(No Model.) 5 Sheets—Sheet 1.

J. M. WILLIAMS & T. P. & H. W. KINNEY.

AUTOMATIC BLOCK SIGNAL.

No. 593,504. Patented Nov. 9, 1897.

Fig. 1.

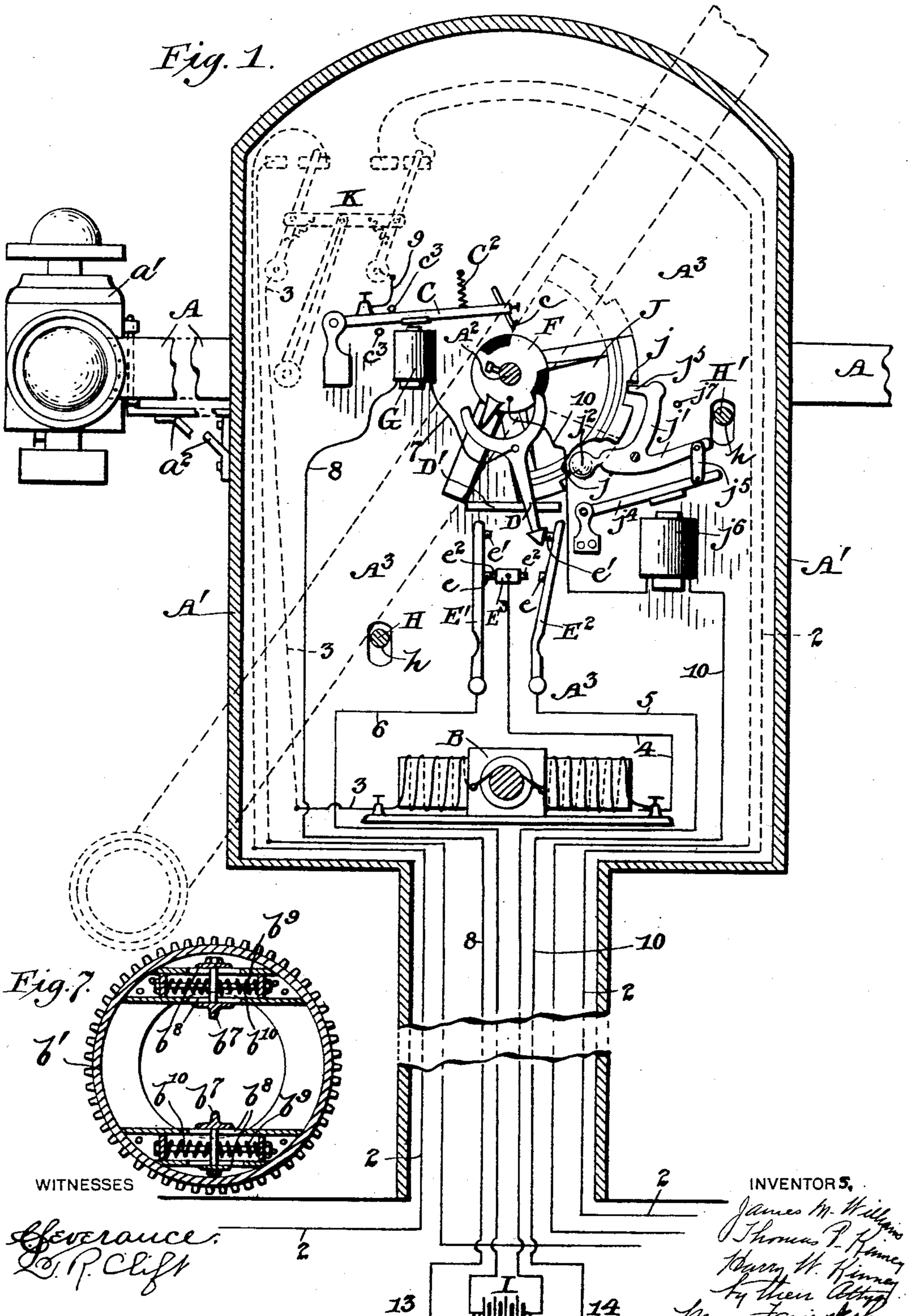

Fig. 7.

WITNESSES

Severance.
L. P. Clift

INVENTORS.

James M. Williams
Thomas P. Kinney
Henry W. Kinney
by their Attys.
Munn & Comstock & Evans

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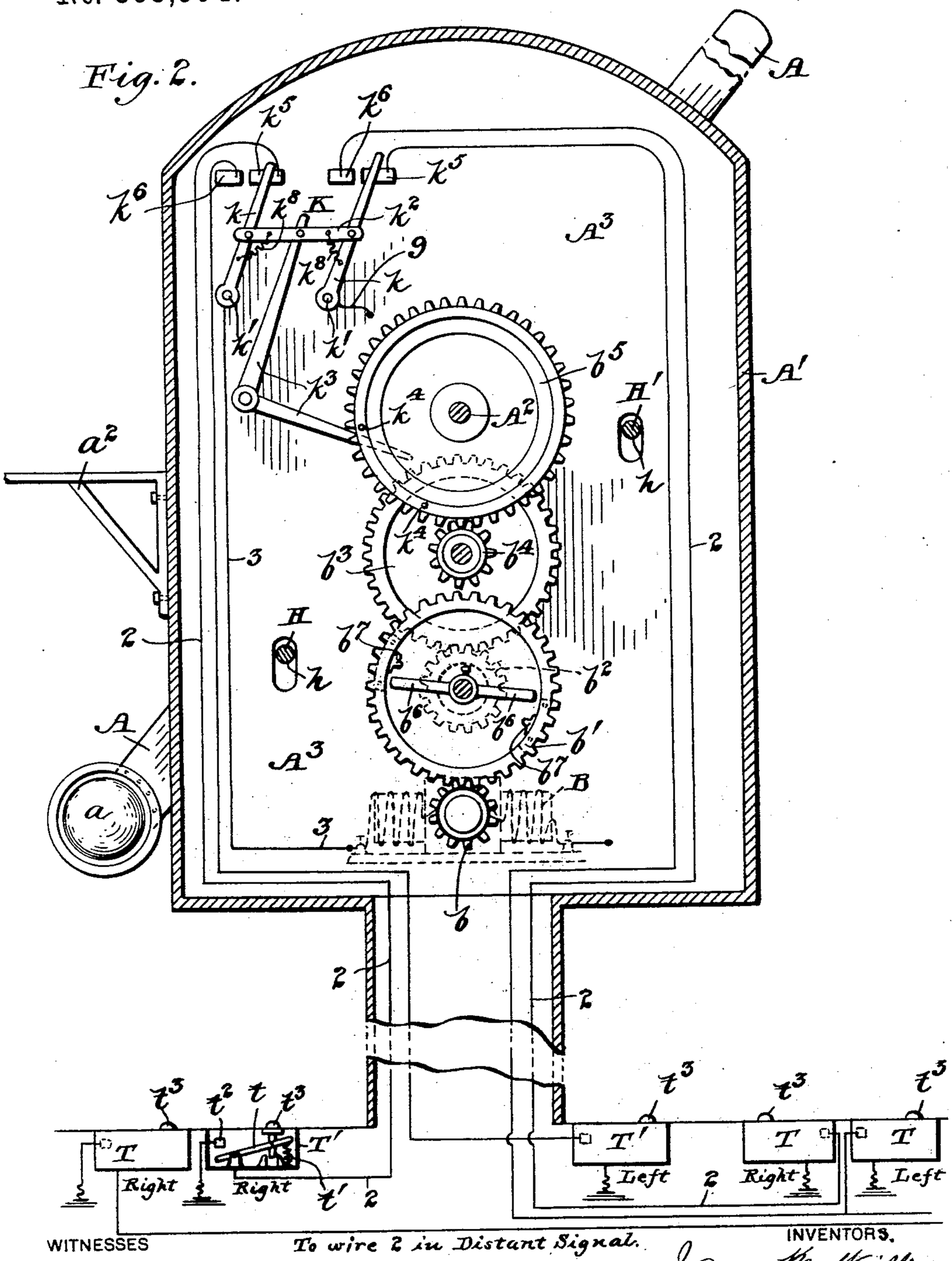
Fig. 2.



WITNESSES

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James M. Williams
Thomas P. Kinney
Harry W. Kinney
by their Attys
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(No Model.) 5 Sheets—Sheet 3.

J. M. WILLIAMS & T. P. & H. W. KINNEY.

AUTOMATIC BLOCK SIGNAL.

No. 593,504. Patented Nov. 9, 1897.

Fig. 3.

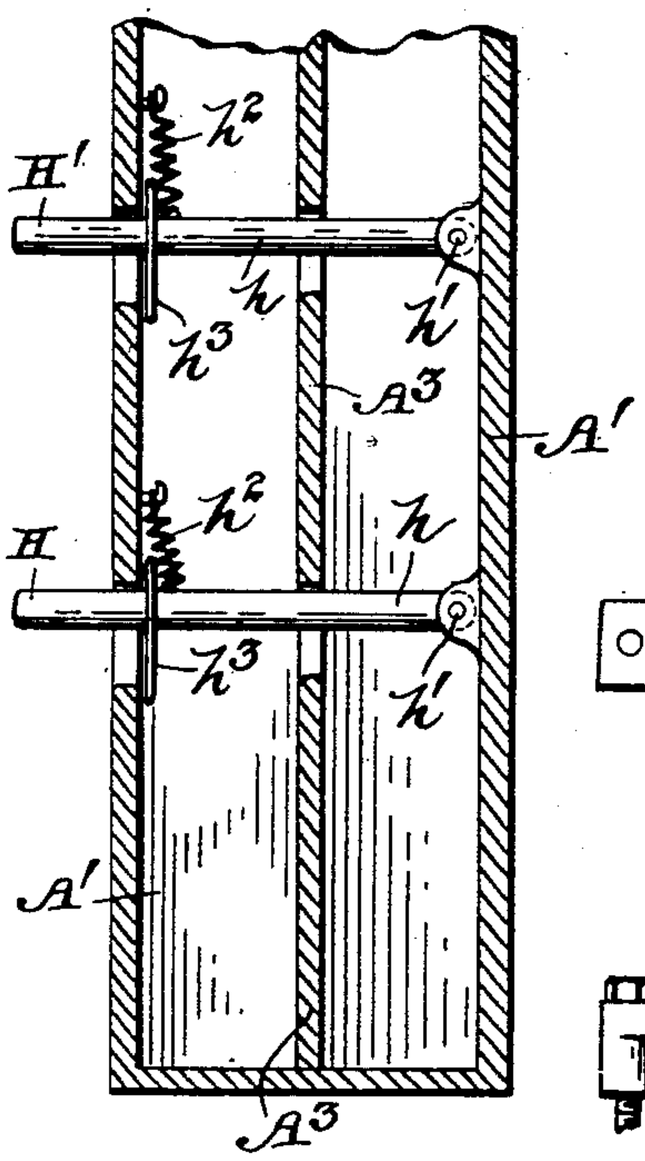


Fig. 4.

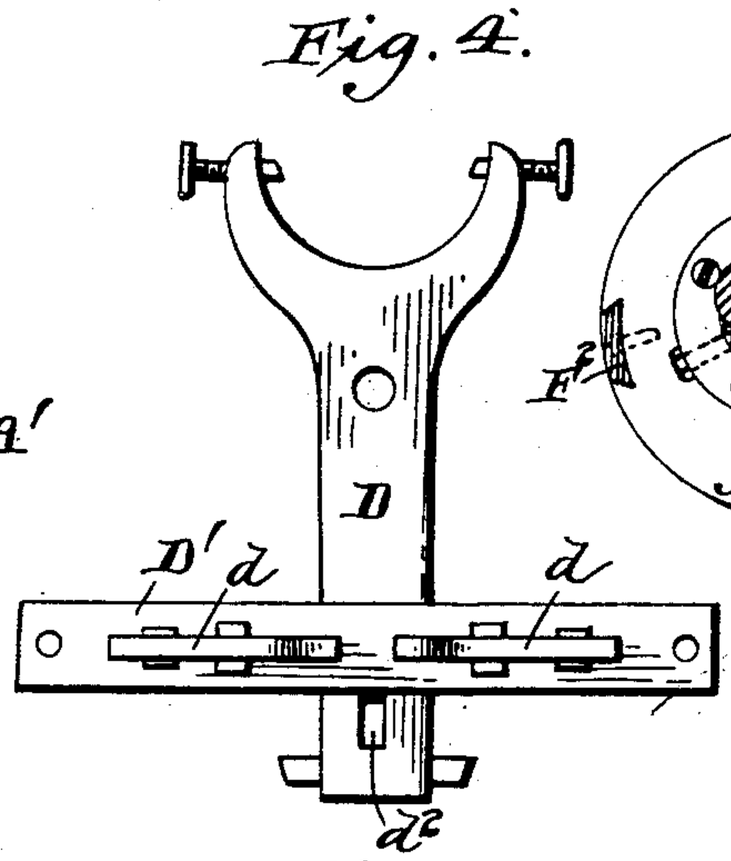


Fig. 6.

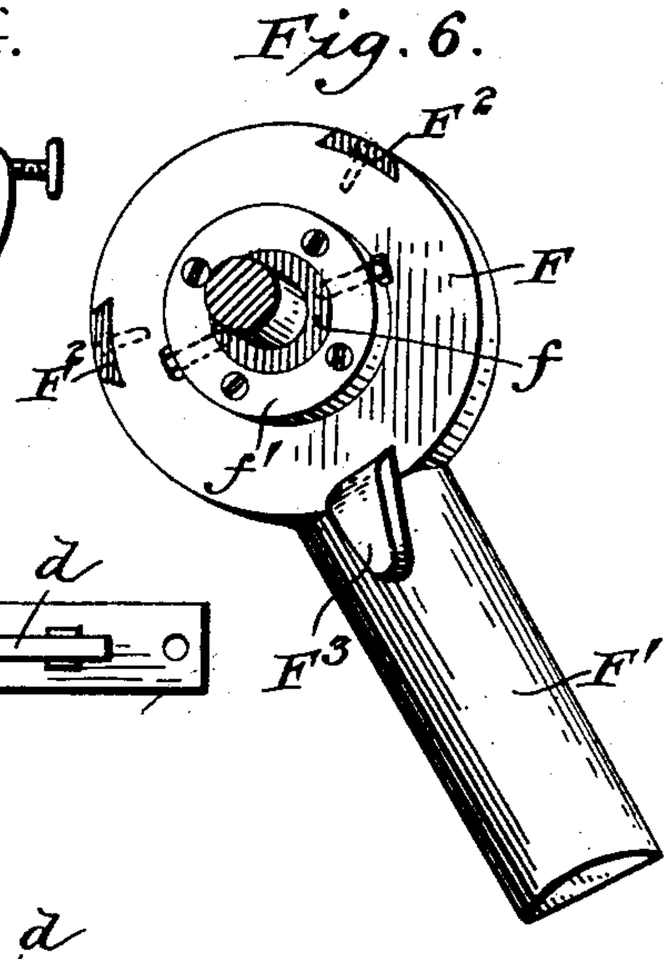


Fig. 5.

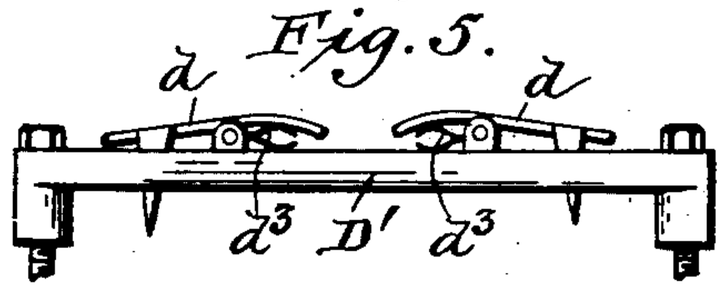


Fig. 8.

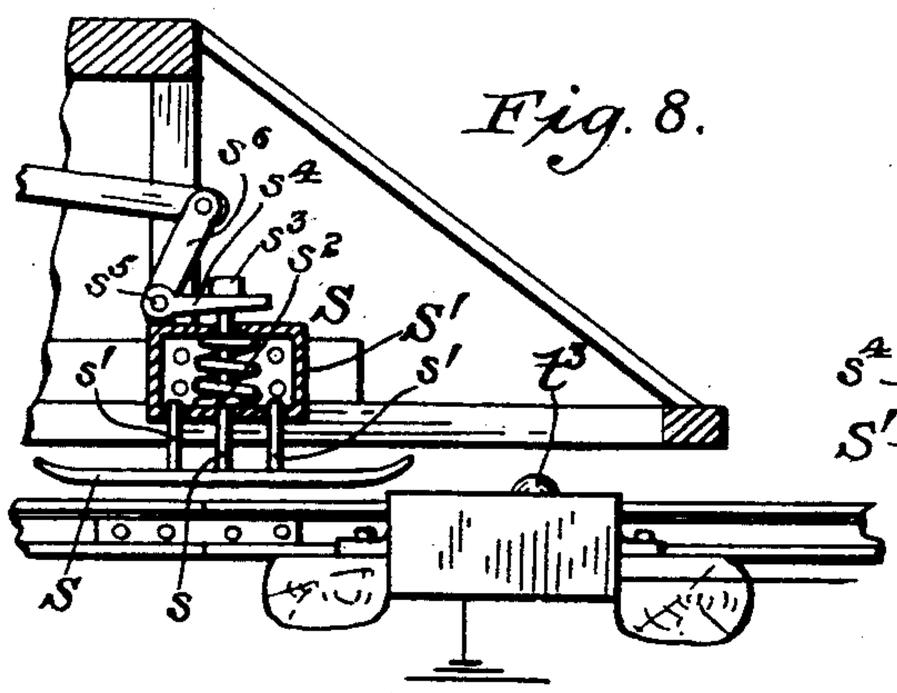


Fig. 9.

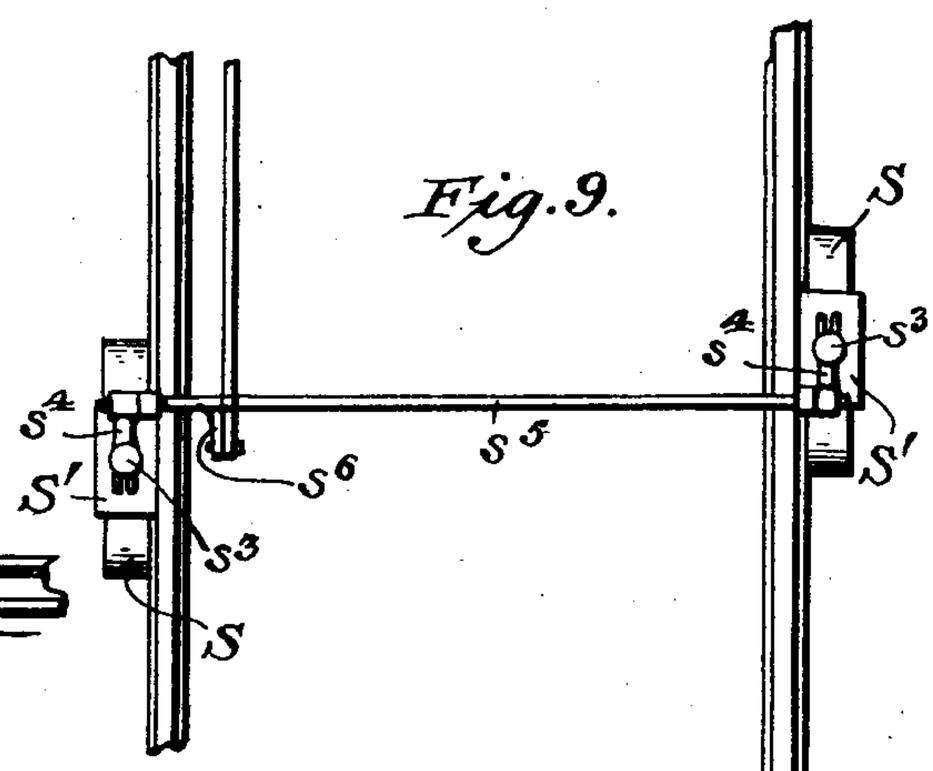
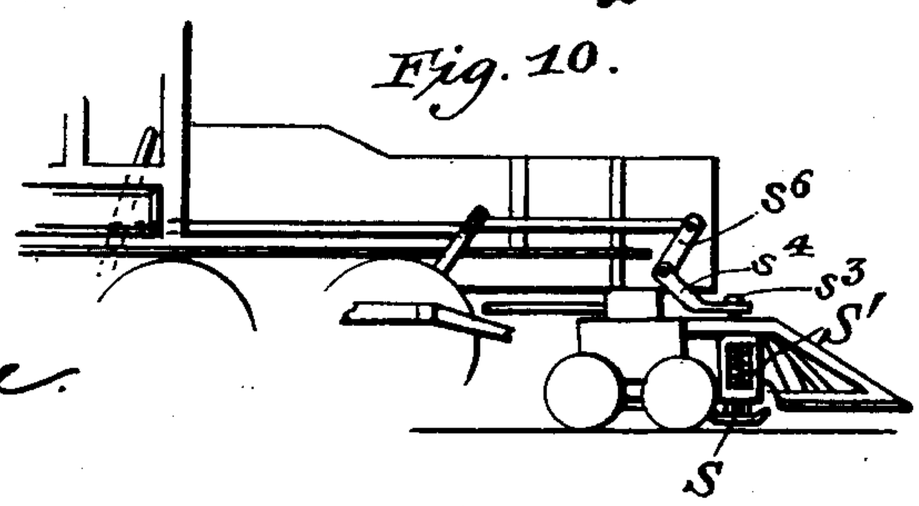


Fig. 10.



WITNESSES

Geverance.
L. P. Clift

INVENTORS.

James M. Williams
Thomas P. Kinney
Harry W. Kinney
By their Attys
Mason Fenwick & Lawrence

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J. M. WILLIAMS & T. P. & H. W. KINNEY.

AUTOMATIC BLOCK SIGNAL.

No. 593,504. Patented Nov. 9, 1897.

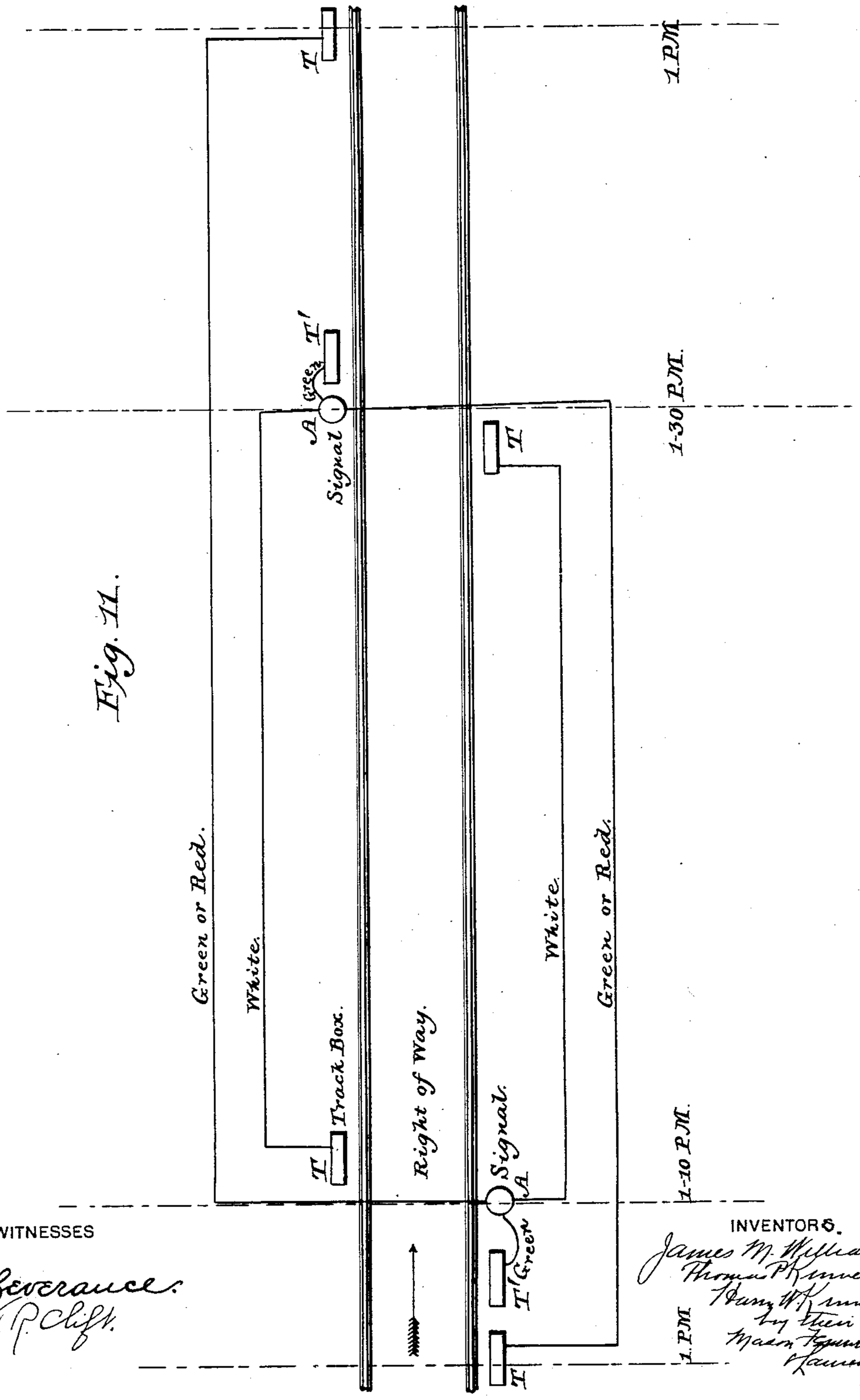

Fig. 11.

WITNESSES

Geo. Geverance.
T. P. Clift.

INVENTORS.

James M. Williams
Thomas P. Kinney
Harry W. Kinney
by their Atty
Mason Fenwick
& Lawrence

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.) 5 Sheets—Sheet 5.

J. M. WILLIAMS & T. P. & H. W. KINNEY.

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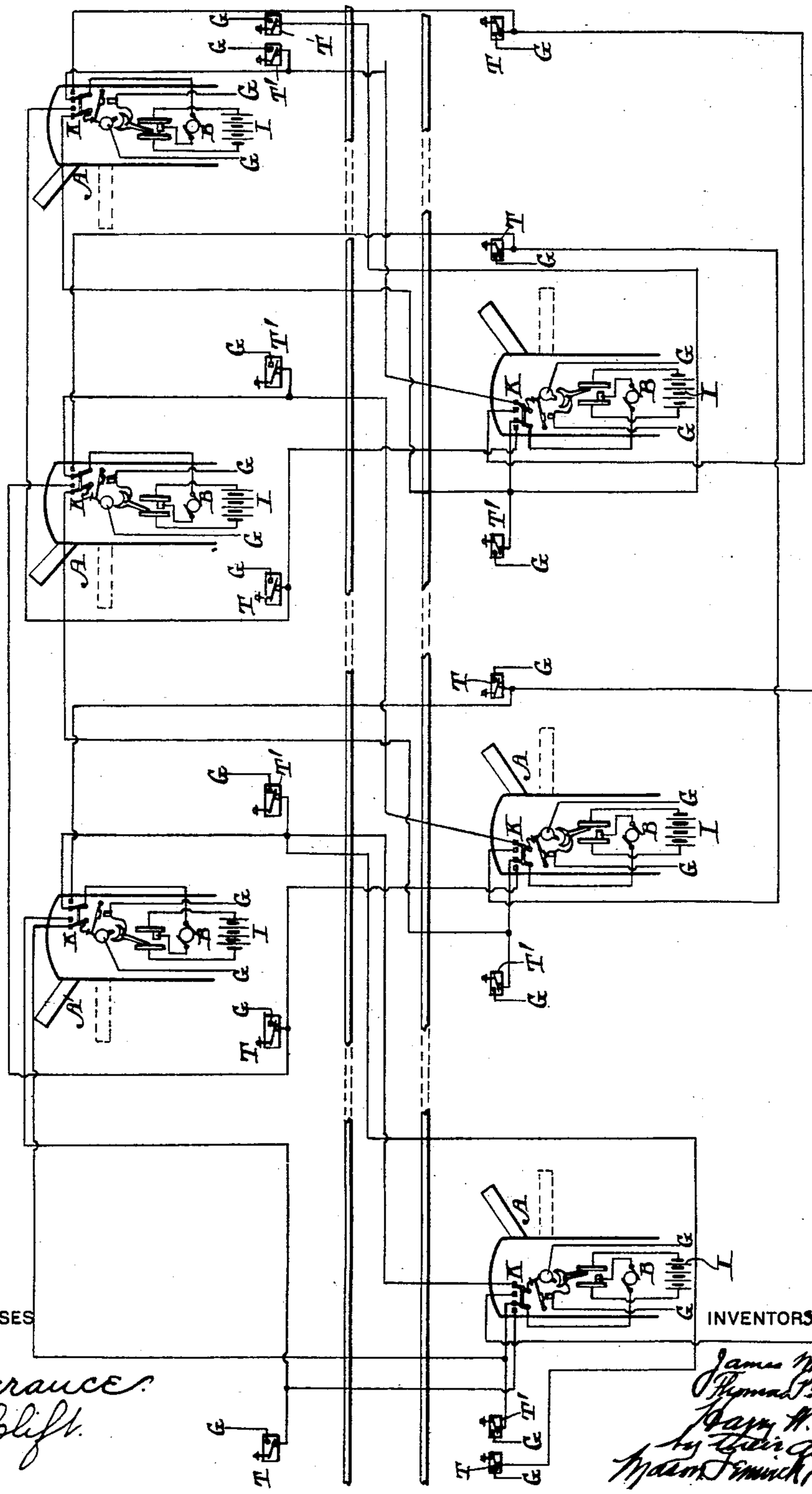

Fig. 12.

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UNITED STATES PATENT OFFICE.

JAMES M. WILLIAMS AND THOMAS P. KINNEY, OF DANVILLE, AND HARRY W. KINNEY, OF LYNCHBURG, VIRGINIA, ASSIGNORS OF ONE-FOURTH TO JAMES A. HENDERSON, OF DANVILLE, VIRGINIA.

AUTOMATIC BLOCK-SIGNAL.

SPECIFICATION forming part of Letters Patent No. 593,504, dated November 9, 1897.

Application filed May 28, 1897. Serial No. 638,600. (No model.)

To all whom it may concern:

Be it known that we, JAMES M. WILLIAMS and THOMAS P. KINNEY, residing at Danville, county of Pittsylvania, and HARRY W. KINNEY, residing at Lynchburg, in the county of Campbell, in the State of Virginia, citizens of the United States, have invented certain new and useful Improvements in Automatic Block-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 improvements in signals, and more particularly to that class of signals which are known as "railway block-signals," and which are adapted to be operated by electricity and controlled automatically by the rolling-stock of the railway.

It consists in a block-signal comprising a suitable signal-arm, an electric motor connected therewith, an electric generator in circuit with said motor, track instruments in the circuit controlling the motor-circuit, a magnet and an armature controlling the circuit-closing brush, and a commutator coöperating with said brush and arranged to move with the signal-shaft, the commutator holding the motor circuit closed during the movement of the said signal and its shaft.

It also consists in a railway block-signal comprising a suitable signal-arm, an electric motor connected therewith, an electric generator in circuit with the motor, track instruments in the circuit controlling the motor-circuit, a magnet and an armature controlling the circuit-closing brush, and a commutator coöperating with said brush and arranged to move with the signal-shaft, the commutator holding the motor-circuit closed during the movement of the shaft, and means for disconnecting the distant track instruments from the motor-circuit when a train is upon the block.

It also consists in certain other novel constructions, combinations, and arrangements of parts, as will be hereinafter more particularly set forth and claimed.

In the accompanying drawings, Figure 1 is a vertical sectional view of our improved block-signal, showing the electrically connected and operated parts. Fig. 2 is a vertical sectional view of the same upon another plane, disclosing the mechanical connection between the signal and the electric motor. Fig. 3 represents a detail sectional view taken transversely of the signal-supporting housing, showing the means for limiting the movement of the signal. Fig. 4 represents an enlarged detail view of the pole-changing fork. Fig. 5 represents a detail view of the catches for the said pole-changing fork. Fig. 6 represents a detail view of the circuit-breaking disk. Fig. 7 represents a detail view showing the means whereby the motor is adapted to start in its movement before it will impart motion to the signal-operating mechanism. Fig. 8 represents a detail view showing the construction of one of the track instruments and also showing the construction of shoes to be mounted upon the locomotive for operating the said track instruments. Fig. 9 is a detail view showing the arrangement of the shoes on both sides of the locomotive, and Fig. 10 represents a detail view showing the connection between the shoes and the reversing-lever of the locomotive. Fig. 11 represents a diagrammatical view of the arrangement of the signals and track-boxes, showing the connecting-circuits. Fig. 12 represents a diagrammatical view showing the circuits through the signal mechanism and the track-boxes.

In the drawings, A represents a signal-arm pivotally mounted upon a hollow standard or housing A′.

B represents an electric motor; C, an armature; G, a magnet controlling it; F, a circuit-breaking disk; T T′, track instruments, and S shoes secured to the locomotive.

The signal A is provided with a supporting-shaft A^2, passing through the housing A′ and having suitable bearings therein. The electric motor B, of ordinary construction, is secured to the base of the housing A′ interiorly thereof, and is provided with a pinion *b*. The pinion *b* meshes with a gear-wheel *b*′,

provided upon its shaft with a pinion b^2, which meshes with another gear-wheel b^3, also provided with a pinion b^4 upon its shaft. This pinion b^4 meshes with a gear-wheel b^5, secured to the shaft A^2 of the signal A. In order to enable the motor to get a start before it imparts movement to the signal-operating gearing, the gear-wheel b' is mounted loosely upon its shaft. The shaft is also provided with laterally-extending arms b^6 b^6, keyed to said shaft. The ends of these arms are adapted to strike spring-held projections upon the opposite sides of the gear-wheel b'. It will be apparent from an inspection of Fig. 2 of the drawings that upon the motor starting in its movement the gear-wheel b' will be turned half a revolution before the projections b^7 b^7 will come in contact with the ends of the arms b^6 b^6 and move the shaft and pinion b^2 secured thereto. Each of the projections or stops b^7 move in slots, as b^8, formed on the periphery of the wheel b'. Coil-springs b^9 b^9, mounted upon a suitable bolt b^{10}, engage the stem of the projection or stop b^7 and cushion its movement. They also serve to return the stops b^7 to their normal position. By the use of this connection between the gears b' and the pinion b^2 the motor is allowed to start as heretofore mentioned, and a smaller motor can therefore be used than would otherwise be necessary. The shafts carrying these intermediate gears and pinions find suitable bearings in the housing A'. By the use of this connecting-gearing for communicating movement to the signal from the motor B the said motor B can be permitted to revolve with its usual speed and yet impart the desired comparatively slow motion to the signal A.

The signal A is constructed in the usual form, having a panel or paddle at one end for giving signals in the daytime and provided with a red or green glass, as a, at the other end, which is adapted to be moved in front of or away from a signal-lantern for night use. The lantern a' is preferably mounted upon a bracket a^2, secured to the side of the housing A'. The movement of the signal-arm is adapted to be limited by stops H H', suitably secured to the housing. The stops H H' are preferably made alike, and consist of swinging bars or buffers, as h h, which are pivoted, as at h', to the inside of the housing A. The opposite ends of these bars or buffers h h extend through apertures in the opposite side of the housing A' a sufficient distance to intercept the movement of the signal-arm A. Coil-springs, as h^2 h^2, are each secured at one of their ends to the inside of the housing in any suitable manner and at their other end are secured to the bars or buffers h h. These springs h^2 h^2 tend to hold the buffers normally in their uppermost positions. Shields, as h^3 h^3, are also secured to the buffers h h just inside the wall of the housing A' and cover the openings through which the ends of the buffers protrude. These shields serve to keep out ice and snow, and thus prevent the clogging of the mechanism just described. The buffer H limits the movement of the signal when it is returned to "safety" and the buffer H' limits the movement of the signal when it is dropped to "danger." These spring-buffers perform an important function in the operation of the device, as will be hereinafter fully described. A storage battery I is located either beneath or near the base of the housing A' for supplying an electric current to operate the herein-described mechanism.

The housing is preferably divided interiorly thereof with a partition A^3. The gearing above described for connecting the motor mechanically with the signal-arm is preferably arranged upon one side of the partition A^3. Upon the other side of the partition is arranged the mechanism for operating the electrical connections.

Two springs E' and E^2 are secured in the housing A', preferably to the partition A^3, their free upwardly-extending ends carrying contacting points e and e', respectively. Between these springs is located a fixed contact E^3, provided with contacting points e^2 e^2 on its opposite ends, which are adapted to be brought into touch with the contacting points e e, as will be hereinafter described. The contacting points e' e' are adapted to be struck by the contacting end of a forked pole-changing lever D, pivotally mounted in the housing A'.

Catches d are pivotally mounted upon a cross-bar D', secured to the housing, the angular ends d' of said catches extending through apertures in said bar D' and adapted to engage an aperture d^2 in the lower end of the lever D to retain said lever at either extremity of its vibratory movement. The opposite ends of said catches are held away from the cross-bar D' by interposed springs d^3.

Upon the shaft A^2 is secured a metallic disk F. In order to insulate said disk from the shaft A^2, a ring f, of suitable insulating material, is secured to the said shaft, and to this insulating-ring is secured a collar f', of any suitable material. The disk F is then attached to the collar f', preferably by screws. In the periphery of the disk F are dovetailed or otherwise secured insulating-blocks F^2 F^2. Said insulating-blocks may also be further secured by countersunk screws.

The disk F is provided with a downwardly-extending projection F', preferably flat upon one side and semi-oval upon the other, and a shorter projection F^3 is also secured upon said disk F on the periphery thereof and is well insulated therefrom. The projection F^3 is in position to engage the forked end of the lever D, so that when the signal is operated and the disk F moved in consequence the said projection will move the lever D from its contact with one of the springs—say E'—to the

other spring E^2. Now the springs E′ and E^2 are respectively connected by wires 6 and 5 with the negative and positive poles *i i′* of the battery I. The contact E^3 is connected with the motor by the wire 4. When the contacting end of the lever D engages one of the springs, it forces it out of contact with the contact E^3, at the same time permitting the other spring to make such contact. In this simple manner the current is changed in direction through the motor for making it operate in one direction or the other for raising the signal to "danger" or dropping it to "safety." As the disk F revolves with the shaft A^2 the projection F′ thereof engages with its semi-oval side the catches *d*, retracting them from engagement with the aperture d^2 in the lever D and permitting said lever to be quickly moved to the opposite position by the projection F^3 coming in contact with the forked end of the lever D at that moment. The projection F′ may be made broad enough to hold both catches *d d* in their retracted positions while the lever D is moving from side to side, but in the event of its not thus holding the catch toward which the lever D is moving long enough the said lever would readily snap by the point of the said catch until it engaged the aperture d^2.

A magnet G is also mounted in the housing A′ and connected by wires 7 and 8 with the lever D and the ground 13, respectively. This magnet, when energized by the electric current, is adapted to attract an armature C, pivotally mounted in the housing and limited in its movement by suitable stops c^3 c^3. The armature C is normally held away from the magnet G by a coil-spring C^2 and carries on its swinging end a brush *c*, adapted to engage the periphery of the disk F when the said armature is attracted by the magnet. The armature C and brush *c* are connected by a wire 9 with the switch which is connected with the track instruments, the said brush serving the purpose of preserving the circuit through the motor until the signal has been raised or lowered. A wire 3 also connects the motor with the switch K, and a wire 10 connects the disk with the ground 14.

In order to lock the paddle automatically in either position which it assumes, we have constructed an automatically-operating catch mechanism upon the shaft A^2 of the signal. To the shaft A^2 is secured a segment J and provided in its periphery with notches, as *j j*. These notches are adapted to be engaged by a lever *j′*, pivoted in the housing A′ and having a weighted end, as at j^2, and an engaging end, as j^3. An armature j^4 is pivotally mounted in the casing A′ and is connected with a lever *j′* by means of a link, as j^5. The armature is adapted to be attracted by a magnet, as j^6, which magnet is in circuit with the wire 10. A stop j^7 limits the movement of the lever *j′* in one direction. When the mechanism in the housing is set into operation by the actuation of a track instrument, the current is caused to attract the armature j^4 toward it. This withdraws the catch j^7 from one of the notches *j* and permits the signal to move to its opposite position. The current through the wire 10 being broken when this movement is completed, the catch will again engage the other notch *j* by reason of the action of the weight j^2.

The track instruments for starting the operation of the signal consist of distant boxes T T, placed on either side of the signal the required distances along the tracks and near boxes T′ T′, placed near the signals.

The distant boxes T T and the near boxes T′ T′ are identical in construction and comprise boxes of cast iron or other suitable material provided with external lugs on either end for support and spiking to the ties. Each box is provided internally with a pivotally-mounted lever *t*, connected with the signal mechanism by a suitable wire. One end of the lever *t* is normally held up by a spring *t′*, while the opposite end is adapted to engage a contact t^2, connected with the ground. The lever *t* carries a depressor-piece t^3, pivoted to the same between the spring *t′* and the pivotal point of the lever *t*. These boxes are placed so that the depressor-pieces t^3 will be near the level of the cowcatcher of a locomotive—say about three inches above the top of the rail—and sufficiently far from the rail to avoid the tread of the wheels.

The track instruments are preferably so arranged that when a train enters a block the shoe, which will be hereinafter fully described, upon the right side of the locomotive will engage an instrument which will actuate the near signal-blocks so as to set the same at "danger" and prevent any train from following the first-mentioned train upon the block. The track instruments are also so disposed that a signal at the opposite end of the block will also be set at "danger," so that a train coming in the opposite direction will not run onto the block, and thus create the danger of a head-end collision. The boxes are also so arranged that when the train passes off the block the two signals at each end thereof will be set at "safety" again. To prevent the possibility of a train which might follow closely after another and engage the track instrument which has just set a signal at "danger" and operate it again to set it at "safety," we have devised a mechanism by which the box just operated becomes disconnected from the actuating mechanism in the signal and also a means for disconnecting the signal at the opposite end of the block from the track instruments, so that a train engaging it will not set the signal at "safety" during the time when the first train is upon the block. This mechanism consists of a switch K, preferably mounted upon the partition A^3 in the housing A′. The switch K consists of levers, as *k k*, pivotally mounted to the partition A^3

at k'. These levers k are preferably connected by a link k^2, so that they operate in unison. A bell-crank lever k^3 is also pivoted to the partition A^3. One end of the bell-crank k^3 is pivotally connected to the link k^2, but well insulated therefrom, and the other end of the said bell-crank is adapted to be engaged by studs or pins, as k^4, upon the gear-wheel b^5. By this means when the gear-wheel b^5 is actuated to move the signal from one position to the other the bell-crank will be struck by one of the studs k^4 and be caused to set the switch in another position from the one which it then occupies. The free ends of the levers k are adapted to engage insulated blocks, as k^5 k^6. As shown in the drawings, one of the blocks k^5 is connected by wire 2 with the near signal-box T′ upon the right-hand side of the track and the other block k^5 is connected by a wire with a distant box T upon the left-hand side of the track. One of the blocks k^6 is connected with a near box T′ upon the left-hand side of the track and the other block k^6 is connected with a distant box T. The wire 3 connects the switch with the motor and the wire 9 connects the switch with the armature C. It will be seen that when the signal has been actuated by contact with the near box T on the right-hand side of the track and the mechanism has dropped the signal to "danger" that the switch will be moved so that the box T′ will be cut out of circuit and the distant box on the right-hand side of the signal will be placed in circuit, so that when the train is ready to leave the block it will again be ready to actuate the signal and set it at "safety." The operation will be seen to be the same in the opposite direction. The blocks k^5 k^6 are insulated from each other and also from the partition A^3, to which they are secured. The moving parts of the switch are also thoroughly insulated from the partition A^3. In order to make a good electrical connection between the moving parts of the switch, wires, as k^8 k^8, connect the levers k k with the link k^2.

In order that the locomotives passing over the road may be adapted to suitably engage the depressor-pieces t^3 of the boxes T T T′ T′, each one is provided with a pair of spring-pressed shoes S, one on each side, preferably of wrought-iron, having vertical stems s and guides s' s', one on either side of said stems. The stems s pass through hollow boxes S′, adapted to be secured to the locomotive, preferably to the truck-frame just behind the cow-catcher. Coil-springs of suitable strength, surrounding the stems, are interposed between the tops of the boxes and collars s^2, secured to the stems s for normally depressing the same. The stems s extend above the boxes S′ and are provided at their ends with heads or projections s^3, adapted to be engaged by arms s^4 upon either end of the rock-shaft s^5, suitably mounted upon the locomotive. A lever-arm s^6, attached to the shaft s^5, may be connected with the reversing-lever of the engine, so that when the locomotive is traveling forward the shoe on the right of the same will be lowered to engage the depressor-piece t^3, while the shoe on the other side of the locomotive will be raised out of operative position. The opposite dispositions of the shoes will be consequent upon the reversal of the lever and the traveling backward of the locomotive. This alternate movement of the shoes S is brought about by arranging the arms s^4, so as to extend upon opposite sides of the rock-shaft s^5 in such a manner that when one is raised the other is lowered.

If it is not desired to connect the shoe-operating mechanism with the reversing-lever of the locomotive, it may be connected with a suitable operating-lever of its own.

The operation of the herein-described mechanism is as follows: When a locomotive equipped with shoes S approaches a near box T′ of a block, the shoe S on the right-hand side depressing the pieces t^3, a circuit is made by wire from ground to lever t and contact t^2 to wire 2 to switch K, causing current from battery to pass through motor from wire 3 to wire 4, through contact E^3 and spring E′ to wire 6, through negative pole of battery to wire 5, through spring E^2, lever D, wire 7, through magnet-spools G to wire 8, to ground 13, causing magnet G to attract armature C and forcing the contact of the brush c with disk F, thus forming a short circuit from wire 6 through battery to wire 5, to spring E^2, lever D, through magnet G to ground 13, through wire 10 from ground 14 to disk F, through armature-brush c, through wires 9 and 3 to switch, to motor, to 4 and 6 to battery again. The signal will then rise to "danger," and the current will be preserved and exerted on the motor till the brush c of the armature C touches the insulating-blocks F^2 of the disk F, breaking the short circuit at the brush c. The motor will of course cease to to operate until another circuit is started and completed. At this point the rebound of the buffers H and H′ becomes of importance, for the buffer H will force the signal slightly upward, leaving the armature-brush c in proper position to form contact with the disk F upon the depression of the depressor-pieces t^3 of another box, as distant box T. The action of the buffer H′ will be the same upon the opposite movement of the signal A. It will be observed that the projection F^3 on the disk F will have forced the forked lever D to E′ at the same moment that the armature-brush c ran upon the insulating-block F^2, thus placing the positive pole into circuit and changing direction of the current and leaving the signal in condition to be dropped to "safety" at the proper time.

When the locomotive passes the distant box T in leaving the block and operatively engages the same, the circuit will be made through the wire from the ground to lever t,

to wire 2, switch K, and wire 3, through motor to 4, to E^3, to E^2, wire 5 to positive pole, through battery to wire 6, lever D, through wire 7 to magnet-spools G, through 8 to ground, causing armature C to make contact by brush C with disk F, forming short circuit, as before. The signal will then be moved until brush *c* runs on insulating-block F^2, breaking circuit around T', and the signal is at "safety" again. The projection on disk F' will have forced the lever D from E^2 to contact at E', breaking circuit at E^3 at the moment the brush *c* ran on the insulating-block F^2, and the rebound of the signal caused by the spring H' will have left brush *c* in position for contact with disk F upon the next depression of the apparatus in the track instruments. It will be seen from the aforegoing that by the mechanism described a signal is provided, automatic in its action, which can be operated at any desired distance from the said signal, either singly, in pairs, or in groups, by locomotives running either forward or backward, and requires only attention at intervals to the battery. It should be understood, however, that it is not desired to be limited to the use of a battery, for it is evident that other sources of electricity, when convenient, can be as easily and effectively used without departing from the spirit of our invention.

When the signal is placed at "danger" by a passing train, it remains at "danger" until the train passes from the block, regardless of the length of time elapsing between the passing of the train upon the block and the time when it leaves the same. The signal will also remain at "safety" indefinitely until another train passes on the block. It will also be observed that the device uses very little electricity, only employing it when changing the signal. Where batteries are used, they may be charged at terminal electric stations at long intervals, perhaps months, this of course depending upon the number of trains run.

Where the shoes S are connected with the reversing mechanism of the locomotive, the attention of the engineer is not necessary to the operating of the signal; but, if it is desired, the signal can be operated at the will of the engineer by providing the shoes S with a special lever in the cab, as hereinbefore mentioned.

It will be noticed that the parts are simple and easily repaired at small cost and can be applied by laborers of ordinary intelligence, and that a grounded circuit is preferably used.

In the operation of block-signals for railways there is a possibility of two trains entering the opposite ends of the same block at the same time, and in such an event, unless the signals are especially located with a view to such a contingency, there would be danger of a collision. In the use of our block-signal it is merely necessary to locate the track-boxes a little differently at one end of the block from the way in which they are located at the opposite end of the block. By this means trains passing in one direction will always have the right of way over those coming in an opposite direction. In the use of our signal apparatus it will be seen that it is only necessary to locate the boxes to the distant signal and the box to the near signal at a point close by the near signal itself at one end of the block, so that a train entering that end of the block and moving at the ordinary rate of speed will be on the block before the near signal has been completely operated. On the other hand, in arranging the boxes at the opposite end of the block the box for the distant signal is so placed as to be reached by the train a few minutes before the box to the near signal and the signal itself is reached. By this expedient, if a train has entered the opposite end of the block, the signals at both ends of the blocks will have been set at "danger" by that train, and the other train, after passing the distant boxes and operating the near box, will find the signal closed and already set at "danger," so as to indicate that a train is upon the block. It will be seen by this simple arrangement of the boxes that the engineers will always know who has the right of way, and no occasion will rise when they will not be given the proper signal.

While the above description is applicable particularly to a system for a single track, yet we do not wish to be understood as limiting our invention to the use of such a track only, as it is obvious that the same mechanisms can be, if desired, employed for a double track to prevent rear-end collisions by connecting up signals upon one side of the roadbed independently with respect to those on the opposite side.

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

1. In an electric signal, the combination with a suitable housing, of a signal-arm mounted thereon, a reversible motor in said housing, means for connecting the said motor with the said arm whereby the motor is adapted to impart a positive movement thereto, both to raise and to lower the same, track instruments for closing a circuit through the said motor, means for reversing the circuit through the motor and means operated by the moving parts of the signal-operating means, separate from said track instruments, for cutting them out of circuit after they have been operated by a train passing upon a block and means for placing the said track instruments into circuit again when the train passes from the block, substantially as described.

2. The combination with a member adapted to be raised or lowered, of a motor connected therewith, means for completing a circuit through the said motor, a pole-changing de-

vice for changing the direction of the current through the said motor, a commutator secured to the shaft of the member, a brush adapted to engage and disengage said commutator and preserve the current for a predetermined period of time, a switch comprising independent levers, means for causing the said levers to operate simultaneously, and means connected with the said connecting means adapted to be struck by a projection upon the signal-operating means whereby the switch may be caused to shift quickly from one position to another to cut out the desired track instruments, substantially as described.

3. In an electric signal, the combination with a suitable housing, of a signal-arm mounted thereon, an electric motor in the said housing, means for mechanically connecting the motor with the signal and means for controlling the electric circuit passing through the said motor, a locking means secured to the shaft of the signal consisting of a segment rigid upon the said shaft and provided with notches in its peripheral edge, a pivoted catch adapted to engage said notches consisting of a forked lever, a weight upon one end of said lever, a catch upon the upper arm of said lever and a link securing the other arm of said lever to an armature pivotally mounted in the said casing, an electromagnet for operating it in one direction, the construction being such that the magnet is adapted to retract the catch from the said notches and the weight is adapted to bring the catch into engagement with the said notches, substantially as described.

4. In an electric signal, the combination with a housing, of a signal mounted thereon, an electric motor connected with the said signal, means for completing a circuit through the said motor, means for preserving the said circuit for a predetermined period, means for breaking the circuit at the proper time and means for limiting the movement of the signal consisting of spring-buffers mounted interiorly of said housing and extending outside of the same in the path of the signal-arm, the said buffers being adapted to set the signal-operating mechanism in proper position for the next operation of the signal, substantially as described.

5. In a signal, the combination with a suitable housing, of a signal-arm mounted thereon, an electric motor for operating the said signal-arm, means for closing a circuit through the said motor, means for preserving the said circuit for a predetermined period, of time, means for limiting the movement of the signal-arm consisting of buffer-bars pivotally mounted in the said housing and projecting therefrom so as to intercept the movement of the said signal-arm, and springs for holding the said buffers normally against action of the said signal-arm, substantially as described.

6. In a signal, the combination with a suitable housing, of a signal-arm mounted thereon, an electric motor for operating the said signal-arm, means for closing a circuit through the said motor, means for preserving the said circuit for a predetermined period, of time, means for limiting the movement of the signal-arm consisting of buffer-bars pivotally mounted in the said housing and projecting therefrom so as to intercept the movement of the said signal-arm, and springs for holding the said buffers normally against the action of the said signal-arm, shields secured to said bars adapted to cover the openings through which the said bars project whereby the snow and ice and other foreign substances are prevented from entering the housing at that point, substantially as described.

7. In a signal, the combination with a suitable housing, of a signal-arm mounted thereon, a motor for operating the said arm, gearing for connecting the said motor with the said arm, a gear-wheel of the said gearing being loose upon its shaft, arms rigidly secured to the said shaft, spring-controlled stops loosely mounted upon said loosely-mounted gear-wheel adapted to engage the arms for imparting movement to the said shaft, the construction being such that the motor is enabled to attain a degree of velocity before it actuates the said arm and means for electrically controlling the said motor, substantially as described.

8. In a signal the combination with an arm adapted to be raised or lowered, of a motor connected therewith, means for completing a circuit through the said motor, a pole-changing device for changing the direction of the current through the said motor, a commutator secured to the shaft of the signal, a brush adapted to engage and disengage said commutator and preserve the current for a predetermined period of time, a switch for connecting the circuit-closing means with the said motor, and means for shifting the said switch according to the movement of the signal, comprising a lever secured to the switch at one end and adapted to extend into the path of a projection on the gear-wheel of the arm-operating mechanism, whereby the switch is caused to be moved back and forth, substantially as described.

9. In a signal, the combination with an electric motor connected therewith, an electric generator in circuit with the motor, track instruments in the circuit controlling the motor-circuit, a magnet and an armature controlling a circuit-closing brush, a commutator coöperating with said brush and arranged to move with the shaft of the signal, the commutator holding the motor-circuit closed during the movement of the signal-shaft, springs connected with the poles of the motor-circuit, a lever operated by the commutator-shaft and adapted to engage the springs alternately for changing the direction of the electric current,

catches for holding said lever in its alternate positions and means for releasing the lever from the catches when desired, a switch for connecting the circuit-closing means with the motor and a means for immediately shifting the said switch according to the movement of the signal comprising a lever secured to the switch at one end and adapted to extend out at its other end into the path of a projection on the gear-wheel of the arm-operating mechanism whereby the switch is caused to be moved back and forth, substantially as described.

In testimony whereof we hereunto affix our signatures in presence of two witnesses.

JAMES M. WILLIAMS.
THOS. P. KINNEY.
HARRY W. KINNEY.

Witnesses to James M. Williams and Thos. P. Kinney:
W. H. ALLEN,
J. C. WATSON, Jr.
Witnesses to Harry W. Kinney:
C. W. PRICE,
C. W. SCOTT.