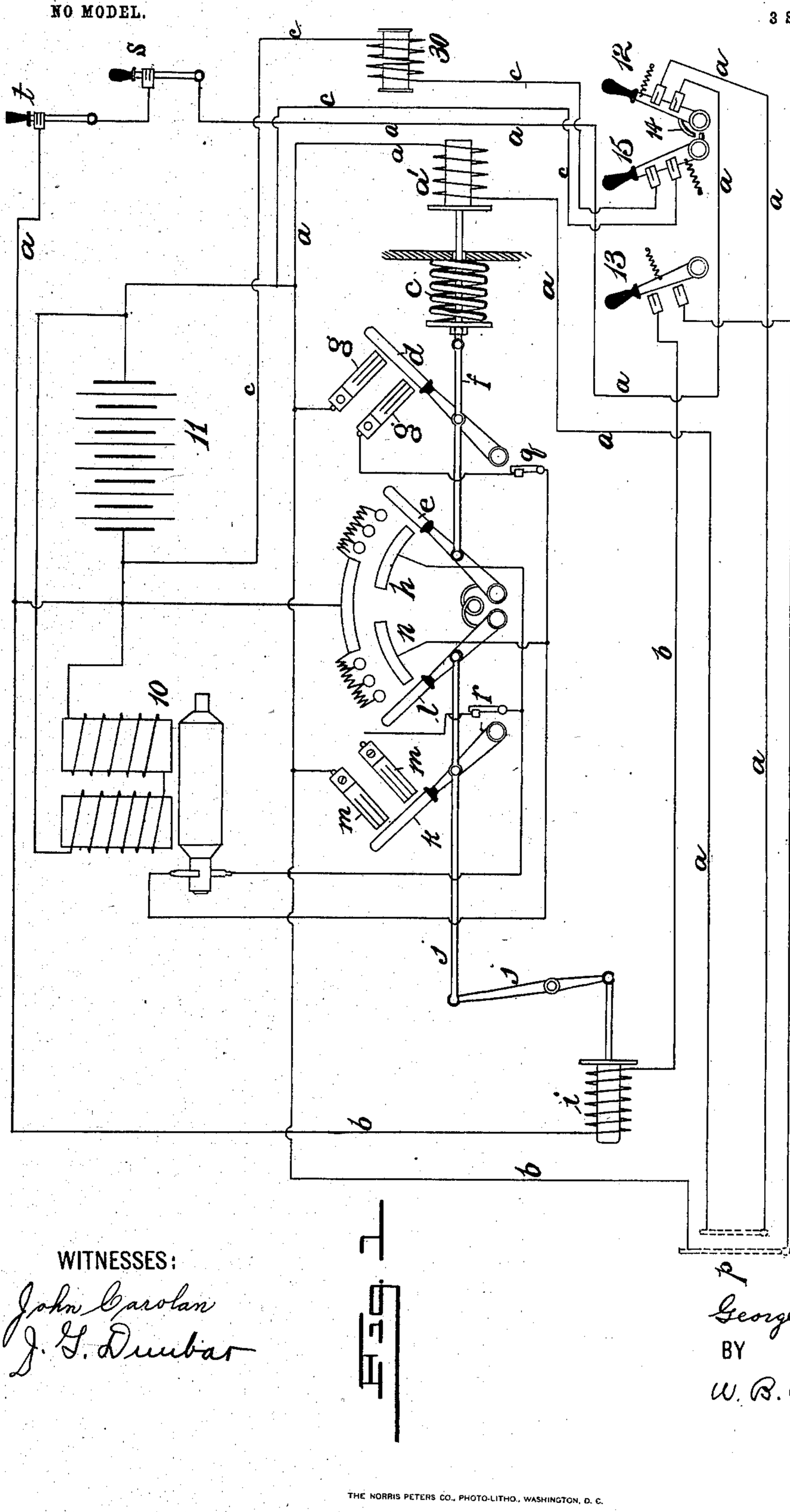
No. 736,120. PATENTED AUG. 11, 1903.

G. A. LE FEVRE.

ELECTRIC BRAKE.

APPLICATION FILED JUNE 21, 1902.

NO MODEL. 3 SHEETS—SHEET 1.



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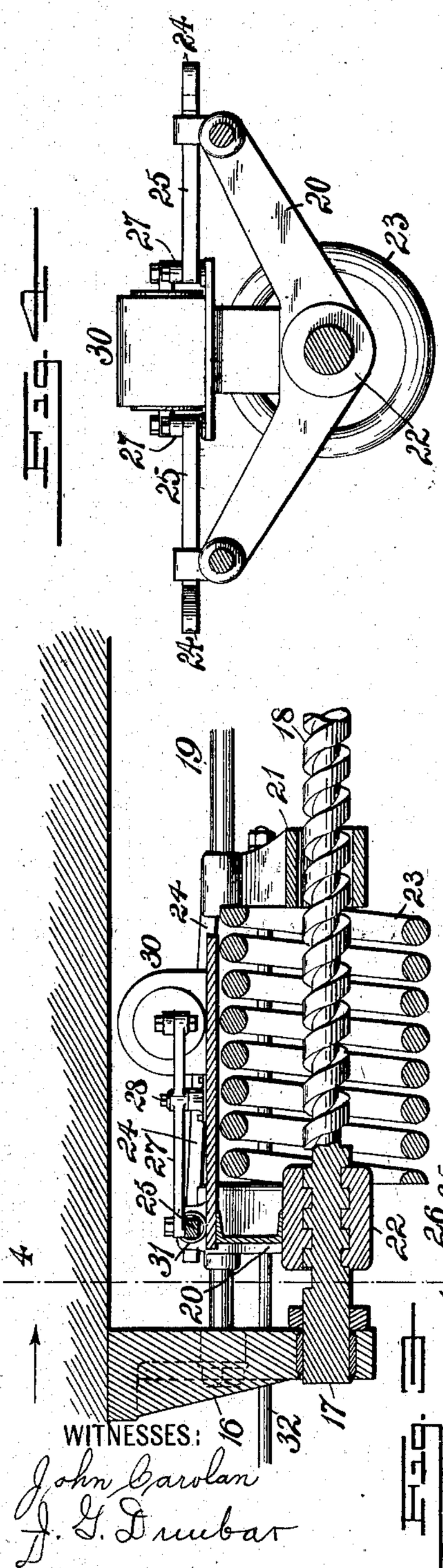
NO MODEL. 3 SHEETS—SHEET 2.



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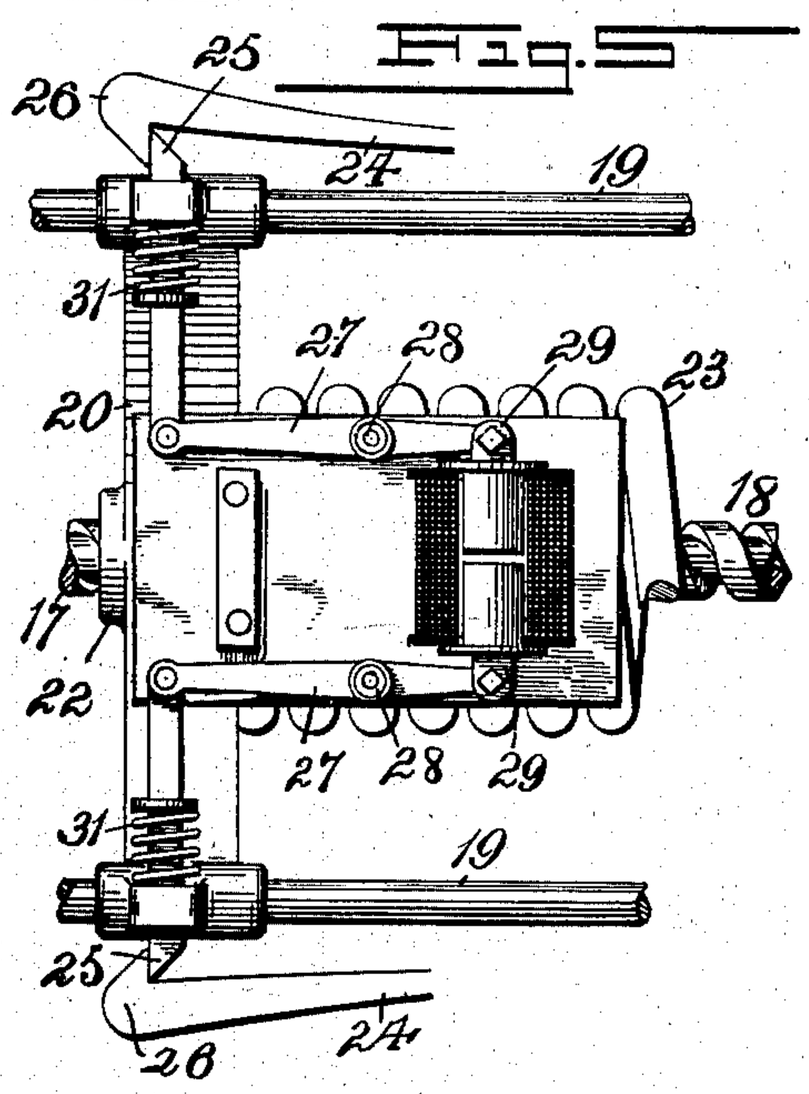
NO MODEL. 3 SHEETS—SHEET 3.

Fig. 5



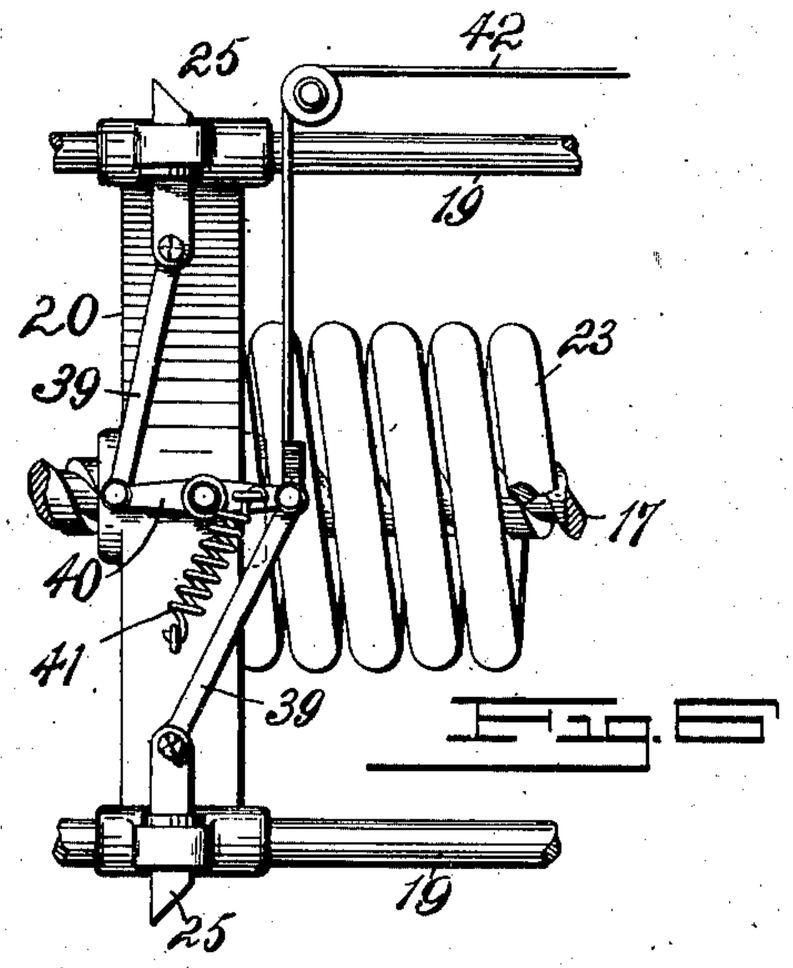
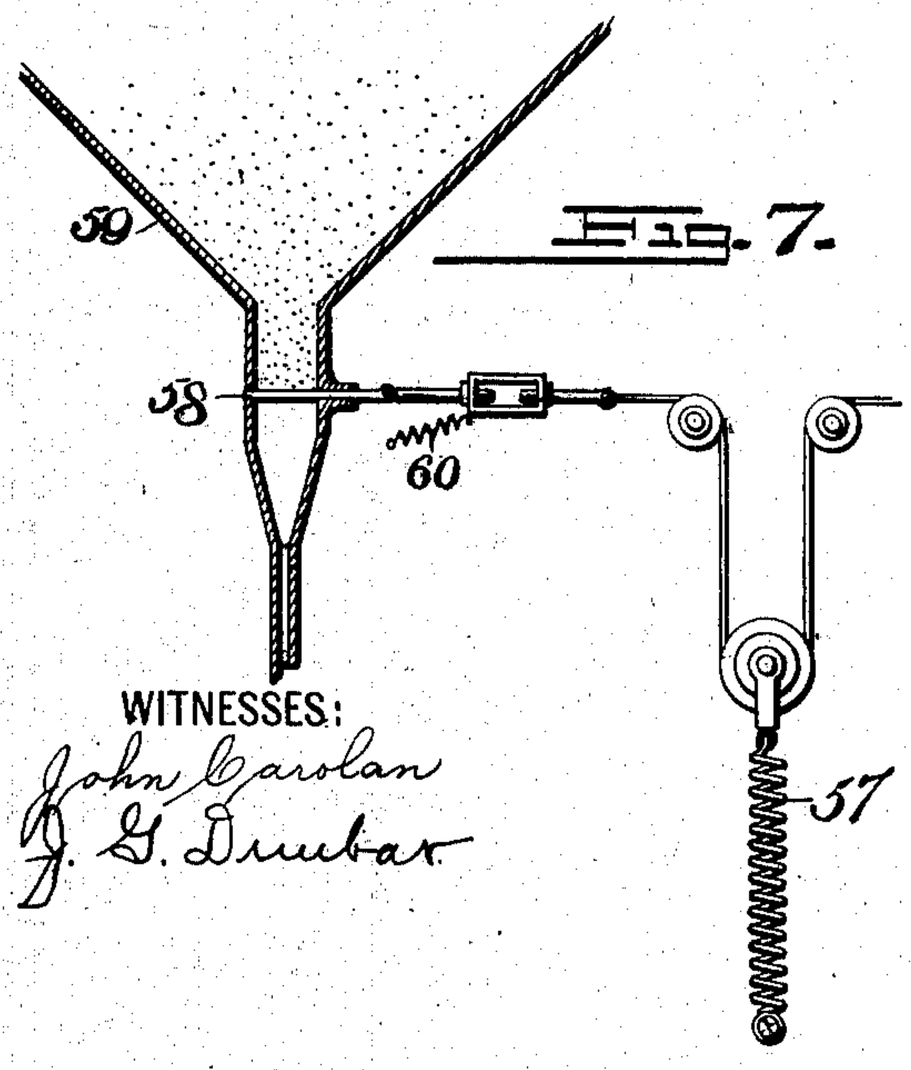
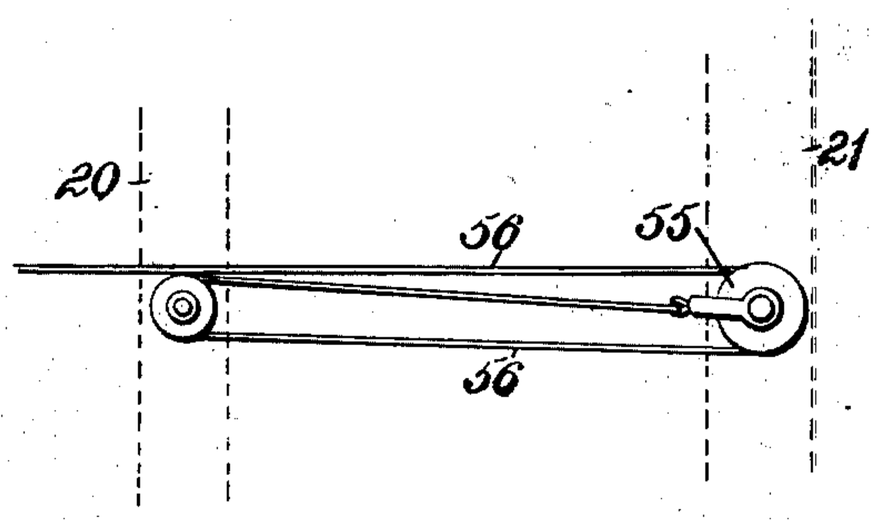


Fig. 6.

Fig. 7.





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No. 736,120. Patented August 11, 1903.

UNITED STATES PATENT OFFICE.

GEORGE A. LE FEVRE, OF NEW YORK, N. Y.

ELECTRIC BRAKE.

SPECIFICATION forming part of Letters Patent No. 736,120, dated August 11, 1903.

Application filed June 21, 1902. Serial No. 112,579. (No model.)

To all whom it may concern:

Be it known that I, GEORGE A. LE FEVRE, of the city, county, and State of New York, have invented certain new and useful Improvements in Electric Brakes, of which the following is a full, clear, and exact description.

This invention is designed to provide a brake for a railway or other traction car or train of cars adapted to be operated by means of electric currents and also to be quickly operated by means of an emergency mechanism.

A further object is to provide a series of independent systems, all of which systems can be operated from a common point or all of them operated by a breaking of the communication between them, such as the parting of a train.

A further object is to provide a mechanism to be placed on a car or the cars of a train to be operated by electrical means to cause a stoppage of the same in a gradual way or a sudden braking in case of necessity therefor.

Another object of the invention is to furnish a system of brakes on the cars of a train, each of which after being set in motion will travel until a predetermined pressure is established between the brake-shoes and the wheels and then automatically cease its operation irrespective of the other cars.

This brake also provides for an even braking irrespective of the thickness of the brake-shoes.

To these ends my invention consists of an electric brake, the construction and arrangement of which will be hereinafter fully described and claimed.

Reference is to be had to the accompanying drawings, forming part of this specification, in which similar figures and letters of reference refer to similar parts throughout the several views.

Figure 1 is a diagrammatic view of the circuits on a car-body connected to the switches in the cab of the locomotive or on the platform of the car. Fig. 2 is a bottom view of the brake-operating mechanism placed on the bottom of the car-body. Fig. 3 is a central longitudinal vertical section of same, and Fig. 4 is a section on line 4 4 in Fig. 3. Fig. 5 is a top view of the emergency releasing means, and Fig. 6 is a modification of the same adapted for manual operation. Fig. 7 shows a connection whereby the operation of this brake mechanism opens the valve of a sand-box.

On a car, whether single or in a train, is placed a motor 10, adapted to be operated by any source of electrical energy 11, preferably a storage battery, which is adapted to be thrown in and out of circuit by means of an operating-switch 12, the opening of which opens a circuit *a*, releasing the plunger of the solenoid *a'* and allowing the spring *c* to throw the levers *d* and *e* by means of the rod *f* in engagement with the contacts *g* and the motor-starting rheostat *h*, respectively. It will thus be evident that the circuit now passes from the battery, through the plates *g* and the switch *q*, to the armature and back through the plates *h* and lever *e*, through the rheostat, back through switches *t* and *s*, to the switch 12, the current passing from the battery or other source of power to the field of the motor, always in the same direction. A closing of the switch 12 will reëstablish a current through the solenoid *a'* and by means of the rod *f* will throw the switch *d* and the rheostat *h* back out of contact, thereby stopping the motor. On the other hand, the closing of the switch 13 will tend, by means of the circuit *b*, to throw the solenoid *i* into circuit, operating by suitable mechanism *j* to throw the levers *k* and *l* into engagement with the contacts *m* and the rheostat *n* to reverse the direction of rotation of the motor by running the current from the battery through the plates *m* and the switch *r* to the armature of the motor in the opposite direction to the previous arrangement and back through the plate *n* and lever *l* through the rheostat, and thus back to the switch 13, by means of the conductor *p* and circuit *b*. An opening of the switch will, by means of the cutting out of the solenoid *i*, stop the said rotation. It will thus be seen that the direction of the rotation of the motor is at all times under control. When the switch 12 is opened just enough to open the circuit, it operates independently; but a further movement, as in case of an emergency, a finger 14 or any other similar device actuates a switch 15 of an emergency-circuit, coöperating to cut out of circuit a magnet 30, the op-

eration of which is illustrated and described hereinafter. The free ends of the circuit *a* and *b* are shown connected in dotted outline at *p*, which may be connected to the next succeeding car, or, in case of the rear end of the last car of a train, acts as a terminal connection.

In the circuit *a* I may place a switch *s* on each car in any convenient place, which is adapted to be operated by the conductor or brakeman to set the brakes from that point. Likewise a switch *t* can be placed in this circuit to project from the outside of the car or train and be actuated by any obstruction or lever placed in position by the operation of a track-switch at a distance therefrom to automatically set the brakes by the misplacement of the switch. Any suitable means may be placed between the levers *e* and *l* to lock either one in its open position when the other is operated.

The apparatus for actuating the brakes on each car is shown more particularly in Figs. 2, 3, and 4, and consists of a pair of supports 16, secured to the bottom of the car-body and in which is journaled the revolving shaft 17, which is screw-threaded a portion of its length, as at 18. A pair of guide-rods 19 are also supported by said supports and act to guide a pair of yokes 20 and 21, the yoke 20 having a boss 22, which is screw-threaded and acts as a nut. A spring 23 is compressed between the yokes and operates to throw them apart when a holding means adapted to maintain them at a predetermined distance apart is released. Said holding means may be constructed as shown in the drawings, consisting of a pair of spring-hooks 24 on either side and secured at one end to the yoke 21. A pair of latches 25 project from either side of the yoke 20 on the top thereof and lock into a hook 26 on the end of the spring-arms 24. As will be seen more particularly from Fig. 5, these latches are connected on their inner ends to a pair of levers 27, pivoted at 28, connected to plungers 29 of the magnet 30, which, as will be seen from the description of the circuits hereinbefore, is normally in circuit and holds these latch-pieces 25 in engagement with the said spring-arms; but when out of circuit springs 31 tend to throw the latches inward and release the spring-arms 24 and the yoke 21, thereby allowing the spring 23 to throw the yoke 21 and cause a tension on the rods or cables 32, which are connected in the usual way with the levers of the brake-beams of cars. This provides for the instantaneous setting of the brakes and is designated herein as the "emergency mechanism." When it is desired to cause a gradual setting of the brakes, the switch 12 is opened, which in the manner described hereinbefore causes a rotation of the motor 10, which is connected by gearing or otherwise with the shaft 17, the rotation of this shaft causing the nut 22, and consequently the yokes 20 and 21, to travel slowly along the guide-rods 19 until the brakes are fast up against the wheels. When the switch is closed, no matter at what point on the shaft the nut happens to be, it will maintain that position until by means of the switch 13 the direction of rotation of the motor is reversed, when the yokes will travel back to their normal position. Assuming that a series of cars are being operated simultaneously by one switch 12 each mechanism will travel until the tension on the rods or cables 32 is so great as to overcome the tension of the spring 23, and as the yoke 20 still advances it will come in contact with a pin 33, which in turn will swing a switch-lever 34 to break the circuit and bring the mechanism to a standstill irrespective of the apparatus on the other cars, whereby the brakes on all the cars of a train have the same tension. In case of a breakage of the aforesaid circuit-breaking apparatus or of the cables 32 the yoke 20 will ride up against a pair of buffers 35, which will convey both yokes until a limit-switch *q* is reached, said switch being actuated by the yoke 21 at its extreme forward position, opening the circuit and causing the brake-operating mechanism to stop. A similar switch *r* is placed on the other end of the limit of travel of the yokes, as shown in Fig. 2, by means of which the movement is limited in this direction. It will thus be seen that I have devised a safety arrangement on either end of the brake-actuating device to cause a cessation of revolution of the actuating-screw by cutting off the circuits. When the emergency mechanism has been operated and the spring is expanded the direction of its length and it is desired to again couple the yokes, all that is necessary is to start the motor, when the yoke 20 will force the spring together until the latches 25 ride up under the hooks 26, as will be evident.

I may provide the rod or shaft 17 with a beveled gear 36, (shown in dotted outline in Fig. 2,) meshing with a gear 37, which may be actuated by means of a hand-wheel 38. This device is adapted for use in case a car has become uncoupled and the brakes are on and it is necessary to release them; but any other manual means, such as a worm-wheel, may be used.

The emergency device previously described as electrically operated may be made as shown in Fig. 6, in which case the latches 25 are connected at either end of a pivoted lever 40 by means of links 39 being held to normally project from the sides of the yoke 20 by a spring 41, suitably placed, the whole to be operated by a rope or cable 42, extending to the platform of the car or other point of convenient access. This construction is particularly adapted for trolley or surface cars, but is not limited to these.

In Fig. 7 I show the means for simultaneously operating with the emergency mechanism the valve of a sand-box. When the yokes 20 and 21 are suddenly thrown apart, as in the operation of the emergency-brake, a pul-

ley 55 on the yoke 21 pulls a rope or cable 56, which can be secured to the yoke 20 or can run over a pulley thereon and be secured to the yoke 21. This pulling of the cable tends to open a valve 58 of a sand-box 59 and to release the contents thereof. A spring 60 closes the valve on the releasing of the brake. A spring 57 normally under tension keeps the cable 56 taut.

It will thus be seen that I have devised a brake that can be operated to press gradually on the wheels of a car or cars or to be thrown immediately into engagement and that both can be operated simultaneously—that is, the emergency mechanism can be operated with the mechanism designed to provide a gradual pressure. In this construction I have also provided a brake which by means of the pressure-limits 34, *q*, and *r* is not liable to breakage and which will allow of the fullest contact between the brake and the shoe, which at the present time presents quite an obstacle to the successful operation of railway-brakes. It will be understood that the operation of the cut-out switch 34 is regulated to a predetermined point by the adjustment of the cables or rods 32 by means of the nuts 61; but any other suitable mechanical means for this adjustment may be used. It will thus be evident that I have devised a brake suitable for railway or other traction cars simple in construction, inexpensive to make, the liability of which to become disarranged is slight, and in which a predetermined pressure can be maintained on each car of a train irrespective of the other cars, such pressure being the same on the brake-shoes no matter what their thickness.

It is obvious that I may change the details of construction in this mechanism or rearrange the parts without departing from the scope of my invention.

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

1. An electrically-operated brake comprising a motor arranged in an electric circuit and having an operative connection with the brake to set it, an independent emergency mechanism in a separate circuit arranged to operate the brake to set it, and means for setting the emergency mechanism in operation by breaking its circuit.

2. The combination with the car-brakes and the motor operatively connected with the brakes to actuate them, of electrical circuits arranged to start and reverse the motor, mechanism as the springs and solenoids in the said circuits to make and break the said circuits, and means as the manually-operated switches for controlling the said circuits.

3. The combination with a train of cars, independent motors for the several cars, and brake mechanism for the cars actuated by the said motors, the said motors being also arranged in the same circuit, of means for automatically cutting out each motor independent of the other motors as a predetermined pressure of its brakes is reached.

4. The combination with a train of cars, of brake mechanism for each car, and motors in multiple for operating each brake mechanism, together with means for individually and automatically controlling the several motors.

5. An apparatus of the kind described comprising a sliding yoke or head having means for connection with a brake, a second sliding yoke or head adapted to move the first head, an electric motor geared to the second yoke or head to move it, means for fastening the two yokes or heads together, means for operating the first yoke or head and setting the brakes by releasing the connection between the two yokes or heads, and electrically-controlled means for effecting the separation of the two yokes or heads.

6. An apparatus of the kind described comprising a rotary screw-shaft, a motor for turning it, a sliding yoke or head having means for connecting with a brake, a second sliding yoke or head adapted to abut with and move the first yoke or head, means for moving the second yoke or head from the screw-shaft, a locking device normally holding the two yokes or heads in fixed relative positions, means for moving the first yoke or head independently of the second when the two are released, and electrically-controlled means for releasing the two yokes or heads.

7. An apparatus of the kind described comprising a sliding yoke or head having means for connection with a brake, a second yoke or head sliding parallel with the first, an electric motor geared to the second head, means whereby the movement of the second head will be imparted to the first head, a spring arranged between the two heads and adapted to move the first in relation to the second, a locking device to normally hold the two heads in fixed relative position when the spring is pressed, and electrically-operated means for releasing the said locking device.

8. An apparatus of the kind described comprising a sliding two-part mechanism, the two parts being adapted to move independently or together and having means for connection with a brake, an electric motor geared to the said mechanism so as to operate the two parts together and one part independently, means for operating one part of the mechanism independently of the motor so as to set the brakes, and means arranged in an electrical circuit to control the said independently-acting brake-setting mechanism whereby the said mechanism may be operated by a break in the circuit.

9. In an apparatus of the kind described, the combination with the two-part sliding mechanism having means for connection with a brake, of means as a spring arranged between the members of the mechanism to operate one member independently and set the brakes, and means as the hooks on one mem-

ber of the sliding mechanism and the electrically-operated latches on the other, to lock the two members together.

10. In a device of the kind described, the combination with the two yokes or heads operated as described and arranged to move independently, of the hooks on one member, the sliding latches on the second member to engage the hooks, and means for moving the latches and releasing the hooks.

11. In an apparatus of the kind described, the combination of the two sliding yokes or heads, means for directly moving one of the said heads, a spring for separating the heads, means for moving the two heads in unison, hooks on one head extending opposite the other head, latches on the second head to engage the said hooks, means for releasing the latches and hooks, and an operative connection between the head carrying the hooks and the brake.

12. In an apparatus of the kind described the combination with the two sliding independent yokes or heads, of the screw-shaft connected to one head to move it, a spring arranged between the two heads, means for connecting the second head with a brake, and means as the hooks on the second head and the electrically-controlled latches on the first, to fasten the hooks together and to permit their separation.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

GEORGE A. LE FEVRE.

Witnesses:

W. B. HUTCHINSON,

J. G. DUNBAR.