

No. 765,922.

PATENTED JULY 26, 1904.

J. H. HARRELL.
ELECTRIC SIGNAL SYSTEM.

APPLICATION FILED SEPT. 30, 1903.

NO MODEL.

4 SHEETS—SHEET 1.

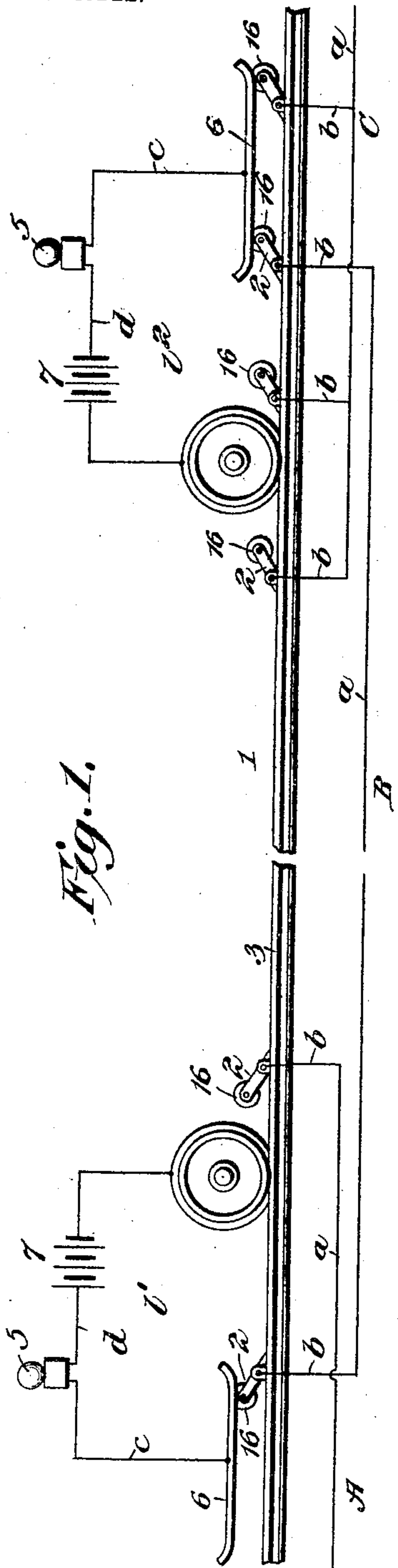
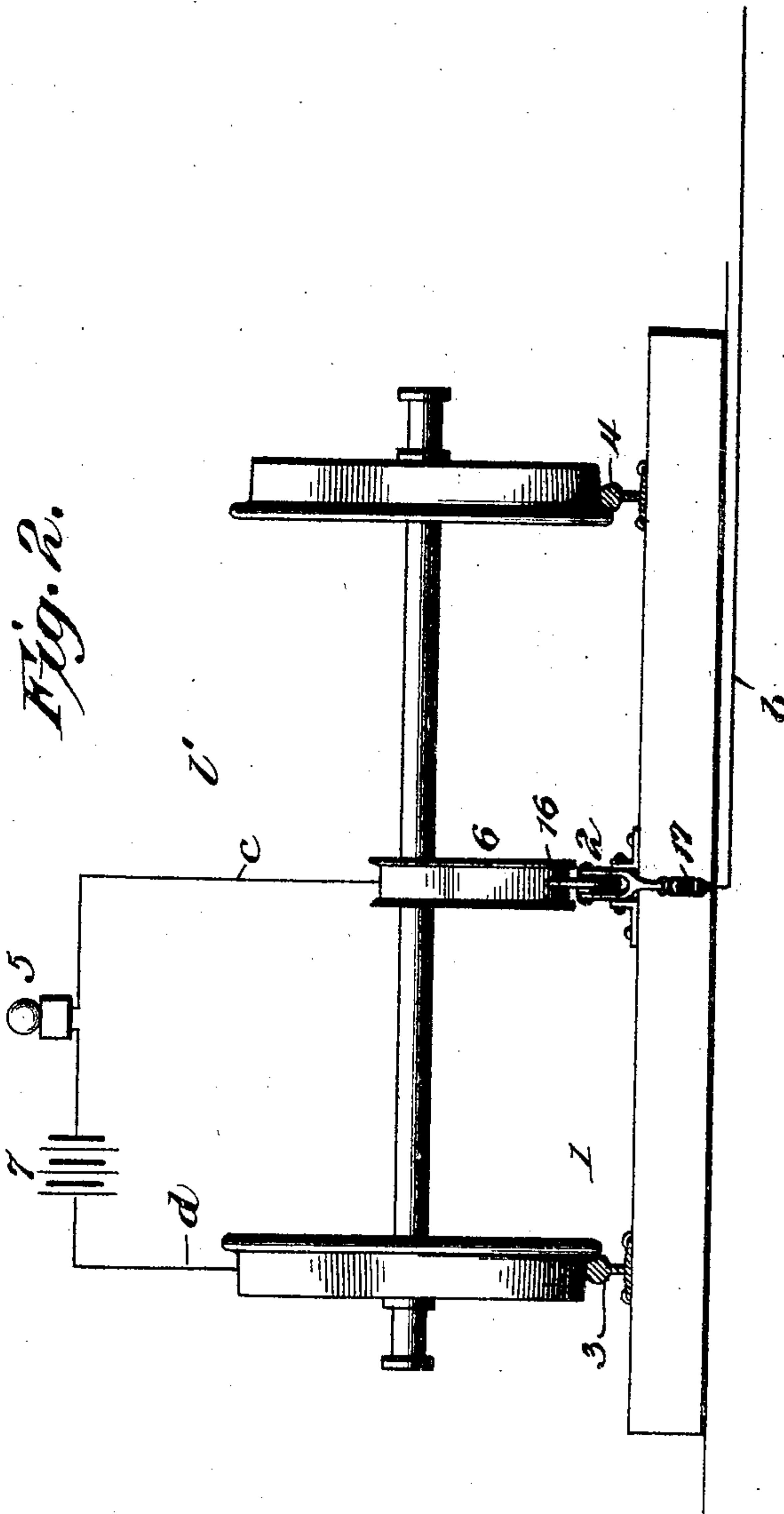


Fig. 1.

Fig. 2.



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4 SHEETS—SHEET 2.

Fig. 1.

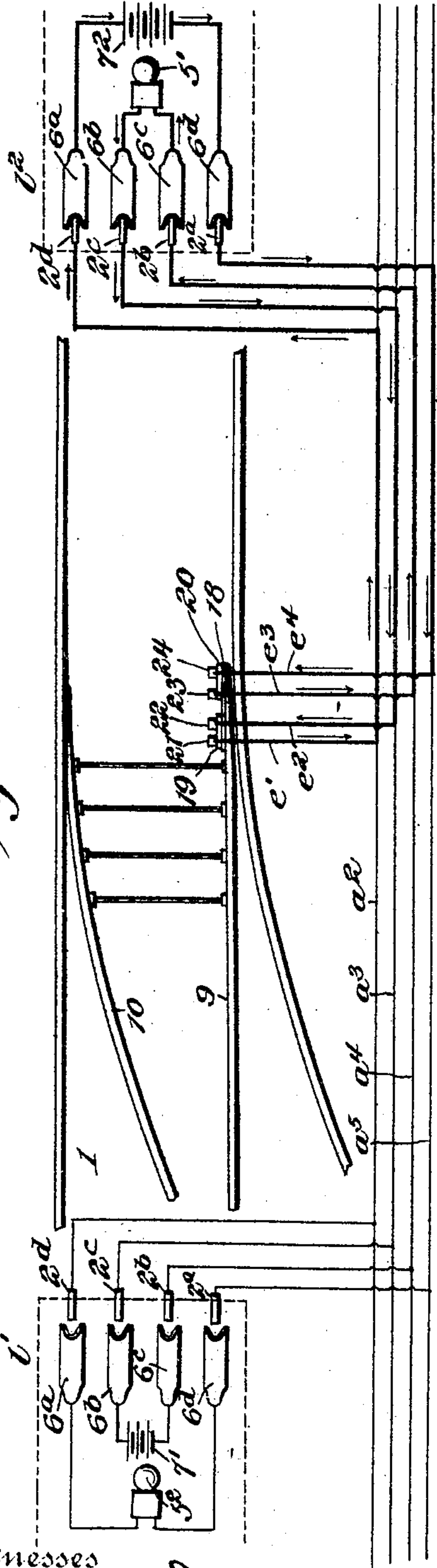


Fig. 3.

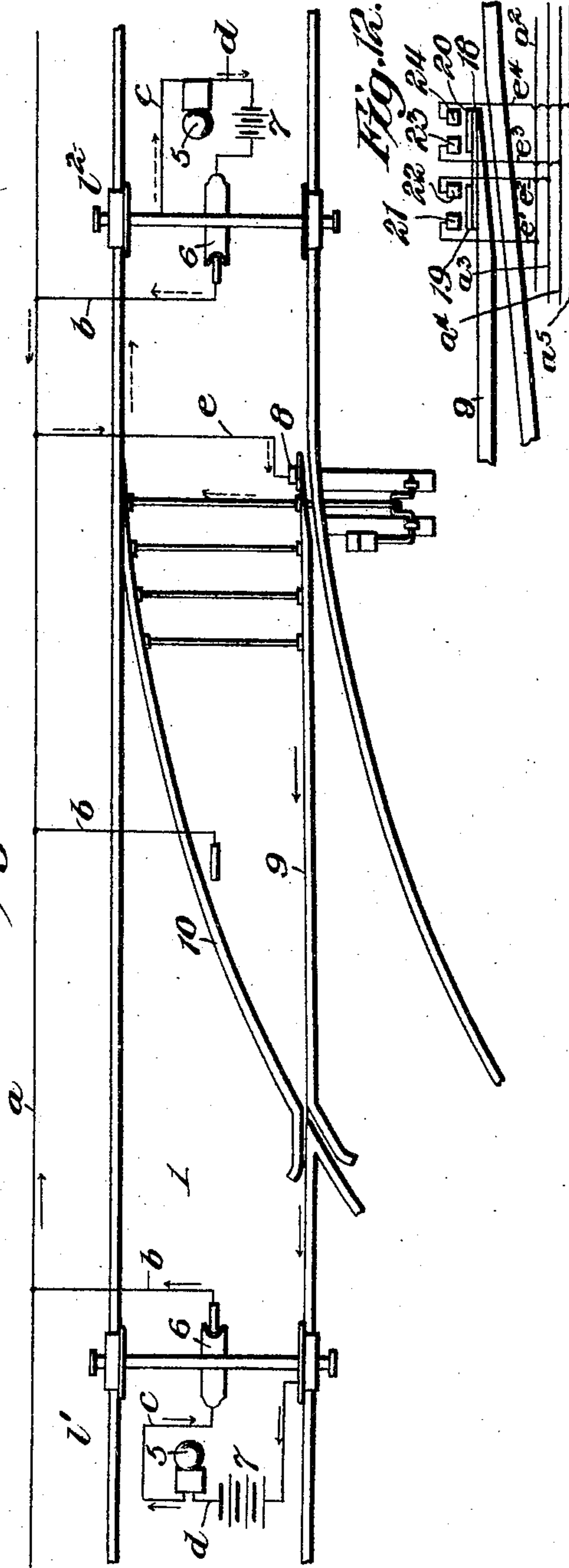


Fig. 12.

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4 SHEETS—SHEET 3.

Fig. 4.

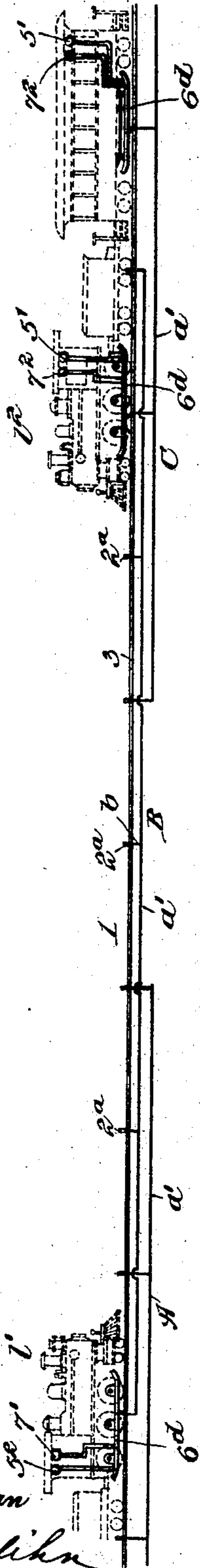


Fig. 5.

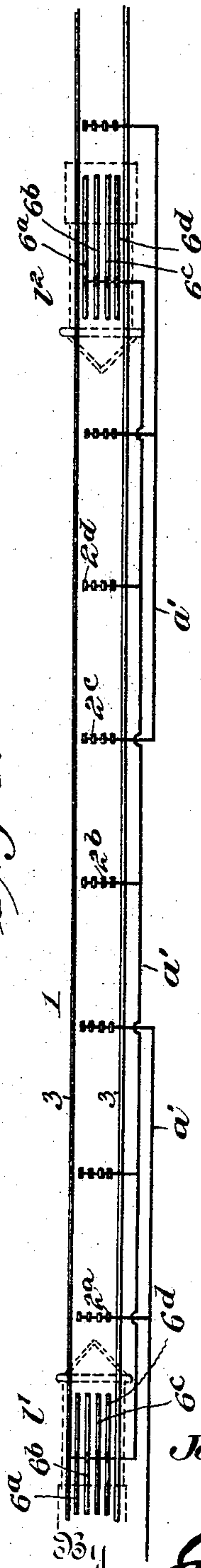
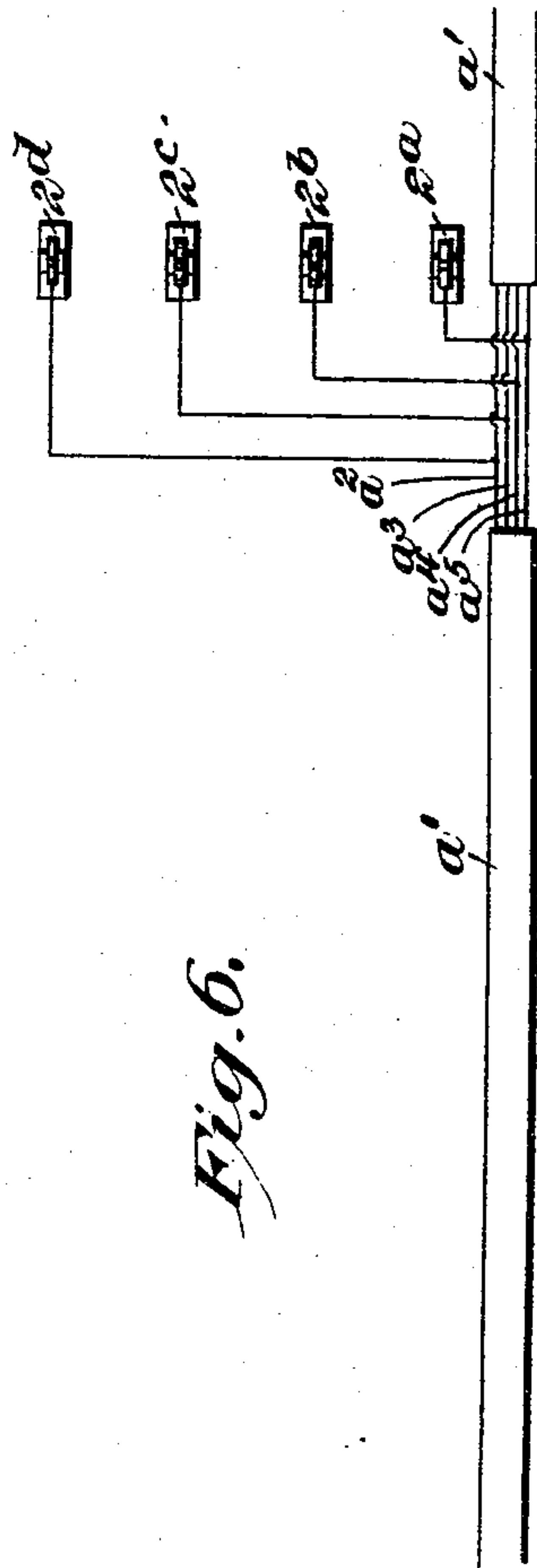


Fig. 6.



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4 SHEETS—SHEET 4.

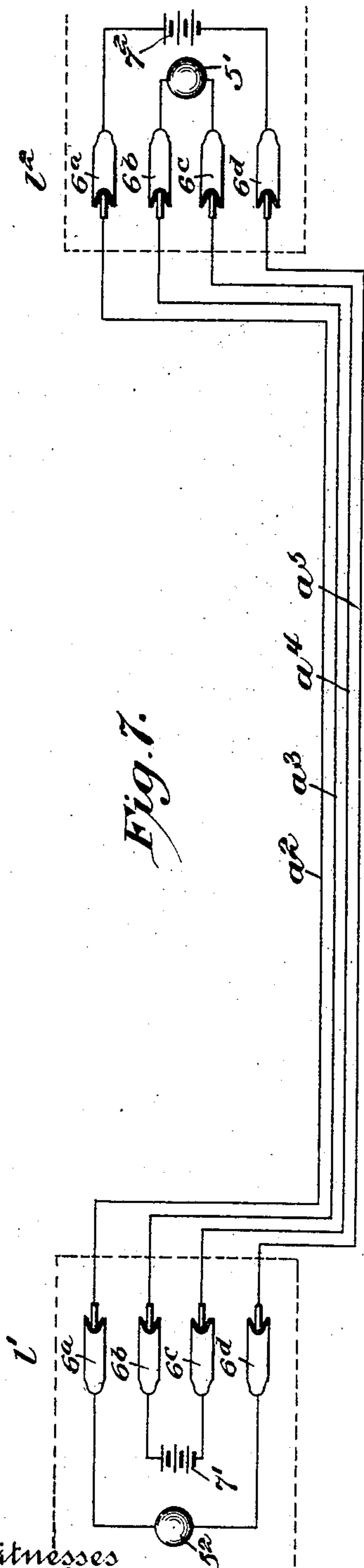


Fig. 7.

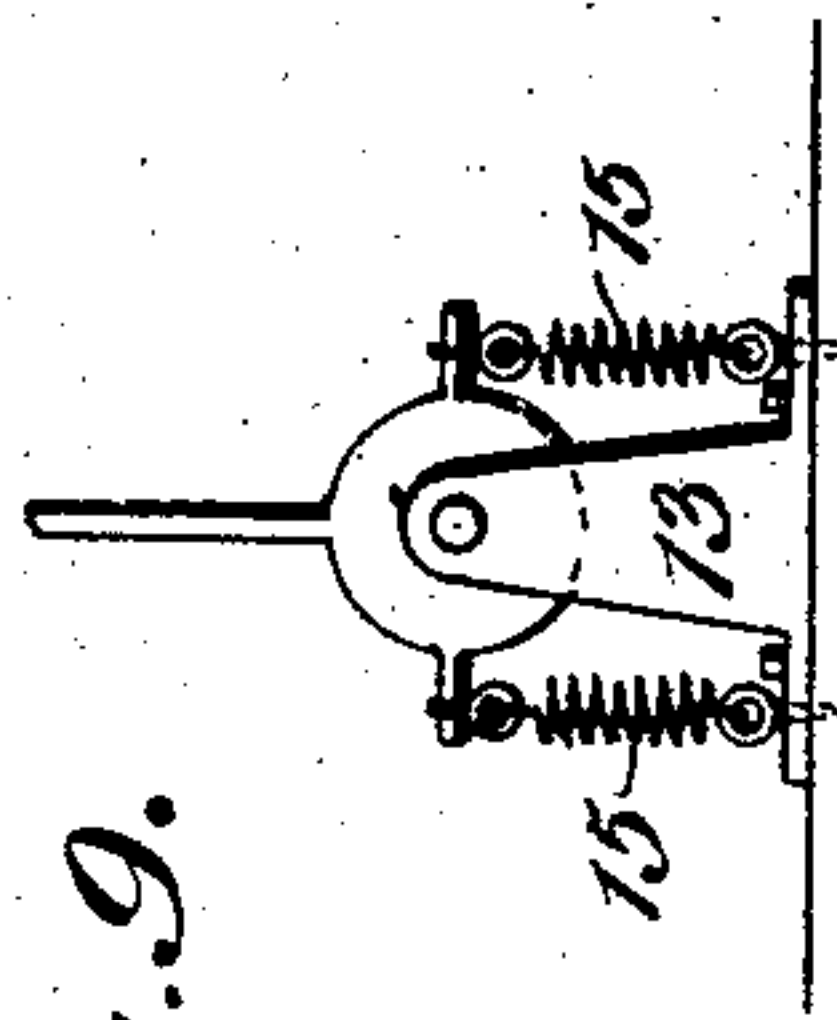


Fig. 9.

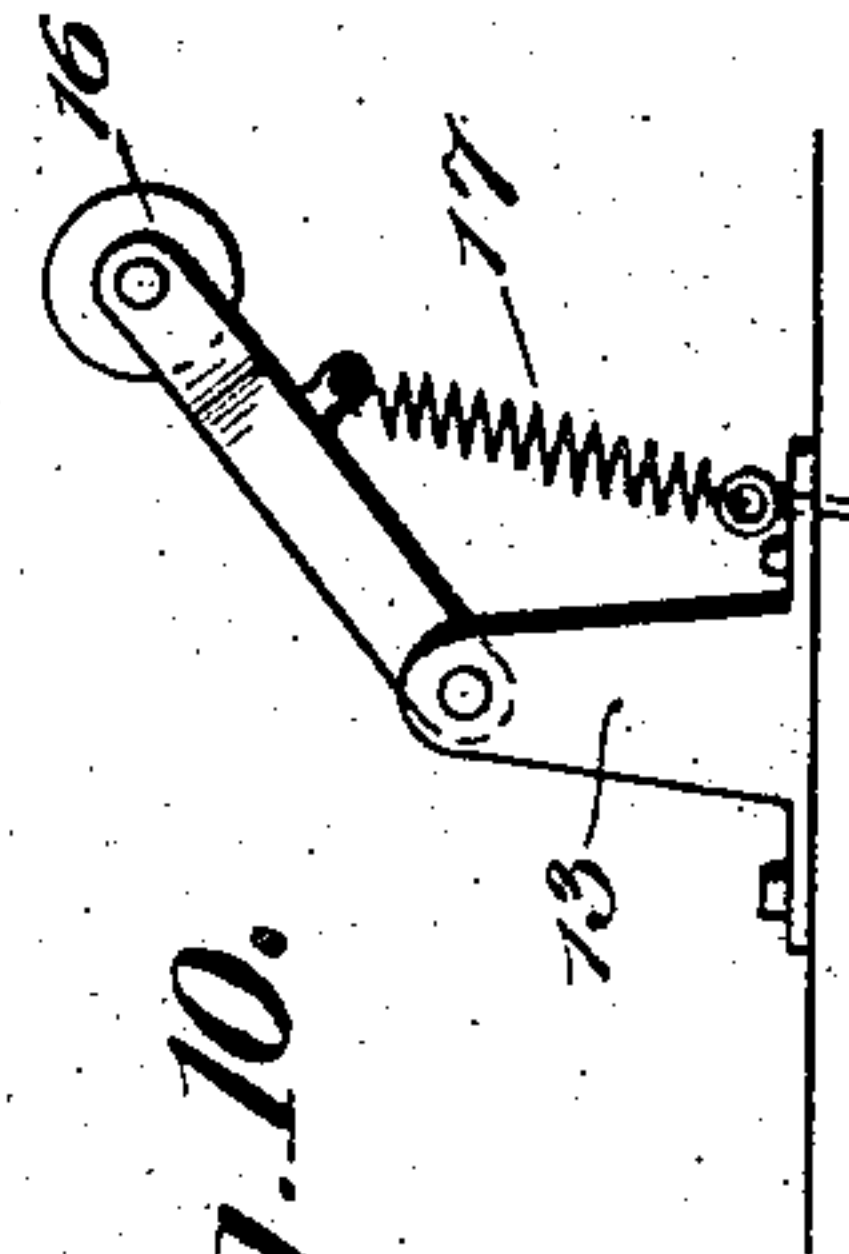
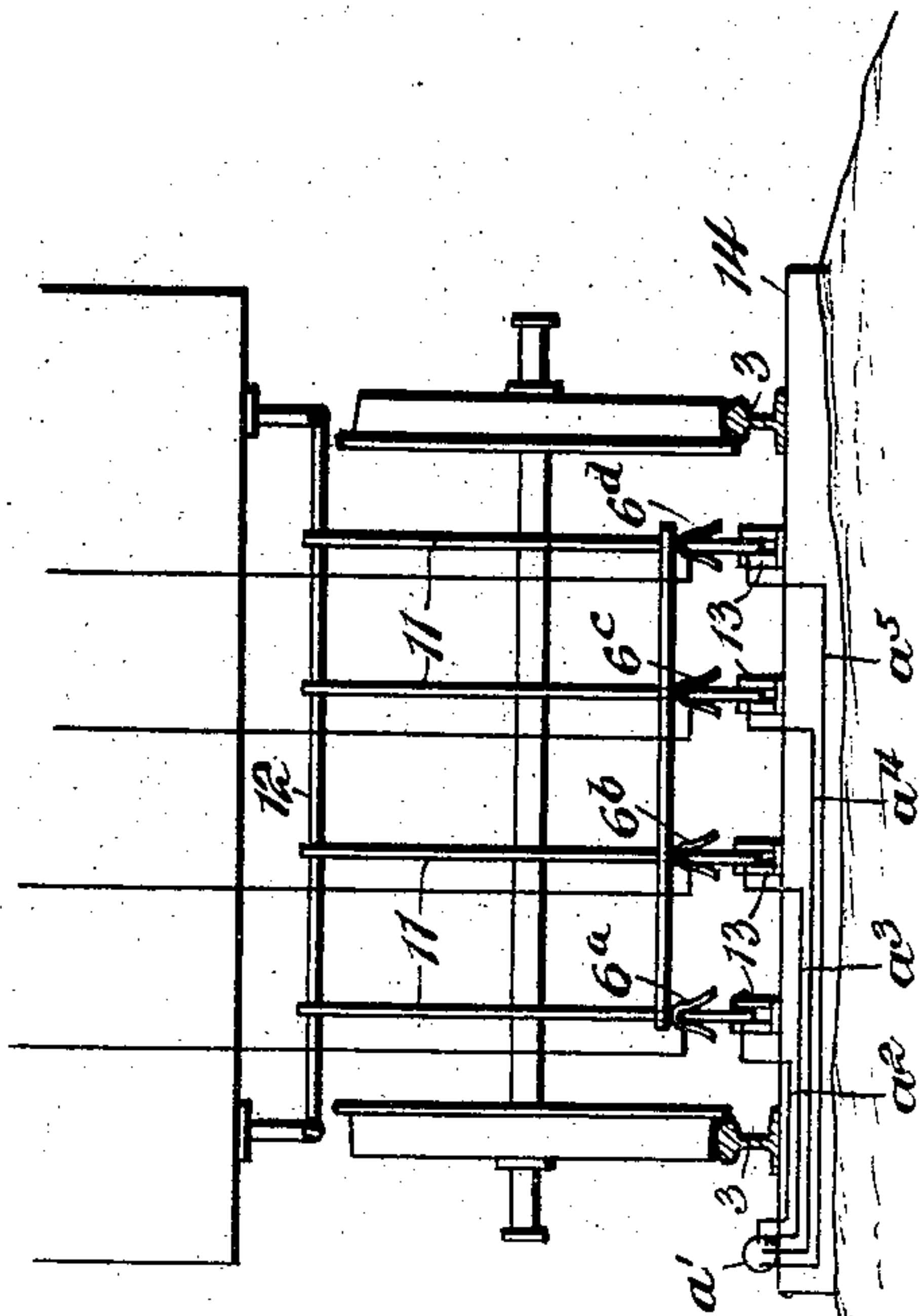


Fig. 10.

Fig. 8.



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JOSEPH H. HARRELL, OF CHARLOTTE, NORTH CAROLINA.

ELECTRIC SIGNAL SYSTEM.

SPECIFICATION forming part of Letters Patent No. 765,922, dated July 26, 1904.

Application filed September 30, 1903. Serial No. 175,209. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH H. HARRELL, a citizen of the United States, residing at Charlotte, in the county of Mecklenburg and State of North Carolina, have invented a new and useful Electric Signal System, of which the following is a specification.

This invention relates to an electric signal system for railroads, the object being to avoid the possibility of collisions between railway-trains by providing means controlled by train movements for automatically operating a visible or audible signal device on the train when the latter is in dangerous proximity to a second train located on the same track or to an open switch.

A further object of the invention is to provide for the simultaneous operation of signal devices carried on different trains when the latter simultaneously occupy the same block or section.

A still further object of the invention is to arrange the blocks or sections of the system in lapping relation, so that a train will move into the range of the signal system of one block before leaving the block last traversed by it, to the end that the several blocks will constitute a practically continuous signal system, avoiding intervals during which a train would be out of the range of the signal-operating connections.

To the accomplishment of the several recited objects and others subordinate thereto, the preferred embodiment of the invention embraces the construction and arrangement of parts to be hereinafter described, illustrated in the accompanying drawings, and succinctly defined in the appended claims.

In said drawings, Figure 1 is a diagrammatic elevation of a portion of my system with two vehicles—as, for instance, locomotives—located in the same block and having their signal apparatus in a closed circuit. Fig. 2 is a diagrammatic view showing the arrangement of the signal apparatus on one of the vehicles and the manner in which the shoe, constituting a terminal of the local circuit, engages one of the contact devices along the road to close the circuit through the signal apparatus, provided the shoe on an approaching vehicle is

similarly in contact with a contact device or finger appurtenant to the same block. Fig. 3 is a diagrammatic plan view showing the manner in which the signal-circuits on the vehicles are closed to sound the signals when an open switch is approached from either direction. Fig. 4 is a diagrammatic elevation of a somewhat-modified form of the system, the further development thereof consisting in suitable provision for obtaining two distinct metallic circuits, each including a signal device on one vehicle and a battery on the other. Fig. 5 is a plan view of the form illustrated in Fig. 4. Fig. 6 is a diagrammatic view showing the manner in which the contact devices or fingers are electrically connected to the wires combined in the form of a cable extending along the railway. Fig. 7 is a diagrammatic view showing the two metallic circuits contemplated in that form of the system illustrated in Figs. 4 and 5. Fig. 8 is an end view of a portion of a vehicle and illustrating the mounting of the several contact-shoes and also the mountings of a series of contact devices or fingers. Figs. 9 and 10 are detail views of contact-fingers adapted for use in connection with my system. Fig. 11 is a diagrammatic view similar to Fig. 3, but showing the modified form of my system. Fig. 12 is a detail view of the switch-contacts shown in Fig. 11.

Like characters of reference are employed to designate corresponding parts in the several views.

1 indicates a section of railroad which is subdivided into signal-blocks of sufficient length to insure the safety of trains, provided the latter are not permitted to traverse a single block at the same time. In Fig. 1 of the drawings three of these blocks (designated A, B, and C) are shown, each block being defined by a line-wire *a*, extending along the road from end to end of the block and having a series of branch wires *b* arranged at intervals and in electrical connection with track instruments in the form of contact-fingers 2, located between the rails 3 and 4, as shown in Fig. 2.

Upon each locomotive or other vehicle is located suitable signaling apparatus, which in the present embodiment of the invention is

in the form of a bell 5, one terminal of which is electrically connected, by means of a wire *c*, with a contact-shoe 6 of any suitable form, carried by the vehicle and arranged to move in a path obstructed by the several contact-fingers 2, disposed at intervals along the road, as stated. The other terminal of the signal apparatus or bell 5 is connected, by means of a wire *d*, with one of the axles of the wheels or other metal part of the vehicle structure, through the medium of which one side of the circuit may be closed through one of the track-rails of the road—as, for instance, the rail 3. Interposed in the line of connection—as, for instance, in the wire *d*—is a suitable source of electrical energy—as, for instance, a battery 7. As the two vehicles indicated diagrammatically in Fig. 1 are similarly equipped, it will be apparent that upon their approach within the range of the signal system of the same block the shoes will contact with fingers 2, thus effecting an electrical connection, through the line-wire *a*, between the shoes and closing a circuit including the bells and batteries of both vehicles. Obviously the closing of this circuit will effect the operation of the signal apparatus 5, and this causes alarms to be sounded upon the trains, apprising some person—as, for instance, the engineers of approaching locomotives—that a condition of imminent danger exists. As will be noted by reference to Fig. 1 of the drawings, one peculiarity of the signal system, considered as a whole, resides in the fact that the blocks are arranged in lapping relation—that is to say, each end of each block extends somewhat beyond the adjacent ends of contiguous blocks—so that a vehicle before passing out of the range of the signal system of one block will move into effective relation with the system of the next succeeding block. It follows, therefore, that during the entire traverse of road the train is protected and that it will be impossible for two trains to move into dangerous proximity to each other without the trainmen being apprised of the extraordinary condition.

The contact-fingers of each block may be disposed at approved intervals; but it is, perhaps, preferable to so locate these fingers that the contact-shoes 6, which are comparatively long, will move into contact with one finger before the electrical connection between the shoe and the last finger engaged by it is broken. This arrangement will serve to give a continuous alarm as long as two trains are located in the same block and will also avoid the possibility of failure to operate the signal in the event that two trains moving in opposite directions at the same speed enter the opposite ends of a block without effecting coincident closing of the opposite ends of the track-circuit. It is also desired to make provisions for the sounding of the signals on the vehicles whenever an open switch is approached from either direction. When, therefore, a

switch is located in any block of the system, I provide for the electrical connection of the line-wire with the return-rail whenever the switch is opened, so that the alarm will be sounded as soon as the vehicle enters the block and completes the alarm-circuit by the contact of the shoe 6 with one of the contact-fingers.

The arrangement of the system at the switch is shown in Fig. 3 of the drawings, the only variation required at this point being the provision of a fixed contact member 8, electrically connected to the line by means of a branch wire *e* and arranged to be engaged by the free end of the switch-rail 9 when the switch is moved to its open position, as shown. It will of course be understood that when the switch-rail 9 is moved away from the track to open the switch the companion switch-rail 10 will move into contact with the other track, so that a signal-circuit may be closed by a train approaching the switch from either direction.

That embodiment of my invention which has been described is extremely simple, inexpensive, and highly efficient. It may be undesirable, however, under some conditions to rely upon a single circuit for the operation of the signals on both vehicles, since an accident to the line or to one of the contact devices would result in the failure of the entire apparatus, and neither engineer would be apprised of the approaching danger. It may also be undesirable to rely upon one of the track-rails as a return-conductor for the signal-circuit. Having in mind, therefore, the elimination of both of these features of the described system, I have illustrated a further development thereof, comprehending an arrangement whereby the signal devices of the vehicles will be included in separate independent metallic circuits, both sides of which are closed through line-wires. In this form of the system, as in the other, the road is divided into overlapping blocks, but instead of the single line-wire a cable *a'* extends from end to end of the block and is made up of four line-wires *a*², *a*³, *a*⁴, and *a*⁵. At suitable intervals along the road and between the tracks are located contact-fingers arranged in sets, each set being composed of four fingers arranged in a row and indicated by 2^a, 2^b, 2^c, and 2^d. The contact-fingers of each row are connected to the several line-wires by suitable branch wires, as shown in Fig. 6, it being noted in this connection that the corresponding fingers of the several rows or sets are in electrical connection with the same line-wire—that is to say, each of the fingers 2^d are connected to the line-wire *a*², while the fingers 2^c, 2^b, and 2^a are connected, respectively, to the wires *a*³, *a*⁴, and *a*⁵. The locomotives (indicated by *l'* and *l''*) are each equipped with four contact-shoes 6^a, 6^b, 6^c, and 6^d, arranged in a transverse row corresponding to the contact-fingers of each set. The shoes 6^b and 6^c of one locomotive are connected to the terminals of a signal 5', while the correspond-

ing shoes of the other locomotive are connected to the terminals of a battery 7'. Similarly the shoes 6^a and 6^d of the vehicle 7² are connected to the terminals of a battery 7², while the corresponding shoes of the other locomotive 7' are connected to the terminals of a signal apparatus or bell 5². If now the locomotives move into the same block, each set of shoes will contact with a set of fingers and two complete metallic signal-circuits will be closed. (See Fig. 7.) The bell 5' on the locomotive 7² will be in circuit with the battery 7' of the locomotive 7', while the bell 5² of the latter will be in circuit with the battery 7² of the locomotive 7².

The particular character of contact-fingers and shoes employed in connection with my system is not material. Preferably, however, the shoes are suspended by hangers 11 from a support 12, fixed to the vehicle structure, and the fingers of each row or set are pivotally mounted in brackets 13, bolted or otherwise secured to one of the ties 14, provided for the support of the track-rails of the road. The fingers may be retained in an upright position, as shown in Fig. 9, by reactive springs 15, connected to the opposite sides thereof, or each finger may be inclined and provided with a terminal contact-roller 16, as shown in Fig. 10, and yieldingly retained in such position by a spring 17.

In Fig. 11 of the drawings I have shown a block including a switch and the arrangement whereby that form of system illustrated in Figs. 4, 5, and 7 is adapted to effect the sounding of the alarm upon approaching an open switch. At the inner side of the free end of the switch-rail 9 is secured a strip of insulation 18, upon which are mounted two spaced contact-plates 19 and 20, which are thus insulated from each other and from the switch-rail. Opposite the plates 19 and 20 are located contact members or blocks 21, 22, 23, and 24, connected, respectively, by branch wires e^1 , e^2 , e^3 , and e^4 to the line-wires a^2 , a^3 , a^4 , and a^5 . When the switch is opened, as indicated in Fig. 11, the plate 19 will place the blocks 21 and 22 in electrical connection, thus connecting the line-wires a^2 and a^3 , while the plate 20 will connect the blocks 23 and 24 and establish the electrical connection of the line-wires a^4 and a^5 . If now a locomotive moves into the block and presents its shoes to a set of contact-fingers, a circuit will be closed through the bell and battery thereof, as indicated in Fig. 11 of the drawings, attention being directed to the fact that the arrangement is such that no battery is required at the switch and that while upon the approach of two trains each signal-circuit includes a bell on one vehicle and a battery on another the circuit closed by the movement of the trains into close proximity to an open switch includes the bell and battery of the same vehicle. It will therefore be seen that

while there is more or less interdependence of two trains, so far as the operation of the signal apparatus upon the approach thereof is concerned, the signal apparatus of each train is entirely independent of any other train with respect to the avoidance of an open switch. If desired, different vehicles of each train may be equipped with signal apparatus comprising a battery, a bell, and a series of shoes, as indicated in Fig. 4, and this arrangement may perhaps be desirable in order that the conductors and other responsible trainmen, as well as the engineer, may be apprised of impending danger.

It is thought that from the foregoing the arrangement of the system and the construction of the apparatus included therein will be clearly comprehended; but while the described embodiments of the invention appear at this time to be preferable I desire to be distinctly understood as reserving the right to effect such changes, modifications, and variations in the illustrated structure as may fall fairly within the scope of the protection prayed.

What I claim is—

1. In a railway signal system, the combination with the tracks and a switch; of a signal-circuit including suitable wiring extending along the road, a circuit-closing device operated by the switch, contact devices located at intervals along the road, vehicles equipped with signal apparatus, batteries and contact-shoes, the latter being arranged to contact with the contact devices to close the signal-circuit through a battery and signal apparatus when a vehicle approaches the open switch from either direction.

2. In a railway signal system, the combination with a series of blocks in lapping relation, tracks and a switch located in one of said blocks; of a signal-circuit for each block including a series of connected contact devices located at intervals along the road-bed, a circuit-closer arranged to be closed by the opening of the switch to close the signal-circuits at both sides of the switch, and vehicles equipped with signal apparatus, batteries and shoes, said shoes being arranged to engage the contact devices to put the signal apparatus on each vehicle in circuit with a battery when said vehicles enter the same block, and to close a circuit through a signal apparatus and battery when a vehicle equipped therewith approaches the open switch from either direction.

3. In a railway signal system, the combination with line-wires and a series of sets of contact devices disposed at intervals, the corresponding devices of the several sets being in electrical connection with the same line-wire; of a vehicle carrying a battery and shoes constituting battery-terminals, and another vehicle carrying a signal and shoes constituting signal-terminals, said battery and signal terminals being arranged to engage corre-

sponding contact devices of different sets to close the circuit through the battery and signal.

4. In a railway signal system, the combination with a plurality of blocks; of a cable extending from end to end of each block and lapping the ends of the cables of adjacent blocks, four line-wires in each cable, a series of sets of contact-fingers located at intervals in the block, branch wires electrically connecting each line-wire with corresponding contact-fingers in each of the several sets, and independent vehicles each equipped with a signal, a battery, and four shoes constituting battery and signal terminals, said shoes being disposed for engagement with the contact-fingers to close independent circuits, each including the signal on one vehicle and the battery on the other.

5. In a railway signal system, the combination with a series of sets of pivoted contact-fingers, and counteractive springs for yieldingly retaining the fingers in their normal positions; of separate line-wires in electrical connection with the corresponding fingers of each set, independent vehicles, each equipped with a battery and a signal and with a set of shoes constituting battery and signal terminals and arranged to engage and swing the contact-fingers.

6. In a railway signal system, the combination with the tracks; of a series of blocks provided with independent wiring, the wiring of each block extending beyond or lapping the adjacent ends of the wiring of two adjacent blocks, contact-fingers disposed at intervals along each block and connected to the wiring thereof, the contact-fingers at the ends of each block being located within the limits of the adjacent blocks, and vehicles equipped with signal apparatus, batteries and shoes, the latter being arranged to contact with the fingers for the purpose of closing a signal-circuit and of sufficient length to contact with fingers of two blocks when the vehicles are

passing from one block to another, whereby vehicles located at the opposite end of a block will be apprised of the presence of each other, and will also be in electrical connection with the signal systems of the two adjacent blocks.

7. In a railway signal system, the combination with the tracks and separate blocks, each provided with independent wiring and a series of contact-fingers, the wiring of each block extending beyond or overlapping the ends of the wiring of the two adjacent blocks, and the fingers of adjacent blocks being in alternating arrangement at the lapping ends thereof, of vehicles equipped with signal apparatus, batteries and shoes, the latter being arranged to contact with the fingers.

8. In a railway signal system, the combination with a plurality of blocks and a switch, of a cable extending from end to end of each block and lapping the ends of cables of adjacent blocks, four line-wires in each cable, a series of sets of contact-fingers located at intervals in each block, branch wires electrically connecting each line-wire with corresponding contact-fingers in each of the several sets, independent vehicles each equipped with a signal, a battery, and four shoes constituting battery and signal terminals, said shoes being disposed for engagement with the contact-fingers to close independent circuits each including a signal on one vehicle and a battery on the other, and a circuit-closing device operated by the switch to close a circuit through the signal device and battery on one vehicle when the shoes of the latter are in engagement with a set of fingers.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

JOSEPH H. HARRELL.

Witnesses:

PAUL CHATHAM,
J. L. LILLARD.