(No Model.) 5 Sheets—Sheet 1.

F. STITZEL & C. WEINEDEL.

SEMAPHORE SIGNAL.

No. 393,865. Patented Dec. 4, 1888.

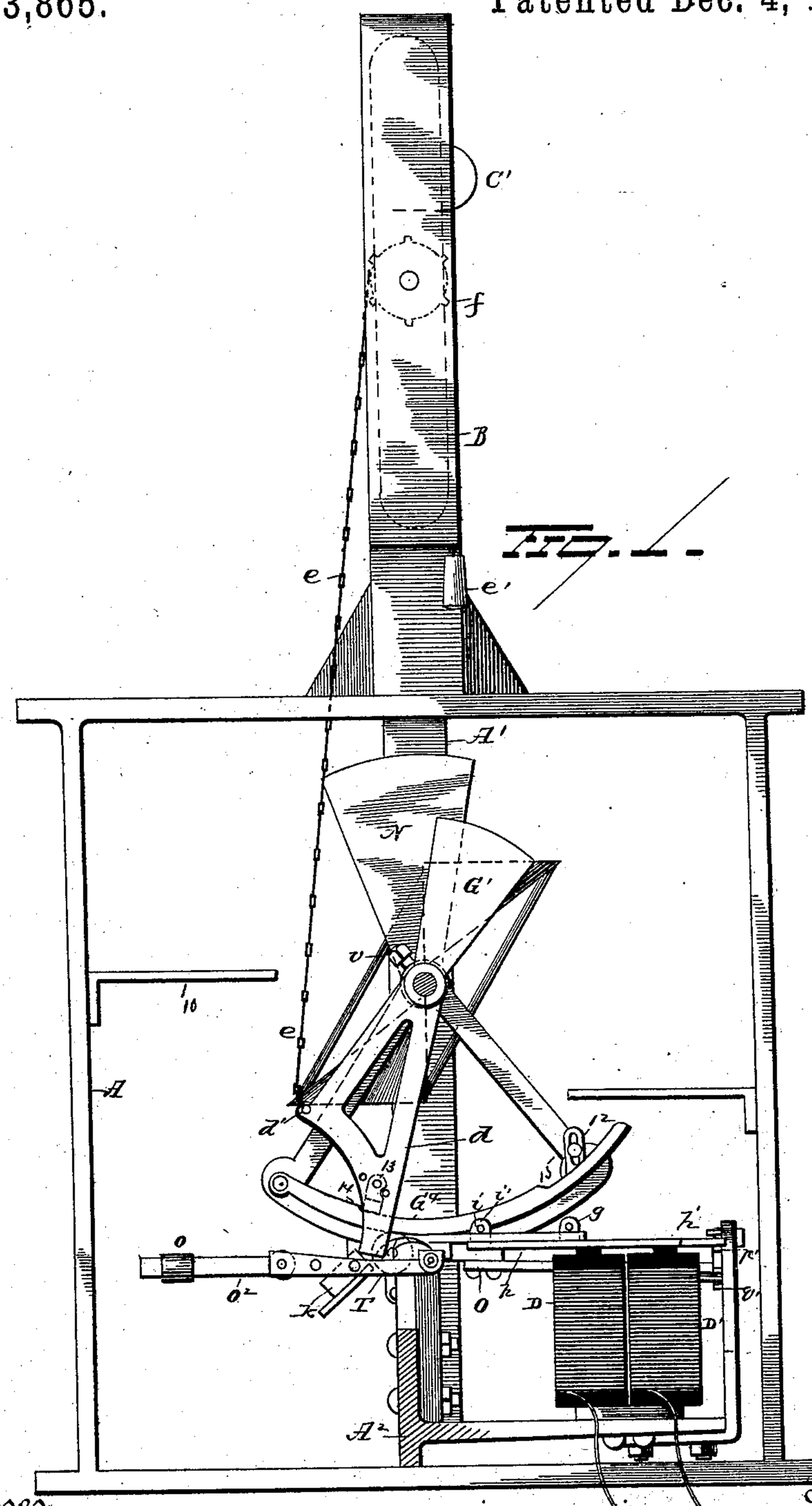

FIG. 1.

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(No Model.) 5 Sheets—Sheet 2.

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SEMAPHORE SIGNAL.

No. 393,865. Patented Dec. 4, 1888.

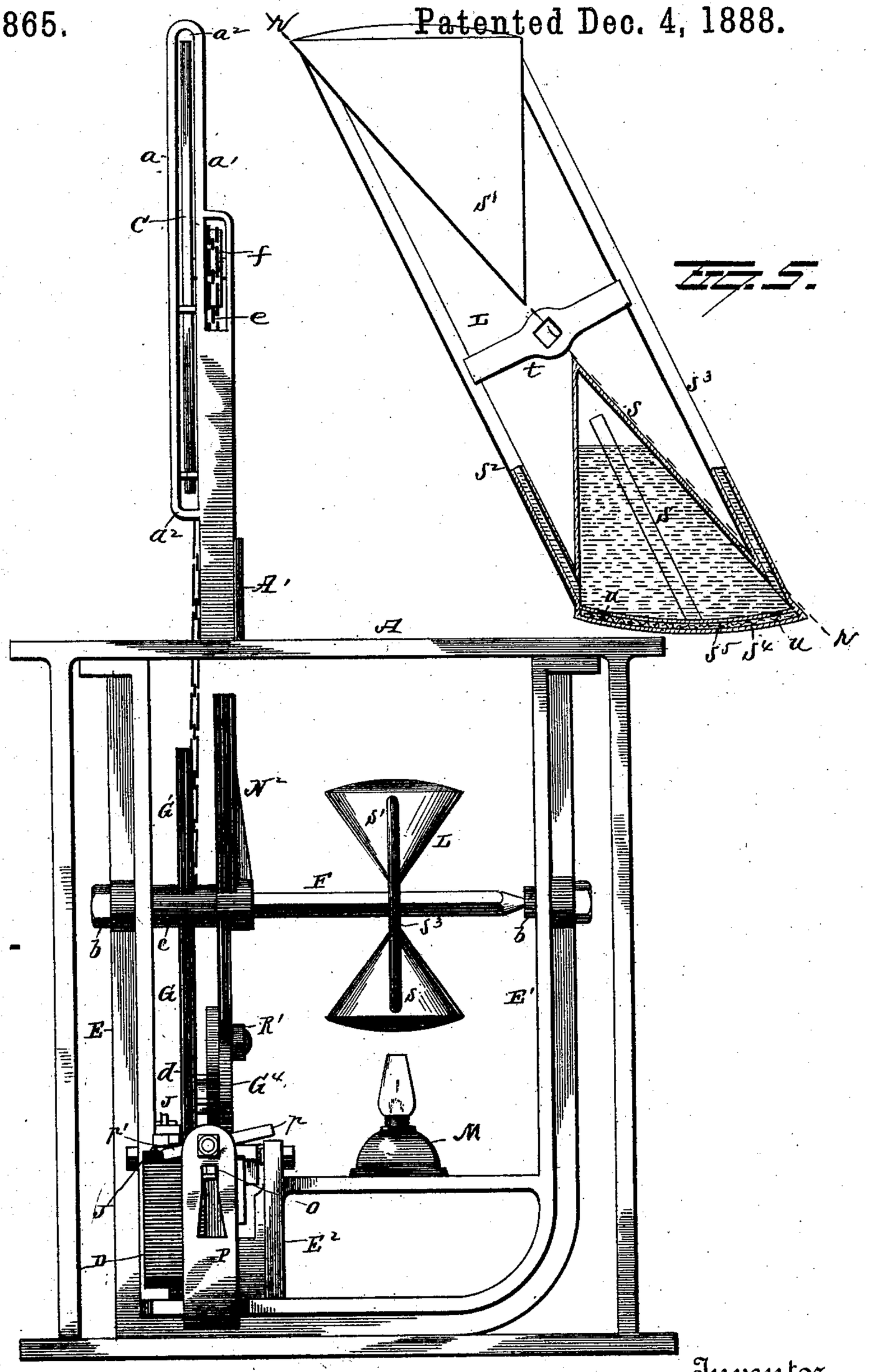

FIG. 2.

FIG. 5.

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(No Model.) 5 Sheets—Sheet 3.

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SEMAPHORE SIGNAL.

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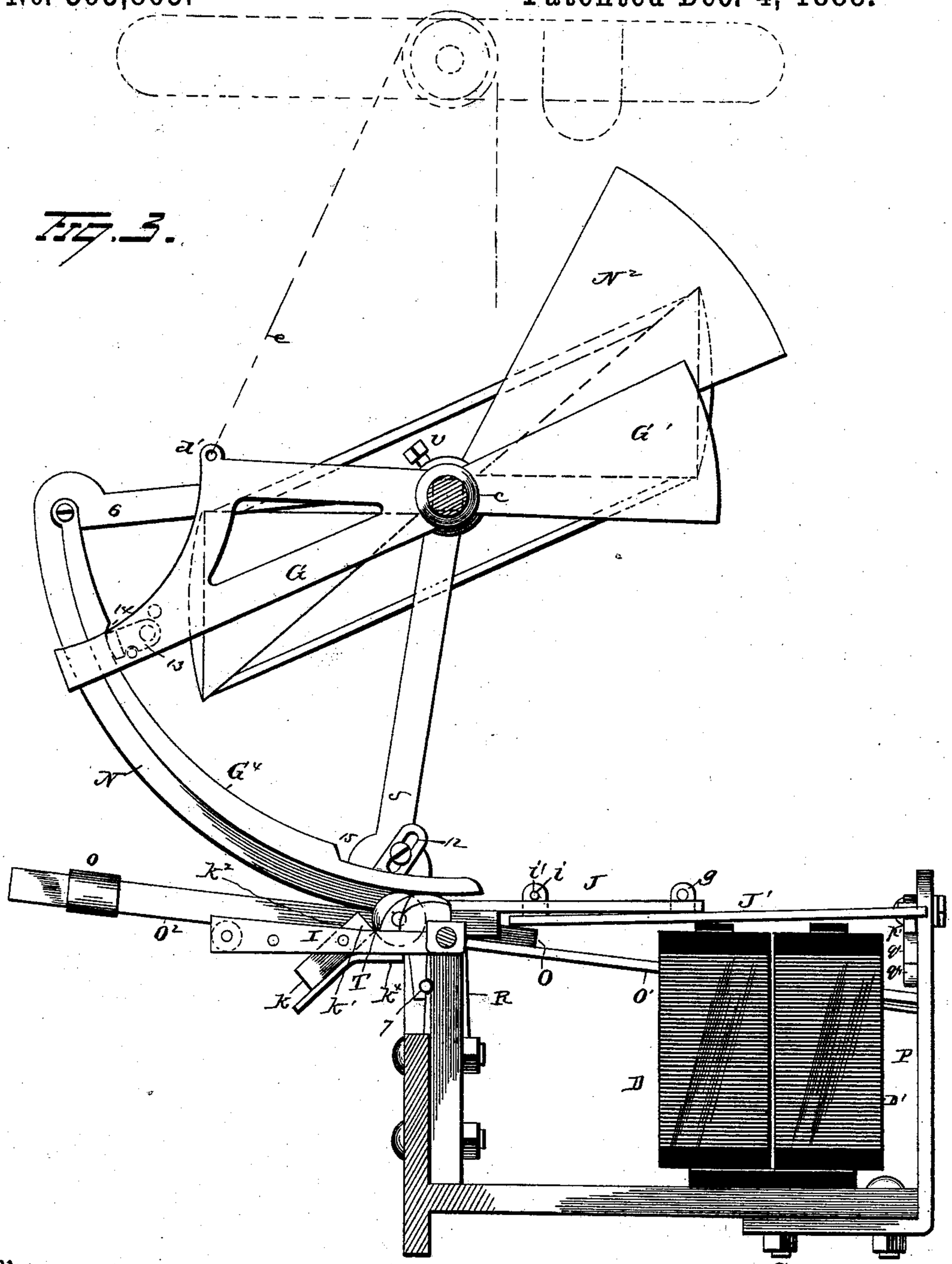
Fig. 3.



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(No Model.) 5 Sheets—Sheet 4.

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SEMAPHORE SIGNAL.

No. 393,865. Patented Dec. 4, 1888.

Fig. 4.

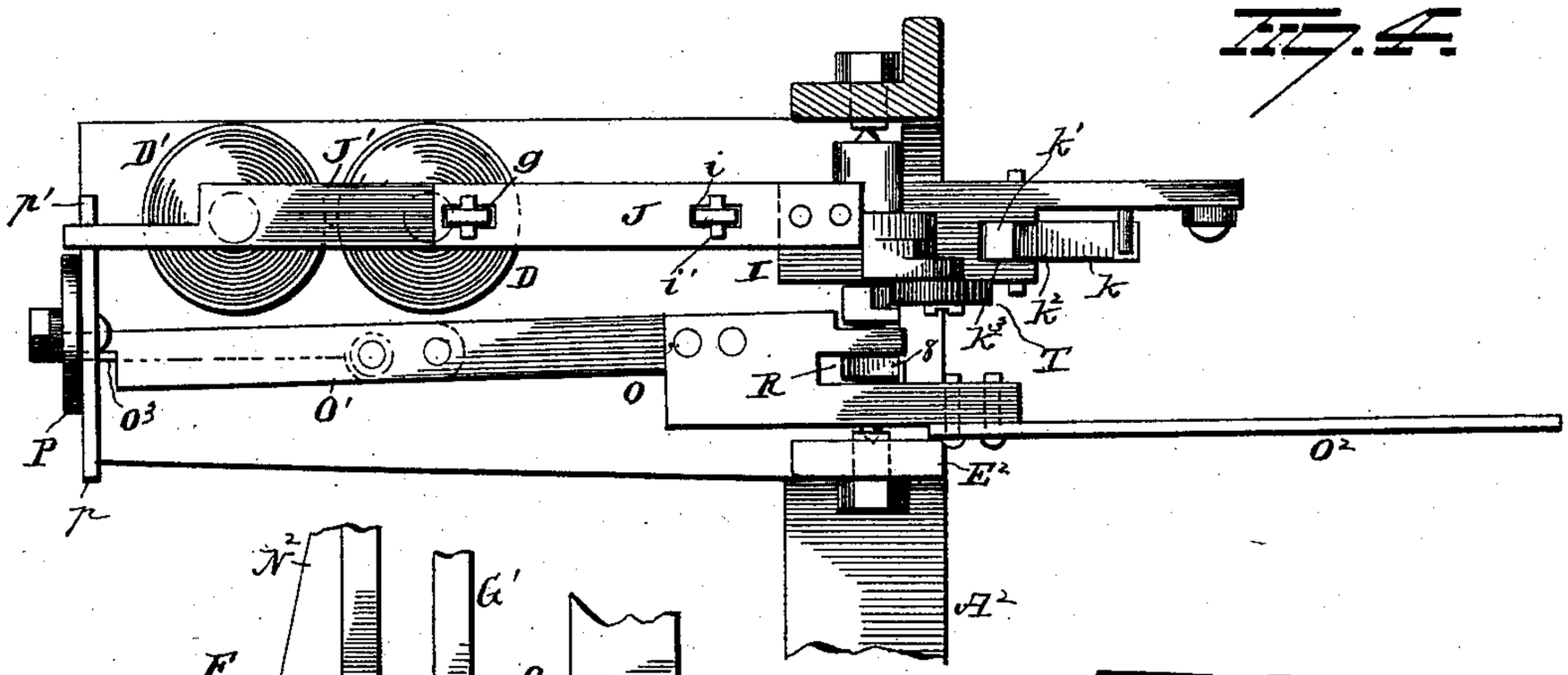


Fig. 9.

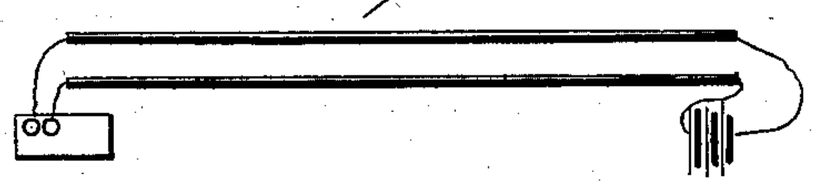


Fig. 5.

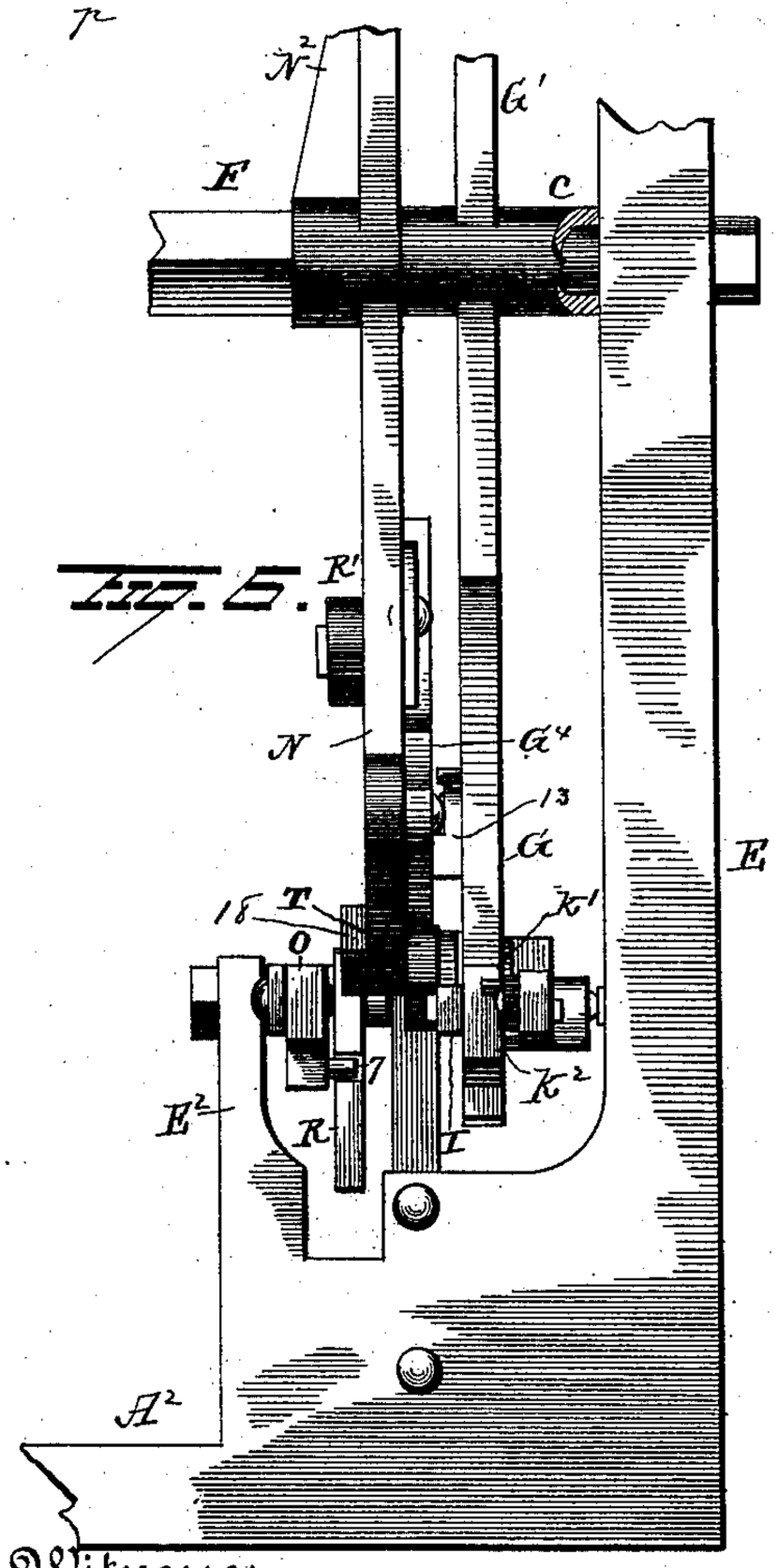
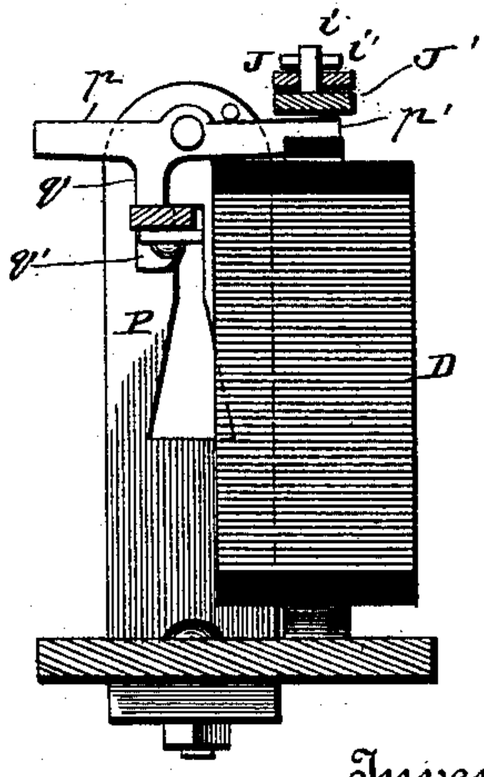


Fig. 8.



Witnesses,
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(No Model.) 5 Sheets—Sheet 5.

F. STITZEL & C. WEINEDEL.

SEMAPHORE SIGNAL.

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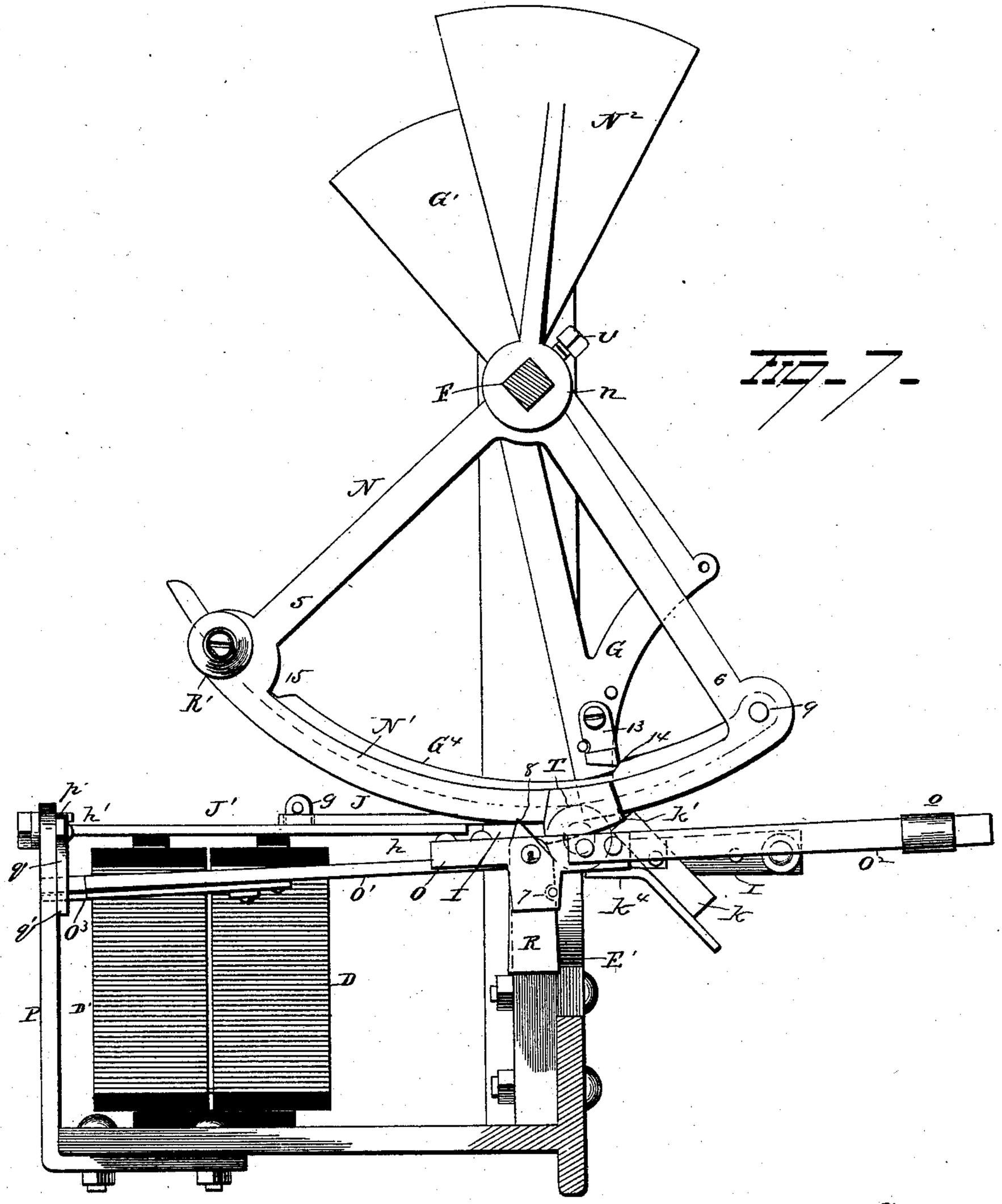

Fig. 7.

Witnesses,
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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. 393,865, dated December 4, 1888.

Application filed March 20, 1888. Serial No. 267,811. (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.

In Letters Patent No. 344,755, dated June 29, 1886, and a subsequent application for patent, Serial No: 231,475, filed March 13, 1887, we have shown signaling devices that embody some of the general features of our present invention. The leading characteristics of these two inventions, which are employed in our latest improved signaling device, consist in a vertical shield or box in which the signaling-blade is concealed when not in a position to indicate "danger," a visual signal-blade that is adapted to drop from its shield and be held at right angles thereto when the block is entered by cars or a locomotive, a thermo-motor that assists to operate the mechanism, and electro-magnets that act conjunctively with the thermo-motor and the gravity of the signal-blade to set this blade so as to indicate "danger," or conceal the blade, and thus show the block to be clear.

The object of our present improvement is to further perfect the working mechanism of a semaphore signaling device so as to render each block a continuous magnetic circuit when it is clear of cars or in a state of "safety," and cause the locomotive or cars that enter the block, and while they occupy the same, to cut off the battery-current from the electro-magnet of the semaphore and return it to the battery by establishing a continuous circuit through the wheels and axles of the locomotive or cars.

A further object is to provide an improved means for utilizing the railway-rails of a block, between the terminals of said block, as electrical conductors for battery-current, which is adapted to energize electro-magnets employed to operate the semaphore signaling device in conjunction with other forces, so as to set and hold the visual blade concealed, and thus indicate a clear track or "safety," the short-circuiting of the current by a locomotive or car entering the block and forming an electrical connection between the tracks causing the electro-magnets of the semaphore to become dormant and allow the force of gravity to operate upon the semaphore mechanism and carry the signal-blade to a position which will indicate "danger."

A further object is to so construct a portion of the working mechanism of the semaphore apparatus as to release the visual blade or semaphore and allow it to fall to "danger" by the gravity of the blade, without the aid of the thermo-motor, when the electro-magnets that hold the blade concealed to indicate "safety" are demagnetized and their armature released.

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 specification, 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 line * *, or between the electro-magnets, to show the standard and hook-latch pivoted on it that engages a 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.

We provide a casing, A, which is made rectangular, and preferably of metal; but other material may be used in its construction. This casing is of such a relative size to the contained mechanism as to receive it and give support thereto by suitable bracketed projections which are attached to the interior surface of its vertical walls. The depending bracket-plate A′ 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.

Between the post E and another shorter upright post, E^2, 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 are 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 arm 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 a stop or check lug formed on the adjacent front wall of the casing A, so as to prevent the arm from a further vertical movement.

Upon the square shaft F the thermo-motor L is securely mounted. This motor is substantially the same as is shown and described in our patent application filed March 13, 1887, Serial No. 231,475. A proper description of it will be given here in order to show its adaptability for use in combination with the novel features of construction of this semaphore signaling device.

The motor L is composed of two conical chambers, s s', held together by tubular braces s^2 s^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 s^2 s^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 s^2 s^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. 5 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 line 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 evolves 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 head, 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 s^2 s^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 M, 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 influences.

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, *r*, 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 counter-balance, N², is secured or made integral therewith. This is of such weight that it will poise the quadrant and attached parts.

Between the post E² and another upright bracket, E³, 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 O², that projects in the opposite direction, and a movable weight, *o*, is placed on the latter-named part O², 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 O² 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 end *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, O³, pivoted by one of its ends upon the lower surface of the end O′ of the locking-bar. The other end of this piece O³, 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 are 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, G⁴, 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 G⁴ is secured 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 G⁴, 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 G⁴. On the rear face of the rocking arm G a pendent latch, 13, will engage the offset shoulders 14 15, formed near the opposite ends 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 G⁴ 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 G⁴ 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 G⁴.

In Fig. 10 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 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.

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. 10, 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 the 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 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, 6, 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 a 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^2 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 one of the important features of our present invention that the action of the motor and its position relative to the rocking arm C 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 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 armature J J′, and it, 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. 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 a 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 present 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-circuit will automatically effect the return of the visual signal-blade to its shield, and thus conceal the danger-signal from view.

Many slight changes might be made in the parts and combination of parts of this device without a departure from the spirit or exceeding the scope of our invention. Hence we do not desire to be restricted to the exact forms and combinations herein shown; but,

Having fully described our invention, what

we claim as new, and desire to secure by Letters Patent, is—

1. In a semaphore signaling device, the combination, with a closed circuit made through the track-rails of a railway-block, and a pair of electro-magnets, of a compound armature-bar pivoted to have contact with the poles of the magnets, a visual signal-blade pivoted to fall by gravity to indicate "danger," a motor adapted to engage the armature-bar, and a chain or its equivalent connecting the motor and visual signal, substantially as set forth.

2. In a semaphore signaling device, the combination, with a thermo-motor, a shaft, a quadrant, and supports for the shaft to allow the shaft, quadrant, and motor to vibrate together, of a locking-bar pivoted on supports to allow it to vibrate from a horizontal plane below the quadrant, and a swinging hook pivotally supported to engage the end of the locking-bar and hold it in horizontal position, substantially as set forth.

3. In a semaphore signaling device, the combination, with a thermo-motor, a heating device, a quadrant, a shaft, and supports for the shaft, of a locking-bar pivoted to vibrate from a horizontal plane and adapted to engage a shoulder or stop on the quadrant, an adjustable weight placed on the locking-bar to vibrate it to a horizontal position, and a pivoted hook that is supported near the end of the rocking bar to hold this bar from vibrating, substantially as set forth.

4. In a semaphore signaling device, the combination, with a thermo-motor, a heating device, a quadrant, a rocking arm, and a shaft that is secured to the quadrant and motor and loosely supports the rocking arm, of a curved latch-bar pivoted by one end to the arched rim of the quadrant, and a pivoted gravity-bar to which is attached a compound armature-bar, a swinging latch-block supported on the rocking bar to have contact with a roller on the quadrant, and a pair of electro-magnets that are located to have their poles engaged by the compound armature-bar when the magnets are energized, substantially as set forth.

5. In a semaphore signaling device used in combination with a railway block system, the combination, with two electro-magnets that are included in a circuit of which the parallel rails of the block are electrical conductors, the parallel railway-rails of a block, and an electrical generator or battery, of a compound armature-bar supported to vibrate and assume a position in contact with the pole of one magnet and near the pole of the other magnet when the magnets are rendered dormant by reason of a short circuit of the electric current through the axles and wheels of a car or locomotive on the block, and be attracted to have close contact with both magnets, and be thus forcibly held, when these magnets are electrically energized by reason of the removal of the short circuit from the main conductors or railway-tracks of the block, substantially as set forth.

6. In a semaphore signaling device used in combination with a railway block system, the combination, with a pair of electro-magnets that are included in an electrical circuit of which the railway-rails are conductors, the railway-rails of a block, a compound armature-bar supported and pivoted to engage the poles of these magnets, and a pivoted latch-hook that is supported near the end of the armature-bar, to be engaged by it when the magnets are energized, of a locking-bar pivotally sustained in a plane parallel to the armature-bar by an engagement with the pivoted latch-hook when the armature-bar is electrically held in contact with the magnets, and released from the latch-hook to vibrate from a horizontal plane when the magnets are demagnetized by a short circuit formed on the block, substantially as set forth.

7. In a semaphore signaling device, a compound armature-bar adapted to have contact with the pole or core of one magnet of a pair of electro-magnets set in line with the bar when these magnets are dormant or demagnetized, and to be attracted and yield so as to have contact with the poles of both magnets when said magnets are rendered electrically active or are in a closed electrical circuit, substantially as set forth.

8. In a semaphore signaling device used with a railway block system, the combination, with a casing, a shield, and a visual signal-blade that is pivoted in the shield to fall and indicate "danger" on the track, of a thermo-motor that is supported on the same shaft with a balanced quadrant, a quadrant that is moved by the thermo-motor, and a rocking arm which is actuated by the quadrant and thermo-motor and caused by them to pull the visual signal-blade within its shield to indicate "safety," substantially as set forth.

9. In a semaphore signaling device used with a railway block system, the combination, with a closed electrical circuit including a battery, two parallel railway-tracks the length of the block, and two electro-magnets, of a compound armature that is adapted to hold the signal-operating devices in a position to indicate "safety" when the block is not occupied by its electrical contact with the poles of the magnets and release these devices so that they fall by gravity to indicate "danger" when the track is occupied at any point on the block, substantially as set forth.

10. In a semaphore signaling device, the combination, with a horizontal shaft pivoted to rock on its centers, of a thermo-motor and a quadrant secured on and to this shaft to rock with it, and a rocking arm loosely mounted on the shaft that gives support to the motor and quadrant, substantially as set forth.

11. In a semaphore signaling device, the combination, with a shaft supported to rock,

a thermo-motor, and a quadrant mounted on the shaft and secured to rock with it, of a curved latch-bar that is pivoted to one end of the curved rim of the quadrant and secured so as to have a limited vibratory movement, and a rocking arm which is supported loosely on the shaft on which the motor and quadrant are placed, so that a latch that is pivoted on the side of this rocking arm will engage offset shoulders on the quadrant, and thus adapt the quadrant to rock the arm downwardly, substantially as set forth.

12. In a semaphore signaling device used in connection with a railway block system, the combination, with a visual signal-blade that is pivoted to swing from an upright position to indicate "danger," a thermo-motor, a quadrant fastened to the same shaft that pivotally supports the motor, a rocking arm loosely mounted on the same shaft with the motor, a flexible weighted connection between the signal-blade and rocking arm, and quadrant, of a closed electrical circuit that extends through the parallel railway-rails as conductors, a pair of electro-magnets included in this circuit, and an armature-bar adapted to hold the rocking arm and the connected signal-blade to indicate "safety" when the track of the block is clear, and release these parts to fall and indicate "danger" when the block is entered by a car or locomotive, substantially as set forth.

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

FREDERICK STITZEL.
CHARLES WEINEDEL.

Witnesses:
ALLAN G. BROWN,
GEO. V. LEBRE.