No. 666,184. Patented Jan. 15, 1901.

# F. L. CLARK.

## ELECTROMAGNETIC BRAKE.

(Application filed May 14, 1900.)

(No Model.) 3 Sheets—Sheet 1.

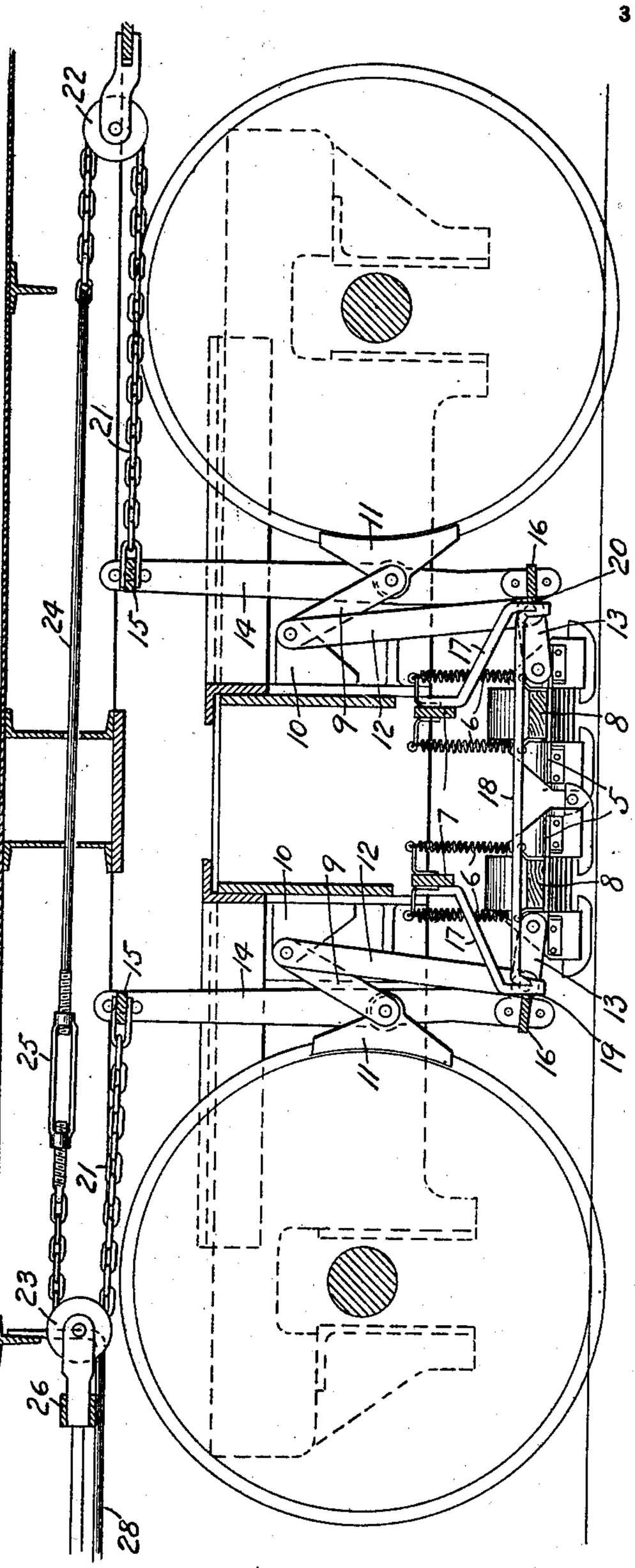


Fig. 1.

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Fig. 2

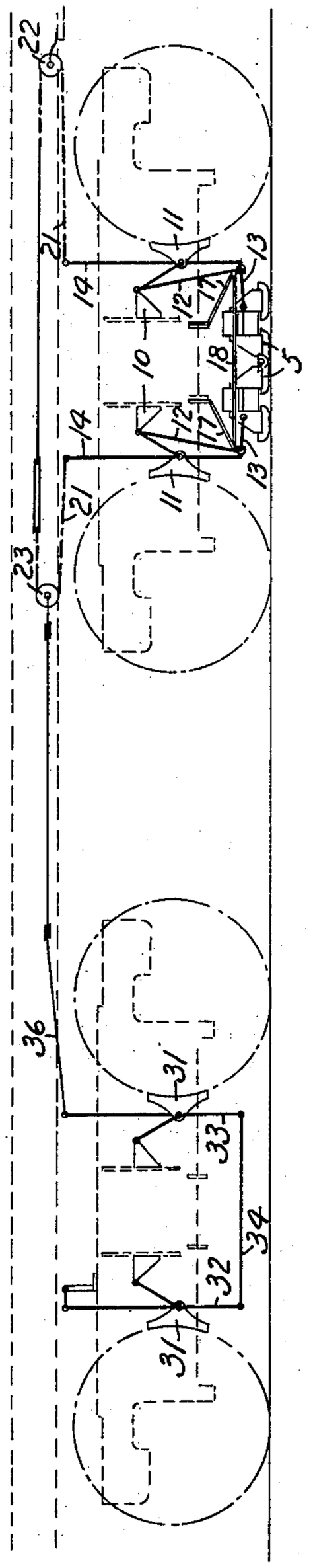


Fig. 3

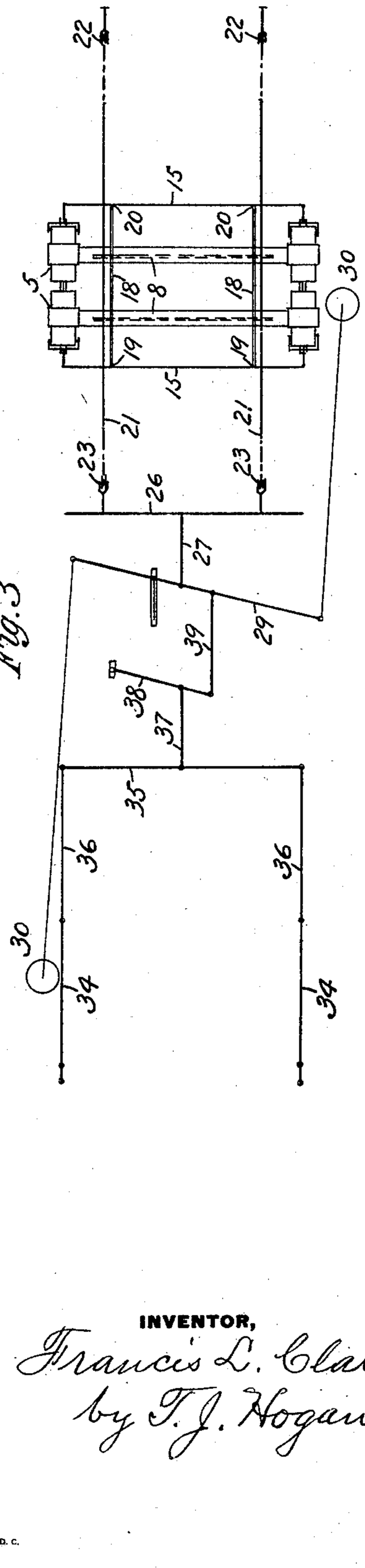


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Fig. 5

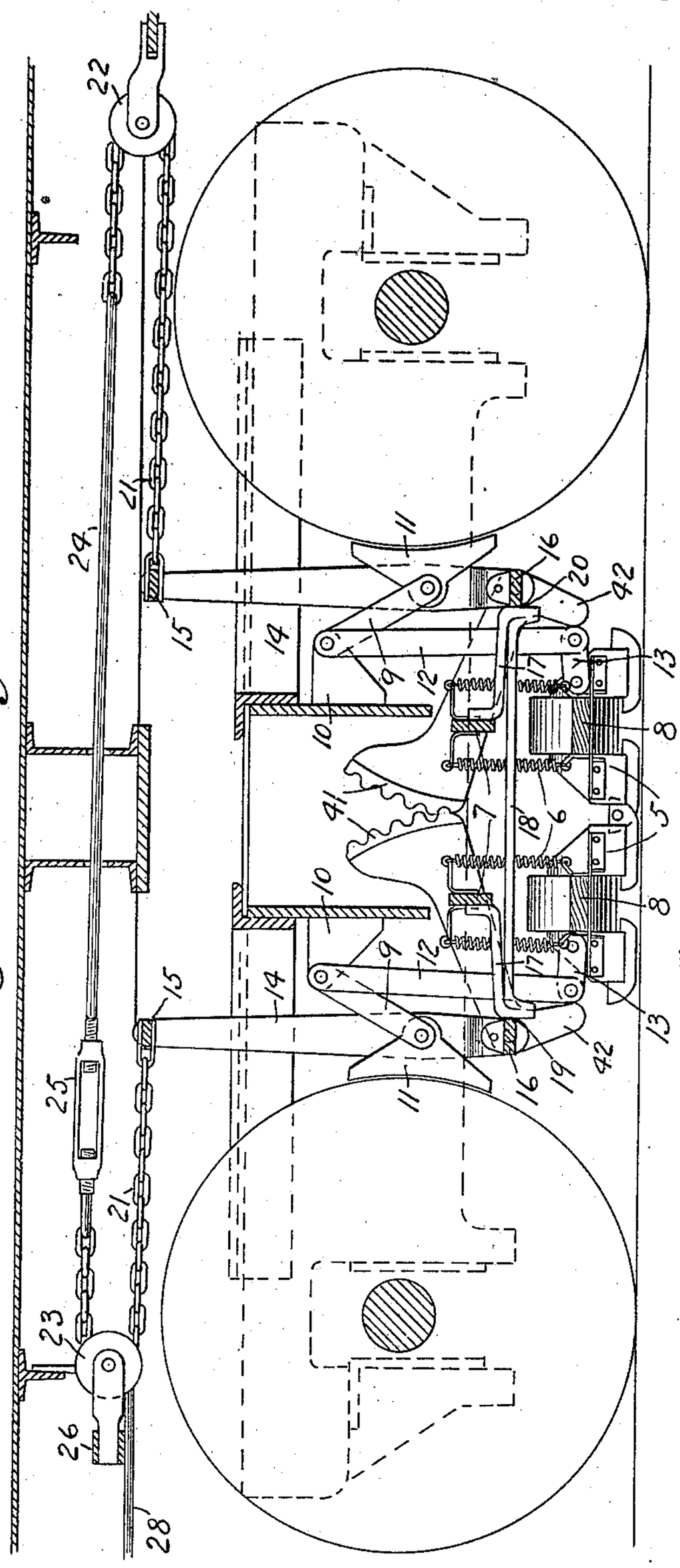


Fig. 4

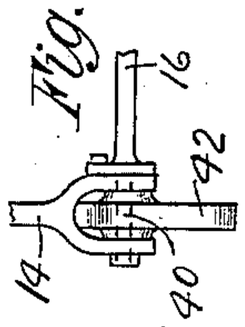


Fig. 6

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# UNITED STATES PATENT OFFICE.

FRANCIS L. CLARK, OF PITTSBURG, PENNSYLVANIA, ASSIGNOR TO THE WESTINGHOUSE AIR BRAKE COMPANY, OF SAME PLACE.

## ELECTROMAGNETIC BRAKE.

SPECIFICATION forming part of Letters Patent No. 666,184, dated January 15, 1901.

Application filed May 14, 1900. Serial No. 16,547. (No model.)

*To all whom it may concern:*

Be it known that I, FRANCIS L. CLARK, a citizen of the United States, residing at Pittsburg, county of Allegheny, State of Pennsylvania, have invented or discovered a certain new and useful Improvement in Electromagnetic Brakes, of which improvement the following is a specification.

My invention relates to electric brakes for cars, and particularly to that class of brakes in which both rail-shoes and wheel-shoes are employed.

The object of the invention is to provide a new and improved means whereby the application of the rail-shoe will operate to set the wheel-shoes when the car is running in either direction. My improvement is also adapted to be applied to cars having a multiple truck at each end of the car and provides means by which the wheel-shoes of all the wheels of both trucks may be set by the application of one rail-shoe when the car is moving in either direction.

I have illustrated an application of my improved construction by which these objects are secured in the accompanying drawings, in which—

Figure 1 is a longitudinal section of the car-truck, showing my improvement applied thereto. Fig. 2 is a side view in diagram, showing the two trucks of a car and the connections between the rail-shoe and the wheel-shoes of both trucks. Fig. 3 is a plan of said connections, also in diagram. Fig. 4 is a longitudinal section of a car-truck, showing a modified form of my improvement applied thereto. Fig. 5 is a side view of one of the cam-levers, and Fig. 6 is a detail view showing the lower end of one of the brake-levers shown in Fig. 4 with the cam-lever supported thereby.

The magnetic rail-shoe 5, as shown in Figs. 1 and 4, is suspended between the wheels of the truck by means of springs 6, which are attached to the cross-bars 7 of the truck-frame. Any form of magnetic rail-shoe may be employed, although I have shown the double form of rail-shoe, which I find gives a greater magnetic traction force and is better adapted to the irregularities of the track.

The rail-shoes on opposite sides of the truck are connected by cross-beams 8. Each wheel-shoe 11 is pivoted to a pair of links 9, which are pivotally connected to a bracket 10, secured to the truck-frame. From each bracket 10 is also pivotally suspended another pair of bars or links 12, which in turn are pivotally connected at their lower ends with the short thrust-bars 13, which are secured to the rail-shoe 5. Similar connections are arranged at each end of the rail-shoe, so that the brake device may operate when the car is moving in either direction. The brake-levers 14 are located between the links 9 and are pivotally secured to the back of the wheel-shoes 11. At their upper and lower ends the brake-levers on opposite sides of the truck are connected by cross-bars 15 and 16, respectively. Two depending brackets or frames, composed of arms 17 and longitudinal rods 18, are secured to the cross-bars 7 and provide fixed fulcrums at points 19 and 20, against which the lower cross-bars 16 of the brake-levers 14 are adapted to rest. The upper cross-bars 15 of the brake-levers 14 are connected at intermediate points by a chain 21, which passes over a stationary pulley 22, secured to some fixed part of the frame near the end of the car and also over the movable pulley 23, toward the middle of the car. A rod 24, provided with a turnbuckle 25, is inserted in the upper length of the chain.

The movable pulleys 23 on opposite sides are connected by a cross-bar 26, which at its middle is connected to the pull-rod 27. (See Figs. 2 and 3.) Supporting-bars 28 are provided at each side, on which the cross-bar 26, with the movable pulleys, is adapted to slide. The pull-rod 27 is connected to the cross-lever 29, which is pivoted beneath the body of the car and connected at its ends with the hand-operated devices 30.

The wheel-shoes 31 of the other truck of the car are pivotally connected with the brake-levers 32 and 33. The lever 32 is pivoted to some stationary part of the frame at its upper end and is connected at its lower end with the lower end of lever 33 by a rod or bar 34. The upper ends of levers 33 are connected to cross-bar 35 by rods 36, and cross-bar 35 is connected to lever 29 by means of rod 37, pivoted lever 38, and rod 39.

The operation of my improved device, as shown in Figs. 1, 2, and 3 is as follows: Suppose the car to be running to the right and the magnetic brake-shoes are connected in the braking-circuit. The rail-shoes 5 will then be drawn down upon the rail and by frictional contact therewith will exert a pull in the opposite direction to that in which the car is moving. This will force the thrust-bar 13 on the left against the cross-bar 16 at the lower end of the brake-lever 14, setting the left wheel-shoes 11 against the wheels and throwing the upper end of this brake-lever and the corresponding cross-bar 15 to the right. By means of the chain 21 passing over the pulleys 22 and 23 the upper end of the other brake-lever 14 is also thrown to the right with equal force, which brings the right-hand wheel-shoe against its wheel, while the cross-bar 16 at the lower end of the right-hand brake-lever 14 bears against the suspended frame, forming a fulcrum at the point 20. The pulley 23 and pull-rod 27 are also drawn toward the right, and the brake-shoes 31 on the wheels of the other truck are applied by brake-levers 32 and 33.

In case the car is moving toward the left when the rail-shoe is applied the thrust of the right-hand bar 13 will be in the opposite direction, engaging the right-hand cross-bar 16 and forcing the upper ends of the brake-levers 14 to the left. The left-hand cross-bar 16 will then be forced against the point 19 of the suspended frame as a fulcrum, and the wheel-shoes 11 will be applied. The movable pulley 23 is drawn toward the right, and the wheel-shoes 31 are applied to the wheels of the other truck, as before. It is to be noted that the movable pulley 23 is always drawn in the same direction (toward the right) by means of the chain 21 whenever the rail-shoe is applied and regardless of the direction in which the car may be moving. In this way connections are provided whereby all the wheel-shoes on both trucks will be set by the application of the rail-shoe when the car is moving in either direction.

When my improvement is applied to a car having only four wheels or to one double truck, both the pulleys 22 and 23 may be fixed or the ends of levers 14 may be directly connected by a rod. The wheel-brakes 11 may then be applied by means of the rail-shoe when the car is moving in either direction, as above described.

In the modified form of my improvement shown in Fig. 4 the lower ends of the brake-levers 14 are forked, and in the forks are pivoted the cam-levers 40. These cam-levers at their inner ends engage with each other on curved bearing-surfaces 41, which may be provided with gear-teeth, as shown. The distance from the upper end of the curved bearing-surface to the pivot of the cam-lever is greater than the distance from the lower end of the curved bearing-surface to the pivot, and by this means when the cam-levers are moved downward a wedging action is secured by which the lower ends of the brake-levers 14 are thrust in opposite directions. The curved bearing-surface 41 of the cam-levers is so formed that the thrust-angle of the cam-levers remains substantially constant as they turn upon each other. This compensates for the wear of the wheel-shoes and secures a uniform application of the brakes. The cam-levers are provided with extensions 42, which are adapted to be engaged by the thrust-bars 13. When the rail-shoe 5 is applied, one of the thrust-bars 13 engages the extension 42 of one of the cam-levers and turns it about its pivot. By this movement both cam-levers are turned downward and the lower ends of the brake-levers 14 are forced in opposite directions. The wheel-shoes 11 will be forced against the wheels, and the pressure will be transmitted to the wheel-shoes of the other truck by means of the chain and movable pulley, as before described.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A brake mechanism, for cars having two multiple trucks, comprising a rail-shoe, wheel-shoes for the wheels of the different trucks, and connections by which the wheel-shoes on all of the trucks will be operated by the application of the rail-shoe.

2. A brake mechanism, for cars having two multiple trucks, comprising a rail-shoe for one of the trucks, wheel-shoes for both trucks, and connections by which the wheel-shoes of both multiple trucks may be operated by the application of the rail-shoe when the car is moving in either direction.

3. A brake mechanism, for cars having two multiple trucks, comprising a rail-shoe, wheel-shoes for the wheels, brake-levers for the wheel-shoes, means connected to the rail-shoe for operating the brake-levers of one truck by a movement of the rail-shoe in either direction, and connections between the levers of one truck and those of the other truck by which the second set of levers are always moved to apply the brakes whichever direction the rail-shoe may be moved.

4. In a brake mechanism, for cars having two trucks, wheel-shoes for the wheels of both trucks, brake-levers for the wheel-shoes, a rail-shoe and means connecting the brake-levers of one truck with those of the other truck and adapted to be operated in the same direction each time the rail-shoe is applied, when the car is running in either direction.

5. In a brake mechanism, for cars having two trucks, a rail-shoe, wheel-shoes, brake-levers for the wheel-shoes of both trucks, and means operated by the rail-shoe for applying the wheel-brakes of both trucks when the rail-shoe is moved in either direction with respect to the car.

6. In a brake mechanism, for cars having two trucks, a rail-shoe, wheel-shoes, brake-

levers for the wheel-shoes, a movable pulley, a chain passing over the movable pulley and secured to a brake-lever that is operated by the rail-shoe, and connections from the movable pulley to the wheel-shoes of the other truck.

7. A brake mechanism, for cars having two trucks, comprising wheel-shoes for the wheels of both trucks, brake-levers for the wheel-shoes, a fixed pulley and a movable pulley, a chain passing over both pulleys and connecting the brake-levers, and connections from the movable pulley to the wheel-shoes of the other truck.

8. In a brake mechanism for cars, a rail-shoe, wheel-shoes for the wheels, brake-levers for the wheel-shoes, cross-beams connecting the lower ends of each pair of levers, a fulcrum for the lower ends of either pair of brake-levers and means for operating the brake-levers by the application of the rail-shoe when the car is running in either direction.

9. In a brake mechanism for cars, wheel-shoes, brake-levers for the wheel-shoes, upper and lower cross-beams by which the brake-levers are connected in pairs, the upper cross-beams being connected together, a fulcrum for the lower ends of each pair of brake-levers, and a rail-shoe adapted to operate the brake-levers.

10. In a brake mechanism for cars, a rail-shoe, wheel-shoes, brake-levers for the wheel-shoes, and means for forcing the lower ends of the brake-levers in opposite directions when the rail-shoe is applied.

11. In a brake mechanism for cars, a rail-shoe, wheel-shoes, brake-levers for the wheel-shoes, the upper ends of the brake-levers being connected together, and means connected to the lower ends of the brake-levers and operated by the rail-shoe to force the lower ends of the brake-levers in opposite directions.

12. In a brake mechanism for cars, a rail-shoe, wheel-shoes, brake-levers for the wheel-shoes and cam-levers adapted to be operated by the rail-shoe.

13. In a brake mechanism for cars, a rail-shoe, wheel-shoes, brake-levers for the wheel-shoes, cam-levers connected to the lower ends of the brake-levers and adapted to be operated by the rail-shoe to set the wheel-shoes when the car is running in either direction.

14. In a brake mechanism for cars, a rail-shoe, wheel-shoes, brake-levers for the wheel-shoes, cam-levers connected to the lower ends of the brake-levers and thrust-bars for the rail-shoe adapted to engage the cam-levers whereby the wheel-shoes may be operated by the application of the rail-shoe.

In testimony whereof I have hereunto set my hand.

FRANCIS L. CLARK.

Witnesses:

R. F. EMERY,

JAS. B. MACDONALD.