T. C. FOGARTY, F. W. BROCK & F. A. BOWDLE.

ELECTRIC RAILROAD SIGNAL.

APPLICATION FILED JAN. 13, 1908.

898,862.

Patented Sept. 15, 1908.

4 SHEETS—SHEET 1.

Fig. 1.

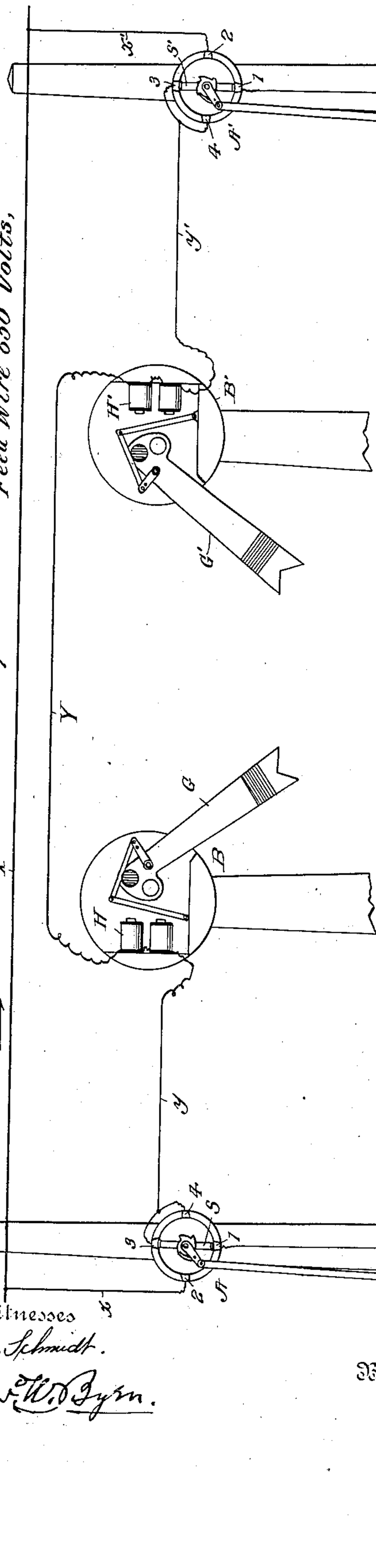
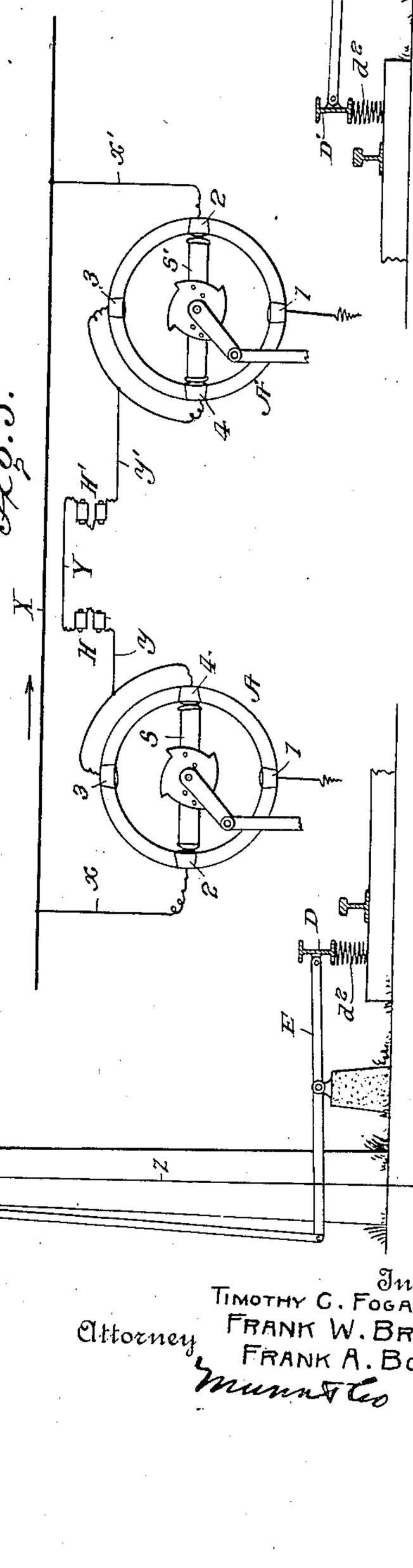


Fig. 2.

Fig. 3.



Witnesses

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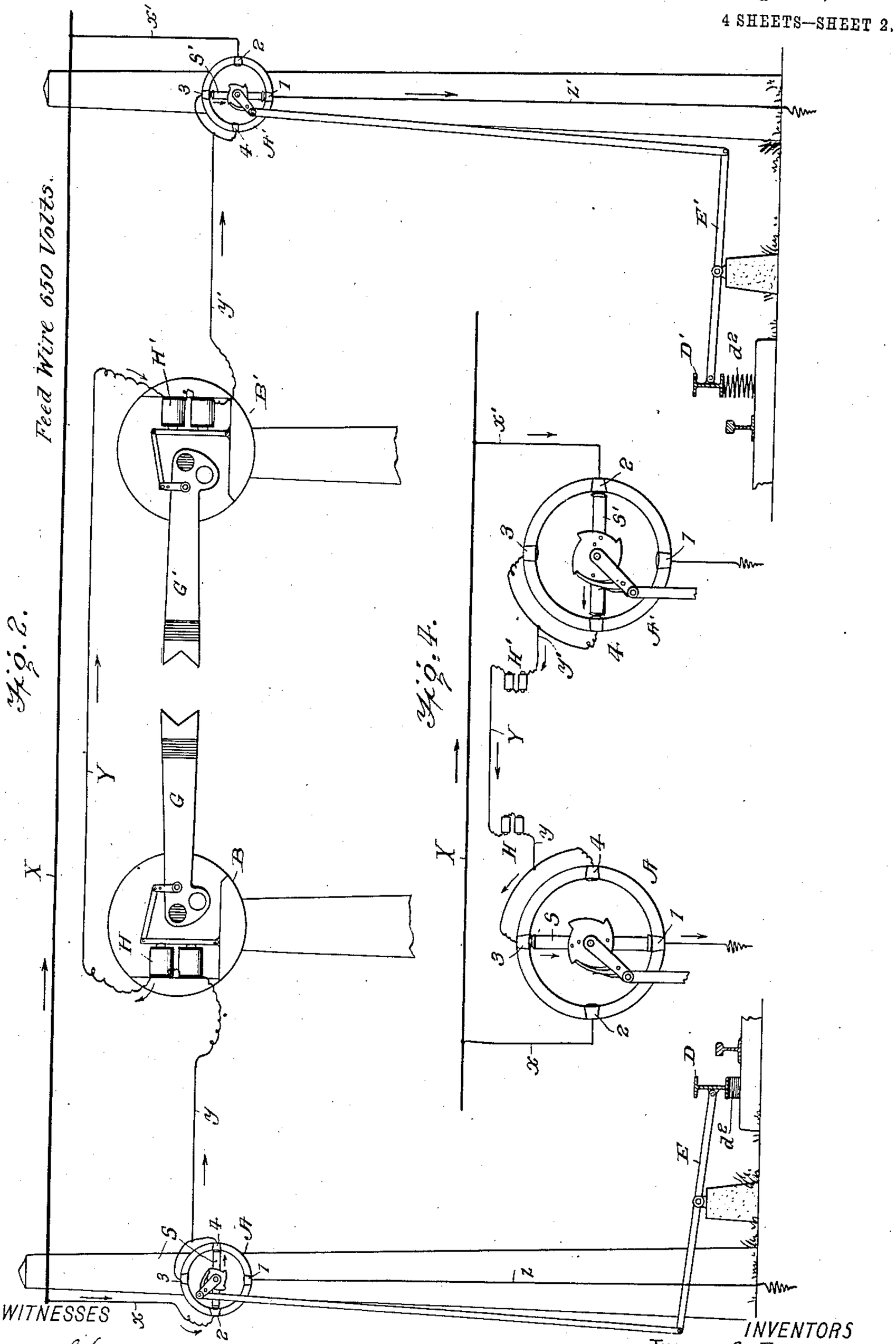
4 SHEETS—SHEET 2.



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4 SHEETS—SHEET 3.

Fig. 5.

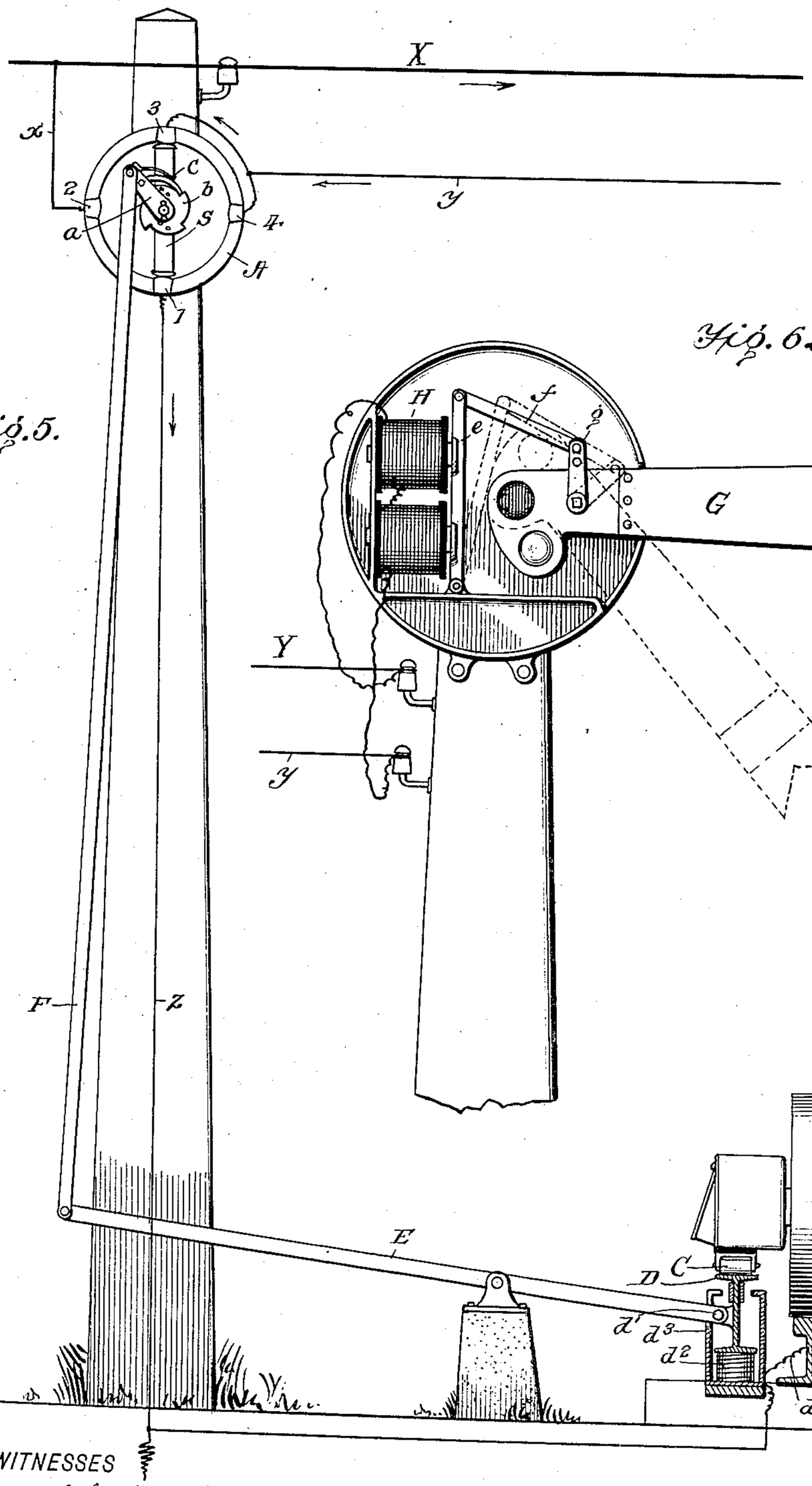

Fig. 6.

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4 SHEETS—SHEET 4.

Fig. 7.

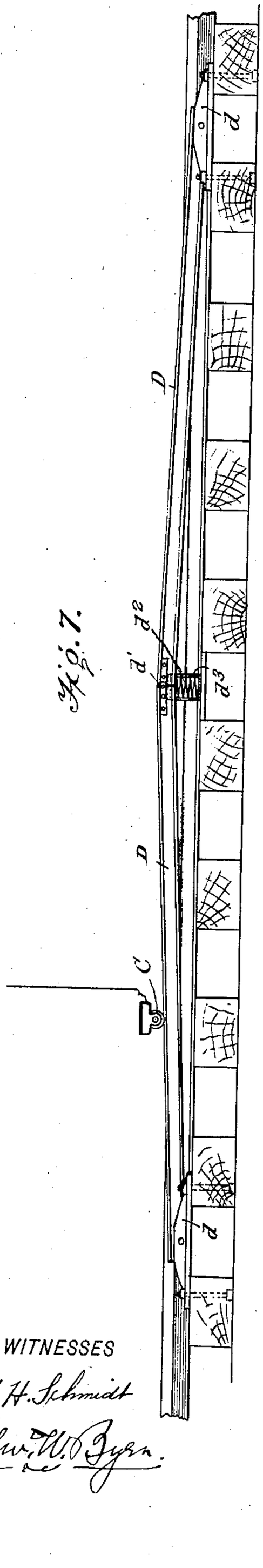

Fig. 9.

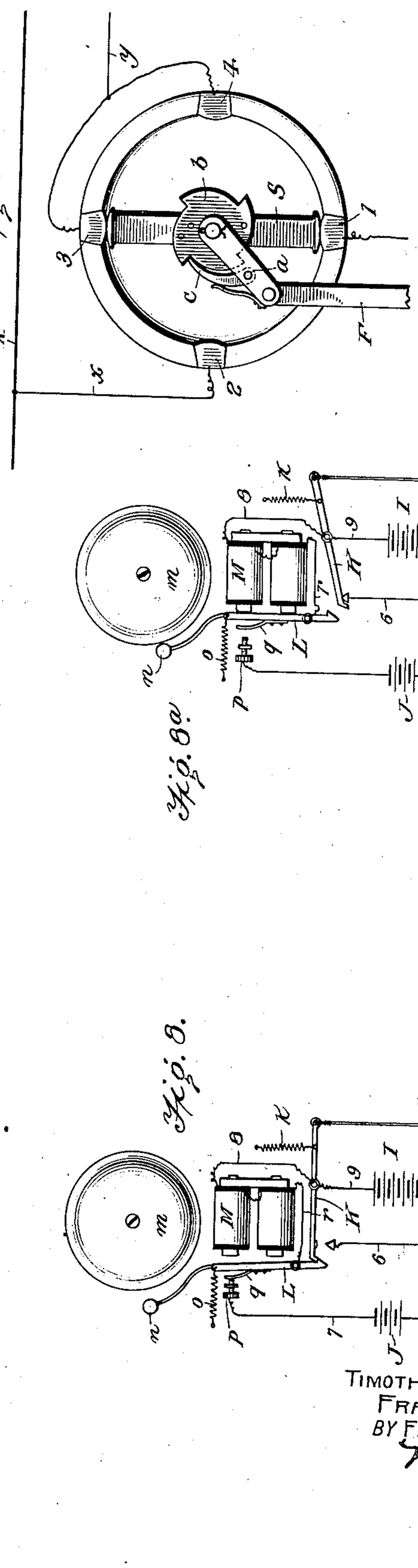

Fig. 8.

Fig. 8a.

Fig. 8.

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UNITED STATES PATENT OFFICE.

TIMOTHY C. FOGARTY, FRANK W. BROCK, AND FRANK A. BOWDLE, OF CHATHAM, ILLINOIS.

ELECTRIC RAILROAD-SIGNAL.

No. 898,862. Specification of Letters Patent. Patented Sept. 15, 1908.

Application filed January 13, 1908. Serial No. 410,632.

To all whom it may concern:

Be it known that we, TIMOTHY C. FOGARTY, FRANK W. BROCK, and FRANK A. BOWDLE, citizens of the United States, and residents of Chatham, in the county of Sangamon and State of Illinois, have invented certain new and useful Improvements in Electric Railroad-Signals, of which the following is a specification.

Our invention is in the nature of a novel construction and arrangement of electric railroad signal systems, which is arranged in blocks, and especially of that form of signal systems adapted for electric railroads in which a continuous feed wire carrying an operating circuit of 650 volts is employed. Although applicable for general use as a block signal system, it is especially designed for protecting a car on a curve both in front and rear. To that end just before a car enters a curve it will raise the semaphore at the point of entering and at the same time will raise a corresponding semaphore on the other side of the curve and these semaphores will both stay in elevated position until the car reaches the curve and as it passes out it will drop both semaphores.

Our invention consists in the novel construction and arrangement of the switch and switch operating devices controlled by the passage of the car as will be hereinafter fully described and pointed out in the claims.

Figure 1 is a side elevation showing the automatic switch and semaphore apparatus separately mounted on posts at each end of the block, the parts of the apparatus being in inoperative position. Fig. 2 is a similar view showing the same parts with the position of the switches and semaphores as automatically adjusted by the entry of a car coming from the left hand side into the block, the position here shown being that of "danger" and indicating the fact that there is a train in the block. Fig. 3 is a diagrammatic view of the same switches and semaphores showing another inoperative position. Fig. 4 is a view of the same parts shown in Fig. 3, but with the position of the switches adjusted again to an operative position by a second train following one which has already left the block. Fig. 5 is an enlarged side elevation partly in section of one of the elevated switches and the connecting mechanism whereby it is operated from the passage of a train. Fig. 6 is an enlarged view in side elevation of the operating parts of the semaphore. Fig. 7 is a side view of the special provision of track rails located at the ends of the block or on opposite sides of the curve. Figs. 8 and 8ª are side views of an automatic alarm arranged to be located in the cab or motor car and designed to apprise the engineer or motorman of the fact that the train has entered the block, Fig. 8 representing the inoperative position of the alarm, and Fig. 8ª representing its operating position. Fig. 9 is an enlarged detail of the switch and its contacts.

Referring to Fig. 1, A represents an elevated switch, and B a semaphore apparatus located at one end of the block, or at one side of the curve. A′ and B′ are the corresponding switch and semaphore apparatus located at the other end of the block, or at the other side of the curve. The switch apparatus A and A′ are alike and the semaphore apparatus B and B′ are also exactly alike. Upon the elevated posts which carry the switches A and A′ of the block there is mounted the main feed wire X which carries the operating electric current of 650 volts, such as is employed for ordinary trolley cars. This feed wire runs continuously along the entire line of track. Between the switch A and the switch A′ of each block there is arranged a subsidiary circuit Y in which is placed the two semaphore operating devices. This subsidiary circuit Y is arranged to derive current from the main line X and pass it through the semaphore apparatus through one of the ground connections Z, Z′, taking the current at one end through the branch wire x and passing it through the semaphores B and B′ and thence to the ground Z′, or conducting the current from the main line through the branch x' and sending it through the subsidiary circuit Y and semaphores B′ and B and down to the ground through the ground connection Z. There are two inoperative positions for the circuit Y; in one of which both ends of the circuit Y are connected to the main line X and in the other of which both ends of the circuit Y are connected to the ground as more fully described hereinafter.

The automatic switch mechanism is best shown in Fig. 5, and the semaphore apparatus in Fig. 6. The switch apparatus A consists of a supporting ring bearing four stationary insulated electrical contacts 1, 2, 3, 4, spaced apart 90° in quadrantal relation.

The lower contact 1 is connected to the ground by the wire Z and the contact 2 is connected to the main feed wire X by the small branch wire *x*, and the contacts 3 and 4 are connected together with each other and to a branch wire *y*, which extends to the semaphore as shown in Fig. 6 and thence to the subsidiary circuit Y. The contacts 1, 2, 3 and 4 of the switch are arranged to be connected diametrically in pairs by means of the intermittently rotating metal bar S rigidly attached to a ratchet wheel *b* having four teeth spaced apart to correspond with the angular positions of said contacts. This ratchet wheel is turned intermittently by means of the spring pressed pawl *c* carried by a swinging arm *a* to whose outer end is attached a vertical rod F connected at its lower end to a horizontal lever E, fulcrumed near the center, and having its opposite end connected to an especially constructed portion of the track D, as shown in Figs. 5 and 7. This portion of the track consists of two long rails D, D, seen in Fig. 7, whose outer ends are loosely secured within flanged shoes *d*, *d* bolted to the cross-ties. The two shoes *d d* are entirely separate castings and as here shown are located a distance of ten cross ties from each other. The inner adjacent ends of the rail sections D, D, are jointed together at the point *d'*, and are held in elevated position by means of a subjacent spiral spring d^2 contained within a suitable housing d^3. The tension of this spring normally holds the adjacent ends of the two rail sections D, D, in elevated position at a very slight incline and when these rails are depressed by the passage of a train they serve to depress the connected end *d'* of the lever E and by raising the rod F and swinging arm *a* automatically turn the ratchet wheel *b*, and the switch bearing S, one-fourth of a revolution at each depression of the said track section D. The depression of the track section D, D, is effected as shown in Fig. 5 by the insulated roller C carried on the trucks of one of the car wheels so that at the moment of entering the block or curve the insulated wheel C, striking the rail sections D forces them down and automatically adjusts the switch to set the semaphores within the block.

Owing to the great distance apart of the rail supporting shoes *d d* and the length of the rails D D, the latter are arranged at a very slight incline so that trains traveling at a high speed do not have a violent hammering action on the rails D, but depress them gradually without damage to the connecting mechanism. As these rails D are made of such length they are necessarily heavy and therefore the central supporting spring d^2 must be made stout enough and of large tension enough to maintain both rails in an elevated position. For similar reasons it is protected within a housing d^3 having a suitable base.

The semaphores which are shown in detail in Fig. 6 consist of the circular case containing an electro-magnet H, to the opposite terminals of whose coils are connected respectively the subsidiary circuit Y and the branch of the same *y*.

G is a semaphore arm fulcrumed within the case and having an adjustable link connection *g* whose upper end is connected by the bar *f* to the upper end of an armature *e* playing in front of the poles of the electro magnet H. When the electro magnet H is energized by the passage of a current through the same, it attracts the armature *e* and lifts the semaphore arm G from the dotted position to the full line position, said full line position indicating danger and expressing the fact that there is a train in the block.

Referring now to Fig. 1, it will be seen that the semaphores at the opposite ends of the block are both down and that the track levers E and E' and rails D, D' are both in an elevated and inoperative position which they normally occupy at all times except when depressed by the passage of a train. In this position of parts shown in Fig. 1, it will be seen that both of the switch bars S S' are in vertical position and that the branch wires *x* and *x'* from the main line X have no electrical connection therewith, while the subsidiary circuit Y connecting with the contacts 3 and 4 of each switch are both connected to the ground and there is therefore no current through either magnet of the two semaphores, and consequently the semaphores are in their lower safety position. If now, a train enters the block from the left hand side, the entry of the train into the block causes the switch A and the semaphores to assume the position shown in Fig. 2, that is to say, the passage of the insulated roller on the truck will have depressed the inclined rails D and have turned the switch bar S of that end of the block to the horizontal position connecting the bar diametrically with the contacts 2 and 4, the switch A' at the opposite end of the block still remaining in its former position with its bar S vertical. When this takes place the current from the main wire X entering by the branch *x* passes to contact 2, diametrical bar S, contact 4, branch wire *y*, electro magnets H and H' through the subsidiary circuit Y, branch *y'* to the other end of the block and thence by contact 3 and switch bar S' to the ground, thereby completing an electric circuit through the electro magnets of both of the semaphore apparatus B and B', and setting their arms G and G' to the elevated position, indicating thereby the fact that there is a train entering the block. When this train reaches the end of the block and its insulated roller C depresses the inclined rails D' it ad-

justs the switch S′ to a horizontal position and both switch bars S and S′ at the opposite ends of the block will then occupy the horizontal position shown in Fig. 3 in which position it will be seen that both semaphores H and H′ at the opposite ends of the block are connected through the subsidiary circuit Y to the main line X at both ends, while the ground connections 1, 1, are out of connection with the switch bars S, S′. When this takes place and the car leaves the switch apparatus A′ in Fig. 2, the inoperative position shown in Fig. 3 is assumed, and as there is now no current through either of the magnets of the semaphores B and B′, these semaphores drop to the safety position, as soon as the train has passed out of this block. The train having passed out of this block it leaves both of the switches A and A′ in the position shown in Fig. 3. If now, a second train enters the block from the left hand side, a second movement of the switch A is given in the manner hereinbefore described at the left hand end and this switch bar S is now turned to the vertical position shown in Fig. 4, while the switch bar S′ at the other end of the block will still remain horizontal. In this position of parts, it will be seen that the subsidiary circuit Y now takes the current from the main line X at the remote end of the block through the branch wire x', contact 2, switch bar S′, contact 4, semaphore magnets H′ and H, branch wire Y, contact 3, switch bar S, contact 1, and the ground. It will therefore be seen that the magnets of the two semaphores B and B′ are again energized and so held until the train passes the switch A′ at the end of the block. It will be seen therefore that there are two operating positions for the switches and also two inoperative positions for the switches which alternate with each other as the train enters and leaves the block, no matter which direction the train may be moving in.

In order to apprize the engineer or motorman of the fact of entering the block an automatic alarm is arranged within the cab which is set into action at the moment of the depression of the inclined rails D by the special provision of circuits and electro-magnetic apparatus shown in Figs. 8 and 8ª. Referring to Fig. 5, it will be seen that the main rail and the movable switch rail D are in electrical connection with each other through the wire d^4 of any suitable metallic plate, and when the insulated roller C touches the inclined rail D, the circuit is closed through the apparatus in the cab shown in Fig. 8, as follows. I is a battery, one pole of which is connected by a wire 10 with the car axle. The other pole of this battery is connected to the fulcrum of the lever K, and thence by wire 8 extends to an electro-magnet M, thence by wire r it extends to a vibrating armature L and thence through its spring q and contact stop screw p, it passes through a battery J and wire 5 to the insulated roller C carried on the truck of the car. It will therefore be seen that the insulated roller C and inclined rail D represent the open terminals of the circuit of the battery I, and when the roller C touches the inclined rail D in depressing the same, a circuit from the battery I will be made as follows. From one pole of the battery I, wire 10, the axle of the car, the inclined rail D, contact roller C, wire 5, battery J, contact stop screw p, spring q, armature L, wire r, coils of magnet M, wires 8 and 9 to the opposite pole of the battery I. The effect of this closure of the current from the battery I through the electro-magnet M is to attract the armature L which bears on its lower end a catch which holds up the free end of the lever K, allowing said free end to drop from the action of the tension spring k onto the subjacent contact of the branch wire 6. When this takes place, as shown in Fig. 8ª, the battery J establishes its own circuit though the electro-magnet M and the back stop contact p, over the following path. From the battery J, wire 6, lever K, wire 8, electro-magnet M, wire r, armature L, spring q, back stop contact p to the other pole of the battery whenever the armature L is drawn away from the electro-magnet by means of the spiral spring o, and whenever the electro-magnet is thus charged the contact spring q is removed from the back stop p to alternately make and break this electrical circuit in the manner well known. It will therefore be seen that the function of the battery I and roller C is to bring into action the ringing circuit of the battery J, thus sounding an alarm in the cab. After the engineer's or motorman's attention has been called to the fact by this alarm, the lever K is readjusted by means of the pull wire l to its locked position, which causes the free end of the lever K to be reëngaged with the catch at the lower end of the armature L.

We claim—

1. A rail road signal, consisting of a continuous feed wire and a block section comprising a visual signal at each end of the block, a separate block circuit connecting the two signals, a switch at each end of the block connected to said block circuit, said switch being formed as a ring with four equally spaced stationary contacts quadrantally arranged, two of said contacts of each switch ring being connected to one end of the block circuit and the other two contacts of each switch ring being connected—one to the continuous feed wire and the other to the ground, a shaft with diametrical conducting bar arranged in the plane of the ring and connecting its opposite contacts, a ratchet wheel rigid with the shaft, a swinging arm arranged on the shaft and having a pawl engaging the ratchet wheel and a movable track device

operated upon by the passing car and connected to and operating the swinging arm and pawl.

2. A rail road signal, consisting of a continuous feed wire and a block section comprising a semaphore arm and electro-magnet controlling the same arranged at each end of the block to form a visual signal, a separate block circuit connecting the two signals, a switch at each end of the block connected to said block circuit, said switch being formed as a ring with four equally spaced stationary contacts quadrantally arranged, two of said contacts of each switch ring being connected to one end of the block circuit and the other two contacts of each switch ring being connected—one to the continuous feed wire and the other to the ground, a shaft with diametrical conducting bar arranged in the plane of the ring and connecting its opposite contacts, a ratchet wheel rigid with the shaft, a swinging arm arranged on the shaft and having a pawl engaging the ratchet wheel and a movable track device operated upon by the passing car and connected to and operating the swinging arm and pawl.

3. A rail road signal, consisting of a continuous feed wire and a block section comprising a visual signal at each end of the block, a separate block circuit connecting the two signals, a switch at each end of the block connected to said block circuit, said switch being formed as a ring with four equally spaced stationary contacts quadrantally arranged, two of said contacts of each switch ring being connected to one end of the block circuit and the other two circuits of each switch ring being connected—one to the continuous feed wire and the other to the ground, a shaft with diametrical conducting bar arranged in the plane of the ring and connecting its opposite contacts, a ratchet wheel rigid with the shaft, a swinging arm arranged on the shaft and having a pawl engaging the ratchet wheel and a movable track device operated upon by the passing car and connected to and operating the swinging arm and pawl, said track device consisting of two long rails having their outer ends mounted upon widely separated and detached bearing shoes and their inner ends connected together, a spring arranged below the inner jointed ends of the rails for holding them normally above the track rails and a housing and base for said spring.

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