(No Model.)

W. F. RICHARDS.

ELECTRIC LIGHTING SYSTEM FOR RAILWAY CARS.

No. 604,082. Patented May 17, 1898.

Fig. 1

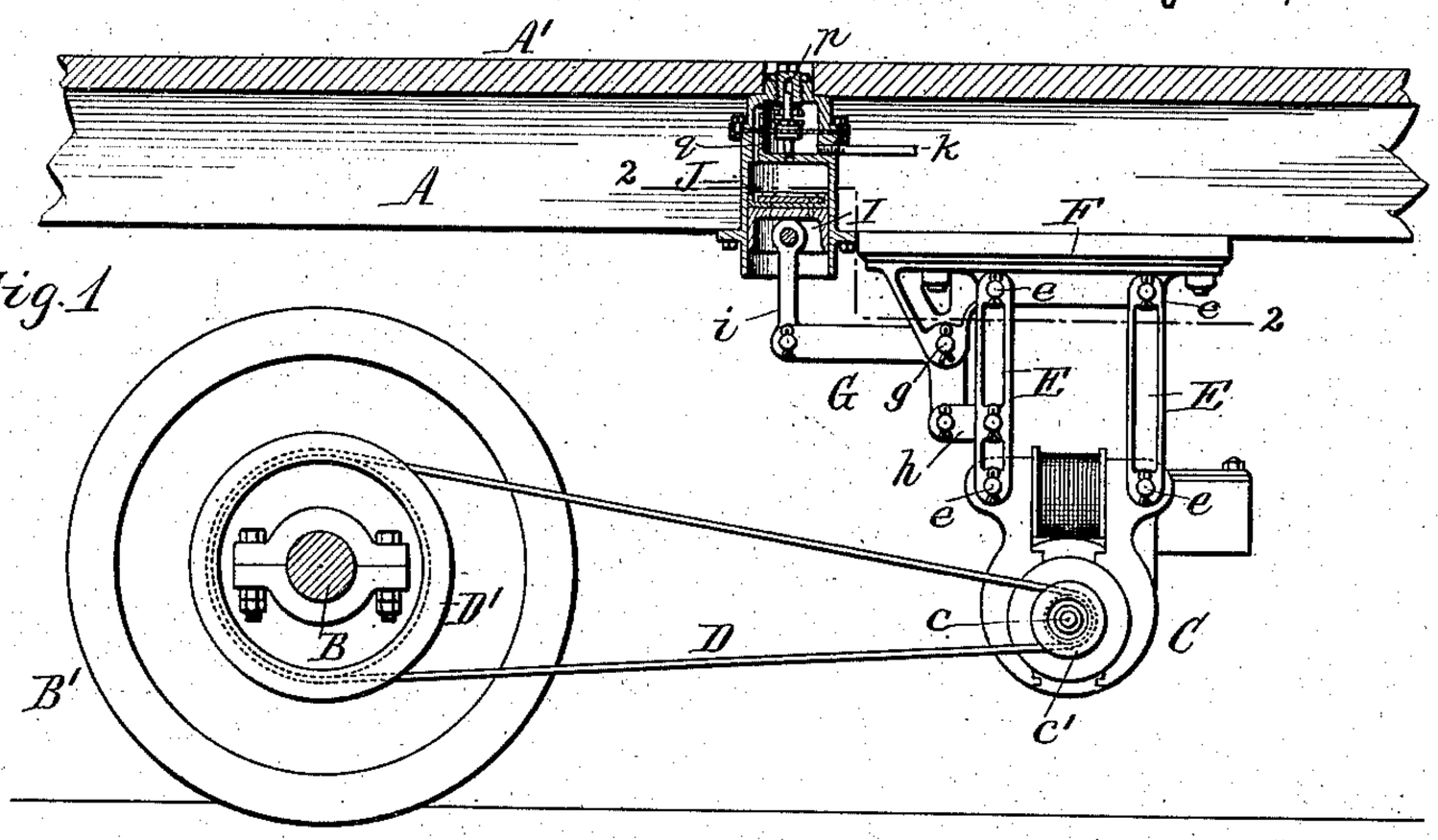


Fig. 2.

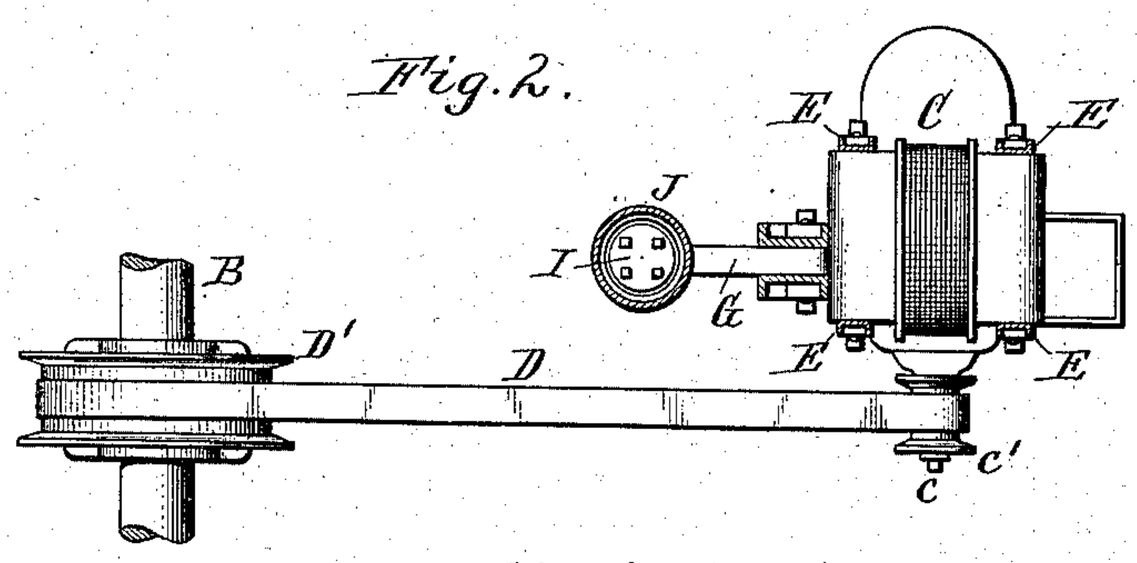
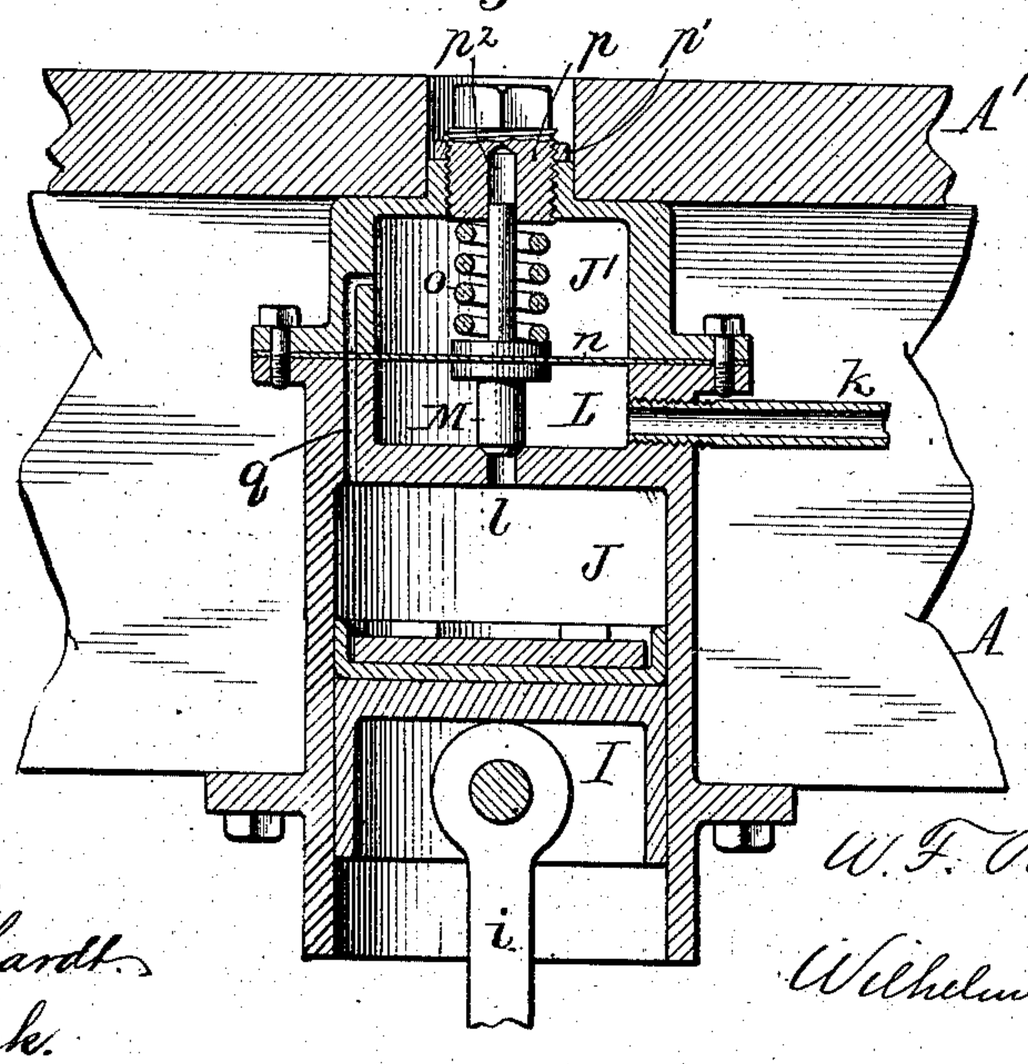


Fig. 3.



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ELECTRIC-LIGHTING SYSTEM FOR RAILWAY-CARS.

SPECIFICATION forming part of Letters Patent No. 604,082, dated May 17, 1898.

Application filed September 22, 1897. Serial No. 652,511. (No model.)

To all whom it may concern:

Be it known that I, WILLARD F. RICHARDS, a citizen of the United States, residing at Buffalo, in the county of Erie and State of New York, have invented new and useful Improvements in Electric-Lighting Systems for Railway-Cars, of which the following is a specification.

This invention relates to an electric-lighting apparatus for railroad-cars in which the dynamo is driven from the car-axle by a belt and the dynamo is movable toward and from the driving-axle, so that the belt slips when the speed of the driving-axle exceeds that which is necessary to properly drive the dynamo, thereby neutralizing such excess of speed and maintaining a practically uniform normal speed of the dynamo. An apparatus of this general character is described and shown in the application for patent of Preston and Gill, filed February 25, 1895, Serial No. 539,618. In this apparatus the dynamo is suspended on one side of its center of gravity, and the overhanging weight of the dynamo is utilized for tightening the belt. This one-sided suspension of the dynamo answers well when the dynamo is comparatively small, but is unsuitable for large dynamos, such as are required for furnishing sufficient candle-power to illuminate satisfactorily coaches and chair and sleeping cars of the size ordinarily used on American railroads.

One of the objects of my invention is to regulate the adhesion of the driving-belt irrespective of the weight of the dynamo by air-pressure.

Another object of the invention is to check by the same means the vibrations of the dynamo in coupling.

In its general features the apparatus of this application is similar to that of my application, Serial No. 651,840, filed September 16, 1897.

In the accompanying drawings, Figure 1 is a sectional side elevation of a dynamo suspended from a car-frame and provided with my improvement. Fig. 2 is a horizontal section in line 2 2, Fig. 1. Fig. 3 is an enlarged vertical section of the air-cylinder and the reducing-valve.

Like letters of reference refer to like parts in the several figures.

A is the car-frame; A', the floor of the car; B, one of the car-axles, and B' one of the wheels mounted thereon.

C is the dynamo suspended from the car-frame, *c* the armature-shaft having the driving-pulley *c'*, and D the driving-belt running around the pulley of the armature-shaft and a pulley D', secured to the car-axle.

E represents parallel suspension-links or hangers which connect the dynamo with a base-plate F, secured to the under side of the car-frame and which are pivoted to this plate and the dynamo by transverse pins *e*, so as to permit the dynamo to vibrate toward and from the car-axle. Four of such links are preferably employed, two on each side of the dynamo, one pair being attached to the upper front corners of the dynamo and the other pair to its upper rear corners.

In order to tighten the belt D sufficiently to drive the dynamo from the car-axle under normal conditions, a tension device is employed, which preferably is also arranged to act as a resistance for opposing or checking the forward swing of the dynamo, caused by the shock of the cars in coupling the same. In the construction shown in the drawings this tension device consists of an elbow-lever G, pivoted by a transverse pin *g* to a bracket of the base-plate F and having its short depending arm connected with the front pair of links or hangers E by links *h*, while its long horizontal arm is connected by a rod *i* with a piston I, which moves in a vertical cylinder J, secured to the car-frame on the front side of the dynamo. The upward movement of the piston in the cylinder J is checked by a suitable fluid under pressure, preferably compressed air, which is supplied from the usual air or storage tank of the air-brakes. The compressed air is delivered to the cylinder by a pipe *k*, entering a valve-chamber L, which is arranged at the top of the cylinder and communicates therewith by an opening or passage *l*, formed in the bottom of the chamber and provided at its upper end with a valve-seat, as clearly shown in Fig. 3.

M is an automatic regulating or reducing

valve applied to the seat at the upper end of the passage *l* and carried by a flexible diaphragm *n*, which extends across the valve-chamber and divides the same into a lower main chamber and an upper equalizing-chamber J'. The air-inlet pipe *k* is connected with the valve-chamber below the flexible diaphragm, so that the pressure of the air against the under side of the diaphragm raises or deflects its central portion upwardly, thus opening the valve M, allowing the air to enter the cylinder and forming an air-cushion in the upper portion of the cylinder, which checks the upward movement of the piston.

o is a spring which is arranged in the valve-chamber L above the diaphragm *n* and which resists the upward deflection of the diaphragm, causing the valve M to act as a reducing-valve, whereby the air-pressure upon the piston is diminished. This spring surrounds the valve-stem between an enlargement or shoulder of the valve and an adjustable screw-plug *p*, arranged in a screw-threaded opening in the top of the valve-chamber. The adjusting-plug is provided with a square or angular upper end adapted to receive a wrench for turning it, and it preferably extends upward into or through an opening formed in the floor of the car, as shown in Figs. 1 and 3, so that the plug can be adjusted from the inside of the car. By adjusting the plug up or down the resistance of the spring *o* is varied accordingly and the air-pressure upon the piston is regulated correspondingly, the air-pressure being increased as the tension of the spring is diminished and the pressure being reduced as the tension of the spring is increased, thus changing the tension or resistance of the air-cushion in the cylinder in the same measure.

The adjusting-plug is provided with a jam-nut *p'* and with a vertical socket p^2, in which the stem of the reducing-valve is guided.

q is an equalizing port or passage which connects the cylinder J with the portion of the valve-chamber L above the diaphragm *n* and whereby the pressure above and below the diaphragm is balanced. Upon admitting air to the cylinder the pressure raises the diaphragm and opens the valve, when the air enters the cylinder and also passes through the equalizing-passage *q* into the chamber above the diaphragm. As soon as the pressure in the cylinder and said chamber is balanced the spring *o* depresses the diaphragm and closes the valve. The air-pressure in the cylinder will now be equal to the difference between the initial pressure in the supply-pipe and the resistance offered by the diaphragm-spring. When any leakage of air from the cylinder takes place, the loss is followed by a reduction of pressure in the chamber above the diaphragm as well as in the cylinder, and the initial pressure now overcomes the resistance of the diaphragm and raises it and opens the valve, whereupon air enters the cylinder and said chamber until the loss of air and the normal air-pressure are restored, when the spring, owing to the balancing of the pressure above and below the diaphragm, is allowed to again close the valve. The loss of air is thus restored automatically.

It will now be understood that the air in the cylinder above the piston, through the medium of the piston, the elbow-lever G, the connecting-links *h*, and the suspension-links E, tends constantly to move the suspended dynamo backwardly or away from the car-axle from which it is driven, thus acting as a tensioning device which keeps the driving-belt taut. The motion of the car-axle is transmitted to the armature-shaft of the dynamo so long as the speed of the latter remains at or below the normal; but as soon as the speed rises above the normal by the increased speed of the train the increased pull of the belt resulting therefrom overcomes the resistance of the tensioning device and draws the dynamo toward the car-axle from which it is driven, thereby slackening the driving-belt, allowing it to slip on the driving-pulley of the dynamo and permitting the speed of the dynamo to fall to the normal, when the dynamo will again swing away from the driving-pulley under the force of the tension device and tighten the belt and so maintain the normal speed and output of the dynamo. The suspended dynamo and its belt thus act as a governor which regulates and equalizes the speed and output of the machine, thereby supplying a constant current to the electric lamps in the car and producing a steady light so long as the car remains in motion. By means of the adjusting plug or screw *p* the tension of the driving-belt can be regulated for obtaining any predetermined output of the dynamo.

In coupling cars provided with this lighting apparatus the oscillations of the dynamo are reduced to a minimum, as the movement of the dynamo is restrained in one direction by the driving-belt and in the opposite direction by the air-pressure device. The latter holds the dynamo-pulley snugly in the bight of the belt and prevents the pulley from leaving the belt to such an extent that the belt can run off or can be injured by the pulley striking the belt on resuming its normal position.

The air-pressure device produces the desired pressure against the belt irrespective of the weight of the dynamo, which latter can be made as light as circumstances will permit, and enables the necessary pressure to be produced with a pressure device of comparatively small size and weight, whereby the size and weight of the lighting apparatus are considerably reduced, which are important items in an apparatus attached to a railroad-car.

The upper arm of the elbow-lever G is preferably considerably longer than its lower arm—say twice as long—as shown. By thus proportioning the arms of the lever the ten-

sion device has an advantageous leverage over the dynamo in adjusting the tension of the driving-belt, while the dynamo, on the other hand, has an unfavorable leverage over the tension device in swinging forward from the shock of the cars in coupling.

The conducting-wires, switches, and other accessories of the car-lighting system, are not shown in the drawings, as they form no part of my invention.

I claim as my invention—

1. The combination with the driving-axle provided with a pulley, a dynamo provided with a pulley and capable of movement toward and from the driving-axle, and a driving-belt applied to said pulleys, of a fluid-pressure mechanism which is connected with the movable dynamo and by which the same is pressed away from the driving-axle to tighten the belt, while the dynamo is drawn toward the axle by an excessive speed of the belt, substantially as set forth.

2. The combination with the driving-axle provided with a pulley, a dynamo provided with a pulley and capable of movement toward and from the driving-axle, and a driving-belt applied to said pulleys, of a fluid-pressure mechanism which is connected with the movable dynamo and by which the same is pressed away from the driving-axle to tighten the belt and which is provided with a pressure-equalizer by which a uniform fluid-pressure is maintained, substantially as set forth.

3. The combination with the driving-axle provided with a pulley, a dynamo provided with a pulley and capable of movement toward and from the driving-axle, and a driving-belt applied to said pulleys, of a cylinder and piston adapted to receive fluid-pressure and apply it to the movable dynamo and to press the same away from the driving-axle, a valve-chamber connected with said cylinder, a reducing-valve arranged in said chamber, and an equalizing-passage connecting the cylinder with said chamber, substantially as set forth.

4. The combination with the driving-axle, a dynamo and a frictional mechanism whereby the dynamo is driven from said axle, of a cylinder and piston for tensioning such driving mechanism, a valve-chamber connected with said cylinder and having a flexible diaphragm and a fluid-inlet entering the same between the cylinder and said diaphragm, a reducing-valve controlled by said diaphragm and governing the admission of the fluid into the cylinder, and an equalizing-passage, connecting the cylinder with the portion of the valve-chamber above or in rear of said diaphragm, substantially as set forth.

Witness my hand this 18th day of September, 1897.

WILLARD F. RICHARDS.

Witnesses:
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