(No Model.)

G. L. THOMAS.

ELECTRICALLY CONTROLLED MOTOR.

No. 542,543. Patented July 9, 1895.

FIG. 1.

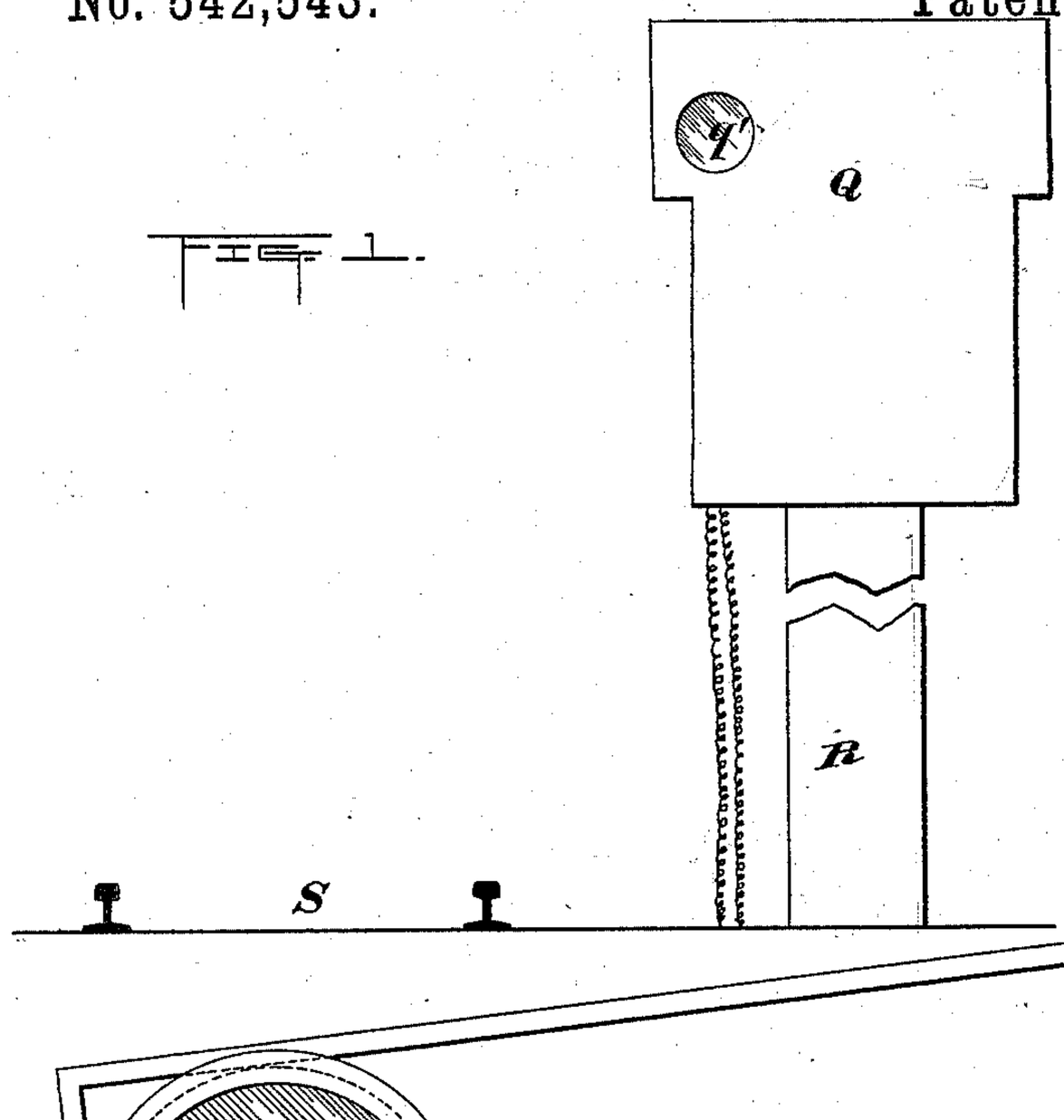


FIG. 2.

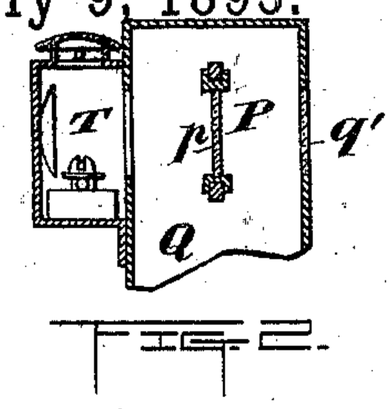
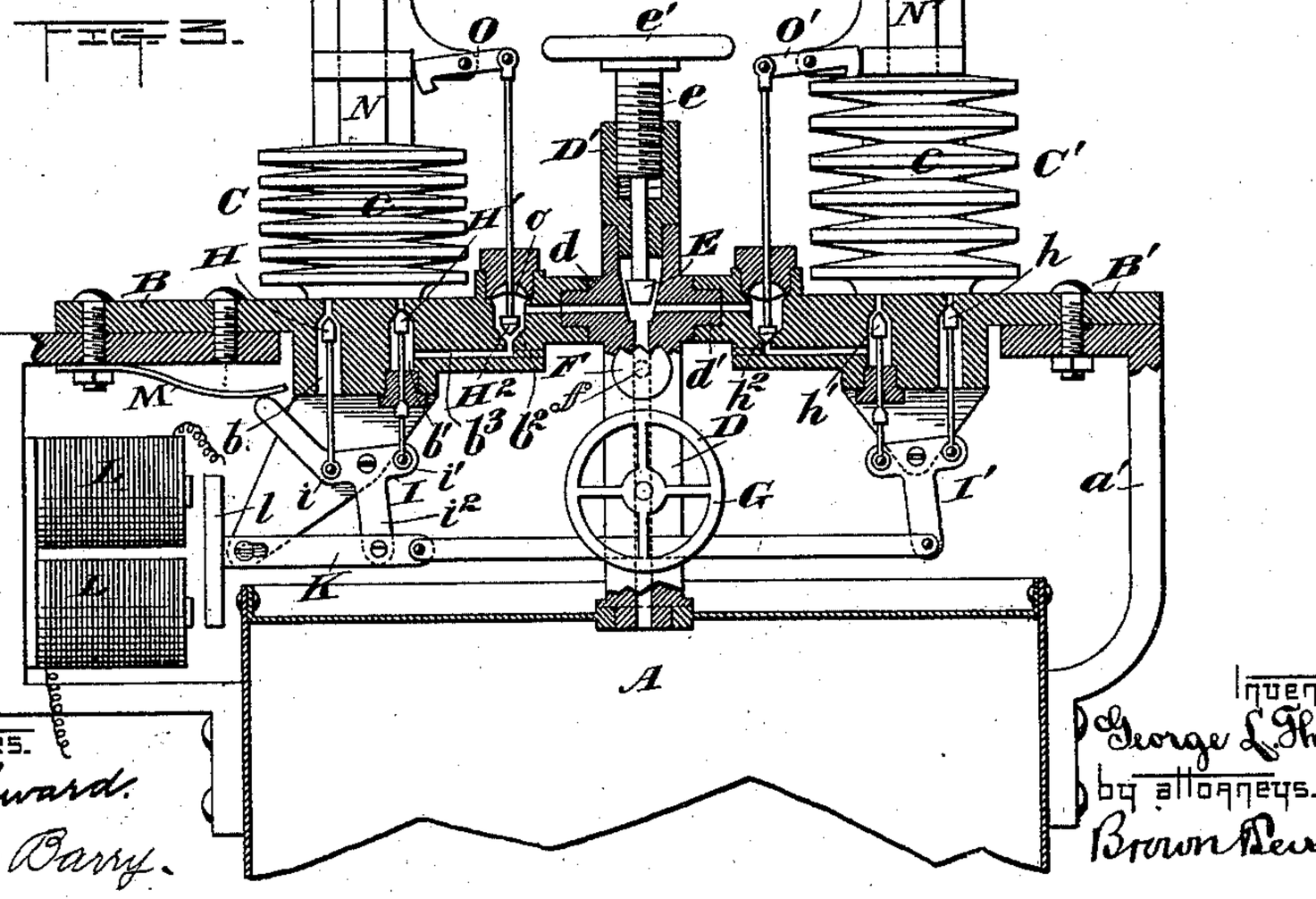


FIG. 3.



Witnesses.
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UNITED STATES PATENT OFFICE.

GEORGE L. THOMAS, OF BROOKLYN, NEW YORK.

ELECTRICALLY-CONTROLLED MOTOR.

SPECIFICATION forming part of Letters Patent No. 542,543, dated July 9, 1895.

Application filed April 25, 1895. Serial No. 547,119. (No model.)

To all whom it may concern:

Be it known that I, GEORGE L. THOMAS, of Brooklyn, in the county of Kings and State of New York, have invented a new and useful Improvement in Electrically-Controlled Motors, of which the following is a specification.

My invention relates to an improvement in electrically-controlled motors, in which the pressure of a fluid within an expansible chamber serves to set in motion an actuating-rod.

The form in which I have presented the motor for the purpose of illustrating my invention is adapted to operate a semaphore for railway signaling; but I do not wish to be understood as confining my invention to such specific use.

In the accompanying drawings, Figure 1 is an outside view of the motor in side elevation as it appears in connection with a signal-post at the side of the track. Fig. 2 is a transverse section through the upper portion of the motor-casing, sephamore, and lamp; and Fig. 3 is an enlarged view of the motor in elevation, partly in section, the motor-casing being removed.

The motor, as shown, is set up in duplicate, the two expansible chambers being connected with a common supply-tank and under the control of a single electromagnet to positively operate the sephamore in one direction when the magnet is energized and in the opposite direction when the magnet is de-energized.

The supply-tank for containing the actuating fluid, which, in the present instance, is compressed carbonic acid, is denoted by A. At opposite sides of the tank brackets *a a'* are fixed, and to their upper ends, above the top of the tank, are secured the base-plates B B' of the expansible chambers C C'. The pipe for conducting the actuating-fluid from the supply-tank to the expansible chambers is denoted by D and is connected by branches *d d'* with the base-plates B B' respectively. The bore in the pipe D at the point where it connects with the bores in the branches *d d'* is closed by a valve E, having a screw-threaded stem *e* engaged with an extension D', fixed to the end of the pipe D, the said valve-stem having a hand-wheel *e'* fixed to its stem for turning it. The valve E also closes the bores in the branches *d d'* at the same time that it closes the bore in the pipe D. A cap F covers an opening *f* leading from the side of the pipe D to its bore for the purpose of charging the supply-tank, and a stop-cock G, of any well-known or approved form, is arranged to open and close the bore of the pipe D intermediate of the valve E and the tank.

The base-plate B is provided with three valve-chambers, (denoted by *b b' b²*.) The valve-chamber *b* communicates with some suitable exhaust-space, in the present instance with the outside air, and with the interior of the expansible chamber C. The valve-chamber *b'* communicates with the interior of the expansible chamber C and through a passage-way *b³* with the valve-chamber *b²*, which in turn communicates with the bore of the branch pipe *d*.

A valve H for opening and closing communication between the valve-chamber *b* and the interior of the expansible chamber has its stem connected with one arm *i* of a rocking valve-operating lever I, and a valve H' for opening and closing communication between the valve-chamber *b'* and the interior of the expansible chamber has its stem connected with an oppositely-extending arm *i'* of the lever I. A third arm *i²* of the lever I is connected by a rod K with the armature *l* of an electromagnet L, secured to the bracket *a*, and a spring M, in the present instance secured to the bracket *a*, with its free end engaged with an extended portion of the arm *i* of the lever I, serves to hold the lever I normally rocked in position to hold the valve H open, the valve H' closed, and the armature *l* out of contact with the magnet.

The expansible chambers C C' are of bellows form, consisting of hollow convex disks *c*, having flexible walls, in the present instance thin metallic walls, with open communication from disk to disk. The chamber C is surmounted by a rod N for transmitting the movement of the upper wall of the upper disk *c* to the device to be operated.

A valve H² for opening and closing communication between the valve-chamber *b²* and

the passage-way b^3 has its stem connected with one arm of a vibrating lever O supported on a standard extending upwardly from the base-plate B, and the opposite arm of said lever O is in position to be engaged by the top of the expansible chamber C as it reaches the predetermined limit of its expansion and be rocked in a direction to close the valve H^2. The valve H^2 is normally held open by a diaphragm *o* engaged with its stem and subject to the pressure of the actuating-fluid on its under side.

From what has been described it will be seen that, supposing the tank to be charged with a fluid under pressure, when the electromagnet is energized the movement of its armature will rock the lever I to close the valve H and open the valve H′. The admission of the actuating-fluid to the expansible chamber C will elevate the rod N and impart the required motion to the device to be operated. As soon as the rod N has been moved the desired distance the engagement of the top of the expansible chamber with the lever O will close the valve H^2, and hence shut off the further passage of the actuating-fluid to the chamber C, and thereby arrest the movement of the rod N.

As soon as the electromagnet is de-energized the spring M will rock the lever I back to its normal position, opening the valve H and closing the valve H′. This will permit the expansible chamber C to collapse and the rod N to return. The valve H^2 will also be opened by the action of the diaphragm *o*.

In my preferred form for operating a semaphore I arrange a companion expansible chamber C′, with its valves *h*, *h′*, and h^2 operated by a rocking lever I′ and a vibrating lever O′ in a manner quite similar to that hereinabove described in reference to the expansible chamber C. The rocking lever I′ is connected with the rocking lever I, so that they will be simultaneously operated by the armature *l* of the electromagnet; but the valves *h* and *h′* are connected with the lever I′ in reverse order, so that the movement of the armature *l* toward its magnet will cause the expansible chamber C′ to collapse at the same time the chamber C expands, and vice versa. Thus if the operating-rod N′ be connected with a pivoted part to be operated on the opposite side of the pivot from that on which the rod N is connected the said pivoted part would be positively operated in one direction when the electromagnet is energized and positively operated in an opposite direction when the electromagnet is de-energized

The rods N N′ are shown in the accompanying drawings connected with a tilting semaphore P, pivoted to a casing Q at a point *q* intermediate of the points where the rods N N connect with it.

The casing Q, which is preferably made to inclose both the semaphore and the motor, is fixed to a post R at the side of a track S and provided with a transparent window *q′* at one end, through which a colored signal may be displayed.

The semaphore P consists of a skeleton frame, within which a disk *p* of colored glass or other suitable translucent material is free to travel back and forth under the influence of gravity as the frame is tilted.

Provision is made for securing a lantern T to the casing Q at an opening in the casing opposite the window *q′*, so that it will shine through the window toward the approaching train and through the disk *p* when the latter is moved in front of the window by the tilting of the semaphore-frame.

In the position shown in the drawings the semaphore is tilted to indicate danger and the disk *p* of red glass is in position to show a red signal whether it be daylight or dark. The energizing of the electromagnet, as hereinabove explained, will set the motor in action and will positively tilt the semaphore-frame and cause the red disk to disappear from in front of the window, showing simply the white interior of the casing if it be daylight or the white light if it be night. The de-energizing of the electromagnet will in turn, as above explained, positively return the semaphore-frame to its tilted adjustment to present the red disk in front of the window to indicate danger.

What I claim is—

1. In combination, means for retaining a supply of fluid under compression, an expansible chamber, means for communicating the movement of the expansible chamber to the work to be done, means for admitting the actuating fluid to and discharging it from the expansible chamber and means for automatically cutting off the admission of the actuating fluid to the expansible chamber at a predetermined point in the movement of the expansible chamber, substantially as set forth.

2. In combination, means for retaining a supply of fluid under compression, an expansible chamber, valves for admitting the actuating fluid to and discharging it from the expansible chamber, an electromagnet for controlling the movement of said valves and a valve under the control of the expansible chamber to cut off the admission of the actuating fluid at a predetermined point in the movement of the expansible chamber, substantially as set forth.

3. In combination, means for retaining a supply of fluid under compression, an expansible chamber, valves for admitting the actuating fluid to or discharging it from the expansible chamber, a rocking lever for simultaneously opening one of said valves and closing the other, an electromagnet for moving the said rocking lever in one direction and means for moving said rocking lever in the opposite direction when the electromagnet is de-energized, substantially as set forth.

4. In combination, means for retaining a

supply of fluid under compression, an expansible chamber, means for admitting the actuating fluid to and discharging it from the expansible chamber, a valve under the control of the expansible chamber to cut off the admission of the actuating fluid, said valve being under the control of the pressure of the actuating fluid to force it open when the expansible chamber is permitted to collapse, substantially as set forth.

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