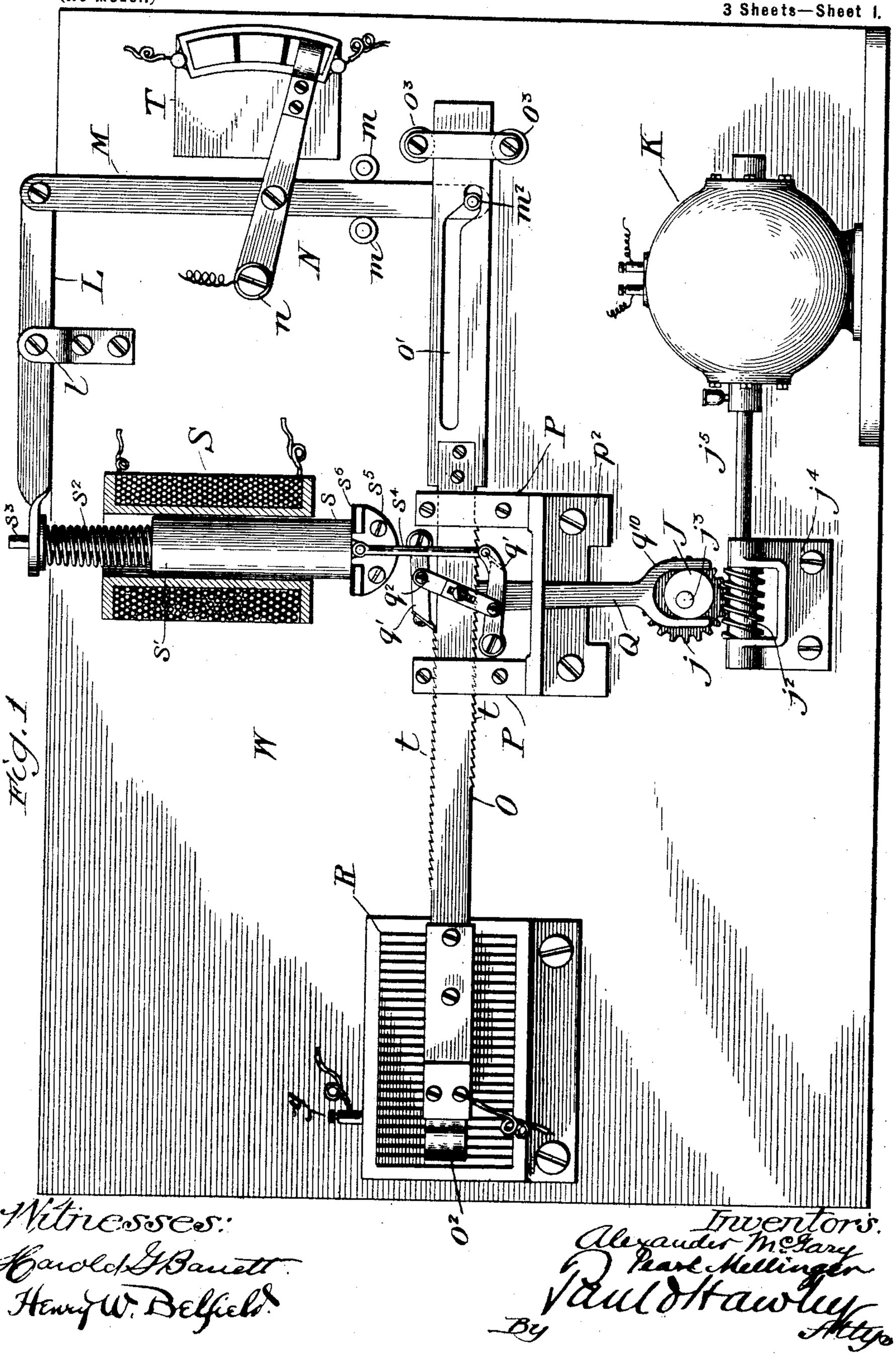
No. 697,267. Patented Apr. 8, 1902.

A. McGARY & P. MELLINGER.

AUTOMATIC ELECTRIC CONTROLLER.

(Application filed May 25, 1901.)

(No Model.) 3 Sheets—Sheet 1.



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(No Model.) 3 Sheets—Sheet 2.

Fig. 2

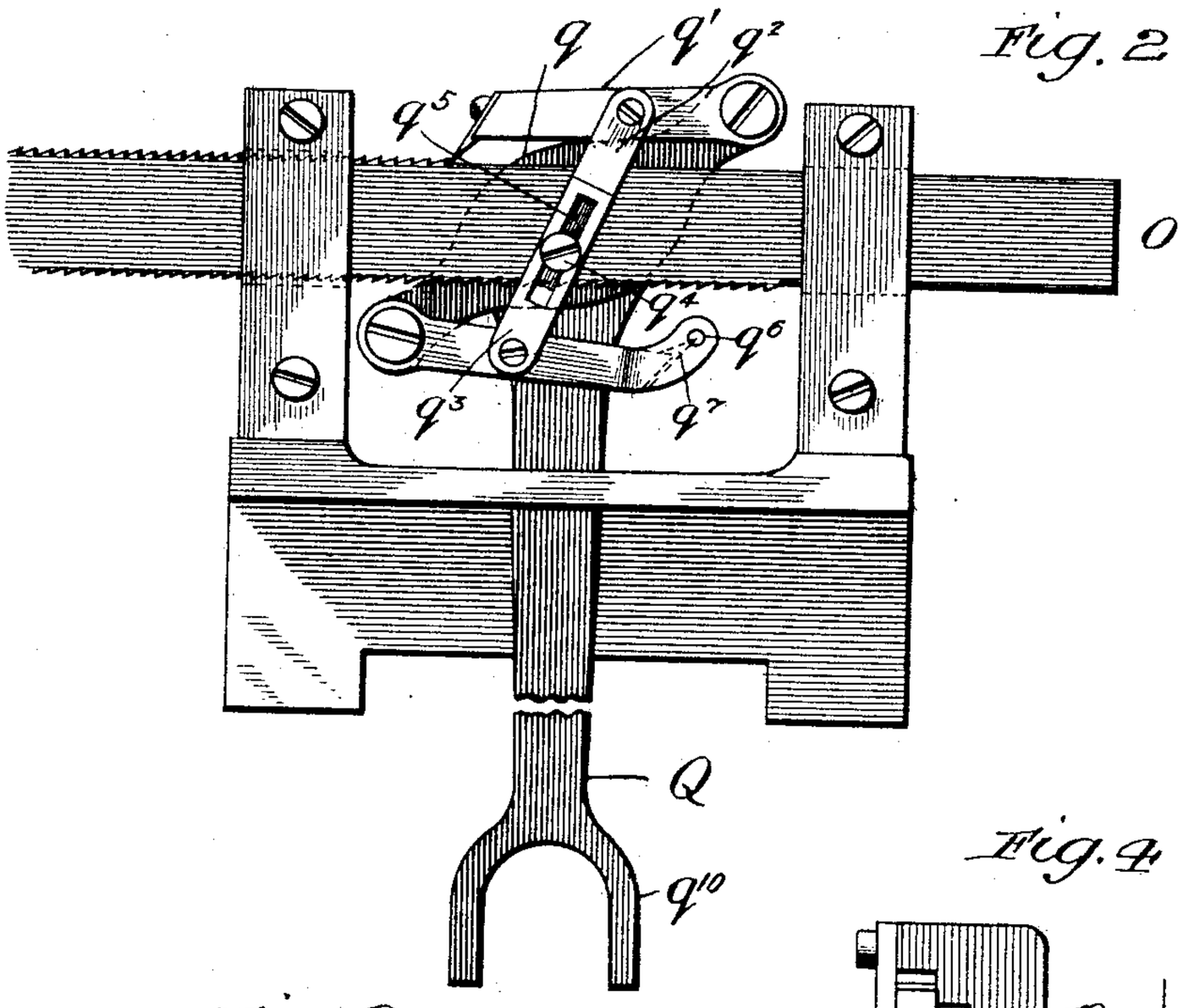


Fig. 4

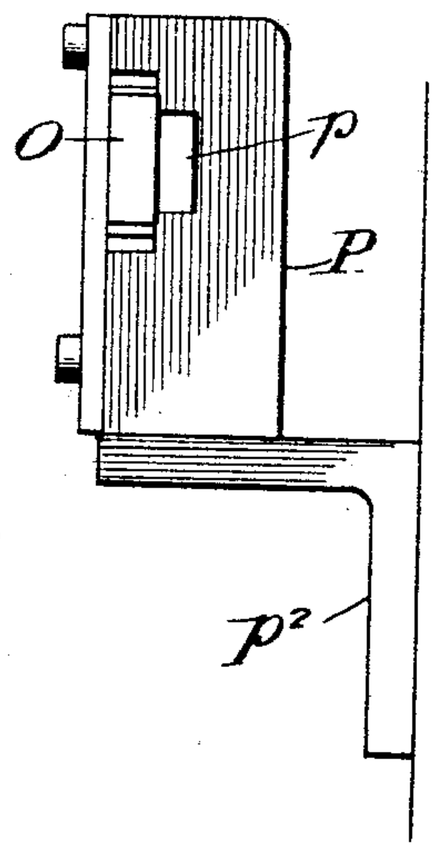


Fig. 3

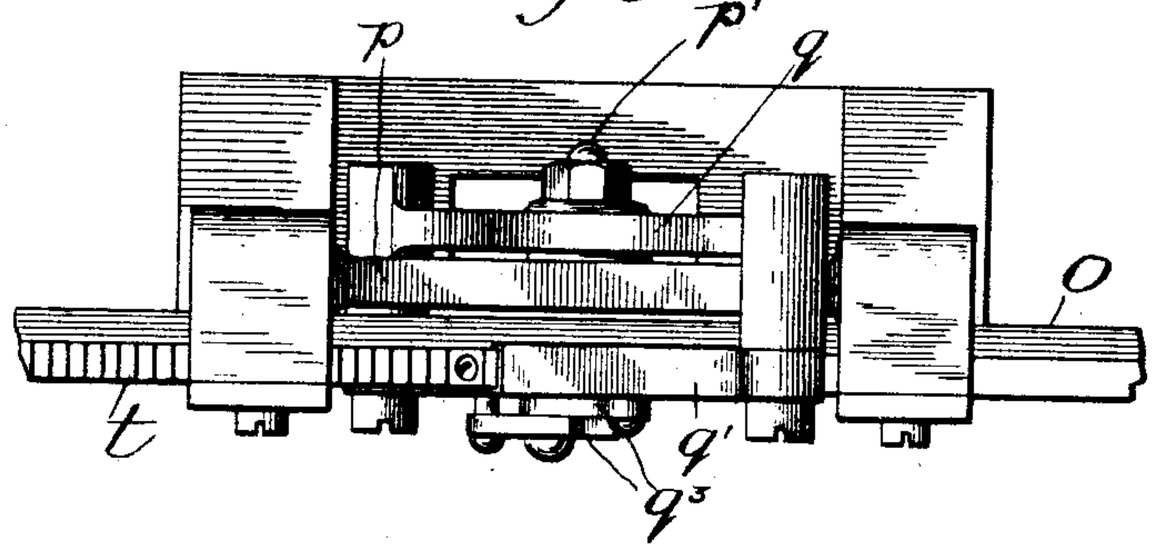
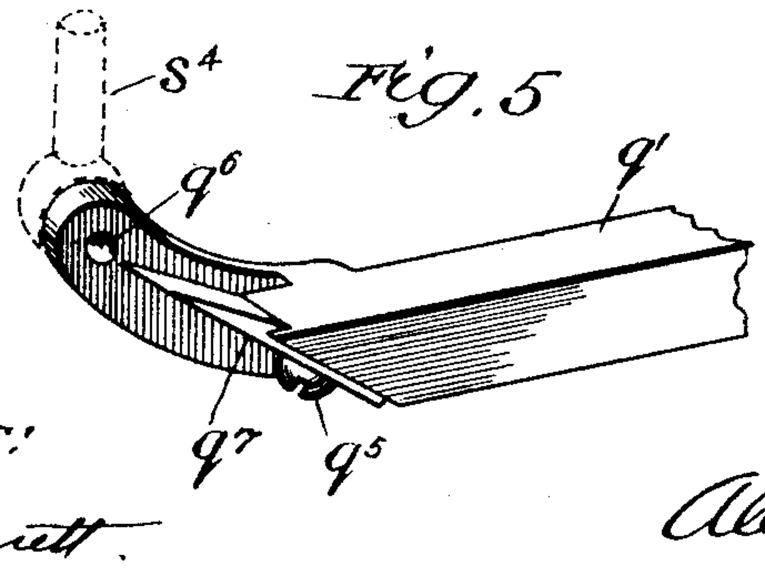


Fig. 5



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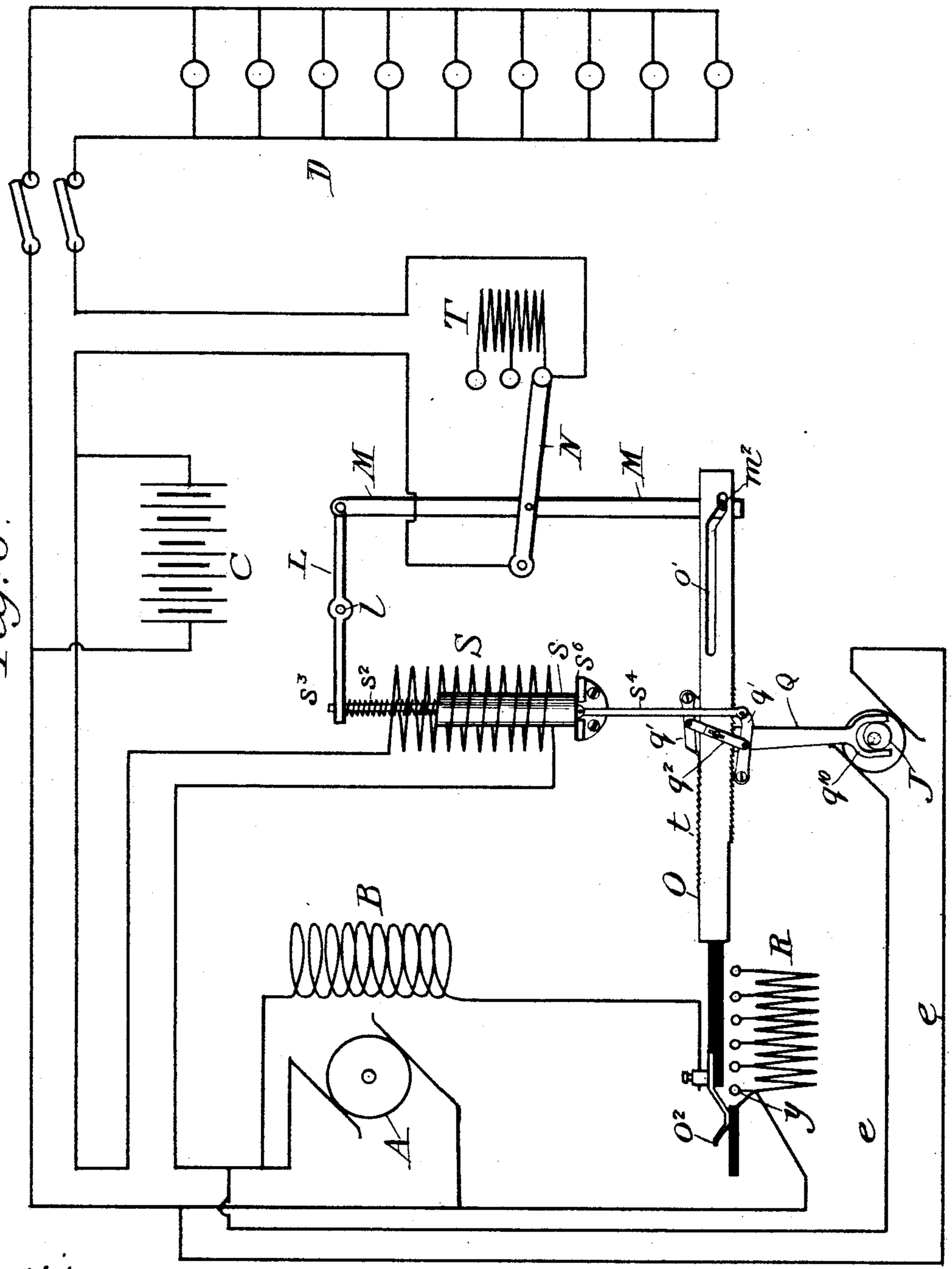
(No Model.) 3 Sheets—Sheet 3.

Fig. 6.



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UNITED STATES PATENT OFFICE.

ALEXANDER McGARY AND PEARL MELLINGER, OF LAGRANGE, ILLINOIS.

AUTOMATIC ELECTRIC CONTROLLER.

SPECIFICATION forming part of Letters Patent No. 697,267, dated April 8, 1902.

Application filed May 25, 1901. Serial No. 61,893. (No model.)

To all whom it may concern:

Be it known that we, ALEXANDER McGARY and PEARL MELLINGER, citizens of the United States, residing at Lagrange, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Automatic Electric Controllers, of which the following is a specification.

Our invention relates to automatic electric controllers, and more particularly to car-axle lighting—that is, to the lighting of trains and cars by means of dynamos which are driven from the axles of the car-trucks.

Much difficulty has been experienced heretofore in regulating the output of dynamos driven from car-axles by reason of the fact that the speed of such dynamos varies according to the speed of the train, and in consequence thereof the voltage and current delivered by the dynamo also vary, with the result that the storage batteries which are associated with the dynamos are frequently overcharged and the lights rendered variable in intensity and quickly destroyed.

The particular object of our invention is to provide a simple controller or regulator which shall act according to the strength of the current derived from the axle-driven dynamo to the end that the storage battery associated therewith shall be charged by a substantially constant current and the lamps maintained at a uniform intensity by a substantially constant voltage.

With the above general object in view our invention consists, primarily, in the combination, with the dynamo, its circuit, and the storage battery and lamp-circuit, of a variable resistance arranged for introduction in the field-circuit, a traveling bar whereby said resistance may be varied, constantly-actuated means for operating the said bar, and electromagnetic means for setting the constantly-actuated means into operation to move said bar, and in the parts and combinations which will be hereinafter more fully described, and definitely pointed out in the claims.

In the drawings which illustrate one embodiment of our invention as adapted to a car-lighting system, Figure 1 is a view of the controller or regulator and its coacting parts, the solenoid being shown in section. Fig. 2 is a broken side elevation in detail, illustrating the ratchet mechanism through which the resistance in the field-circuit is increased or diminished. Fig. 3 is a plan view of the parts shown in Fig. 2. Fig. 4 is an end elevation of the guide-blocks and supporting-bracket therefor. Fig. 5 is a detail view of one of the pawls for actuating the ratchet-bar, and Fig. 6 is a diagrammatic view showing the circuit and the relation therewith of the various parts.

In the drawings, W represents a plate or any suitable support adapted to be secured to the side of a car and upon which the mechanical parts of the controller or regulator are mounted in appropriate position, as will appear. Upon the plate or support W is mounted a resistance-box R of any ordinary construction and, being well understood in the art, need not be specifically described, one of the wires of the field-circuit being secured in the usual manner by a binding-post y to the resistance or rheostat.

A, Fig. 6, represents the dynamo, and B the field-circuit, which is connected to the rheostat contact-strip o^2, carried by the rack-bar O, as indicated in Fig. 6. From this general outlined description of the resistance R and the main circuit it will be evident that as the rack-bar O is moved to the right in Fig. 6 more and more resistance will be thrown or introduced into the main circuit.

Mounted upon the plate W by any suitable means is the solenoid S, connected, as appears in Fig. 6, with the main circuit, the core s being normally pressed toward one end of the solenoid by means of a spring s^2, having a bearing on the top s' of the solenoid, and surrounding a stem s^3, which passes through the free end of the arm of the lever L, pivoted at l to a suitable bracket connected to the plate W. Connected to the opposite end of the lever L is a link M, adapted to move between the guide-rollers $m\,m$, suitably screwed or journaled upon the supporting-plate W, and upon the lower end of the link M a roller or pin m^2 engages the slot o' in the rack-bar O, the said slot o' being provided with a depressed or cam portion at one end, as shown in Figs. 1 and 6. Likewise secured to the supporting-plate W is a resistance T, connected, as shown in Fig. 6, to the lamp-

circuit D, and a lever N, pivoted on the link M and fulcrumed at n on the supporting-plate W, is adapted on movement of the link M to throw or introduce more or less resistance into the lamp-circuit, according to the direction of movement of the link M.

From the construction so far described it will be evident that upon movement of the rack-bar O to the right in Fig. 1 more or less resistance will be thrown into the field-circuit, and at the same time by reason of the cam action of the inclined portion of the slot o' the link M will be raised, and simultaneously with the introduction of resistance into the field-circuit by movement of the contact-strip o^2 resistance will also be thrown by the lever N into the lamp-circuit.

The rack-bar O is mounted to move lengthwise or longitudinally thereof between suitable guide-rolls o^3 o^3 and the guide-blocks P, supported upon the plate W by any form of suitable bracket p^2. The rack-bar is provided on its upper and lower edges with reversely-arranged ratchet-teeth t, as clearly shown in Fig. 1, and pivoted between the blocks P P on a suitable bar p, (shown in Fig. 3,) by means of the bolt or pivot p', is a ratchet-lever Q, provided with an inclined T-head q at its upper end and an eccentric-yoke q^{10} at its lower end, which engages a cam or eccentric J, mounted on a stud or shaft j^3, connected to the supporting-plate W. Also mounted on the shaft or stud j^3 to move with the cam or eccentric J is a worm-wheel j, which engages a suitable worm j^2, mounted on a suitable bracket j^4, secured to the supporting-plate W, the said worm j^2 being connected to the shaft j^5 of a constantly-operating motor K, connected from the main circuit.

Pivoted to the opposite extremities of the T-head q are the pawls q' q', the ends of which are arranged on opposite sides of the rack-bar O and upon which they act, as will be obvious, upon the rack-teeth t to move the said rack-bar in one or the other direction, according to which of said pawls is placed in operative engagement with its adjacent ratchet-teeth t. The pawls q' q' are preferably united by an adjustable link q^2, formed in the present embodiment of my invention of two parts q^2 q^3, held in adjusted relation by means of the set-screw q^4, which passes through a slot q^5, formed in one of said portions of the connecting-link and secured into the other thereof.

The core s of the solenoid is connected to one of the pawls q', preferably the under one, by a link s^4, and when said core is in its inoperative position during a passing of a nominal current the lower end thereof may preferably rest upon suitable insulation s^6, carried by the bracket s^5, secured to the supporting-plate W.

From the construction thus far described it will be seen that during the passage of a current of nominal strength through the main circuit and solenoid the core of the solenoid will remain in its lowered position, with the upper pawl q' acting under the constantly-moving ratchet-lever Q, to move and maintain the rack-bar O to the left in Fig. 1, with the resistance R normally cut out, and the link M will rest with its pin or roller m^2 in the lower part of the inclined or cam end of the slot o' in the rack-bar, with the resistance T of the lamp-circuit also cut out. When, however, the current is increased by reason of the speeding up of the train, the core of the solenoid will be raised, thereby disengaging the upper pawl q' from the upper ratchet-teeth t in the rack-bar O and bring into engagement with the lower teeth t of said rack-bar the lower pawl q', which, since the ratchet-lever L is constantly vibrating under the action of the motor K, will move the rack-bar O to the right in Fig. 1, thereby raising the link M, by means of the inclined or cam end of the slot o', and throw resistance into the lamp-circuit and maintain said resistance in the lamp-circuit as the pin or roller m^2 on the end of the link M rides along the straight portion of the slot o', and simultaneously with the throwing in of the resistance into the lamp-circuit the rack-bar by its movement to the right will also introduce additional resistance through the resistance-box R into the main circuit, thus maintaining a constant current through the lamp-circuit and uniform voltage in the battery.

It will be noticed from Fig. 5 that the lower pawl q' is connected to the link s^4 of the core of the solenoid at its extreme end q^6, thereby insuring considerable movement of the solenoid before changing the operative engaging conditions of the pawls q' q', and it will also be noticed from said Fig. 5 that the end of the pawl is formed by a separate piece q^7, connected by the screw q^5 to the end of the pawl, whereby when these parts become worn they may be removed and others substituted therefor.

The operations above described for throwing into the field and lamp circuits the resistances as the gradually-increasing speed of the train augments the current will of course be inversed as the train slows down, and the solenoid, by reason of a weakened current, being unable to hold its core or armature up against the tension of spring s^2 the core or armature will move down to its stop s^6, whereupon the upper pawl q' will operate to move the rack-bar O to the left, cutting out the resistance in the field-circuit, and likewise by reason of the inclined or cam portion of the slot o' into which the pin or roller m^2 of the link M moves, the resistance in the lamp-circuit will also be cut out, and when the car stops the upper pawl q' will continue to operate to move the rack-bar O to its extreme left position, throwing out the entire resistance in the main and lamp circuits, so that the energy of the battery will pass directly to the lamps and to the motor K through its auxil-

iary circuit *e e* and maintain them in substantially the same current conditions while the car is at a standstill as when the dynamo is running at its highest speed.

It will be further noted in the structure above described that the core *s* of the solenoid is held normally in its lowered position by a light spring s^2, which, bearing upon the end of lever L, will act with only slight spring-pressure to maintain the core in its lowered position when a normal current is passing, by reason of the fact that the link M has at such times assumed its lowest position with respect to the curved or cam slot *o'*, and thus raised the end of the lever L, against which the top of spring s^2 bears. From this it follows that upon starting up the car and the consequent introduction of increased current the core of the solenoid will respond quickly and instantly to the change of current conditions, and immediately thereafter the upward tendency of the core will be obstructed by increased spring-pressure, due not alone to the compression of the spring by the upward movement of the core, but also by the additional compression thereof, due to the lowering the end of the lever-arm against which the spring bears as the link M is raised by the inclined or cam end of the slot *o* during movement of the rack-bar O.

While we have described the above construction as the preferred embodiment of our invention, it is to be understood, of course, that the same may be varied in details and mechanical arrangements.

Having described our invention, what we claim, and desire to secure by Letters Patent, is—

1. In an automatic electric controller, the combination of a dynamo adapted to be driven from a car-axle, a dynamo-circuit, a storage battery and lamp-circuit, of a variable resistance arranged for introduction into the dynamo-circuit, a traveling bar whereby said resistance may be varied, constantly-actuated means for moving said bar, a solenoid having a core, a spring pressing on said core, connections between the core and constantly-actuated means, a lever against which said spring bears, and means between the lever and the traveling bar for moving the latter to compress the spring when the core of the solenoid is moved.

2. In an automatic electric controller, the combination of a dynamo adapted to be driven from a car-axle, a dynamo-circuit, a storage battery and lamp-circuit, of a variable resistance arranged for introduction into the dynamo-circuit, a traveling bar whereby said resistance may be varied, constantly-actuated means for moving said bar, a solenoid having a core, a lever operatively connected to said traveling bar, a spring interposed between the lever and core and means to cause the lever to compress the spring when the current through the dynamo-circuit is increased.

3. In an automatic electric controller, the combination of a dynamo and its circuit, a storage battery and lamp-circuit, a resistance adapted to be introduced into the dynamo-circuit, a traveling bar whereby the resistance may be varied, constantly-actuated means for moving said bar, a solenoid having a core operatively connected to control said constantly-actuated means, a lever, a yielding connection between said lever and core, a link interposed between said lever and traveling bar, and means operative upon movement of said bar to move said link and compress the yielding connection between the lever and core.

4. In an automatic electric controller, the combination of a dynamo and its circuit, a storage battery and lamp-circuit, a resistance adapted to be introduced into the dynamo-circuit, a traveling bar having a slot with an inclined or cam portion whereby the resistance may be varied, constantly-actuated means for moving said bar, a solenoid having a core operatively connected to control said constantly-actuated means, a lever, a yielding connection between said lever and core, a link interposed between said lever and traveling bar, and having one end engaged by the slot in said bar to move the link and compress the yielding connection between the lever and core.

5. In a system for lighting cars comprising an axle-driven dynamo, storage battery and incandescent lamps, the combination of a rheostat to control the current passing to the storage battery, of a second rheostat to control the current passing from the storage battery to the lamps, and automatic means for controlling said rheostats consisting of a solenoid located in the circuit between the dynamo and battery, a spring-pressed armature, an oscillating lever and means for constantly actuating it, said lever carrying at one end two oppositely-directed pawls, means for connecting said pawls to cause them to move in unison, means connecting said pawls to the armature of the solenoid, a rack-bar adapted to be moved in one direction by one of said pawls and in the opposite direction by the other and being provided at one end with a contact-strip of the first rheostat and with means at the other end to actuate the contact-strip of the second rheostat.

6. In a system for lighting cars comprising an axle-driven dynamo, storage battery and incandescent lamps, the combination of a rheostat in the circuit between the dynamo and battery, a second rheostat in the circuit between the battery and lamps, means controlled by the current passing from the dynamo for regulating or controlling said rheostats, comprising a solenoid having a spring-pressed armature, a reciprocating rack-bar, means for actuating said bar controlled by said solenoid, said rack-bar being provided within the contact-strip of the first rheostat

and a cam-slot at the other end, a reciprocating link M having a projection at one end to enter the cam-slot, a pivot sweep carrying the contact-strip of the second rheostat adapted to be actuated by link M, and a lever L connected at one end to the link M and adapted to engage the spring of the solenoid-armature at its other end.

In witness whereof we have hereunto set our hands this 21st day of March, 1901.

ALEXANDER McGARY.
PEARL MELLINGER.

Witnesses:
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