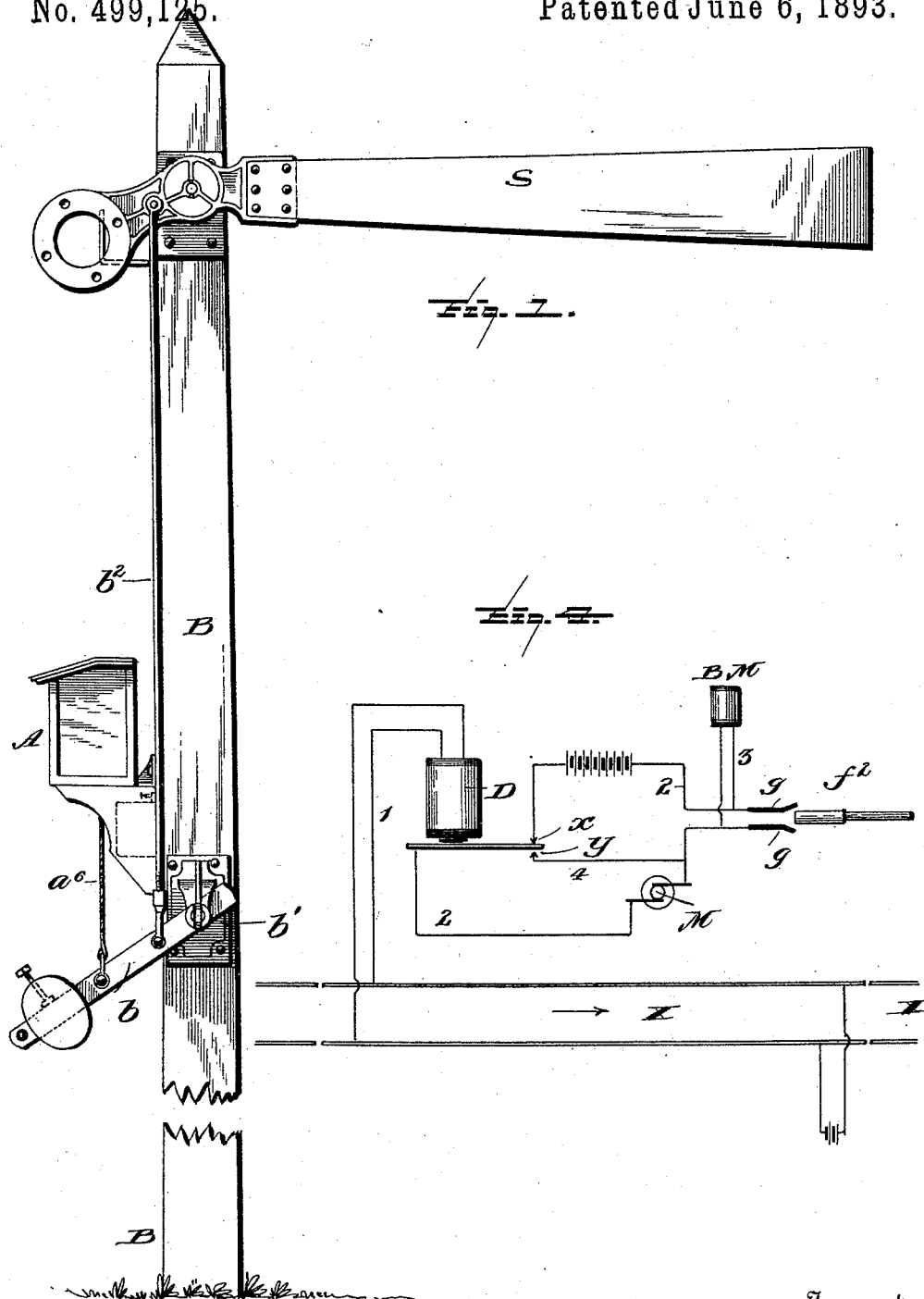


J. W. LATTIG.  
ELECTRIC SIGNAL APPARATUS AND SYSTEM.

No. 499,125.

Patented June 6, 1893.



Witnesses  
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(No Model.)

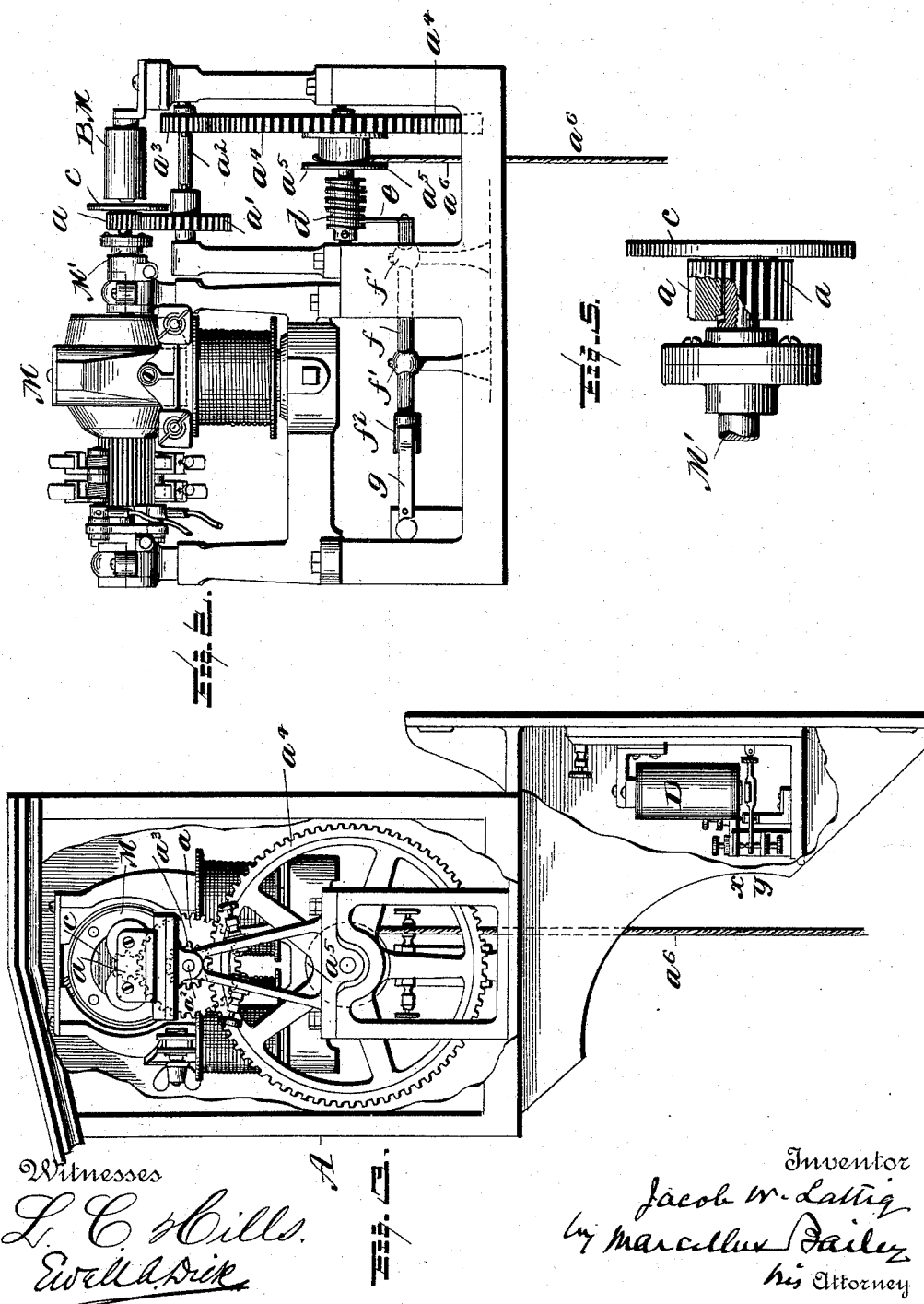
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# UNITED STATES PATENT OFFICE.

JACOB WILLIAM LATTIG, OF EASTON, PENNSYLVANIA.

## ELECTRIC SIGNAL APPARATUS AND SYSTEM.

SPECIFICATION forming part of Letters Patent No. 499,125, dated June 6, 1893.

Application filed April 12, 1893. Serial No. 470,100. (No model.)

*To all whom it may concern:*

Be it known that I, JACOB WILLIAM LATTIG, of Easton, in the State of Pennsylvania, have invented certain new and useful Improvements in Electric Signal Apparatus and Systems, of which the following is a specification.

My invention has been designed with more particular reference to the needs of an automatic block system for railways, and it is in that connection that I shall describe it. The system involves the employment of an electric motor for actuating the signal operating mechanism to move the signal to safety; and the motor which I prefer and in practice use is of the electro-dynamo type, comprising stationary field magnets and a rotating armature. The armature through suitable gearing is connected to and operates the signal to pull it from danger to safety position, and the movement of the signal in the opposite direction—that is from safety to danger—is effected by gravity or a weight. Whenever the signal brings up in one or the other of these positions, its stoppage will rack the gearing as well as the motor and other parts of the mechanism unless some means be taken to prevent it. It is in the preventive means which I employ for this purpose that my present improvements mainly are comprised. The motor remains in gear at all times with the signal; consequently its armature or rotating part will revolve in one direction when the signal moves up, and in the other direction when the signal moves down.

For the purpose of preventing the shock to the mechanism which would result from the sudden stoppage of the signal when brought from danger to safety, I employ an electrically controlled brake, which is automatically brought into circuit at or about the time the motor has moved the signal to safety, and acts at this time to check and stop the motor and gearing without jar or shock. And to prevent the shock which would result from the sudden stoppage of the signal when brought from safety to danger, I, at this time, cut the motor out of its energizing circuit, and close its circuit on itself; the result is that the motor armature is revolved from the signal, and the motor becomes for the time being a generator, and the retarding effect induced under these circumstances, will cause

the armature to hold back and thus to prevent the signal from bringing up into danger position with too much force.

The nature of my improvements and the manner in which the same are or may be carried into effect will be readily understood by reference to the accompanying drawings, in which—

Figure 1 is a front elevation of a semaphore signal pole and appliances embodying my invention. Fig. 2 is a front elevation of the motor and its mechanism on enlarged scale. Fig. 3 is an end elevation of the same. Fig. 4 is a diagram of the electric circuits including the several parts of the apparatus. Fig. 5 is a detail on enlarged scale, of the brake armature and gear attached to it.

The apparatus (together with the track relay hereinafter referred to) is contained in a suitable boxed or inclosed frame A attached to the semaphore pole B.

The motor M, which is of the type hereinbefore referred to, requires no particular description, as its construction and mode of operation are well known to those skilled in the art. On its armature shaft M' is a pinion  $a$ , meshing with a gear wheel  $a'$  on a countershaft  $a''$  on the other end of which is a pinion  $a^3$ , meshing with a spur wheel  $a^4$ , fast to a drum  $a^5$  mounted to revolve in suitable bearings. From this drum a cord  $a^6$  extends to a weighted lever  $b$  pivoted to a bracket  $b'$  fastened to the signal pole. This lever by a connecting rod  $b^2$  is connected to the short or counter-balance arm of the pivoted semaphore blade S. The drum  $a^5$  revolves in the direction of the arrow on it in Fig. 2, in order to wind up the cord, which pulls the blade S down to safety, against the stress of the weight that tends to lift and hold the blade at danger.

The pinion  $a$  is secured to the armature shaft by a key or spline, which fits and can slide in a longitudinal groove or key way in the shaft as seen in Fig. 5, thus permitting the pinion to slide on the shaft with which it revolves. Fast to the pinion is a metallic disk  $c$  which is the armature of the electro-magnet B M. This magnet is the brake-magnet. When energized it attracts its armature  $c$ , and by its power gradually arrests the movement of that armature and the parts with

which it is mechanically connected. The movement of the armature to and from the magnet is permitted by the fact that the pinion  $a$  is mounted so that it can slide lengthwise of the armature shaft.

Upon the shaft or axle of the drum  $a^5$ , is a screw thread  $d$  which is engaged by a finger  $e$  on the adjoining end of a bar  $f$  mounted in bearings  $f'$  in which it can slide without rotating; on the opposite end of the bar, but electrically insulated therefrom is a metallic piece  $f^2$  which is a movable electric contact that enters between, and is withdrawn from two stationary spring contacts  $g$ , according to the direction in which the bar moves. When the signal is at safety the contact  $f^2$  is withdrawn from the contacts  $g$  as in the diagram, Fig. 4; when the signal is at danger the contact  $f^2$  is between the contacts  $g$  as in Fig. 2.

Having now described the mechanical construction of the apparatus, I proceed to a description of the system of circuits and connections therefor, referring to Fig. 4 of the drawings, which represents the application of the apparatus to an automatic railway block system, the railway being divided as customary into sections X insulated from each other. The circuit 2 through which current is supplied to the motor from a battery or other source of electric energy includes contacts  $x$  which are controlled by the armature of a relay D included in a constantly closed circuit 1 which is completed through the rails of the insulated track section or block X to which that relay and the motor circuit controlled by it pertain—the arrangement being such that the motor circuit will be opened at  $x$  whenever and so long as a train is on the section X, the track circuit in that event being completed through the path of lower resistance afforded by the wheels and axles of the train, thus cutting out the track relay D and permitting its armature to drop back from the front contact  $x$ . In a shunt 3, bridging the motor circuit 2, is included the brake magnet B M, by which the armature shaft of the motor and gearing connected therewith are locked and released; this shunt may be termed the “locking and releasing” circuit. And in the motor circuit between the terminals of the shunt circuit 3 are the contacts  $g$ ,  $g$  and  $f^2$ . The armature of the track relay D also controls a circuit 4—which I term the “cushion” circuit—completed through back stop contact  $y$  and including the motor M alone, this circuit being closed only when the relay D is de-energized and its armature is against its back stop. The track relay D is shown with its front and back stops  $x$ ,  $y$ , complete in Fig. 3.

The operation is as follows: The parts are shown in Fig. 4 in the position they occupy when there is no train on the block X and the signal is at safety. Track circuit 1 is completed through the relay D. The cushion circuit 4 is open; and the motor circuit 2 is completed through the locking and releasing

branch or shunt circuit 3, the contacts at  $g$ ,  $g$ ,  $f^2$  (controlled by the signal actuating mechanism) being open. Under these conditions the brake magnet B M will be energized and consequently will attract and hold its armature. As soon however as a train enters the block X, the track circuit 1 will be completed through the path of low resistance afforded by the wheels and axles of the train, and the relay D consequently will be cut out. Its armature therefore will fall back breaking the motor circuit 2 at  $x$  and closing the cushion circuit 4 at  $y$ . By the breaking of the motor circuit, the motor as well as the brake magnet will be de-energized, the signal actuating mechanism will be released from their control, and the signal by gravity will rise from safety to danger—during which movement the contact carrying bar  $f$  will be caused to move in a direction to close the contacts at  $g$ ,  $g$ ,  $f^2$ . During this same movement the armature of the motor by reason of its connection with the signal actuating mechanism will be put in revolution. The motor under these circumstances will be converted for the time being into a generator, but being, by the circuit connections 4, closed on itself resistance to the revolution of the armature will thereby be created which will serve to retard and slow down the movement of the signal blade as it rises to danger, thereby preventing it from having sufficient momentum to rack the gearing when it brings up in danger position. The machine does not generate sufficient current to materially retard the signal until the latter is within a short distance of being fully at danger. And, it may be remarked, that the speed at which the signal moves in going to danger can be perfectly regulated by the introduction of suitable resistance into the cushion circuit 4. As soon as the train leaves the block, track circuit 1 will be once more completed through the track relay D, thus closing the motor circuit at  $x$  and opening the cushion circuit 4 at  $y$ . But inasmuch as the signal in moving to danger closes the motor circuit at  $g$ ,  $g$ ,  $f^2$ , the brake magnet B M will be cut out, and consequently the motor—which again acts as a motor—will through the signal operating mechanism, pull down the signal to safety. By this movement of the signal operating mechanism the contact  $f^2$  will be moved in a direction to cause it to withdraw from the contacts  $g$ ,  $g$ , the parts being so adjusted and timed in their movements that the opening of these contacts takes place a little before the signal is fully at safety. As soon as the contacts  $g$ ,  $g$ , and  $f^2$  are separated the motor circuit is established through the locking and releasing shunt or branch circuit 3. The brake magnet B M consequently is energized, and by its action upon its armature will bring the parts to rest, or sufficiently so for all practical purposes, by the time the signal is pulled down fully to safety.

Having now described my improvements and the best way now known to me of carrying

the same into practical effect, what I claim herein as new and of my own invention is as follows:

1. The combination of the signal; the motor and circuit therefor; intermediate mechanism connecting the signal with the moving part of the motor; a brake for said signal operating mechanism; a brake controlling magnet; and circuit connections therefor controlled by or from the signal operating mechanism whereby the circuit through the said magnet is made and broken at the times and in the manner substantially as hereinbefore set forth.
2. The combination with the signal, the motor and intermediate mechanism connecting the signal with the motor, of a brake for said mechanism, a motor circuit including the motor and containing contacts controlled by or from the said signal operating mechanism, and a brake controlling magnet included in a shunt from the motor circuit around said contacts, substantially as and for the purposes hereinbefore set forth.
3. The constantly closed track circuit and relay included therein, the motor circuit completed through contacts controlled by the track relay, and containing a second set of contacts controlled by or from the signal operating mechanism; in combination with the motor, the signal, intermediate signal operating mechanism connecting the motor with the signal, a brake for said mechanism, and a brake controlling magnet included in a shunt from the motor circuit around said second set of contacts, substantially as and for the purposes hereinbefore set forth.
4. The combination with a primary circuit

1 and a relay therein, of the motor, the signal mechanism connecting the signal with the armature of the motor, whereby the armature and signal move together in both directions, the motor circuit including said motor and completed through contacts controlled by the primary circuit relay, the "cushion" circuit, through which the motor is closed on itself, completed through contacts also controlled by the said primary circuit relay—the arrangement being such that when the one set of contacts is closed the other shall be open, the motor acting when the motor circuit is closed to move the signal, and when the "cushion" circuit is closed to retard and render gradual the return movement of the signal due to gravity, substantially as and for the purposes hereinbefore set forth.

5. The combination with the motor, the signal, intermediate mechanism connecting the signal to the motor, and a brake for said mechanism, of the constantly closed track circuit and relay included therein, the motor circuit, completed through contacts controlled by the track relay, the "cushion" circuit through which the motor is closed on itself whenever the track relay is de-energized, the brake controlling magnet, and circuit connections for said magnet controlled by or from the signal operating mechanism—the combination being and acting substantially as hereinbefore set forth.

In testimony whereof I affix my signature in presence of two witnesses.

JACOB WILLIAM LATTIG.

Witnesses:

JOHN BRUNNER,  
I. GOLDSMITH, Jr.