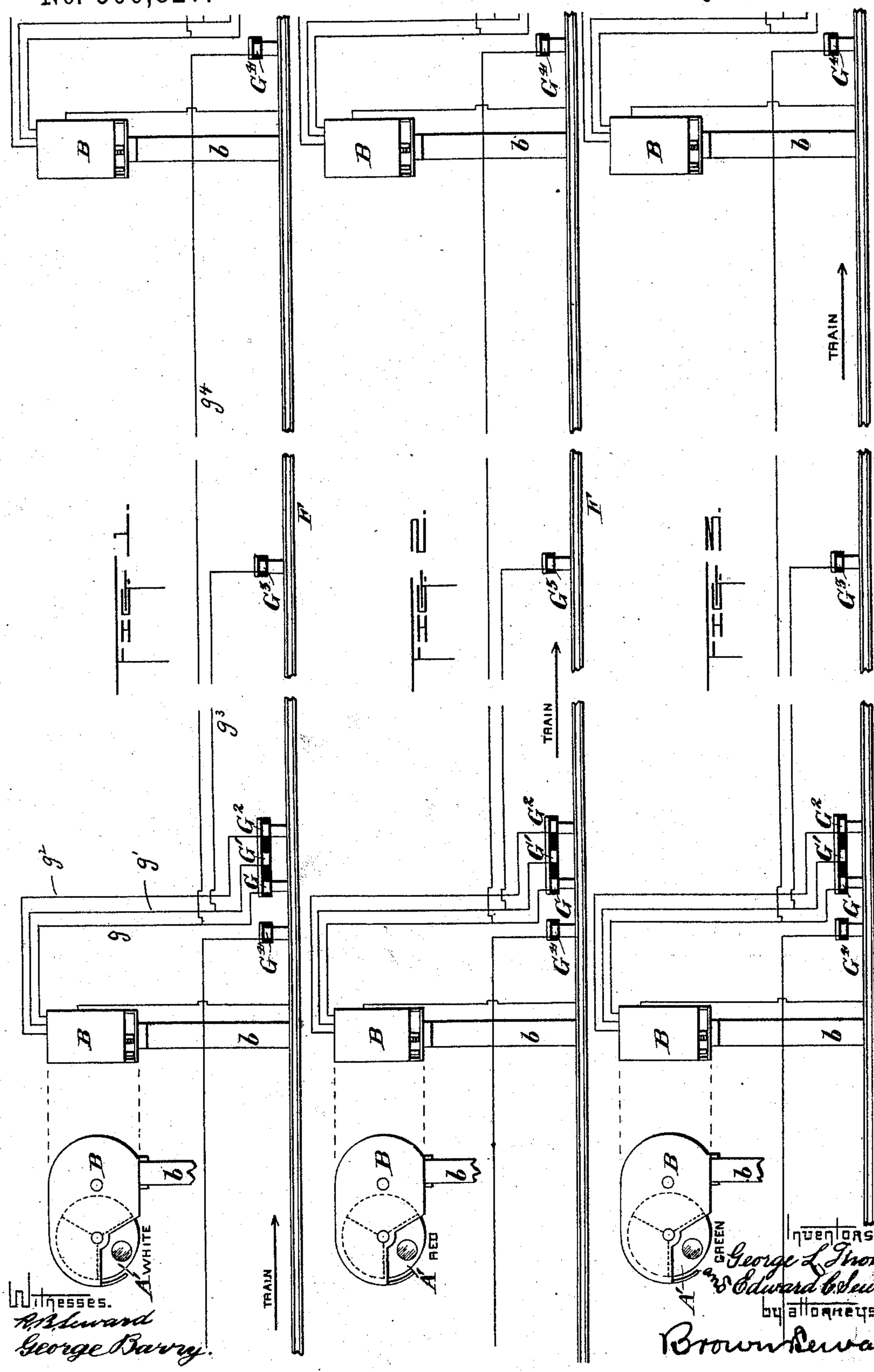
(No Model.) 4 Sheets—Sheet 1.

G. L. THOMAS & E. C. SEWARD.

RAILWAY SIGNAL SYSTEM.

No. 500,827. Patented July 4, 1893.



Witnesses.
R. B. Seward
George Barry.

Inventors.
George L. Thomas
and Edward C. Seward
by attorneys.
Brown & Seward

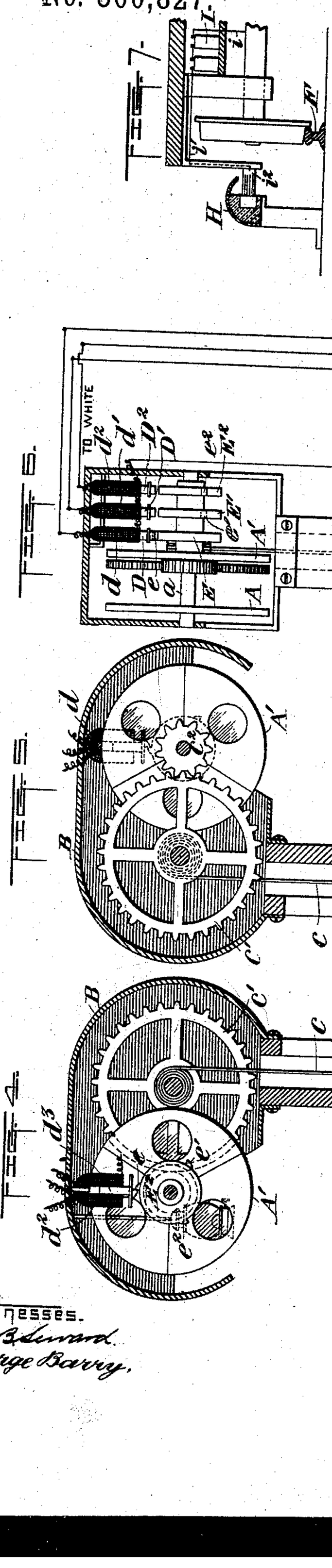
(No Model.)

4 Sheets—Sheet 2.

G. L. THOMAS & E. C. SEWARD.

RAILWAY SIGNAL SYSTEM.

No. 500,827. Patented July 4, 1893.



Witnesses.
B. B. Edwards.
George Barry.

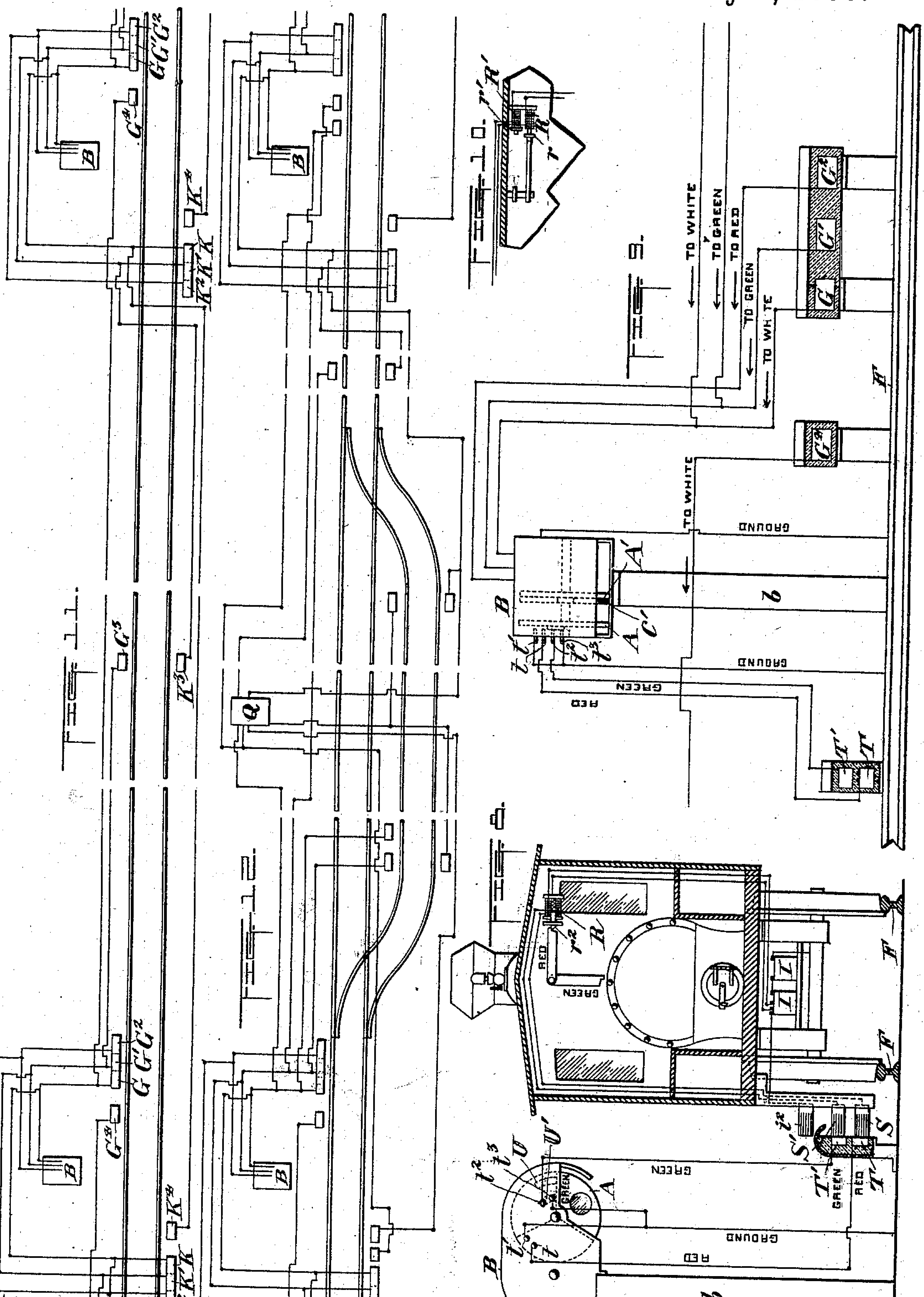
Inventors,
George L. Thomas and
Edward C. Seward
by attorneys.
Brown & Seward

(No Model.) 4 Sheets—Sheet 3.

G. L. THOMAS & E. C. SEWARD.

RAILWAY SIGNAL SYSTEM.

No. 500,827. Patented July 4, 1893.



Witnesses
R. B. Seward.
George Barry.

Inventors.
George L. Thomas & Edward C. Seward
by attorneys. Brown & Seward

(No Model.) 4 Sheets—Sheet 4.

G. L. THOMAS & E. C. SEWARD.

RAILWAY SIGNAL SYSTEM.

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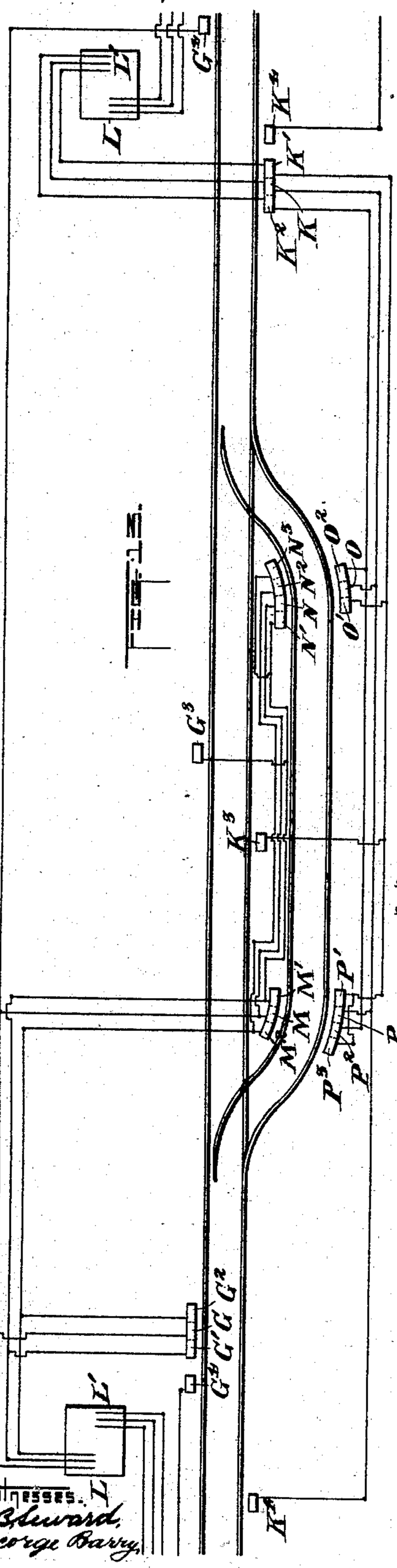

Fig. 1.

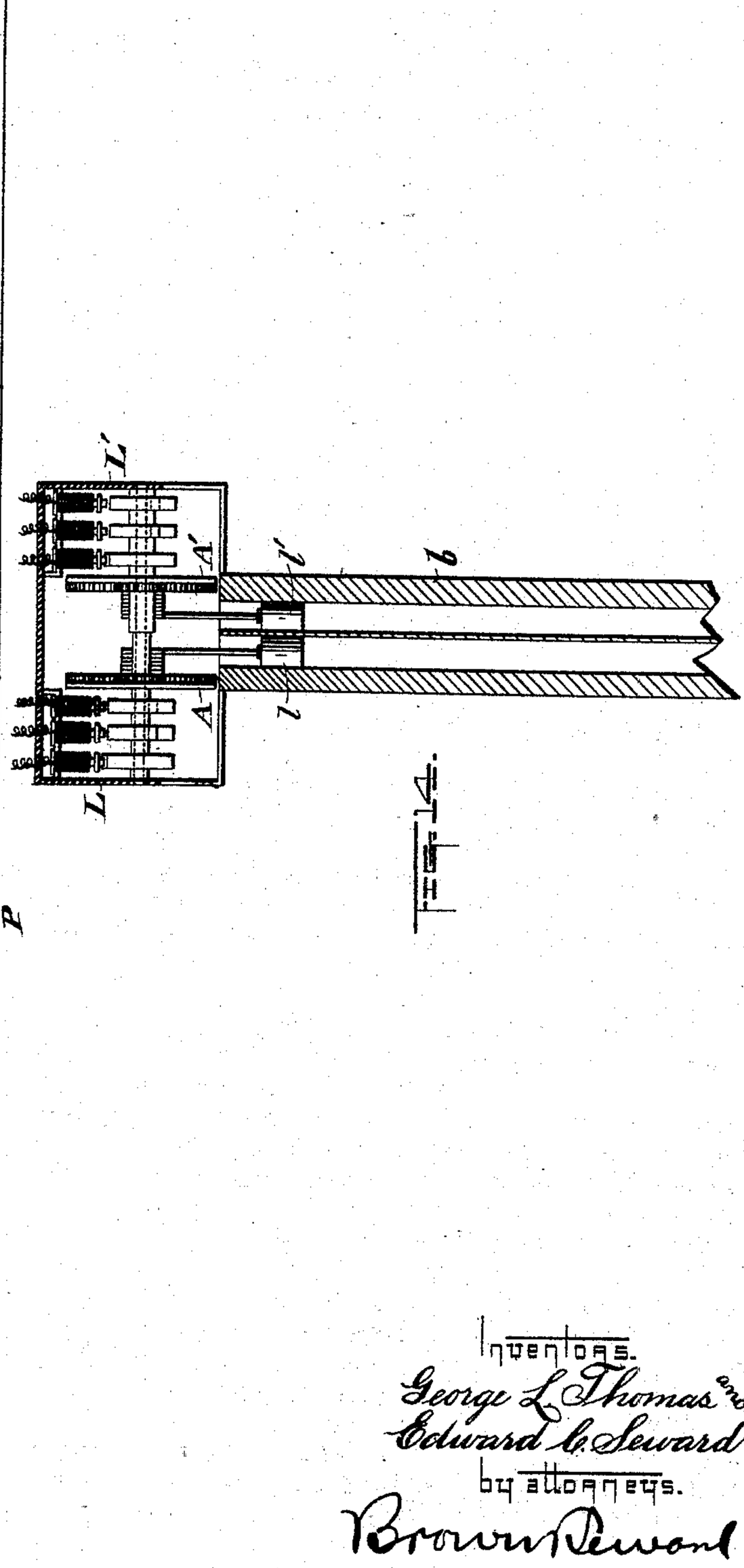

Fig. 2.

Witnesses.
H. B. Seward.
George Barry.

Inventors.
George L. Thomas and
Edward C. Seward
by attorneys.
Brown Seward

UNITED STATES PATENT OFFICE.

GEORGE L. THOMAS, OF BROOKLYN, NEW YORK, AND EDWARD C. SEWARD, OF MONTCLAIR, NEW JERSEY, ASSIGNORS TO SAID THOMAS.

RAILWAY SIGNAL SYSTEM.

SPECIFICATION forming part of Letters Patent No. 500,827, dated July 4, 1893.

Application filed March 6, 1893. Serial No. 464,703. (No model.)

To all whom it may concern:

Be it known that we, GEORGE L. THOMAS, of Brooklyn, in the county of Kings and State of New York, and EDWARD C. SEWARD, of Montclair, in the county of Essex and State of New Jersey, have invented a new and useful Improvement in Railway Signal Systems, of which the following is a specification.

Our invention relates to an improvement in railway signal systems for use in connection with either a single or double track railway and with the general object in view of providing an effective and economical system capable of being operated automatically and adapted to both day and night use.

Our system briefly stated contemplates an endless series of signals arranged to successively appear in operative position and under the control of the passing train, to indicate the condition of the block on which a train at the time being is, to the engineer of a train approaching the block.

Our invention further contemplates the material lessening of the number of signal towers or posts required by presenting to a train about to enter upon a block a permissive signal which will indicate to the engineer of that train that a certain predetermined portion of the block he is about to enter upon is clear thereby enabling him to run at full speed that predetermined distance as though it were a complete free block.

In the accompanying drawings, Figures 1, 2 and 3 each represent a signal block, showing the towers or signal posts at the opposite ends of the block and a short section of track beyond the limits of the block, three different positions of the train being denoted by arrows and the change in signal being represented to correspond with the positions that the trains occupy. Fig. 4 represents one of the signal posts or towers in vertical section, showing the apparatus therein in side elevation. Fig. 5 is a similar view, showing the operative mechanism on the opposite side from that shown in Fig. 4. Fig. 6 is a view of the tower or post in front elevation, the head being shown in section to disclose the operative parts therein, and this view also shows contact plates at the side of the track and their connections with the signal controlling magnets. Fig. 7 is a partial transverse section through the locomotive, conventionally indicated, and through the contact plate support, indicating the electric connection between the locomotive and one of the contact plates. Fig. 8 is a transverse section through the track and cab of the locomotive, conventionally indicated, showing one of the signal towers or posts in side elevation and the connections with a supplementary signal in the cab of the locomotive. Fig. 9 is a view in front elevation of one of the signal posts or towers, showing the contact plates along the side of the track both for the block signal and for the supplementary signal upon the locomotive. Fig. 10 is a top plan view in detail of the signal operating mechanism within the cab of the locomotive. Fig. 11 is a diagrammatical plan view of a block, showing the connections for operating the signals by trains running in opposite directions on a single track. Figs. 12 and 13 represent diagrammatical top plan views of the connections at a shunt or switch on a single track road, the former being adapted to use in connection with a special signal at the station or at the side of the switch track and the latter being adapted to use in connection with a special signal at the opposite ends of the switch track, and Fig. 14 represents in vertical section on a plane parallel with the track, the form of signal post or tower and operative mechanism employed in connection with the shunt or switch track signals indicated in Fig. 13.

In describing the system we have chosen an endless series of three signals colored respectively white, red and green, the former being employed as usual to denote "block clear;" the red to denote "stop" and the green to denote that a portion of the block is clear, in the present instance one-half the block, and hence is permissive and equivalent to "one-half block clear." The signals are formed on a pair of disks A and A′ mounted in axial alignment and separated from each other sufficiently far to permit the hanging of a lantern between them, as indicated in Fig. 4. Each of the colors white, red and green occupies one-third of the disks and each third is provided with a bull's eye or glass section of the same color as the section in which it is inserted, so that if

an ordinary white light be hung between the disks it will indicate by shining through the glass the color of that section which for the time being is exposed in operative position.

The disks A, A′, as represented in the several figures with the exception of the special arrangement shown in Fig. 14 are mounted to rotate in unison upon a shaft *a* supported in a hood or casing B fixed to the top of the post *b* and adapted to conceal from view, to a person looking along the line of track at the signal, the entire faces of the disk excepting the third which for the time being is exposed as a signal. The concealed and exposed sections of the disk are clearly indicated in Figs. 1, 2 and 3.

The disks A and A′ have a constant tendency to rotate in one direction which tendency is imparted to them by a suitable motor acting upon their shaft. The motor which we at present find it most desirable to employ consists of a weight C suspended by a flexible connection *c* from the shaft of a spur wheel *c′* in gear with a pinion c^2 fixed to rotate with the disks, a provision being made for winding the weight in any well known or approved manner, such for example as that employed in the ordinary clock movement. The weight C is arranged to travel up and down within the hollow interior of the post *b* and the latter is, in the present instance, provided with a slot *b′* through its wall through which a tell-tale c^3 on the weight C extends to indicate the position of the weight C so that it may be wound up before it reaches the bottom of the post.

The disks A and A′ are held against the rotary movement under the action of the motor and permitted to rotate step by step, by a series of three independent stops D, D′, D^2 fixed respectively to the armatures of three electro magnets, the stop D fixed to the armature of the magnet *d*, the stop D′ to the armature of the magnet *d′* and the stop D^2 fixed to the armature of the magnet d^2. The several magnets are preferably arranged within the upper portion of the hood B and depend from a suitable support therein, their armatures having a movement up and down toward and away from the poles of the magnets, the said armatures being in the present instance guided in their movements by suitable stems extending between the branches of the magnets, as indicated at d^3, Fig. 4.

The several stops D, D′ and D^2 are arranged to catch and release teeth or abutments on a series of wheels fixed to rotate with the disks A and A′. The wheel E is provided with a tooth *e* adapted to be engaged and released by the stop D, the wheel E′ is provided with a tooth *e′* adapted to be engaged and released by the stop D′ and the wheel E^2 is provided with a tooth e^2 adapted to be engaged and released by the stop D^2. It is obvious that the teeth *e*, *e′* and e^2 might project from the surface of a continuous cylinder instead of from the peripheries of three wheels, as herein shown and referred to. Suppose the tooth *e* to be engaged by the stop D, as shown in Fig. 6. If the stop D be withdrawn, it will permit the disks A and A′ to rotate until the tooth *e′* engages the stop D′. If then the stop D′ be withdrawn, it will permit the disks to still further rotate until the tooth e^2 engages the stop D^2 and if the latter be then withdrawn, it will permit the disks to rotate still further around to the point of starting with the tooth *e* engaged with the stop D. It will further be observed that when the disks are held by any one of the three stops D, D′, D^2 the withdrawal of either or both of the other stops will have no effect upon the disk.

The track along which the signal towers or posts are set is denoted by F. Along the side of the track, a short distance from the signal post, there is located a series of contact plates each insulated from surrounding objects and electrically connected with one of the electro magnets; in the present instance we have assumed that a train is running in the direction indicated by the arrows in Figs. 1, 2 and 3 and that the contact plates with which the locomotive is intended to make connection are located on the left hand side of the track. The contact piece G is connected by a wire *g* with the electro magnet d^2, the contact piece G′ is connected by a wire *g′* with the electro magnet *d′* and the contact piece G^2 is connected by a wire g^2 with the electro magnet *d*. An isolated contact piece G^3 is supposed in the present instance to be located midway of the block between two successive signal posts and is connected by a wire g^3 with the wire *g′* leading to the electro magnet *d′*. An isolated contact piece G^4 is connected by a wire g^4 with the electro magnet d^2 at the preceding signal post, the contact plate G^4 being located in position to be acted upon by a locomotive after it passes a succeeding signal post and before it contacts with the plates G, G′ and G^2 at that post. The contact plates G, G′, &c., are preferably embedded in insulating material and supported at a suitable height along the side of the track and protected from the action of the weather by means of a projecting cover H. The several electro magnets *d*, *d′* and d^2 have a common ground wire connection d^4.

The supply of electricity for energizing the several electro magnets may be conveniently derived from a battery of any well known or approved form, one located at each signal post and inserted for example in the ground wire connection d^4, or as preferred and as herein shown, the battery may be carried by the locomotive and serve to energize the several block circuits as the locomotive passes from block to block and makes contact with the contact pieces at the sides of the track.

The battery, carried by the locomotive is indicated in Figs. 7 and 8 by I, one of its poles being connected by a wire *i* with the locomotive and through it with the rail or ground

and the opposite pole connected by a wire i', insulated from the locomotive, with a brush i^2 carried at the side of the locomotive in position to make electric contact with the several contact pieces G, G′, &c., along the side of the track.

It is obvious that brushes might be substituted for the several contact pieces G, G′, &c., and a single contact piece be carried by the locomotive in place of the brush i^2 if so desired, such construction being a mere reversal of parts.

As thus far described, the system is adapted for use in connection with a double track railway in which the trains follow each other in succession out on one track and in the opposite direction back on the other track, a separate set of signal posts being arranged for each track and under the control of the trains moving in the same direction along that track.

The words "to white," "to green," "to red," placed upon the connecting wires in the several figures are to be interpreted as referring to those circuits which when completed will change the signal disks to disclose respectively white, green and red.

The operation is as follows:—Referring to Figs. 1, 2 and 3, suppose a train to be approaching the block as indicated by the arrow in Fig. 1 and the signal exposed at the beginning of that block be the white signal indicating "block clear." The engineer understands from this that he may run at full speed the entire block between the two consecutive signal posts. As the train passes the first signal post, the locomotive will make connection with the contact plate G^4 and by establishing a complete circuit through the battery carried by the locomotive, the ground and the magnet d^2, at the preceding station will release the stop D^2 and throw the signal at that preceding station to white, provided no train has entered the block before the train indicated by the arrow in Fig. 1 reaches the contact plate G^4. The locomotive will then make contact successively with the posts G, G′ and G^2. The contact with the posts G and G′ will have no effect upon the signal just passed because that signal is being held by the stop of the electro magnet d in electric communication with the plate G^2, but, as soon as the contact with the plate G^2 is made, the stop D will be withdrawn by the energizing of the magnet d and the signal disk will be permitted to rotate one-third of a revolution, bringing the red signal into exposed position as denoted in Fig. 2. This signal will continue exposed and will form a bar to the passage of any following train until the train now on the block has made contact with the plate G^3 at the middle of the block, and by so doing has energized the magnet d' and thereby withdrawn the stop D′ and so permitted the disks A and A′ to rotate another third revolution, thereby exposing the green signal, as indicated in Fig. 3. This signal will remain while the train runs the second half of the block and until it has passed the contact plate G^4 beyond the end of the block under consideration and by its contact therewith will have energized the magnet d^2 and thereby withdrawn the stop D^2 and permitted the signal disk to rotate another third revolution, bringing the white signal into an exposed position, as indicated in Fig. 1. If a second train approach the beginning of a block before the train on that block has left it clear and after the train on the block has passed the middle point of the block and set the signal at the beginning of the block to green—as indicated in Fig. 3,—the train so approaching the block will understand from the green signal that the first half of that block is clear and it may proceed under full headway to the middle of the block. When such second train passes the beginning of the block where the signal is set at green, its contact with the plate G will first set the signal to white by releasing the stop D^2 which holds the signal at green, its contact with the plate G′ will have no effect upon the signal and its contact with the plate G^2 will change the signal from white to red, thereby leaving the signal which it found green changed to red to protect it until it shall have cleared the first half of the block upon which it has been permitted to enter by the green signal. This action of a subsequent train will take away from the train in advance of it and which had not cleared the block when the following train entered it, its control over the preceding signal because when it, viz., the train in advance, passes the contact plate G^4 as it leaves the block, it will not affect the signal at the beginning of the block since that signal is now under the control of the stop which holds it to red instead of the stop which holds it to green and the following train will assume absolute control of the signal.

In applying the system to a single track where trains are run in opposite directions upon the same track and provision is made for their passing one another by means of shunt tracks, our invention contemplates means for giving the control of the line of signals to each train after they have passed each other and move on in opposite directions from each other. In general the same signals are employed along the line of the single track for the trains running in opposite directions and to this end we provide, as represented in Fig. 11, a second set of contact plates K, K′, K^2, K^3 and K^4 corresponding to and in the same circuit with the plates G to G^4 inclusive but arranged upon the opposite side of the track and upon the opposite side of the signal post from the said plates G to G^4 inclusive so that if the locomotive be provided with a contact brush i^2 on its left hand side, as has been hereinabove assumed, it will make contact with the plates G to G^4 inclusive when running in the direction of the arrows in Figs. 1, 2 and 3 and when running in the opposite direction, it will make contact

with the plates K to K^4 inclusive and will operate the several signals in the same manner as hereinabove described.

In providing for the passing of two trains by running one train upon a shunt or switch track, it is desirable that the signals upon the main line should be left clear as soon as the train has passed upon the shunt track and that as soon as train on the shunt track again passes on to the main track, it should find the signals in position to be again operated in the proper manner as it passes on. To this end we have provided at the shunt tracks, which may or may not occur at stations along the line, but which commonly do so occur, a special signal or signals under the control of the train upon the shunt track. Our preferred arrangement is that shown in Figs. 13 and 14 in which a portion of a track including a shunt track is made a special block and the signal posts at its opposite end have a double set of operating magnets, one set for each of the two disks A and A′, the said disks being in this instance arranged to rotate independently of one another, as clearly indicated in Fig. 14. In this arrangement one of the disks, A for example, and its set of operating magnets L are under the control of a train running in the direction from left to right (referring to the diagram Fig. 13) while the other similar disk A′ and its set of operating magnets L′ are under the control of a train running from right to left (referring to the same diagram).

The disks A and A′ are each provided with its own actuating weight, the former denoted by *l* and the latter by *l′*.

In proximity to the tower or post and on the left hand side of the track between the tower and the end of the shunt track, there are the usual sets of contact plates G, G′, G^2 and G^4 and K, K′, K^2 and K^4, the former communicating with the set of operating magnets L and the latter with the set of operating magnets L′. The contact plates G^3 and K^3, located at the middle points of the block, are here shown as happening on the main track between the opposite ends of the shunt track, although their particular location with respect to the shunt track is immaterial.

On the left hand side of the shunt track as a train passes thereon going from left to right and near the end of the shunt track, there is located a set of contact plates M, M′ and M^2, corresponding to and in circuit with the same operating magnets as the plates G, G′, G^2, but arranged in reverse order, *i. e.*, while the contact of the locomotive completing circuit successively with the plates G′, G, G^2 would operate the stops tending to throw the signal, "to green," "to white," "to red;" the successive contacts with the plates M^2, M, M′ would tend to operate the signal "to red," "to white" "to green." Near the opposite end of the shunt track and on the left hand side thereof, supposing the train to be passing from left to right, there is a series of contact plates N, N′ N^2, N^3; the plate N for closing the circuit which is closed by the plates M and G heretofore considered for throwing the signal to white, the plate N′ with M′ and G′ to throw the signal to green, the plate N^2 with M^2 and G^2 to throw the signal to red and the plate N^3 by a short connection with the circuit connected with the plate N′ to throw the signal to green, the same as the plates N′, M′ and G′. In the same manner upon the opposite side of the shunt track in position to engage a circuit closer carried by a train coming onto the track from right to left, there is located near the end of the shunt track a set of three contact plates O, O′ O^2 bearing the same relations to circuits in which the plates K, K′ and K^2 are located that the contact plates M, M′ and M^2 bear to the circuits in which the plates G, G′ and G^2 are located, as hereinabove described. There is also a set of four contact plates P, P′, P^2 and P^3 on the left hand side of the shunt track near the end off which the train from right to left passes which plates correspond in their connections and effect to the plates N to N^3 inclusive, hereinbefore referred to.

In operation, suppose a train passing from left to right to enter upon the shunt track after having passed the signal post at the left, the red signal under control of the set L being left exposed. In passing upon the shunt track connection will be made successively with the plates M^2, M and M′ and the effect upon the signal will be to change it from red to green, since the contact plates M^2 and M will not affect it, while the contact with the plate M′ will operate the stop which changes it to green. A train following the shunted train will find the signal under the control of the set L at green and may pass along the main track, either stopping at a station opposite the shunt track and then proceeding or going along at full speed as the case may be. The train passing along the main track under the green signal will change it first to white and then to red by its contact with the plates G, G^2 and subsequently by its contact with the plate G^3 will set the same at green and after passing the signal at the right hand end of the shunt track will set the same at white and clear the block so far as the main track is concerned. The train upon the shunt track then coming upon the main track by going off the opposite end of the shunt track from which it entered, will engage successively the contact plates N′, N, N^2 and N^3, the effect upon the signals at the preceding station in the set L being as follows: Its contact with N′ will not affect the signal; its contact with the plate N will not affect it: its contact with the plate N^2 will change the signal from white to red and its contact with the plate N^3 will change the signal from red to green, leaving that part of the block onto which the train passes from the shunt track protected under the green signal until the said train shall have passed off to the right

and thrown the signal to white to free the block. If, on the other hand, a train standing upon the shunt track should back off the switch onto the main track, it will make contact successively with the plates M′, M and M^2 and its effect upon the signal will be as follows:—Its contact with the plate M′ will not affect the signal: its contact with the plate M will not affect the signal, but its contact with the plate M^2 will change the signal to red and it will so remain until the train after backing on to the main track passes along the same and by its contact with the plate G^3 and subsequently with the plate G^4 shall have changed the signal first to green and finally to white to clear the block. The effect upon the sets of magnets L′ will be similar to that above described with respect to the sets of magnets L when a train coming from right to left passes upon the shunt track to permit a train to pass it in the same direction on the main track.

In the case of two trains passing each other and going in opposite directions the operation is as follows:—Suppose the train going from left to right to have passed onto the shunt track leaving the signal behind it at green. The train coming in the opposite direction on the main track leaves the signal behind it under the control of the magnets L′ at red until it passes the midblock contact plate K^3 when it changes it to green and passing on finally comes in contact with the plate K^4 just beyond the left hand end of the block thereby throwing the signal at the right hand end of the block to white and the signal under the control of the magnets L′ at the left hand end of the block to red. If now the train on the shunt track passes on to the main track going toward the right, its contact with the plates N to N^3 inclusive will have the following effect upon the signal under the control of the set of magnets L: Its contact with the plate N′ will not affect the signal. Its contact with N will change the signal to white. Its contact with the plate N^2 will change the signal from white to red and its subsequent contact with the plate N^3 will change the signal from red to green and it will so remain until the train passing the end of the block at the right clears the block by making contact with the plate G^4 and throwing the signal from green to white. The same clearance of the block will take place if the train which passes onto the shunt track first passes along the main track past the right hand end of the shunt track and then backs on to it.

In the diagram Fig. 12, we have indicated a special signal Q which may be quite similar to the general signal hereinbefore specifically described, comprising the disks A, A′ mounted to rotate together, the said disks in this case being provided with two signals only, viz., a red and white, each occupying one-half of the disk instead of the three signals each occupying one-third of the disk. The general signals along the main track to the right and left of the shunt track are in this case quite similar to those hereinabove first described and both the special signal and the general signals are so wired and the contact posts so placed along the shunt track that a train passing thereon will clear the block on the main track by controlling the general signal last passed and also the special signal from connections made along the side of the shunt track.

In Figs. 7 and 8 we have indicated a portion of a locomotive in position on the rail adjacent to the contact pieces with which the locomotive is supposed to make contact.

For purposes of indicating to the engineer the condition of the signal which he passes, particularly in cases where it is dark and no light has been set, or where it is foggy and the signal cannot well be seen, we provide a supplemental signal in position to be readily seen by the engineer. In the present instance we locate it in the cab of the locomotive. It consists of a pair of arms, one red and the other green, as indicated in Fig. 8, and so mounted as to fall from the horizontal position which the red arm occupies in Fig. 8 into the depending position which the green arm occupies in the said figure, whenever they are released. The red arm is shown supported and the green arm released and allowed to fall into its depending position. A pair of electro magnets R and R′ (see Fig. 10) are provided with spring actuated armatures r and r', the tension of their actuating spring being exerted to throw the armatures away from the magnets, and each magnet is provided with a nose r^2 for catching the ends of the swinging arms. A contact brush S is in electric communication with an electro magnet R which magnet is also electrically connected with one pole of the battery I; the opposite pole of said battery being, as before stated, in electrical communication with some part of the locomotive and hence with the rail and ground. A second contact brush S′ is in electric communication with the other electro magnet R′ which latter is also in electrical communication with one pole of the battery I. The connections between the brushes S and S′ and the electro magnets and between the electro magnets and the battery are insulated from the locomotive.

Contact pieces T and T′ are arranged at the side of the track in a manner quite similar to the contact plates hereinbefore referred to and at such height as to engage the brushes S and S′ respectively. The contact plate T is electrically connected with a fixed contact piece t projecting on the inner side of the housing B in position to engage a circuit closing plate U carried by the disk A and insulated from surrounding objects. A second contact piece t', fixed to project on the inner side of the housing B and in convenient proximity to the contact piece t is connected with the ground. The contact pieces t and t' are so

located with respect to each other that when the disk A is rotated in position to present the red signal, as indicated in Fig. 2, the contact plate U will engage both the contact pieces t and t' and the electric circuit through the battery I and electro magnet R will be complete whenever the brush S engages the contact plate T as the locomotive moves along the track. The effect of such completion of the circuit will be to withdraw the nose r^2 from the end of the red arm within the cab and said arm will be permitted to fall before the engineer's eyes indicating to him that the signal which he has just passed is set at red. In like manner the contact plate T′ is electrically connected with one of a pair of contact pieces t^2 t^3 fixed on the inner side of the housing B in position to be simultaneously connected by a circuit closing piece U′ carried by the disk A, the other of the two contact pieces t^2 and t^3 being connected with the ground. The contact pieces t^2 and t^3 are so located with respect to the circuit closing piece U′, that when the disk A is set to display the green signal, the contact piece U′ will complete circuit between the contact pieces t^2 and t^3 and the circuit through the battery I and electro magnet R′ will be completed whenever the brush S′ engages the contact plate T′ and the effect will be to drop the green arm in the cab before the eyes of the engineer, indicating to him that the signal which he has just passed is green. If neither the red nor the green arm fall as the engineer passes the block signal, the understanding is that the white signal is set and the block clear. As soon as either one of the arms within the cab has fallen and the signal has been thereby indicated, it may be returned to its position ready for further action.

The several connections and the location of the contact plates T and T′ with respect to the signal which they indicate are denoted in Fig. 9.

It is obvious that numerous slight changes might be resorted to in the form and arrangement of the several parts described without departing from the spirit and scope of our invention, and we do not wish to limit ourselves strictly to such specific construction and arrangement of parts, but

What we claim is—

1. A railway signal system comprising a group of different signals mounted and connected to move at all times together, signal actuating mechanism tending to move the group of signals whenever it is released and different, independent movable stops corresponding to the different signals of the group, under the control of a passing train to arrest and release the group, substantially as set forth.

2. In combination, several different signals mounted and connected to move at all times together and follow one another in succession into and out of an exposed position, signal actuating means, different, independent movable stops corresponding to the different signals for releasing and arresting the signals and electro magnets under the control of a passing train to complete the circuit and operate the stops, substantially as set forth.

3. In combination, a rotary disk provided with different signals fixed thereon, a housing covering a portion of the disk, a motor tending to rotate the disk continuously in one direction, different stops arranged to release and arrest the disk at intervals, electric circuits including electro magnets for controlling the stops and a circuit closer carried by a train along the track for completing the said electric circuit, substantially as set forth.

4. In combination, signals denoting "stop," "block clear" and "block partially clear," mounted at the beginning of a block, signal actuating mechanism, electro magnets for controlling the movements of the signals, contact plates at the beginning and end of the block and at a point intermediate of the ends of the block, the contact plate at the beginning of the block being in electric circuit with the magnet to set the signal "stop," the intermediate contact plate being in electric circuit with the magnet to set the signal "block partially clear" and the contact plate at the end being in electric circuit with the magnet to set the signal "block clear" and a circuit closer carried by a passing train in position to engage the several contact plates, substantially as set forth.

5. In combination, a railway track, a line of signals located at intervals along the track, contact plates upon opposite sides of the track, electro magnets for operating the signals, electric circuits including the contact plates and the electro magnets, one set of electric circuits including the contacts on one side of the track and the electro magnets and another set of electric circuits including the contacts upon the other side of the track and the aforesaid electro magnets and a circuit closer carried by the train in position to engage the contact plates on one side of the track when the train moves along the track in one direction and to engage the contact plates upon the opposite side of the track when the train moves along the track in the opposite direc tion, substantially as set forth.

6. In combination, a set of block signals located along a track and under the control of a passing train to operate them, a shunt track; and a special signal, forming a part of the block system and under the control of a train moving along the shunt track in either direction to operate it and clear the block on the main track, substantially as set forth.

7. Signaling mechanism comprising a pair of rotary disks spaced apart and having fixed thereon a set of signals, translucent sections inserted in the disks, one in each signal, a housing covering the disks so as to leave one signal only exposed at once, disk actuating mechanism and signal operating mechanism

comprising a set of independent stops and means for actuating them under the control of a passing train, substantially as set forth.

8. Signaling mechanism comprising a pair of disks spaced apart and mounted to rotate independently of each other, each disk being provided with a set of signals, a housing covering the signals so as to leave only one signal on each disk exposed at once, disk actuating mechanism and signal operating mechanism under the control of a passing train, substantially as set forth.

9. In combination, a set of signals at the side of the track, including danger and cautionary signals means for operating them, corresponding danger and cautionary signals carried by the train moving along the track and means for operating them the signals carried by the train being under the control of the signals at the side of the track to determine the signal which shall be operated on the train, substantially as set forth.

10. In combination, a set of signals at the side of a track, corresponding signals adapted to be carried by a passing train, means for operating the signals at the side of the track, signal operating mechanism carried by the train for operating the signals thereon, said signal operating mechanism being in electric circuit with contact pieces carried by the train and the signals at the side of the track being in electric circuit with the contact plates at the side of the track in position to engage the contact pieces carried by the train, the circuit to be completed by such engagement being determined by the particular signal exposed at the side of the track, substantially as set forth.

GEORGE L. THOMAS,
EDWARD C. SEWARD.

Witnesses:
FREDK. HAYNES,
I. B. DECKER.