No. 881,938.

PATENTED MAR. 17, 1908.

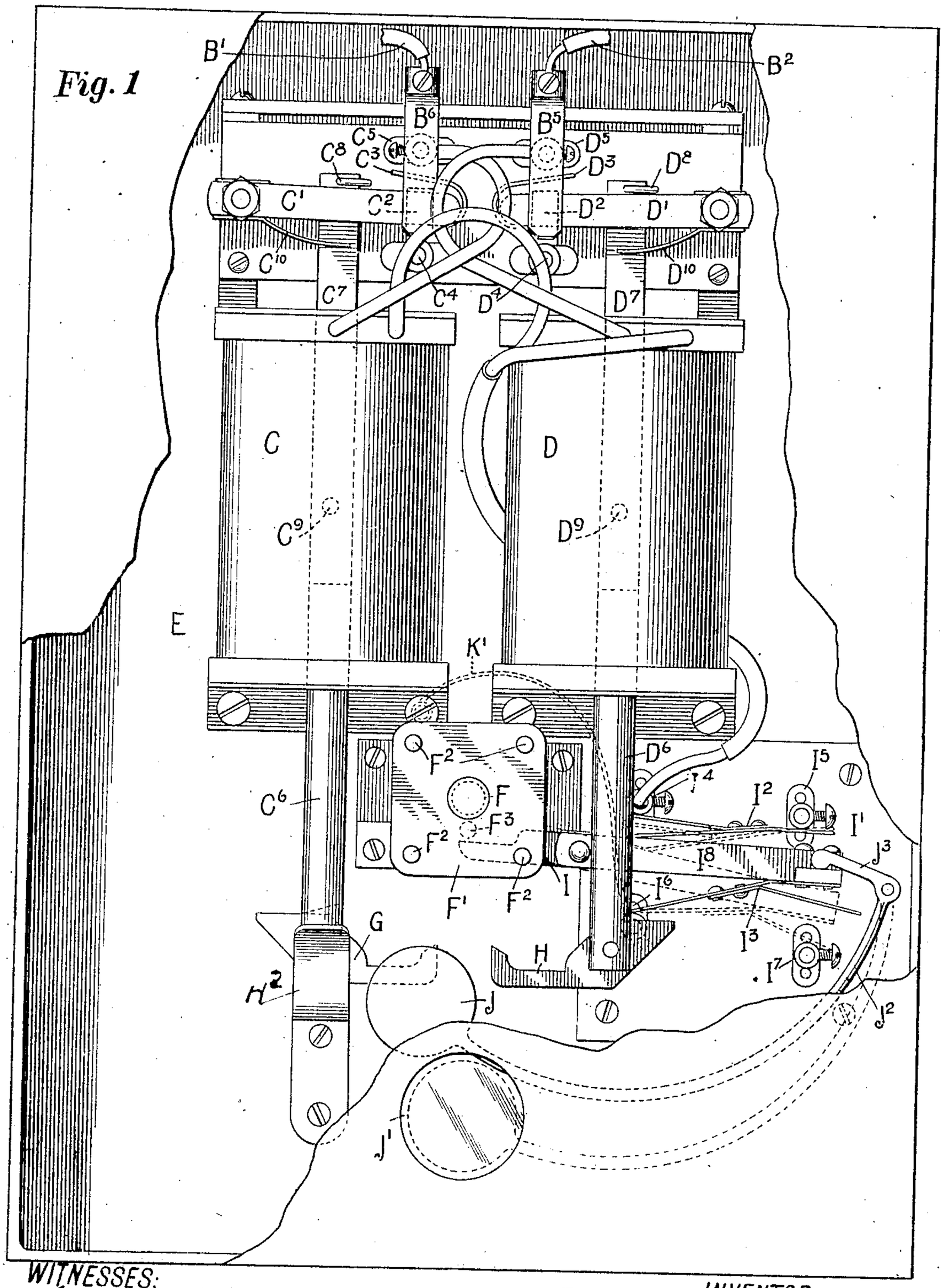
D. D. MILES, JR

BLOCK SIGNAL.

APPLICATION FILED NOV. 10, 1906.

4 SHEETS—SHEET 1.

Fig. 1



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4 SHEETS—SHEET 2.

Fig.2

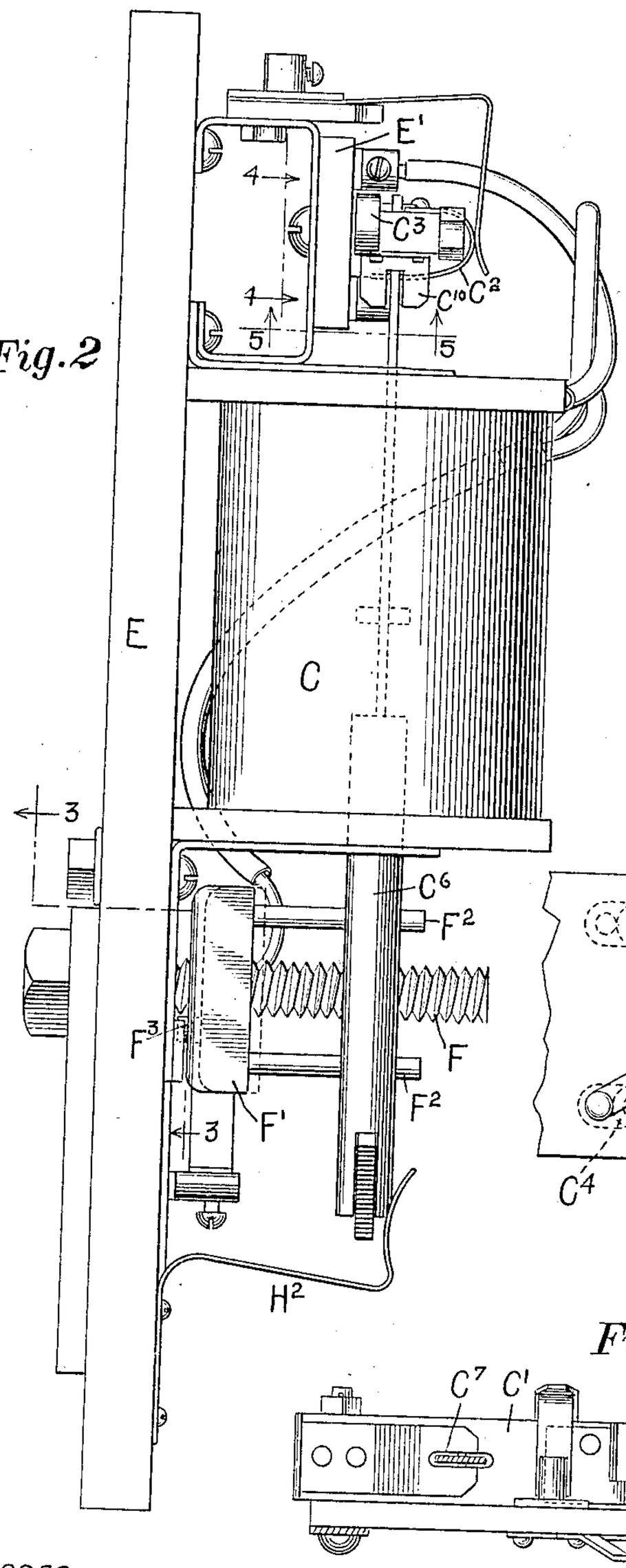


Fig.3

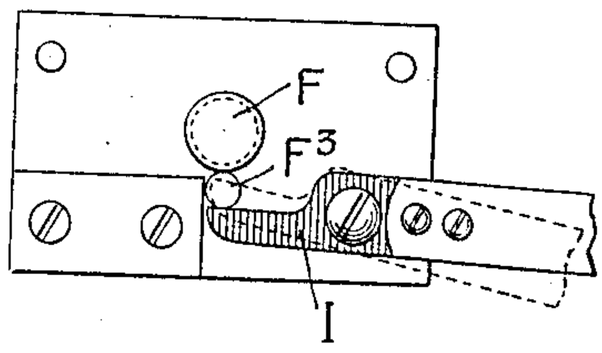


Fig.4

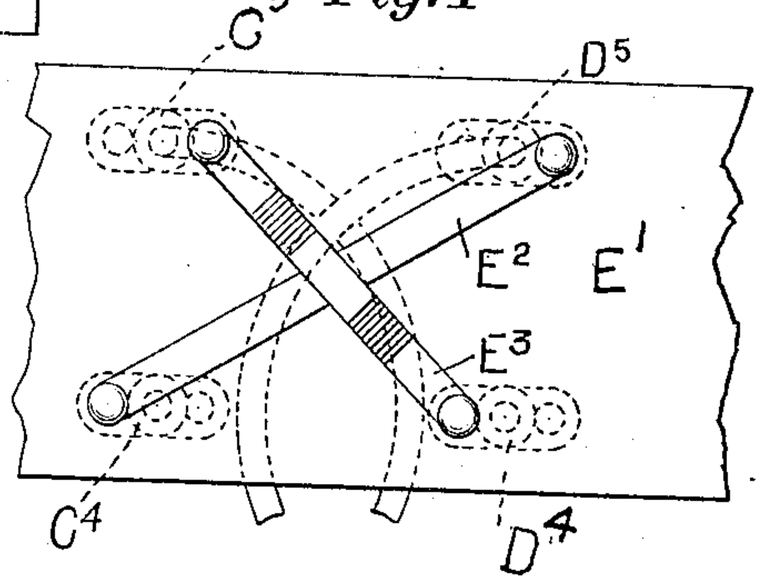
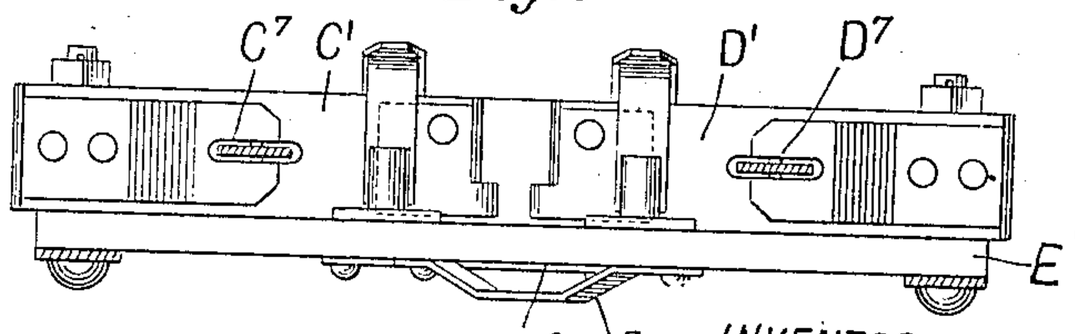


Fig.5



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4 SHEETS—SHEET 3.

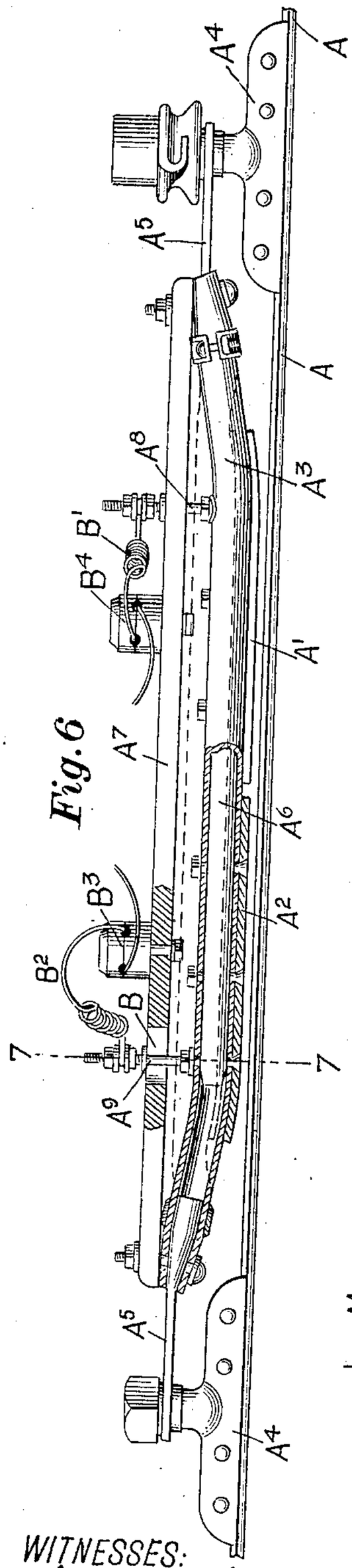

Fig. 6

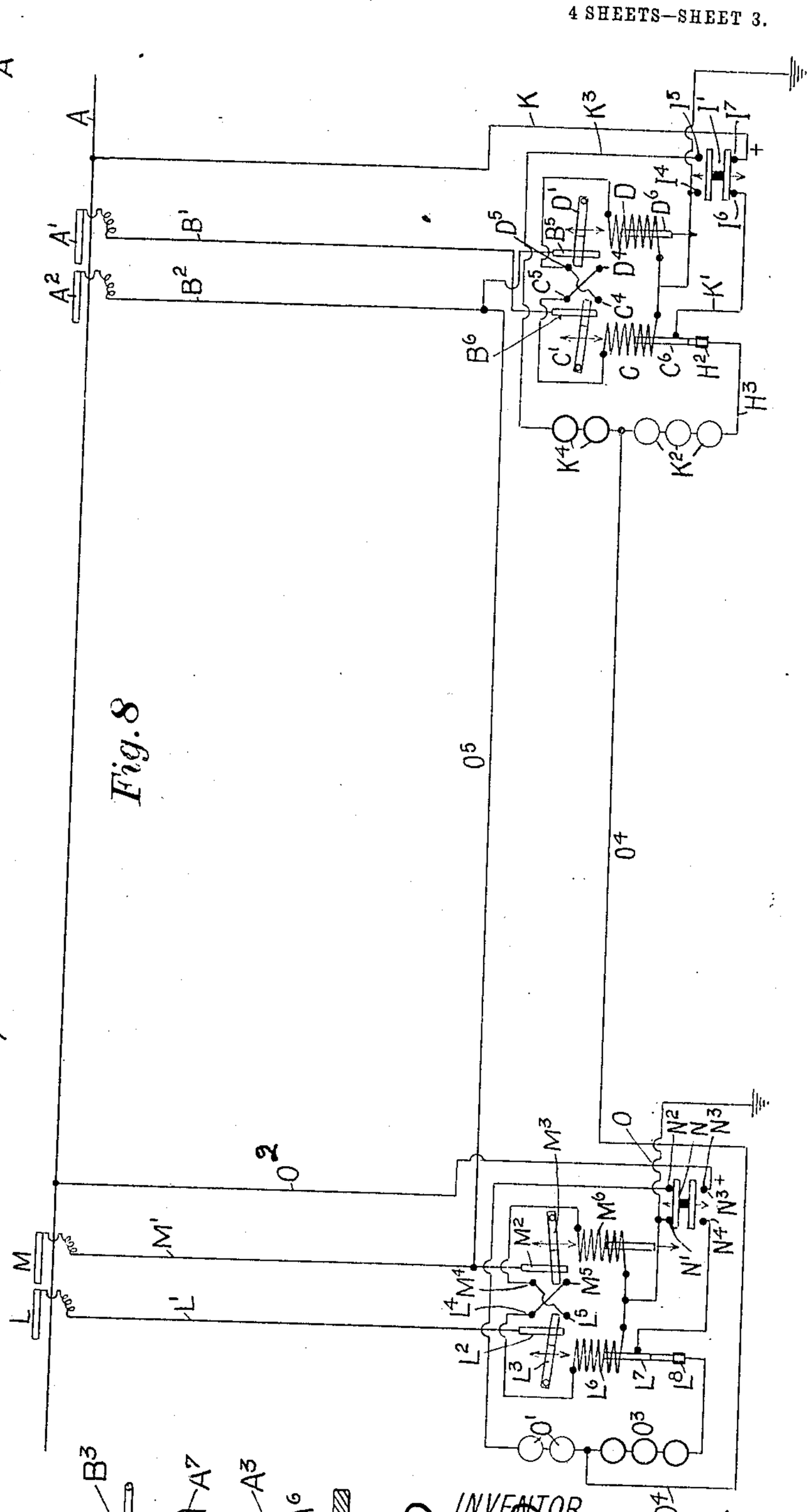

Fig. 8

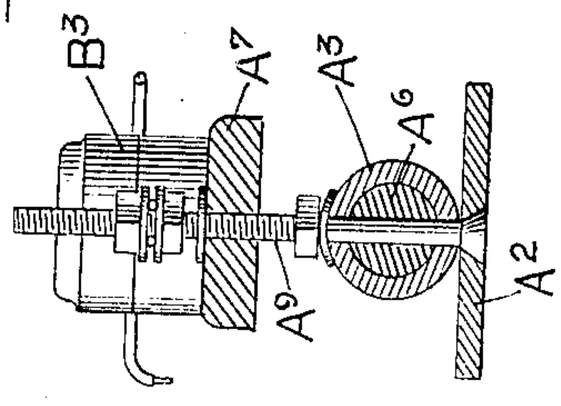

Fig. 7

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4 SHEETS—SHEET 4.

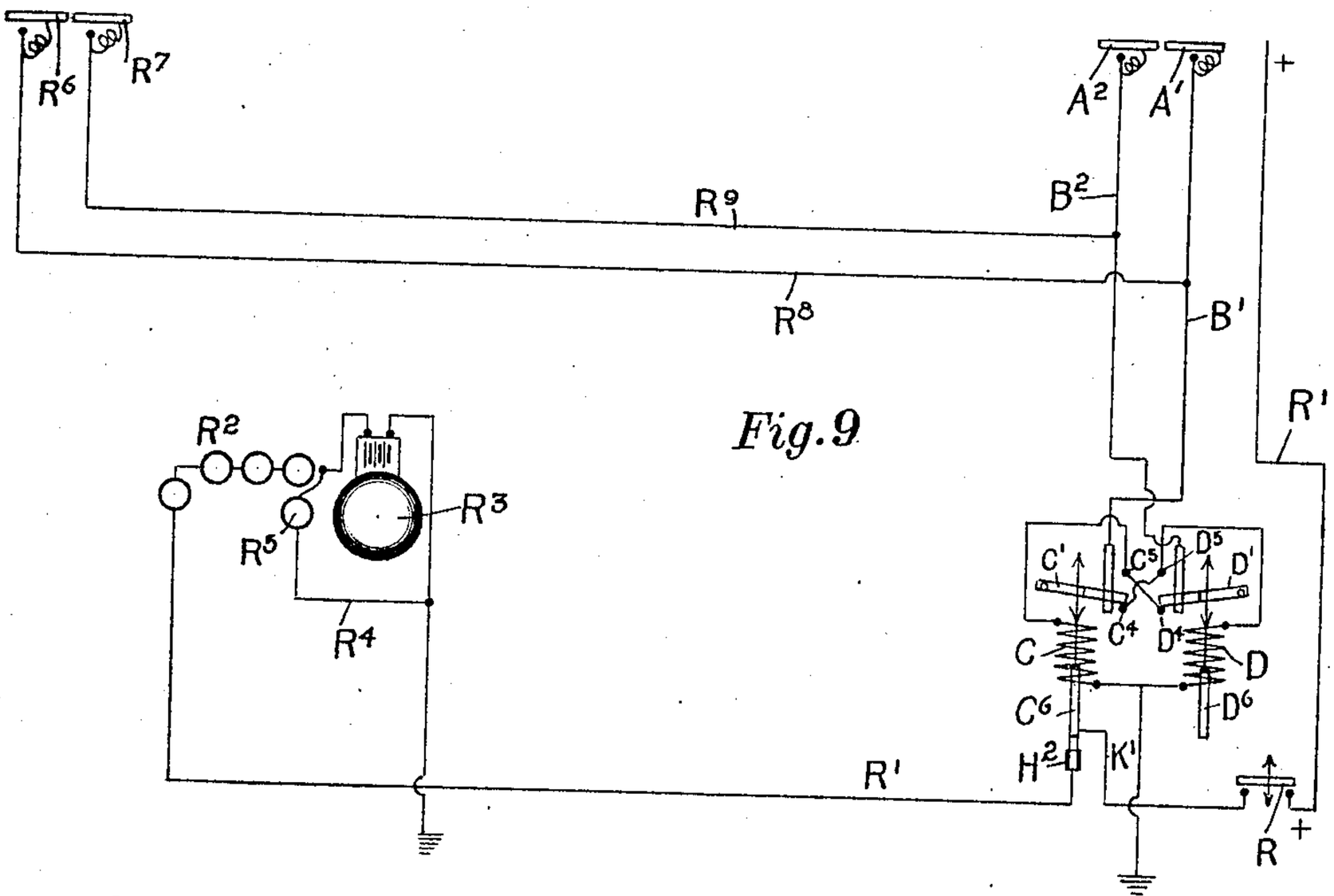

Fig. 9

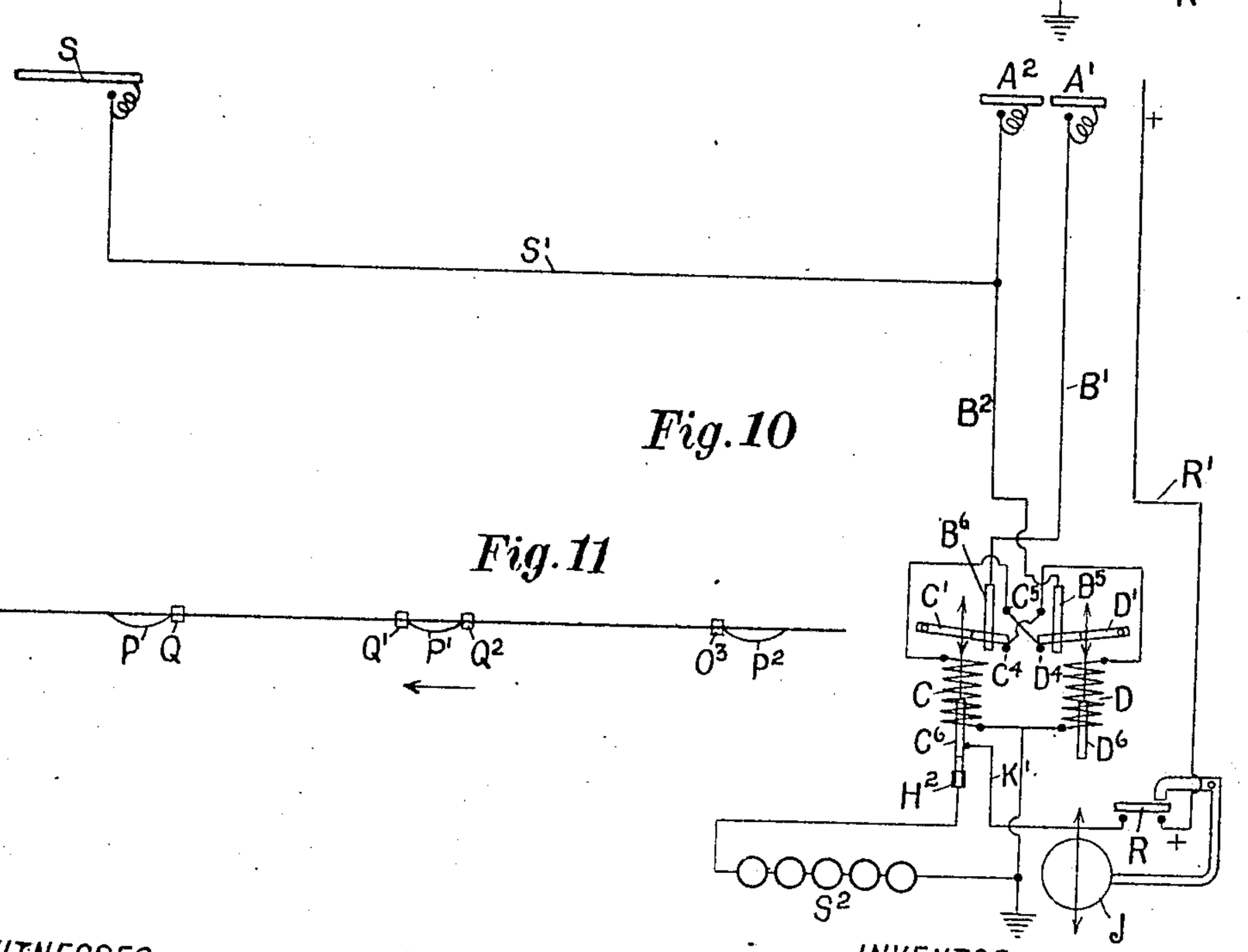

Fig. 10

Fig. 11

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UNITED STATES PATENT OFFICE.

DON D. MILES, JR., OF AURORA, ILLINOIS.

BLOCK-SIGNAL.

No. 881,938. Specification of Letters Patent. Patented March 17, 1908.

Application filed November 10, 1906. Serial No. 342,773.

To all whom it may concern:

Be it known that I, DON D. MILES, Jr., a citizen of the United States, residing at Aurora, in the county of Kane and State of Illinois, have invented a certain new and useful Improvement in Block-Signals, of which the following is a specification.

My invention relates to block signals, and has for its object to provide a new and improved signal of this description.

My invention is illustrated in the accompanying drawings, wherein

Figure 1 is a view of one of the switches and the controlling mechanism therefor, shown in a casing with parts broken away; Fig. 2 is a side view of the device shown in Fig. 1 with the casing removed; Fig. 3 is a section taken on line 3—3 of Fig. 2; Fig. 4 is a sectional view with parts omitted taken on line 4—4 of Fig. 2; Fig. 5 is a sectional view with parts omitted taken on line 5—5 of Fig. 2; Fig. 6 is a view of one of the selecting switches associated with the apparatus; Fig. 7 is a sectional view taken on line 7—7 of Fig. 6; Fig. 8 is a diagrammatic view showing the circuits when the device is in operation; Figs. 9 and 10 are diagrammatic views of the circuits showing modified constructions; Fig. 11 is a diagrammatic view showing an ordinary railway track with turnouts located at intervals.

Like letters refer to like parts throughout the several figures.

My invention is adapted to be used in connection with various railways, but is particularly adapted for electric railways, either trolley or third rail.

For purposes of illustration I have shown the device as used in connection with a trolley system, and have illustrated the apparatus at both ends of one section or block so that the operation of the device may be readily understood.

Associated with the trolley wire A at the end of the section or block is a suitable switch device arranged to be actuated by a part upon the car, such as the trolley wheel. This switch device is illustrated in Figs. 6 and 7, and consists of two conducting plates A^1, A^2 separated and insulated from each other, and supported in any desired manner, so that the trolley wheel or other device on the car makes contact with them as the car passes. As herein shown these plates are connected to an insulating piece A^3. This insulating piece is fastened to the supports or hangers A^4 in any desired manner, as by means of the supporting pieces A^5. The plates A^1, A^2 are preferably elastically supported so that they may give when contact is made with them by the trolley wheel, thus insuring a proper contact. This result may be secured in any desired manner. As herein shown the insulating piece A^3 is a rubber tube containing a stiffening device A^6 to which the plates are fastened. A free space is left between this stiffening device and the supporting pieces A^5. The tube is bent as shown and the two ends are connected by the cross piece A^7. Conductors A^8, A^9 are connected respectively to the plates A^1 and A^2 and pass up through slots B in the cross piece A^7, each being provided with means for attaching an electrical conductor B^1 and B^2 thereto. Mounted upon the cross piece A^7 are the insulating terminals B^3, B^4 to which these conductors are connected.

Located at some suitable point are the solenoids C and D having associated therewith the switches C^1, D^1 (see Figs. 1 to 5). Said switches and the solenoids are preferably mounted upon a suitable back E. The switches C^1, D^1 are pivoted at one end, and are provided with the spring contacts C^2, D^2 and C^3, D^3. The contacts C^2, D^2 are opposed to the contacts or binding posts C^4, D^4, while the contacts C^3, D^3 are opposed to the contacts or binding posts C^5, D^5. The contact D^5 is connected with the contact C^4 back of the plate E^1 by the conductor E^2, while the contact C^5 is connected to the contact D^4 by the conductor E^3, said two conductors arranged so as to be insulated from each other (see Figs. 4 and 5). The contact D^5 is connected to the solenoid D, while the contact C^5 is connected to solenoid C. The switches C^1, D^1 are connected respectively with the cores C^6, D^6 of the solenoids in such a manner that when the solenoids are energized the switches are moved to bring the contacts C^3, D^3 into electrical connection with the contacts C^5, D^5, and when the solenoids are deënergized to bring the contacts C^2, D^2 into electrical connection with the contacts C^4, D^4. Any suitable arrangement for this purpose may be used. As herein shown the cores C^6, D^6 have attached to their ends the non-magnetic pieces C^7, D^7 which are preferably flat as shown, and which pass through slots or holes in the switches. These non-magnetic pieces have engaging devices C^8, D^8 which engage the switches when the solenoids

are deënergized, and C^9, D^9 which engage the switches when the cores are energized and moved upward into the solenoids.

Instead of engaging the switches directly, these engaging devices preferably engage the springs C^{10}, D^{10}, which are slotted at the ends, the non-magnetic pieces working in these slots (see Fig. 2). This gives a spring effect and an elastic pressure to the switches. The conductors B^1, B^2 are connected to the contacts B^5, B^6 which make contact with the contacts C^2, D^2. This switching apparatus may be termed a selecting device, as it selects the solenoid to be actuated when the trolley comes in contact with the plates A^1, A^2, the selection depending upon the direction in which the car is moving.

Associated with the solenoids C and D is a switch device controlled and operated thereby, the parts arranged so that the first car which enters the block throws the switch, and each subsequent car acts upon the device so as to account for itself, thus, as it were, producing a cumulative effect upon the switches. Any suitable construction to secure this result may be provided. As herein shown, there is provided a screw F upon which is mounted a threaded controlling part F^1 which when rotated moves along the screw or threaded part F. This controlling part is provided with a series of projections F^2 which project into the path of actuating parts G and H on the solenoid cores. These actuating parts are pivoted to the cores, and are preferably provided with hooked ends arranged so that when the cores of the solenoid are pulled within the solenoid they project rigidly so as to engage the projecting parts F^2, and when the cores move out of the solenoids they are free to swing toward the said cores so as to pass the projections F^2.

The threaded controlling part F^1 is provided with an engaging device F^3 (see Figs. 1 and 2) which engages the switch arm I when said controlling part reaches a predetermined position on the screw so as to move the switch I^1. When this controlling part F^1 is moved away from this position it releases the switch arm, and the switch is moved in the other direction by any desired means, as a spring or the like. The switch I^1 is provided with the contacts I^2 when the switch is in one position adapted to electrically connect the stationary contacts or binding posts I^4, I^5, and the contact I^3 adapted when the switch is in its other position to electrically connect contacts or binding posts I^6 and I^7. The contacts I^2, I^3 are attached to some suitable connecting piece I^8 of insulating material so as to be insulated from each other, and are spring contacts. These contacts, or one of them, say contact I^2 for example, may also act to assist in moving the switch when the contact arm I is released. This switch, or some part associated therewith or with the solenoids, may be used to move a suitable signal or target J adapted when the switch is in one position to show through an opening J^1 in the casing inclosing the solenoids. The construction and operation of this signal may be arranged in any desired manner. I have illustrated a simple form wherein the signal is attached to a pivoted arm J^2 having a projecting part J^3 which engages the part I^8 of the switch I^1 so that when the switch is moved its position will be varied. The solenoids C and D are electrically connected to the contact or binding post I^4 and thence to the ground. The contact or binding post I^7 is connected by conductor K with some suitable source of electric supply which in the present instance is shown as the trolley wire A. The contact I^6 is connected by conductor K^1 with the core C^6 of solenoid C which core when the solenoid is deënergized engages a contact H^2 which is connected by conductor H^3 with the lamps K^2. The contact I^5 is connected by conductor K^3 with the lamps K^4. The lamps K^4 are preferably red and the lamps K^2 white. The contacts C^2 and D^2 are electrically connected with the contacts C^3, D^3 so that the contacts B^5 and B^6 are connected to the contacts C^4, D^4 when the switches C^1, D^1 are in one position, and to the contacts C^5 D^5 when the switches are in the other position. At the other end of the block or section there is provided a set of solenoids, switches, lamps and connections similar to that just described. These are shown at the left of Fig. 8. The contact plates L, M of this apparatus are connected by the conductors L^1, M^1 to contacts L^2, M^2 associated with the switches L^3, M^3 which coöperate with the contacts L^4, L^5 and M^4, M^5 which are connected with the solenoids L^6, M^6, said solenoids being grounded as illustrated by conductor O. The switch N coöperates with the contacts N^1, N^2, N^3, N^4. The contact N^1 is connected with the conductor O, contact N^2 with the red lamps O^1, contact N^3 by conductor O^2 with a source of electric supply such as the trolley, and contact N^4 with the core L^7 of solenoid L^6. This core coöperates with the contact L^8 which is in turn connected to the white lamps O^3, the circuit being broken by the lifting of the core L^7. A conductor O^4 is connected to the circuit between the lights O^1 and O^3 and runs to the apparatus at the other end of the block, and is connected to the circuit between the lights K^2 and K^4. A conductor O^5 connects conductors B^2 and M^1. The construction shown in Fig. 8 is particularly applicable to systems where a double track is connected for a portion of the way by a single track, and systems where a single track is used with turnouts at various points along the track, the cars running in both directions and passing each other at the turnouts. In such a construction the two sets of

apparatus would be placed one at each end of the section of track between the turnouts. I have illustrated diagrammatically such a track in Fig. 11, wherein the turnouts are shown at P, P^1, P^2, etc. A set of apparatus is placed at each end of the track between the turnouts, as shown at Q, Q^1, Q^2, Q^3, etc.

It is of course evident that the apparatus may be used under various conditions. In Fig. 9, for example, I have shown a construction to be used for a crossing signal or the like. In this construction one apparatus is used, and instead of a double switch being used in connection with the solenoids C and D a single switch R is used. This switch opens or closes the circuit R^1 leading to a source of electric supply such as the trolley wire which circuit leads through the core C^6 and contact H^2 to the lamps R^2 and the bell or alarm R^3, and is then grounded. A shunt circuit R^4 passes around the bell and contains the lamp R^5. This shunt prevents the circuit from being broken when the bell hammer is moved, thus reducing the sparking. The apparatus is placed on one side of the crossing, and on the other side are placed the contacts R^6, R^7, the contact R^6 being connected by conductor R^8 with the conductor B^1, and the contact R^7 being connected by conductor R^9 with the conductor B^2.

In Fig. 10 I have shown a construction adapted to be used on double track systems, or on tracks where the cars all pass in the same direction. Under these conditions only one set of solenoids and switches is used, for each section or block. At the other end of the section or block a single contact S is used, and is connected by conductor S^1 with the conductor B^2. In this case the switch operated by the solenoids is a single switch R, and the contact H^2 is connected with the lamps S^2 which are placed near the apparatus so as to be visible before the block is entered by the car. The switch R^2 in this case may be also used to operate the signal or target J, and this signal may be used alone or the lamps alone, or both combined, as desired.

I have described in detail certain particular constructions embodying my invention, but it is of course evident that the switching apparatus for varying the circuits may be modified in many particulars and the whole apparatus may be varied and parts omitted and other parts used with parts not herein shown without departing from the spirit of my invention. I, therefore, do not limit myself to the particular construction and arrangement herein illustrated, as I have only shown this particular apparatus for the purpose of making my invention clear.

The use and operation of my invention are as follows: If, for example, the signaling system is used on a track having turnouts of the class shown in Fig. 11, the operation of the device will be clearly understood by noting the conditions between the turnouts P and P^1. Suppose, for example, a car is moving in the direction of the arrow (Fig. 11). If no lights or signals are showing the car has an open track, and can enter the block and pass therethrough at the usual speed. When the car passes the apparatus at Q^1 the trolley wheel comes into engagement first with the contact plate A^1. This completes a circuit from the top trolley wire through conductor B^1 to contact B^6, thence through the switch to contact C^4, thence to contact D^5, thence through solenoid D, and thence to the ground. This energizes the solenoid and causes it to draw up its core, thus moving the switch D^1 so that it makes contact with the contact D^5. As the trolley passes to contact plate A^2 this movement of the switch D^1 causes the current to still pass through solenoid D by way of conductor B^2, contact B^5, contact D^5, and thence through the solenoid D. When the core of solenoid D is drawn up, the part H engages one of the projections F^2 on the controlling part F^1 and causes said part to be rotated so as to, as it were, unscrew it. This movement of the controlling part causes the engaging part F^3 to become disengaged from the switch arm I and the spring throws such switch arm so as to disconnect contacts I^4 and I^5 and connect contacts I^6 and I^7, as shown at the right in Fig. 8. When the trolley wheel passes the contact plate A^2, the solenoid D is deënergized, and its core drops without producing any effect upon the controlling part F^1. It will be noted that although there are two contact plates A^1 and A^2, only one solenoid is energized during the movement of the trolley past them, and the particular solenoid depends upon which contact is first engaged. If, for example, the car should be moving in the other direction and should strike contact plate A^2 first, solenoid C would be energized, the current passing from A^2 through B^2 to contact B^5, thence through the switch to contact D^4, thence to contact C^5 and thence to solenoid C, and thence to the ground. The core C^6 would then be moved, and the switch C^1 changed from contact C^4 to contact C^5. When the trolley wheel strikes contact A^1 the current passes through conductor B^1 to contact B^6, thence by switch C^1 to contact C^5, and thence through the same solenoid C. It will thus be seen that there is here provided what may be called a selecting device, by means of which the proper solenoid is selected, and held energized, this solenoid depending upon the direction of movement of the car, and only one solenoid being energized at a time. When the switch I^1 is moved to connect the contacts I^6 and I^7, a circuit is established through the white lamps K^2 at the end where the car enters, and through the red lamps O^1 at the other end of the block. This circuit is from the trolley

wire A^1, through conductor K, through switch I^1 conductor K^1, core C^6, contact H^2, conductor H^3, lamps K^2, conductor O^4, lamps O^1, switch N to ground. The white lights are preferably located so that they can be seen by the operators on the car entering the block as well as the following cars, so that the operators on the car will know the signals are operating. A car approaching the block from the other end will see the red lights O^1 and will, therefore, be prevented from entering the block.

If it is desired to let several cars in the block going in the same direction, the next car moving in the direction of the arrow (Fig. 10) will see the white lights displayed, and will then enter the block slowly, being on the lookout for the car ahead. Upon entering the block the circuit is established through the solenoid D, as hereinbefore described, and the core of the solenoid is moved so as to rotate the threaded controlling part F^1 a portion of a revolution. Since the switch I^1 has been released, this movement has no effect upon it, the only effect being for the car to account for its presence in the block by its action upon the threaded controlling part F^1. Any desired number of cars may thus enter the block depending upon the regulations of the road, each one acting upon the mechanism so as to account for its presence. When the first car to enter the block passes out of the block, that is, passes the mechanism at Q, the trolley first strikes the contact plate M. This completes a circuit. From the trolley wire through the plate M and conductor M^1, conductor O^5 back to the mechanism at the other end of the block, thence through contact B^5, switch D^1, contact D^4, contact C^5, solenoid C, and thence to ground. This causes the core C^6 of solenoid C to be lifted. The engaging part G then engages one of the projections F^2 on the threaded controlling part F^1 and moves it the same distance it is moved when the car enters the block, but in an opposite direction. As the trolley leaves the contact M this circuit is again broken, and the core falls to its normal position. If there are other cars in the block the only effect of the exit of this car is to rotate the threaded controlling part F^1, as hereinbefore stated, so as to, as it were, undo what it did upon entering the block. The lift of the core C^6 being in the light circuit causes a momentary break of this circuit, and thus the lights are momentarily extinguished, thus indicating that the apparatus is properly working. The red lights after going out are instantly relighted, and the operators on the car on the turnout P, for example, will know that there are still other cars in the block, and that said car cannot yet enter. The passage of the car out of the block also actuates solenoid L^6, but as switch N is in its normal position this has no effect upon the apparatus whatever, the core dropping as soon as the car passes. The next car to pass out of the block produces the same effect as the first car, namely, it accounts for its exit by rotating the part F^1 the same amount it rotated it when entering the block, but in an opposite direction, and it momentarily extinguishes the lights. Each car therefore as it leaves the block subtracts the effect it impressed upon the mechanism upon its entering the block. When the last car passes out of the block, the threaded controlling part F^1 is returned to its initial position, the projection F^3 engaging the switch arm I and moving the switch I^1 to its initial position so as to connect contacts I^4 and I^5 and disconnect contacts I^6 and I^7. This breaks the circuits through the lights, and they are extinguished. The car on the turnout P is then free to enter the block, and as soon as it does enter the block the solenoid M^6 is actuated so as to throw the switch N in the manner hereinbefore described in connection with solenoid D, disconnecting contacts N^1, N^2, and connecting contacts N^3, N^4. A like circuit is then established from the trolley wire through conductor O^2, switch N, core L^7, contact L^8, lamps O^3, conductor O^4, back to the other end of the block, thence through lamps K^4, conductor K^3 and switch I^1 to the ground. The red lights at station Q^1 are thus lighted, and the operators on any car approaching said station will see that there is an approaching car in the block, and will thus not enter upon the block. The white lights O^3 will show at the other end, and indicate to cars moving in the same direction that there is a car in the block.

It will thus be seen that this apparatus protects the block in both directions, and that there is mechanism for selecting the proper solenoid depending upon the direction of movement of the car. It will further be seen that there is what may be called a cumulative switch controller. By this arrangement two sets of lights can be operated upon the same line or conductor, the switch controlling this circuit being controlled by the cumulative controller. It will be noted that in view of the construction of this cumulative controller any desired number of cars may be permitted to enter the block, there being practically no limit to this number, except the length of track and the rules of the road, as the screw F can be made any desired length, and the threads any desired pitch, the part F^1 being turned only a portion of a revolution by each car. If after one or more cars are in the block they should back out, that is, go out in the same direction they came in, the device would still be operative, and effective, for if only one car was in the block it would return the parts to their initial position when it backed out, and

if there were more than one each car would subtract from the cumulative controlling part the effect produced on entering the block, and hence when the last car leaves the block at the other end the parts will be returned to their initial position, no signals being displayed.

When the device is used as a crossing signal, as shown in Fig. 9, it is operated by the car when approaching in either direction. If, for example, the car is coming in the direction to strike the contact A^1 the solenoid D is actuated. This throws the switch to complete the light circuit and ring the bell. When the car strikes the contact R^7, the solenoid C is energized, which pulls up its core and returns the switch R to normal position so as to break the circuit. When the car approaches the crossing in the opposite direction, the parts are operated in the same way.

When the device is used on a double track system and the arrangement is such as shown in Fig. 10, two contacts A^1 and A^2 are used at the point where the car enters the block, and only one set of solenoids and switches is used. If no car is in the block, no signal or light is shown. When the car enters, the parts are moved so as to light the lights S^2 or drop the target J, or both. When the car passes out of the block, contact is made at the single contact plate S, and if only one car is in the block the parts are returned to their initial position so that no signals are displayed.

I claim:

1. A block system comprising a display signal, a controlling device therefor, comprising an electro-magnetic device actuated by the car, a controlling part for the display signal, actuated by the said electro-magnetic device and having both rotary and longitudinal movement.

2. A block system comprising two sets of apparatus located at different points, two sets of lights associated with each apparatus, a single line or conductor between the two sets of lights, and with which said lights are connected, a controlling switch associated with each set of lights, and circuit connections arranged so that either set of lights of each apparatus can be connected with said line.

3. A block system comprising two sets of apparatus located at different points, two sets of lights associated with each apparatus, a single line or conductor between the two sets of apparatus, and with which said lights are connected, a controlling switch associated with each set of apparatus, circuit connections arranged so that either set of lights of each apparatus can be connected with said line, an auxiliary switch adapted to be connected with said line, and to be actuated when a car leaves the block so as to momentarily extinguish the lights.

4. A block system comprising a display signal, a switch controlling the same, a controlling part for the switch comprising two screw threaded parts, one engaging the other, and means for rotating one with relation to the other when a car enters or leaves the block.

5. A block system comprising a display signal, a controlling device therefor, two electro-magnetic actuating devices for said controlling part and adapted to move it in opposite directions, two contact devices at each end of the block adapted to be successively connected in circuit by a part on the car, and a selecting device for selecting which electro-magnetic device will be energized, and arranged so that only one is energized during the passage of the car.

6. A block system comprising a display signal, a cumulative controlling device therefor, two electro-magnetic actuating devices for said cumulative controlling device and adapted to move it in opposite directions, two contact devices adapted to be successively connected in circuit by a part on the car, and a selecting device for selecting which electro-magnetic device will be energized, and arranged so that only one is energized during the passage of the car.

7. A block system comprising a signal, controlling means therefor comprising two separate contacts, a switch associated with the signal, two electro-magnetic devices for controlling said switch, and means for connecting both of said contacts with one electro-magnetic device when the car is moving in one direction, and with the other electro-magnetic device when the car is moving in the other direction.

8. A block system comprising a display signal, a controlling part therefor, two electro-magnetic devices associated with said controlling part and adapted when energized to move it in opposite directions, two contacts adapted to be sucessively connected in circuit by a part on the car, means for electrically connecting both of said contacts with one electro-magnetic device when the car is moving in one direction, and with the other electro-magnetic device when the car is moving in the opposite direction.

9. A block system comprising a display signal, a controlling part therefor, two electro-magnetic devices associated with said controlling part and adapted when energized to move it in opposite directions, two contacts adapted to be successively connected in circuit by a part on the car, means for electrically connecting both of said contacts with one electro-magnetic device when the car is moving in one direction, and with the other electro-magnetic device when the car is moving in the opposite direction, said controlling part arranged to be moved a predetermined amount by each car that enters the block so as to account for said cars while

in the block, and means for moving the controlling part in the opposite direction an equal amount as each car leaves the block so as to return the parts to their initial positions when all the cars are out of the block.

10. A block system comprising a display signal, a controlling part for controlling said display signal, two solenoids associated with said controlling part and provided with cores adapted when the solenoids are energized to move said controlling part in opposite directions, two contacts adapted to be engaged by a part on the car as it passes to or from the block, connections between said contacts and said solenoids, and an intervening switch mechanism arranged to connect both contacts with one solenoid when the car is moving in one direction, and with the other solenoid when the car is moving in the other direction.

11. A block system comprising a display signal, a controlling part for controlling said display signal, two solenoids associated with said controlling part and provided with cores adapted when the solenoids are energized to move said controlling part in opposite directions, two contacts adapted to be engaged by a part on the car is it passes to or from the block, connections between said contacts and said solenoids, and an intervening switch mechanism arranged to connect both contacts with one solenoid when the car is moving in one direction, and with the other solenoid when the car is moving in the other direction, a similar apparatus at the other end of the block, and an electrical connection between them arranged so that when the car enters the block it actuates one solenoid and when it leaves the block it actuates the other solenoid at the end where it enters.

12. A block system comprising a display signal, a controlling device therefor comprising an electro-magnetic device actuated by the car, a controlling part actuated by the said electro-magnetic device and having both rotary and longitudinal movement, a switch associated with the display signal and controlled by said controlling part.

13. A block system comprising two sets of signals at each end of the block, indicating the direction in which a car in the block is going, a controlling device for said signals at each end of the block actuated by the car arranged to operate opposite signals at the opposite ends of the block, said controlling device comprising two separated contacts and two solenoids, and means for connecting both contacts with one solenoid when the car is moving in one direction, and with the other solenoid when the car is moving in the other direction, and means associated with said controlling apparatus for permitting several cars to enter the block in the same direction before the first car passes out of the block, and for accounting for their presence.

14. A block system comprising a display signal, an electro-magnetic controlling device therefore, a flexibly mounted contact device attached to the trolley wire and insulated therefrom, and electrically connected with said electro-magnetic controlling device, said flexibly mounted contact device in position to be electrically connected to the trolley wire by a part on the car.

15. A contact device for block systems associated with the trolley wire and comprising two contacts, an insulating support therefor, means for connecting said support to the trolley wire, and a cross piece to which said insulating support is flexibly connected.

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Witnesses:
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