relates to a system of brakes applied by power derived from the rotation of the wheels through the medium of a worm, pinion, and clutch-drum, which latter is placed at will in gear with the worm-pinion, and is thereby caused to wind up the brake-chains until the motion is checked.

In my invention the worm is constructed in two or more sections, so that it may be applied to a permanent axle; and the said worm and the pinion which it drives are inclosed in a box or casing, also applied in sections, adapted to contain lubricating material, and affording journal-bearings for the worm and the pinion-shaft.

In connection with the aforesaid clutch-drum I employ a notched disk and a catch arranged to lock the drum at a given point in its rotation; also a latch-bar by which the said drum is supported out of reach of the clutch-pinion until it is desired to apply the brakes. The devices to trip the latch-bar and to lock the catch in its operative position may be operated by hand, but are preferably controlled by an electro-magnet.

The tripping and locking devices are thrown forward to start the brakes by the descent of a weighted arm supported by a spring-pawl which the forward movement of the armature-lever retracts. The said arm is caught and held in its lowest position by a second pawl, and its descent is further caused to produce tension on the spring of the armature-lever, so that the latter, when released by the magnet, will be drawn back with sufficient force to retract the last-named pawl and release the arm from its lower position. The parts are then returned to their normal position by the action of a spring, so connected with the drum that it will be brought under tension by the motion of the latter which winds up the brake-chain. The brake-chain is carried to the drum in a downward direction so as to automatically unclutch the latter when drawn tight; but the unclutched drum is prevented from unwinding by the catch and lock until the latter is retracted by the release of the armature. The clutch-drum is made hollow to contain material to lubricate the pinion-shaft which runs within it.

Figure 1 is a plan of a car-truck with my invention applied. Fig. 2 is a vertical longitudinal section of the same. Fig. 3 is a side elevation of the automatic devices for actuating the brakes, showing the clutch-drum elevated and unclutched. Fig. 4 is a vertical section of the same on the line *x x*, Fig. 3. Fig. 5 is a side elevation showing the drum in its lower or clutched position. Fig. 6 is a front elevation with the parts in same position shown in Fig. 5. Fig. 7 is a horizontal section on the line *y y*, Figs. 5 and 6. Fig. 8 is an end elevation of the divided worm. Figs. 3, 4, 5, 6, 7, and 8 are on a larger scale than Figs. 1 and 2. Fig. 9 is a sectional elevation of the adjacent ends of two cars illustrating one mode of applying the invention and conducting wires to operate it.

The frame A, wheels B, axles C, brake-bars D, rubbers E, hangers F G, retracting springs H, lever I, and connecting-rods J K may be of common construction, my invention being applicable to the running-gear of cars in common use. Upon one of the axles C is bolted and keyed or otherwise secured a worm formed in two or more sections 1 1 to adapt it to be applied to an axle already in position in the car-truck. On the ends of the worm or screw-piece 1 1 are shoulders and journals 2 2, working in boxes in the lower part of an upright frame, 3 4 5, which supports the other parts of the movement. The lower part 3 4 of the frame forms a close casing for the worm 1 and the pinion 6 which it operates, the pinion-shaft 7 having its bearings in a step, 8, and box, 9, in the bottom and top, respectively, of the said casing. The frame 3 4 5 is cast in two sections, the casing 3 4 being jointed horizontally in the plane of the center of the axle and its parts are secured together by bolts and lugs 10. Near the upper end of the pinion-shaft 7 is keyed a clutch-head, 11. The upper part 5 of the vertical frame is formed of standards connected at top, and affording a

bearing for a short vertical shaft, 12, formed at top, with a flanged head, 13, and supporting within the frame 5 a drum, 14, the lower part of which is formed to clutch with the head 11, when dropped into contact therewith. The pinion-shaft 7 fits loosely in the lower part of the drum 14 to permit and guide its vertical movement. The casing 3 4 is adapted to contain oil or other lubricant for the worm and pinion journals, and the drum 14 is made hollow to contain material to lubricate the upper end of the pinion-shaft 7. 15 represents a dog pivoted at one end to the top of the frame 5, and pressed forward by a spring, 15ª, so as to engage under the flanged head 13, and thus support the drum 14 in its elevated position. The top of the drum itself is formed with a projecting bead or flange, 16, in which is a notch, 17, to receive a spring-catch, 18, which, when locked in by a latch, 19, secures the drum against rotation. The latch 19 is pivoted at 20 to the frame 5, and at its free end is hinged to a horizontal rod, 21, connecting it with the upper end of an arm, 22, which latter is secured by its center to a rock-shaft, 23. The lower end of the double arm 22 is connected by a spiral spring, 24, with a cord or chain, 25, arranged to wind on the lower end of the drum 14. From the rock-shaft 23 projects a horizontal weighted arm, 26. A weight may be applied to this arm, as illustrated at 26ª in Figs. 3, 5, and 9, or in any convenient manner. 27 represents an electro-magnet. 28 is its armature extending in both directions from its pivot 28ª. The armature-spring 29 is attached to a cord, 30, passing over a pulley, 31, and connected to the weighted arm 26, the relative positions of the parts causing tension to be produced on the spring by the descent of the arm. 32 is a spring-pawl employed to catch and lock the arm 26 in its upper position. 33 is a similar pawl, adapted to catch and lock it in its lower position. Projections on the armature-lever or on the pawls themselves cause the forward movement of the said lever (under the impulse of the magnet) to retract the upper pawl 32, allowing the weighted arm to fall, and the backward movement of the lever (when released by the magnet) to retract the lower pawl 33, allowing the arm to be thrown up again by the spring 24, which has meantime been brought to tension, as hereinafter explained. The brake-chain 34, attached to the rod J, is passed over pulleys 35 and carried downward to the drum 14 at an angle of thirty-five degrees, more or less, so that when wound tightly on the drum it will tend to draw the latter upward out of gear with the clutch 11. A stud, 36, which is preferably provided with a friction-roller, bears upon the top of the flange 16 of the drum, so as to keep the latter in gear with the clutch 11 until the notch 17 comes round, when the stud 36 entering said notch allows the drum to rise and prevents backward rotation of the drum while passing between the clutch 11 and catch 18.

When the electric circuit is open and the magnet inactive the brakes are off. This position of the parts is indicated in Figs. 3 and 4. By closing the circuit the helix-cores are magnetized, attracting the armature 28, retracting the pawl 32 from the arm 26, the weight of which causes it to fall. The arm or latch 19 throws the dog 15 from under the flanged head 13 of the shaft 12, allowing the drum 14 to drop into gear with the clutch 11 with its flange under the detaining stud or collar 36. This position of the parts is represented in Figs. 1, 2, 5, 6, and 7. The drum 14 now receives from the shaft 7 of the worm-pinion 6 three-fourths of a revolution (more or less,) winding up the brake-chain 34 until the notch 17 again reaches the stud 36, permitting the oblique and now tightened chain 34 to draw the drum to its uppermost position, where it is caught by the spring-dog 15, and is prevented from turning backward by the spring-catch 18 locked by the button or arm 19. Meanwhile the chain 25, winding on the lower end of the drum 14, produces a heavy tension on the spring 24 attached to the lower end of the double arm or long lever 22. The brakes will thus remain locked so long as the circuit remains closed and the magnet active.

When it is desired to withdraw the brakes the electric circuit is broken, releasing the armature 28, which, by the force of the spring 29, flies back with sufficient force to retract the pawl 33, releasing the arm 26. The force of the stiff spring 24 then reverses the position of the double arm 22, throwing up the weighted horizontal arm 26, which is caught and held in its upper position ready for reuse. The catch 18 is pressed inward by its spring, but its bit is so formed that when released by the withdrawal of the locking-arm 19 it will be forced out of the notch 17 by the pressure of the pulley, allowing the brake-chain to unwind and releasing the brakes.

For freight-cars the dog 15 and locking-arm 19 may be controlled by a lever on top of the car with ordinary angles under the car-body.

On passenger trains they are operated by a system of levers, weights, and springs, substantially as shown, controlled by an electro-magnet worked with an open circuit.

The conducting-wires can readily be connected from end to end of train. The whole train can thus be placed under complete control of the engine-man. By self-operating connections between the cars adapted to close the circuit automatically at either end of a car when detached, and using a small battery at each end of the train, any brake in the train or disarrangement of ordinary distance between cars will at once put on all the brakes of the rear section, and leave the front section under control of the engine-man. I have also devised an arrangement of conducting-wires and electric switches, by which the conductor while at any part of the train may apply the

brakes instantaneously to the whole or a portion of the train if necessary, without communicating with the engine man.

I do not desire to claim broadly controlling car-brakes by electro-magnetism, nor do I desire to limit myself to the use of electro-magnetism in connection with my invention, nor to any specific arrangement of conductors when electro-magnetism is employed. As, however, it is deemed most advantageous to employ electro-magnetism for operating the brakes on passenger-trains, I have shown, for the purpose of illustration, one arrangement of conducting-wires that may be used.

In Fig. 8, L M represent the adjacent ends of two cars. p^1 p^2 may represent positive, and n^1 n^2 negative wires. o^1 o^2 are couplers and automatic circuit closers, which, when the cars are detached, are by their springs pressed in contact with the respective contact springs or plates q^1 q^2 so as to connect the wires p^1 and n^1 (or p^2 and n^2) at the detached end of each car. When the cars are coupled together either coupler o^1 or o^2 is depressed and passed beneath the other one above the rest r, so as to make an electrical connection with said coupler and disconnect both couplers from their contact-plates, q^1 q^2. The said plates q^1 q^2 at the same time pass into connection.

It will be observed that it matters not which of the couplers o^1 o^2 is depressed and passed beneath the other. The effect is the same in either case, so that it can be done by any one without possibility of mistake.

Supposing L to be the rearmost car, if a battery, s, is to be applied at the end of the train the coupler o of the battery-wire n is passed under the coupler o^1, making a connection as already described, and the plates q and q^1 are thereby brought together, while o^1 and q^1 are disconnected.

The conductors are of ordinary insulated wire or cable, and may be variously arranged. n^1 is represented as running from end to end of the car attached to the upper coupling point o^1, and thus connected from one end to the other of the train, its forward end terminating in a key or circuit closer, of any common or suitable form, under control of the engine-man. The wire p^1 runs down from the plate q^1 outside or inside the car, leading to one post of the electro-magnet 27, and continuing from the other post of the same to the other end of the car, being coiled between the bottom of the car and the posts of the magnet, to compensate for variations in the relative positions of the truck and body of car. p^3 p^3 represent supplemental wires branching from the wire p^1 at a point beyond the magnet, and extending to switch-plates t, which by means of switches u may be placed in electrical connection with the wire n^1 so as to close a circuit through the magnet without communicating with the engine-man.

It will now appear that in the event of one or more cars becoming accidentally detached at the rear of a train, the automatic closing of the circuit at the front of the detached section will instantly apply the brakes throughout said section, and the automatic closing of the other circuit at the rear of the other portion of the train will leave said portion under control of the engine-man.

It will be manifest that some parts of my invention are applicable to other useful purposes beside operating car-brakes.

The following is claimed as new:

1. The combination of the worm 1, worm-wheel 6, shaft 9, clutch 11, and drum 14, with the chain 34, aranged to effect the automatic unclutching of the drum in the manner explained.

2. The spring catch 18 and locking arm or button 19 combined with the notched flange 16 of the drum 14, to arrest the rotation of the latter as explained.

3. The rock-shaft 23, with its arms 22 and 26, operating in combination with the armature-lever 28, and pawls 32 33, as set forth.

4. The combination of the spring 29 with the weighted arm 26, and armature-lever 28, to receive increased tension after the forward movement of the lever, as explained.

5. The spring 24 and winding-chain 25, arranged as described tc produce tension on the said spring by the winding of the brake-pulley in readiness for the restoration of the parts to their normal positions when the armature-lever is released.

GEO. EN-EARL.

Witnesses:
W. F. KNOWLES,
C. C. GREGG.