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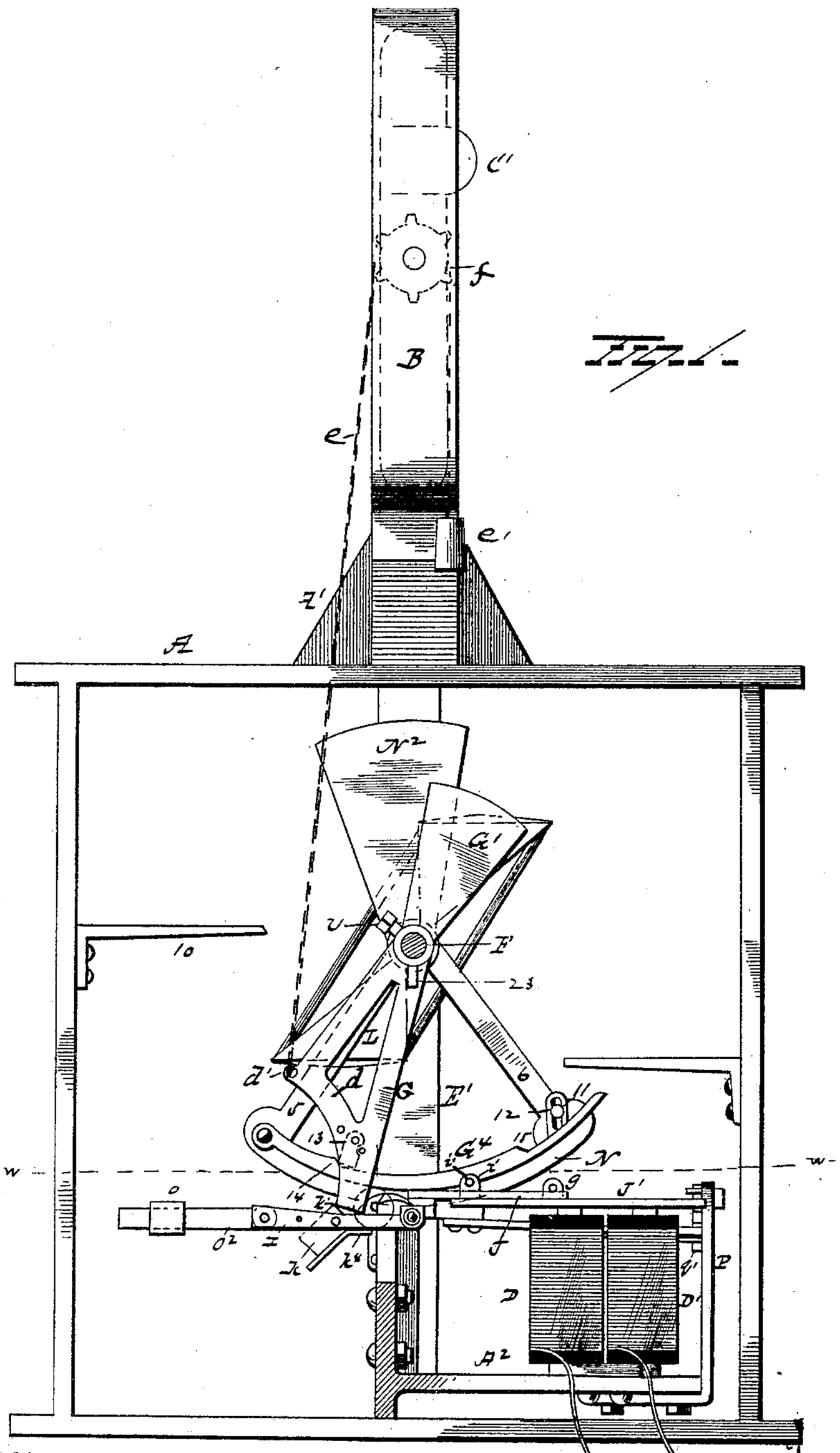
F. STITZEL & C. WEINEDEL.

SEMAPHORE SIGNAL.

No. 399,579. Patented Mar. 12, 1889.



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(No Model.) 5 Sheets—Sheet 2.

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SEMAPHORE SIGNAL.

No. 399,579. Patented Mar. 12, 1889.

FIG. 2.

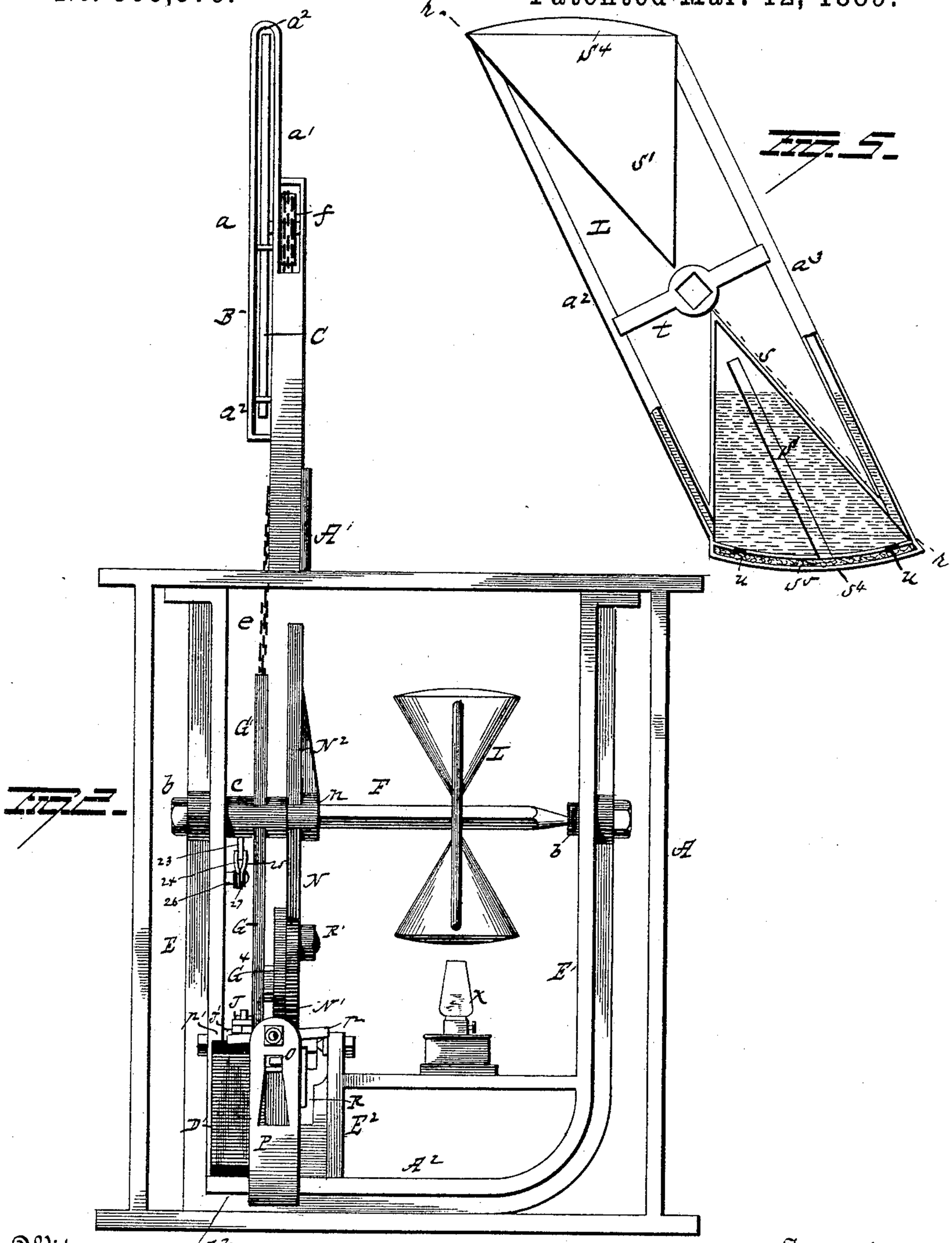

FIG. 5.

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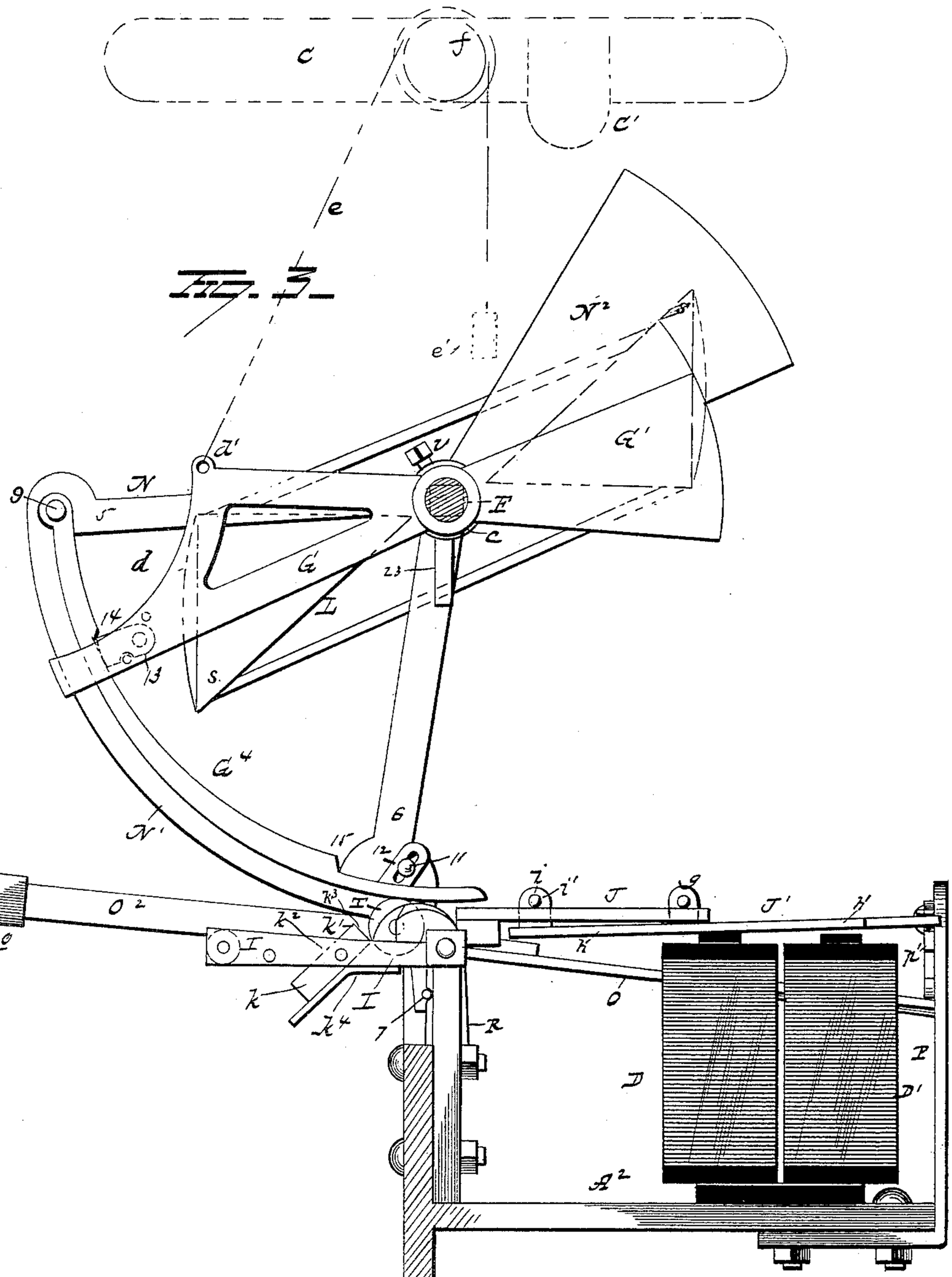
SEMAPHORE SIGNAL.

No. 399,579. Patented Mar. 12, 1889.

FIG. 3.



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SEMAPHORE SIGNAL.

No. 399,579. Patented Mar. 12, 1889.

FIG. 4.

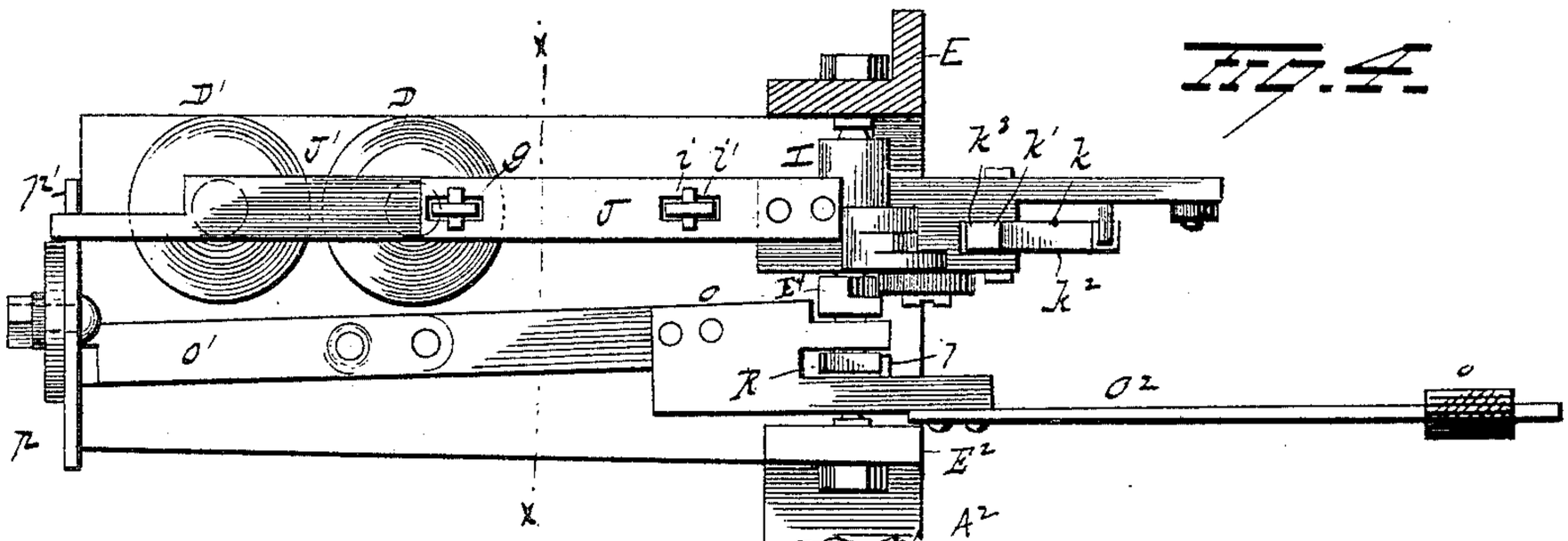


FIG. 5.

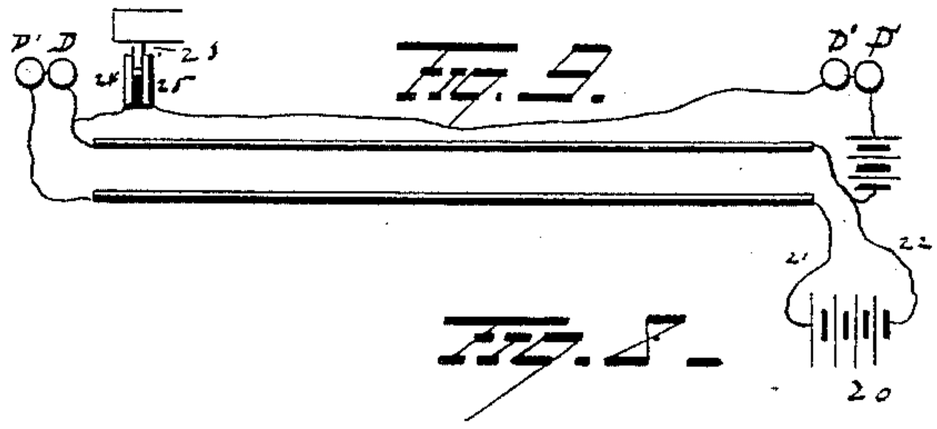
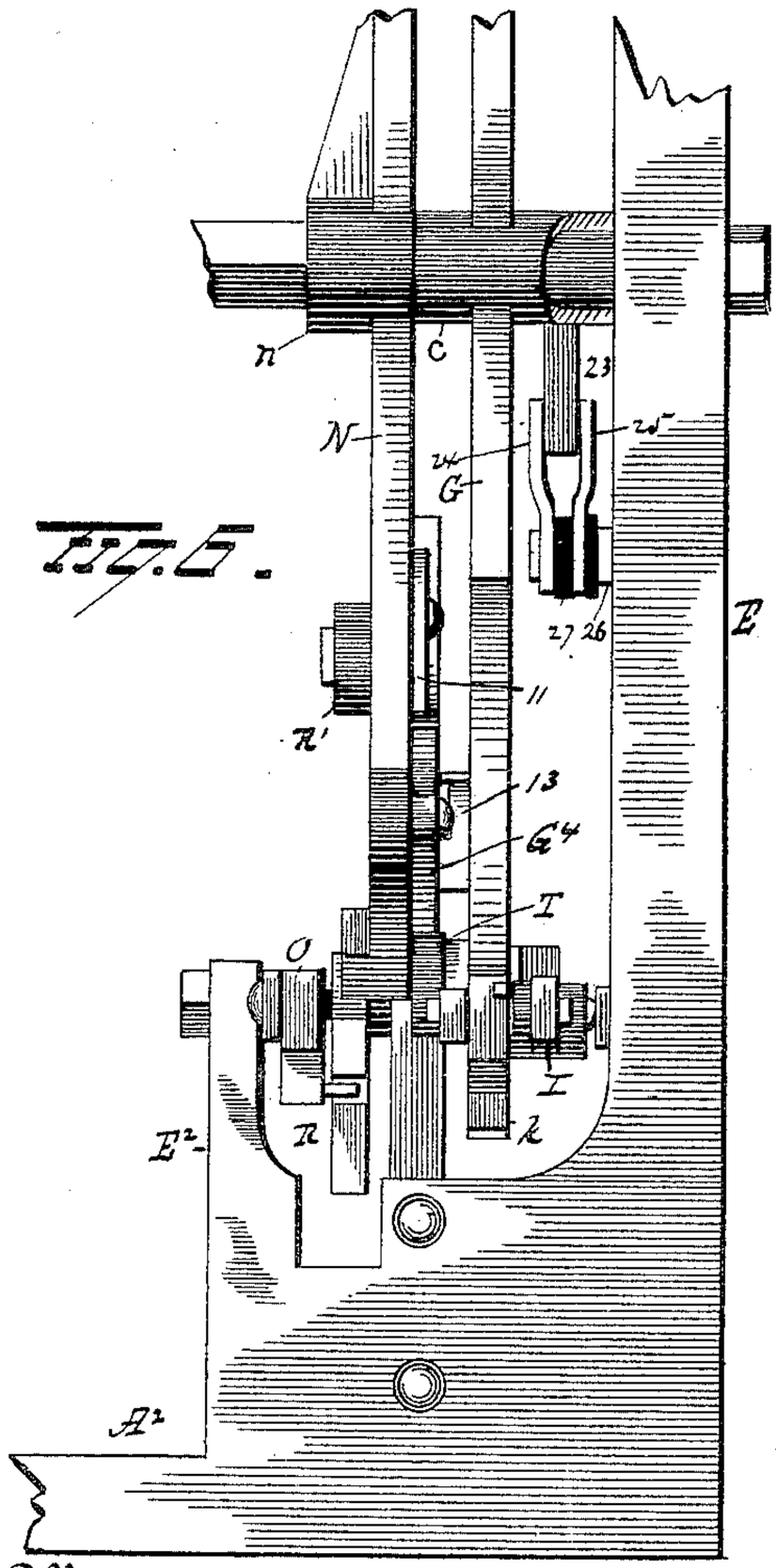
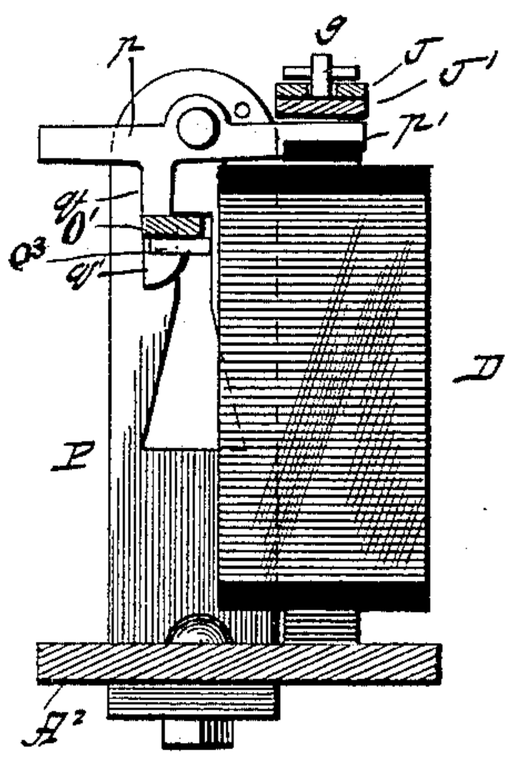


FIG. 6.





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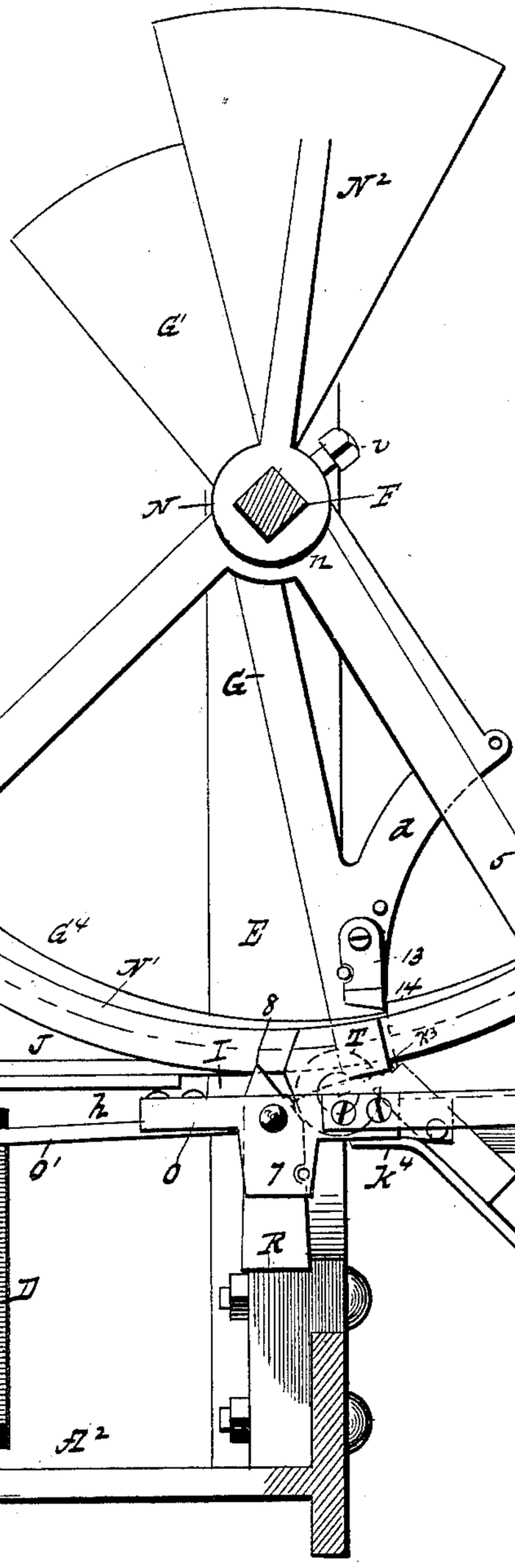
SEMAPHORE SIGNAL.

No. 399,579. Patented Mar. 12, 1889.



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UNITED STATES PATENT OFFICE.

FREDERICK STITZEL AND CHARLES WEINEDEL, OF LOUISVILLE, KENTUCKY, ASSIGNORS TO THE AMERICAN SEMAPHORE COMPANY, OF SAME PLACE.

SEMAPHORE-SIGNAL.

SPECIFICATION forming part of Letters Patent No. 399,579, dated March 12, 1889.

Application filed March 21, 1888. Serial No. 267,929. (No model.)

To all whom it may concern:

Be it known that we, FREDERICK STITZEL and CHARLES WEINEDEL, of Louisville, in the county of Jefferson and State of Kentucky, have invented certain new and useful Improvements in Semaphore-Signals; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

Our invention relates to an improvement in semaphore signaling mechanism that is particularly adapted to signal "danger" or indicate "safety" when the device is employed in connection with the block system of railway service.

The object of our present invention is to provide signaling apparatus with devices and circuits by which the signal-blade at each end of a block will be set at "danger" automatically when a train enters said block.

A further object is to provide electric circuits by which the operation of a semaphore at one end of a block will automatically operate a semaphore at the opposite end of the block and the signal-blades of both instruments remain set at "danger" as long as a train remains in said block.

With these objects in view our invention consists in certain features of construction and combinations of parts, that will be hereinafter described, and pointed out in the claims.

Referring to the drawings, making a part of this application, Figure 1 is a front elevation of the signal apparatus complete with the front removed to show interior mechanism, the parts being set to indicate "safety." Fig. 2 is a side elevation of the working parts as viewed from the right side of the semaphore, the casing being broken away or removed on that side. Fig. 3 is a front view of the machinery, showing the semaphore-blade set for "danger," a portion of the frame being broken away to expose parts behind it. Fig. 4 is a plan view of the operating mechanism, taken on the line *w w*, (see Fig. 1,) or above the armature-bar. Fig. 5 is an enlarged side elevation, in section, of the thermo-motor, taken on an axial line through both chambers. Fig. 6 is a side elevation of the mechanism as viewed from the left side, this side of the case being removed. Fig. 7 is a rear elevation of the semaphore apparatus, with the casing shown in section to expose the interior. Fig. 8 is a sectional elevation of the casing and interior parts, taken on the line *x x*, or between the electro-magnets, to show the standard and hook-latch pivoted on it that engages the locking-bar by one end to hold it horizontal. Fig. 9 is a plan view of the railway-rails of a "block," a battery, and two electro-magnets, showing the manner in which the rails are attached to the battery at one end of the block, and the electro-magnets are electrically connected to said rails at the other end of the block; also showing a second circuit through the track and a conducting-wire.

We provide a casing, A, of suitable material and size to receive the mechanism to be placed in it, and give support to suitable bracketed projections which are attached to the interior surface of its vertical walls. The depending bracket-plate E′ is attached to the upper surface of the casing and hangs down a sufficient distance to engage with its lower end the horizontal plate A^2.

Upon the upper surface of the casing A the shield B is erected. This consists of two parallel plates, *a a′*, which are held spaced apart by a horizontal portion, a^2, at the upper ends of the plates. This latter-named piece may be riveted to the vertical plates to connect them, or it may be an integral portion of these plates.

The shield B should be stiffened to secure it in place, so that it may withstand wind-currents to which it is exposed. To effect this we provide a bracket, A′, which is seated upon the top of the casing A, has a bearing against the rear surface of the shield B, and is rigidly secured to both, so as to form a knee-brace to the shield B. Upon the front side of the plate *a* of shield B a white signal is displayed. This may be attached to the shield, or the surface be painted to produce a "safety" emblem thereon.

Within the shield B a visual-blade, C, is pivoted near its center of length, and upon the side edge of the blade above the point of

pivotal support just mentioned a weight, C′, is affixed, so as to overbalance the upper portion of the blade and cause it to fall into a horizontal position when the attached mechanism, which will be hereinafter described, permits such an action of gravity. The surface of the visual-blade is painted red, or any other preferred color, to indicate an occupancy of the block which the semaphore is intended to make known.

On the horizontal bracket-plate A^2 two electro-magnets, D D′, are mounted, and to the left of these magnets a vertical post, E, is erected that extends vertically, so as to engage the top surface of the casing A. Another post, E′, is placed near the rear of the casing A, in line with the front post, E, and parallel to it. Near the top of the posts E E′ there are screw-tapped holes made in axial line with each other. Into these holes the threaded bolts *b b* are inserted, the inner ends of the same being cupped to receive the conical pointed ends of the squared shaft F, and thus provide anti-friction supports for the shaft, which permit it to rock freely therein.

Upon the shaft F, near the front post, E, an arm, G, is located, its hub *c* having a round hole made through it at right angles to the body of the arm, to allow it to be placed upon the shaft and swing freely thereon, the body of the shaft F being rounded at this end to allow such a connection of parts.

The arm G has a lateral extension, *d*, made upon its body, which latter is lightened by a removal of material, as shown, and at the projecting corner *d′* of the portion *d* a sprocket-chain, *e*, is connected, which is carried up and over a sprocket-wheel, *f*, that is mounted on and affixed to the cross-shaft on which the visual-blade C is pivotally supported to vibrate. To the free end of the chain *e* a weight, *e′*, is attached, which hangs pendent and holds the arm G with its upper edge in the position shown in Fig. 3, or nearly horizontal. When the arm G is adjusted, as just stated, the weight *e′* will have descended far enough to partially rotate the sprocket-wheel *f* and carry the visual-blade C to a position at right angles to the shield B, or to indicate "danger."

A counterbalance-piece, G′, is made to project from the hub *c* of the arm G, about in line with the latter, the piece G′ being of such relative weight as to poise the arm.

The semaphore at one end of each block has secured to the hub *c* of the arm G a short metallic arm, 23, which projects from said hub preferably at an angle to the arm G, and is adapted to enter between and make contact with two contact-springs, 24 25, advisably secured to the post E by means of bolts or otherwise. These springs 24 25 are made of any suitable material capable of conducting electricity, and are insulated from the post E by means of insulating material, 26, and from each other by non-conducting material, 27, as shown in Figs. 2 and 6. When the arm G turns on its shaft, the arm 23 will be carried by the hub *c* between the contact-springs 24 25 and electrically connect said springs, for a purpose hereinafter set forth.

Between the post E and another shorter upright post, E^4, that is erected from the bottom of the casing A, the gravity-bar I is pivotally supported to vibrate freely. This bar has an armature-bar, J, secured to its end that is nearest to the electro-magnets D D′. Said armature-bar extends toward the magnets, and is of such a length as to locate its free end nearly over the pole-piece of the nearest magnet, D.

On the free end of the rigid armature-bar J, just mentioned, another bar, J′, is loosely supported, the connection of the two bars being effected by the insertion of a vertical ear, *g*, through a slot in the top bar, J, the ear having a rigid connection with the lower jaw, J′, a cross-pin being inserted in a hole in the ear to afford a rocking bearing.

It is necessary that the portion *h* of the loose bar J′ which is nearest the gravity-bar I should be slightly heavier than the outer portion, *h′*, so as to hold the latter part raised off of the pole-piece of the magnet D′. The fulcrum-point of the lower bar, on which it has limited vibration, is the one edge of the pole-piece or core of the magnet D that is nearest to the gravity-bar I.

In order to prevent the lower bar, J′, from having an improper vibratory movement on its fulcrum-point, an ear, *i*, is loosely inserted through a slot made in the top armature-bar, J, and a pin, *i′*, is inserted through a hole in the projecting end of the ear *i*, to limit the vibratory movement of the lower bar, J′. The ear *i* is of a sufficient length to allow a proper vertical vibration of the lower bar, J′, so that its outer end may be drawn into close contact with the pole-piece of the outer magnet, D′, when said magnet is energized by completion of an electrical circuit through the pair of magnets.

The length and weight of the gravity-bar I is such that it will nearly balance the compound armature-bar J J′, the latter preponderating sufficiently over the gravity-bar to cause them to fall gently into place over the poles of the magnets when free to do so.

A portion of the body of the gravity-bar I is cut away to allow the latching-dog *k* to be pivoted between jaws formed on the bar. This latch-dog lies in an inclined position with its latching-toe *k′* projected above the upper surface of the gravity-bar, the weight of its body below its pivotal point of support holding it in this position free to yield when it is pressed against on the outer inclined face, k^2, but locked from yielding when pressure is applied to its opposite inclined face, k^3, by the abutment of the finger k^4 with the lower surface of the gravity-bar I.

The end of the rocking bar G is extended, so as to allow it to have contact with the outer face, k^2, of the toe of the latching-dog *k*, so that when this bar is moved by means that

will be explained farther on in this description the latch will yield and fall back to hold the arm G in a nearly upright position, providing the gravity-bar is prevented from vibration by the electrical force of the energized magnets D D′, that will attract the compound armature J J′ and hold its loose piece J′ in close contact with their poles. When the arm G is released from the latch-dog *k*, the chain and weight, together with the overweight of the signal-blade, will cause the latter to fall to a horizontal position and the arm rest in the position shown in Fig. 3, and when this occurs the top edge of the arm G will abut against the stop or check lug 10, formed on the adjacent side wall of the casing A, so as to prevent the arm from a further vertical movement.

Upon the square shaft F is securely mounted the thermo-motor L, composed of two conical chambers, *s s′*, held together by tubular braces a^2 a^3, these latter also furnishing a means for the transferring of contained liquid from one chamber to the other. At a point midway between the ends of the tubes a^2 a^3 a transverse brace, *t*, is fixed to the bodies of these tubes, and a squared perforation is made through this brace at a central point between the tubes a^2 a^3 to allow the thermo-motor to be placed upon the shaft F, which is adapted to afford vibratory support to the motor.

It will be seen by inspection of Fig. 3 that the lower wall of the chamber *s′*, which is located on the side of the apparatus nearest the electro-magnets D D′, is in line with the surface of the upper side of the other chamber, *s*, as shown by dotted lines *r r*, Fig. 5.

The disposition of the two chambers, as just explained, will cause the chamber *s* to be in a proper position to receive liquid from the other chamber, *s′*, when they are located with the line *r r* nearly horizontal.

The heads s^4 of the chambers *s s′* are given an inclination from a right angle with regard to the axis of each chamber, and are slightly convexed or dished outwardly, and it will be noticed in Fig. 5 that the head of the chamber *s*, or the one that is lowest when the motor is given a nearly upright position, is made double-walled, with a space intervening between these walls. The space s^5 that is made between the walls of the head in chamber *s* is preferably filled with wire-cloth or other cellular metallic fabric that will allow a proper amount of the liquid that is introduced into this chamber to enter the space and be quickly heated by the large contact-surface thus afforded, when the exterior face of the head s^4 is exposed to heat-rays from a lamp, X, or other heat-developer that is placed to project the heat it develops upon it.

Two or more perforations, *u*, are made through the inner wall of the head in chamber *s* to permit the flow of liquid from the interior of this chamber into the space between the inner and outer heads, and a tube, S, is preferably made fast to the inner head, so as to furnish a direct passage for vapor generated between the heads to transfer it to the upper portion of the chamber where it escapes, and by its accumulation produces pressure upon the liquid in the chamber to drive it through the tubular braces a^2 a^3 into the upper chamber, *s′*. By this transposition of the liquid an overweight is produced in the upper chamber that will cause the motor to vibrate sufficiently to remove the head of the chamber *s* from the lamp, and lie nearly horizontal, or, more properly speaking, with the line *r r* about in a horizontal plane.

When the motor L is in the position just described, the lower projecting edge of the chamber *s′* will lie on a projecting lug formed on the casing A, so that it will be prevented from falling lower than that point.

We prefer to employ chloroform as liquid to place in the thermo-motor, as it is weighty, is readily vaporized, and quickly returns to liquid form when removed from heat influence.

Upon the shaft F, between the motor L and arm G, a quadrant, N, is placed. It consists of two metal bars that diverge from each other at about an angle of ninety degrees, their adjacent ends centering in a transverse hub, *n*, that has a squared hole made centrally in it of a size to fit neatly upon the shaft F. A set-screw, *v*, that is inserted in the hub, has contact with the shaft to hold the quadrant in position firmly. The outer ends of the bars 5 6 of the quadrant N are made integral with an arched metal rim, N′, and bound or limit the length of this arch. To the hub *n*, opposite the quadrant N, a counterbalance, N^2, is secured or made integral therewith. This is of such weight that it will poise the quadrant and attached parts.

Between the post E^2 and the post E^1 a locking-bar, O, is pivoted near its center of length. The end O′, which extends to lie adjacent to and by the side of the two magnets D D′, is of greater weight than the portion O^2, that projects in the opposite direction, and a movable weight, *o*, is placed on the latter-named part O^2, that can be shifted to slightly overbalance the other end, which is thus caused to abut against the top of the slot in which the free end of the portion O′ vibrates.

The outer end of the portion O′ of locking-bar O is cut away on the edges to permit it to enter a vertical elongated slot made in the upright standard P, on which a vibrating latch, *p*, is pivoted, so that the hook *q′* on the depending arm *q* of the latch *p* will rock below the edge of the end O′ and hold this end of the locking-bar O from falling.

It will be noticed that the latch *p* has an arm, *p′*, extended at right angles to the body of the hook-piece *q*, so as to cross the path of the pivoted bar J′ of the compound armature J J′, which latter-named piece is held slightly above the arm *p′* when the two electro-magnets D D′ are dormant or demagnetized.

In order to avoid frictional resistance, that

might retard the vibration of the locking-bar O, there is a supplementary piece, O^3, pivoted by one of its ends upon the lower surface of the end O′ of the locking-bar. The other end of this piece O^3, being slightly wider than the end of the rocking bar, is allowed to move sidewise and adjust itself without friction, so that it may be engaged by the latching-hook q' when the locking-bar O is vibrated, and its end O′ rises in the slotted standard P to engage the hook, and thus secure the bar in a horizontal position.

The locking-bar O is slotted at the point where it is pivoted between its supports, and in this slot a weighted latching-block, R, is loosely mounted on the same rod that pivotally supports the locking-bar and lies with its body projected vertically downward, a pin, 7, on the side of the locking-bar preventing the body of the latching-block R from moving toward the weighted end of the locking-bar, while a free movement in the opposite direction is afforded when the sloping side of the locking-toe 8 of the latching-block R is engaged by the quadrant, N, or rather by a roller, R′, which is pivotally supported on the rear side of the quadrant at the end nearest the magnets D D′. The diametrical size of the roller R′ and its position on the side of the quadrant-bar 6 is such in relation to the locking-toe 8 of the latching-block R that the roller R′ will abut against the toe and remain in such contact when the quadrant N is carried up by the motor L until said motor rests with its upper chamber, s', in contact with the stop or projection on the casing A, as has been previously mentioned.

Upon the side of the quadrant N that is adjacent to the rocking arm G there is a curved latch-bar, G^4, pivoted by its outer end, 9, so as to have a vibratory motion on this point of attachment. The other end of the curved latch-bar G^4 is caused to have a limited vertical movement by the insertion of a set-bolt, 11, through a slotted projecting flange, 12, and into the side of the quadrant, the length of this slot determining the movement of this curved latch-bar.

Near the point of pivotal support of the gravity-bar I, on the edge that lies below the curved latch-bar G^4, an anti-friction roller, T, is secured to rotate freely on a stud. The diameter and point of attachment of the roller T adapt it to have rolling contact with the outer surface of the curved latch-bar G^4. On the rear face of the rocking arm G a pendent lever, 13, will engage the offset shoulders 14 15, formed near the opposite end of this curved bar upon its upper arched surface.

It will be noticed that the offset 14, which is nearest the point of pivotal attachment of the bar G^4 to the quadrant, is not as deep as the shoulder 15, made near the other extremity of the bar, and that the curved surface of the latch-bar G^4 gradually rises from the offset 14, to afford material for the production of the offset 15, which is formed by the removal of material from the top surface of the curved bar between the bottom edge of the offset 15 and the outer end of the bar G^4.

In Fig. 9 of the drawings a plan view of the tracks of a block is shown, and it will be noticed that the battery 20 for production of a magnetic current is located at one end of the block, with its positive and negative poles connected by conductor-wires 21 22 to the track ends. At the other end of the block the semaphore-signaling device is placed, with its electro-magnets D D′ attached to the rails by proper conductors, so as to complete the electrical circuit when the battery is charged. Another circuit is formed by connecting the contact-spring 24 with one of the rails or a wire leading thereto, and the contact-spring 25 by means of a wire with one end of the coil of the magnets D D′ of the semaphore at the opposite end of the block, the opposite end of the coil of said magnet being connected to one of the rails or a wire leading thereto. A battery, 28, will be included in this circuit at any desired point.

The circuit last above described will remain normally closed by contact of the arm 23 on the hub *c* of lever G with springs 24 25.

It is evident from the position of the compound armature-bar J J′ upon the pole of the magnet D, and nearly in contact with the pole of the other magnet, D′, that if the track is free, as shown in Fig. 9, the current of electricity which energizes the magnets will attract the loose lower bar, J′, with the full force of the magnet to hold it in contact with the same.

If a locomotive, a car, or train of cars enters the block from either end of the same, the axles and wheels of the car or locomotive will establish an electrical connection between the tracks and "short-circuit" the battery, so as to cut out the electro-magnets D D′ of the semaphore apparatus and render them inert, thus releasing the armature J J′.

In operation of the semaphore device it is understood that when the track of a block is clear of cars or locomotive the semaphore visual-blade C will be in an upright position and be concealed in the shield B. It will also be noted that the tendency of the weight C′ and overweight of the visual signal-blade C is to move the latter into a horizontal position that indicates "danger." When the blade is in the "danger" position just mentioned, the arm G is elevated, as shown in Fig. 3.

The top side of the lower chamber, *s*, of the thermo-motor L is in the same plane with the outer bar, 5, of the quadrant N; hence when this chamber of the motor is lowered to a position that will place its head over the flame of the lamp the quadrant N will be vibrated to assume the position shown in Fig. 1, with a shoulder or abutment, 18, formed on the outer edge of its arched rim N′, in contact with the pendent latching-block R, and the arm G, which has been engaged by the offset shoulder 14, will be carried down by the weight of

the liquid in the motor, and after tripping over the latch-dog *k*, that is pivoted in the gravity-bar I, be retained in such position by the contact of said latch-dog *k* and the contact of the armature-bar J J′ with the poles of the magnets D D′. When the parts are in the relative positions just mentioned, the track will be clear and the armatures J J′ will be attracted to hold them to show "safety" on the shield B by concealing the signal-blade C within said shield.

It will be evident from the foregoing description of the mechanism that operates the semaphore-blade that when the quadrant N is carried up by the motor as the latter is vibrated by transposition of the liquid from the lower chamber, *s*, to the upper chamber, *s′*, the roller R′, that is on the rim of the quadrant, will have contact with the pivoted latch of the locking-bar O, and the locking-bar will have its end O′ engaged on the top side of the bar by the upper edge of the slot in the standard P, and the hook *q′* of the latch *p* will lie immediately below the pivoted supplementary piece O^3 on end O′ of the locking-bar O. The bar O will thus be held horizontal or prevented from vibration in the manner just explained when the block is occupied by cars or locomotive. The arm G is released to move up and have its latch nearly in contact with the offset shoulder 14, that is on the arched latch-bar G^4, by the upward movement of the armature-bar J J′, thus allowing the visual signal-blade to fall to a position of "danger" by its own gravity and the auxiliary action of the sprocket-chain and attached weight.

It is important that the action of the motor and its position relative to the rocking arm G will in no case prevent the latter from moving upward when the block is entered and the armature-bar J J′ released, as if the magnets D D′ are rendered inert the overweight of the blade on one side, added to the suspended weight C′, will instantly cause the blade C to fall to "danger." When the magnets D D′ of a semaphore at one end of a block are thus rendered inert by the short-circuiting of their battery and the blade C caused to turn to indicate "danger," the arm 23 of the hub *c*, being normally held between the springs 24 25, will now be moved from between said springs as the hub rotates, and thus break the circuit completed by the arm 23. This circuit being thus broken, the magnets D D′ of the semaphore at the opposite end of the block will be rendered inert and caused to release its armature J J′, and allow that semaphore-blade to be set to "danger," in the manner above set forth.

It will be seen that both the circuits above described employ the railroad-track—the latter circuit using a single return-wire, and that the short-circuiting of one circuit will operate a semaphore at one end of a block—said instrument operating to break the other circuit, and thus cause the semaphore at the opposite end of the blocks to be operated.

When a block has been occupied by cars or locomotive, and these leave the block to enter an adjacent one, the electro-magnets D D′ will instantly draw down their armatures J J′, and they, by contact with the arm *p′* of the latch *p*, will trip the latter and release the locking-bar O, which will thus be allowed to vibrate downwardly and permit the quadrant to fall and carry the arm G downward, so as to vibrate the signal-blade C upwardly, and thus conceal it behind its shield. During this operation the arm 23 on the hub *c* of arm C will turn with said hub and enter between the contact-springs 24 25, and thus complete the circuit to the semaphore at the opposite end of the block and energize its electro-magnets to operate the semaphore, as above explained, and set the signal at "safety."

If the tracks of a block are unoccupied, and the thermo-motor L has by overweight of contained liquid in its lower chamber vibrated so as to carry the quadrant N and rocking arm G down, thereby moving the signal-blade so as to conceal it and indicate "safety," the quadrant and arm G engaged by it will be locked in the position just mentioned, by the simultaneous engagement of the roller on the quadrant with the latch-toe of the pendent latch-dog that is pivoted on the locking-bar O and the lower end of the rocking arm G with the latch-block that is pivoted in the gravity-bar I, which is a part of the compound armature-bar J J′. This locked engagement of parts will not be broken until the armature-bar is free to vibrate and release the arm G, which can only occur when the tracks of the block are connected by the wheels and axle of car, so as to short-circuit the electrical current and render the magnets dormant, as has been explained.

It will be apparent from the foregoing description of our improved semaphore-signaling apparatus that the relative action of the motor L, quadrant N, and rocking arm G is such with regard to the compound armature-bar J J′, magnets D D′, and rocking bar O that they will co-operate to reliably indicate "danger" or "track occupied" by an automatic release of the visual signal-blade C, thus allowing it to move by gravity to a position which will expose its entire surface, and when danger is removed from the block or the track is entirely clear the conjunctive action of the motor, quadrant, rocking arm, locking-bar, armature, and electro-magnets and closed battery-circuits will automatically effect the return of the visual signal-blade to its shield, and thus conceal the danger-signal from view. It will also be seen that the operation of a semaphore at one end of a block will automatically cause the semaphore at the opposite end of the block to operate in the same manner and set both signals to "danger," to remain so set as long as a train is in said

block, and that as soon as the train leaves the block both signals will be automatically set to "safety."

Many features of our invention are shown and described in this application which are set forth and claimed in another application, filed March 20, 1887, Serial No. 267,811; hence such features are not claimed in this case, and are shown and described to render the comprehension of this case more clear.

Many slight changes might be made in the constructive details of this invention without departing from the spirit thereof; hence we do not desire to restrict ourselves to the exact details of construction herein set forth; but,

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

1. The combination, with a railroad-track, of a semaphore signaling apparatus having electro-magnets located at each end of a block of said railroad, a closed circuit through the track and semaphore at one end of the block, and a second closed circuit through the semaphore at the opposite end of the block, said second circuit being adapted to be automatically broken by the operation of the first-mentioned semaphore, substantially as set forth.

2. The combination, with a railroad-track, of a semaphore signaling device having electro-magnets, a closed circuit through the track and semaphore-magnets located at one end of a block, a second circuit through a semaphore at the opposite end of the block, and contact-pieces attached to the first-mentioned semaphore to normally close said second circuit, substantially as set forth.

3. The combination, with a railroad-track, of two semaphores having electro-magnets, a closed circuit through the railroad-tracks and semaphore located at one end of a block, a second closed circuit through the track, a conducting-wire and a semaphore at the opposite end of the block, and contact-pieces attached to the first-mentioned semaphore to normally close said second circuit, substantially as set forth.

4. The combination, with a railroad-track, of two semaphores having electro-magnets, a closed circuit through the railroad-tracks and a semaphore located at one end of a block, a second closed circuit through a semaphore at the opposite end of the block, the track, and a conducting-wire, contact-pieces attached to a rigid part of the first-mentioned semaphore and included in said second circuit, and an arm carried by a moving part of the first-mentioned semaphore to connect the contact-pieces and normally close said second circuit, substantially as set forth.

In testimony whereof we have signed this specification in the presence of two subscribing witnesses.

FREDERICK STITZEL.
CHARLES WEINEDEL.

Witnesses:
H. VAN S. BROWN,
GEO. V. LEBRE.