No. 747,949. PATENTED DEC. 29, 1903.

W. H. DAMMOND.

SIGNALING SYSTEM.

APPLICATION FILED NOV. 5, 1902.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1.

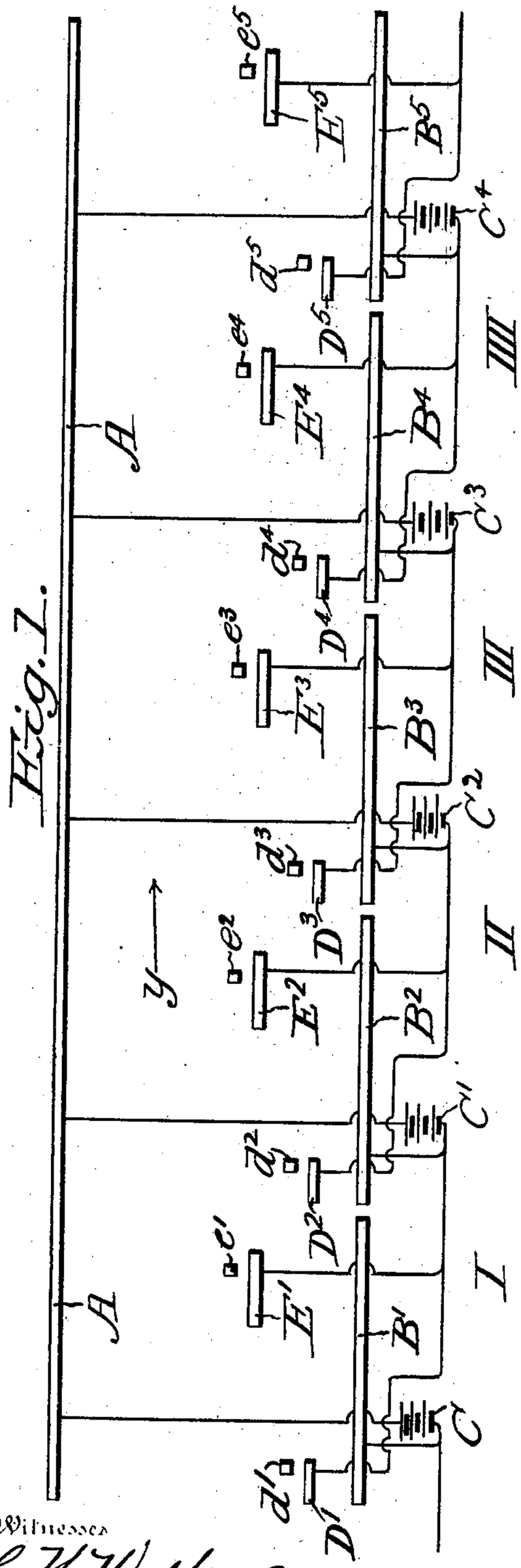
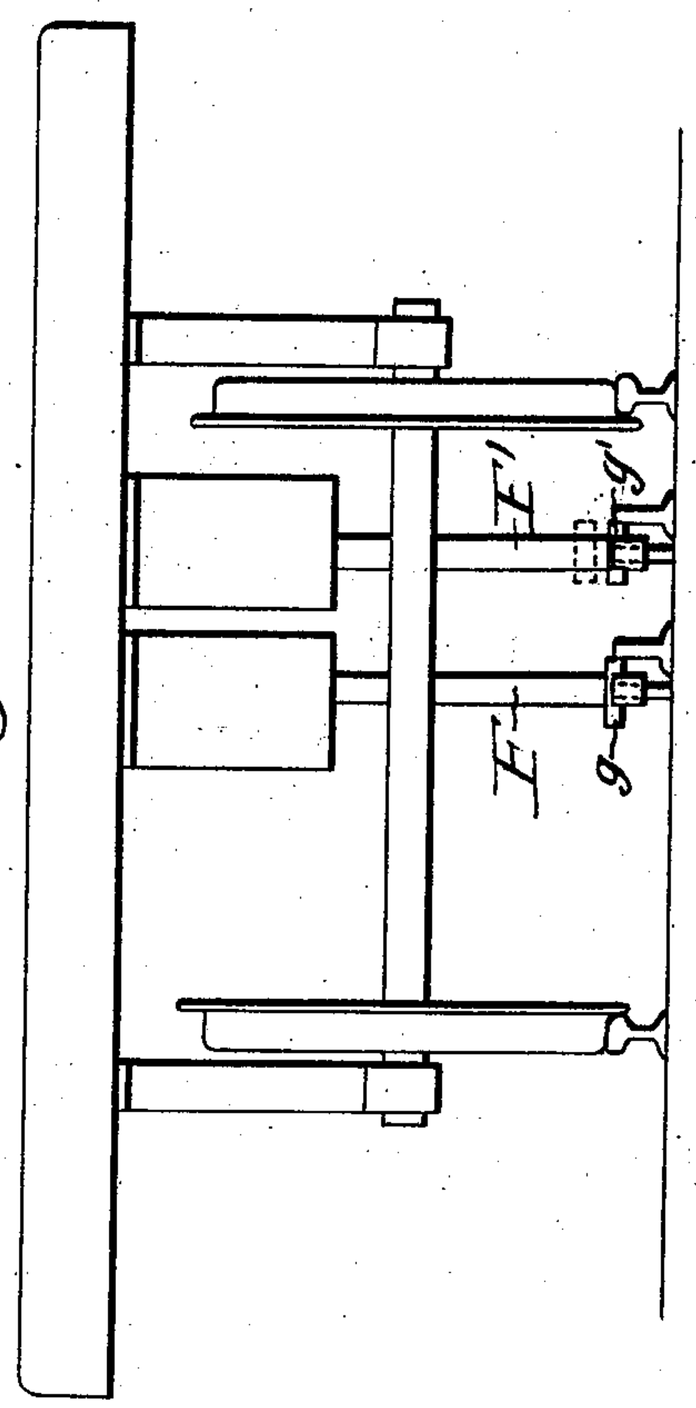


Fig. 2.



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NO MODEL. 2 SHEETS—SHEET 2.

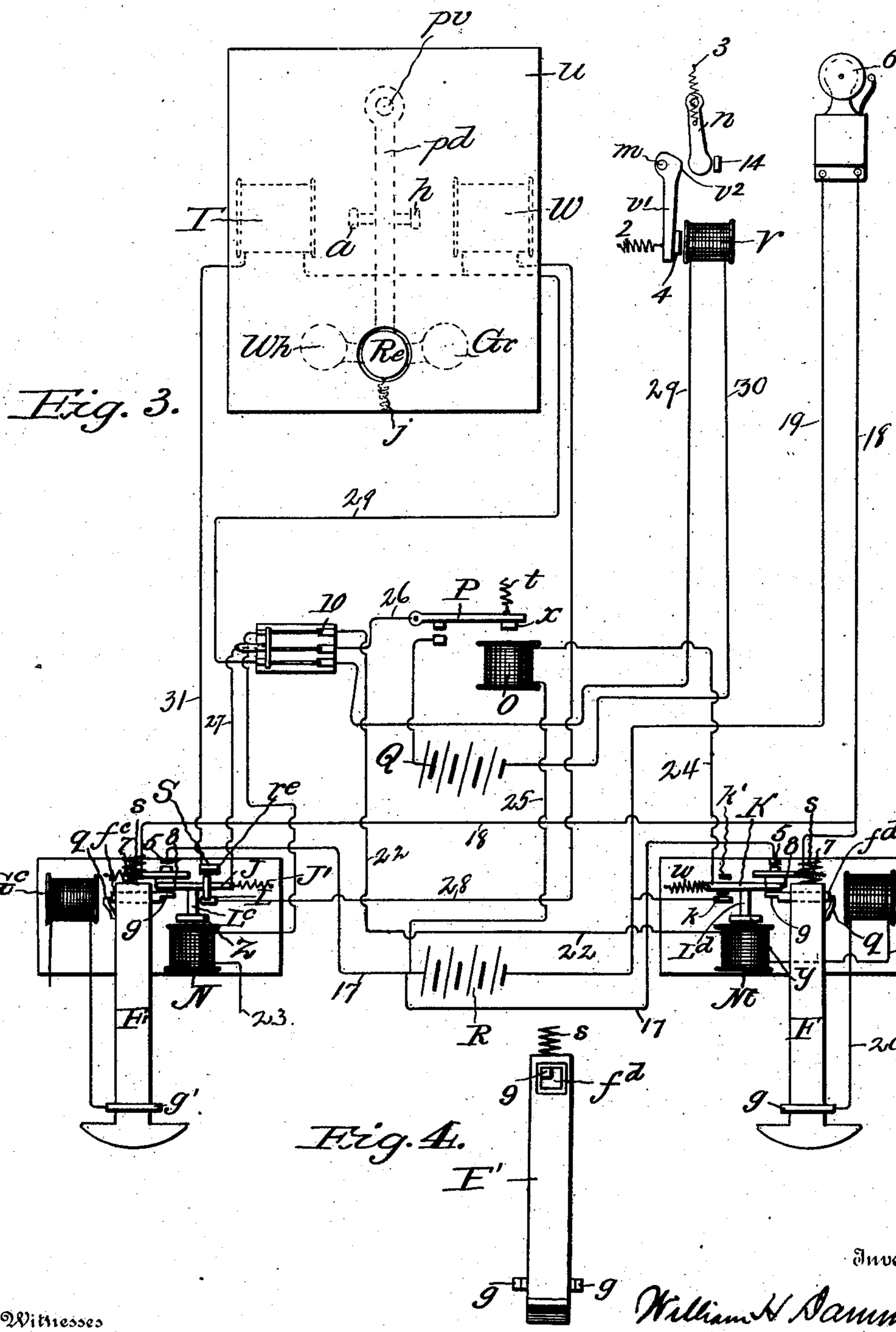

Fig. 3.

Fig. 4.

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No. 747,949. Patented December 29, 1903.

UNITED STATES PATENT OFFICE.

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SIGNALING SYSTEM.

SPECIFICATION forming part of Letters Patent No. 747,949, dated December 29, 1903.

Application filed November 5, 1902. Serial No. 130,194. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM H. DAMMOND, a citizen of the United States of America, residing at Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Signaling Systems, of which the following is a specification.

This invention relates to signals, and particularly to those for use on railways.

The object of the invention is to produce a system of the block type by which through the action of novel automatically-controlled electrical circuits, sounders, and visible signals the engineman of one train gains a knowledge of the approach to another train.

Furthermore, the object of the invention is to produce a system in which signals are given when the train is in motion or when standing.

With the foregoing and other objects in view the invention consists in the details of construction and in the arrangement and combination of parts to be hereinafter more fully set forth and claimed.

In describing the invention in detail reference will be had to the accompanying drawings, forming part of this specification, wherein like characters denote corresponding parts in the several views, and in which—

Figure 1 is a diagrammatic view of a block system indicating several partial circuits. Fig. 2 represents a front elevation of an engine-truck with depending contact-arms. Fig. 3 is a diagrammatic view representing the system. Fig. 4 is a detail view of an arm.

In the drawings, I II III IIII indicate a series of blocks in which a rail A is electrically continuous and in which sections B′, B^2, B^3, B^4, and B^5 are insulated in order that current from one block may not pass to the other block.

C, C′, C^2, C^3, and C^4 are batteries, dynamos, or other sources of electricity, one pole of each being connected to the corresponding block and also to a caution contact and a danger contact of the block to the rear, the direction being noted by the arrow Y of Fig. 1. The caution contacts are indicated by D′, D^2, D^3, D^4, and D^5, and the danger contacts are indicated by E′, E^2, E^3, E^4, and E^5. The caution tripping-posts d', d^2, d^3, d^4, and d^5 are stationed to one side of the caution contacts, and the danger tripping-posts e', e^2, e^3, e^4, and e^5 are stationed to one side of the danger contacts, and the posts and contacts operate in a manner to be presently explained, it being observed that the caution contacts are located, preferably, near the entrance to a block, while the danger contacts are preferably near the opposite end.

It will be observed that in the drawings, Figs. 1 and 2, the contacts D′ E′, &c., and the tripping-posts d' e', &c., are between the rails of the track and that the arms F and F′ are between the wheels of the vehicle. Of course these details are not necessary to the proper operation of my invention. They show merely a possible construction. The essential facts here are that the tripping-posts and contacts shall be in any case on the ground and predetermined distances from the track-rails and either between or outside of said rails and that the arms shall be carried by the vehicle and so positioned as to coöperate with the contacts and the tripping-posts, as hereinafter described. Again, the idea of making the tripping-posts separate from their corresponding contact-pieces shows only a possible and not an essential construction, for the essential fact here is that there shall be at every signaling-point a device which shall serve to trip the arms F or F′, as the case may be, and to afford electrical contact with contact-pieces carried by the respective arms F F′. Said tripping device may consist of a single piece of any suitable size and shape or of two or more pieces, as may be desired.

Each locomotive has depending arms F and F′, the former for the danger contacts and the latter for the caution contacts. The arms are provided with rounded lower ends to pass more readily over the tripping-posts with a cam action, which results in reciprocating or moving the arms vertically against the action of the springs *s*. Of course it is not necessary that the motion of the arms F and F′ be vertical nor operated by a cam action, as mentioned. The cam action and vertical motion of the arm are used only as showing a possible construction. The essential construction here is such that motion is imparted to arms or levers carried by the moving loco-

motive or car through tripping of said arms or levers by tripping-posts suitably placed along the track either between or outside the rails of said track. Each arm is provided with a contact (which may be an insulated ring or the like) g' g, respectively, electrically connected to solenoids G^c G^d, which when the contact-rings engage the caution or danger contacts are energized, resulting in their attracting the pins f^c f^d and also the pins 9, which are carried by the pins f^c and f^d, respectively. The pins just described are drawn toward the solenoids against the action of the springs q, and when said solenoids are demagnetized the springs act to return the pins to the position they occupied before they were attracted by the solenoids. Solenoids M and N are connected in series with solenoid G^d and are energized simultaneously, or, if desired, the solenoid G^d may be grounded similarly to the showing of the connection for the solenoid G^c and solenoids M and N, connected in multiple with solenoid G^d.

A circuit containing switches 5 and bell 6, to be hereinafter termed an "alarm-bell," through conductors 17, 18, and 19 is connected in multiple with solenoid O. Switches 5 are normally open, their levers resting normally on stopping-pegs 8 and in the path of travel of the projecting ends 9, the stopping-pegs 8, however, being out of the path of travel of 9. These switches 5 are closed by the upward movement of the projecting ends 9, and when the ends subsequently drop down it is desirable that the switches 5 open again quickly. To produce this latter effect, gravity alone is not depended upon, but springs 7 are supplied, which unaided (by gravity, for instance) would quickly open the switches 5 after the return of the ends 9 to their downward position. Also these springs are designed to minimize the tendency of the switches 5 when in their normal position to be closed by the jolting of the train. The switches are in such relation to the pins 9 as to be closed thereby when the arms F F' are raised, and when said switches are closed a circuit is made through the bell 6, and when the bell sounds at the caution and danger stations the enginemen know that the arms are in operative position. Should one of the arms be broken or impaired and a signal-station passed without the operation of the bell, the enginemen would know that the system was not operating, and the defect would be investigated.

A solenoid O is in circuit with the electrical source R, and the circuit is controlled by a switch K and contact k. The switch K rests normally in engagement with contact-piece k. This switch is controlled by the action of the solenoid M and the spring w or the action of the arm F, the pin f^d, and the spring w. In case the solenoid G^d is energized it attracts f^d against the action of the spring q, and the arm F then may move without the pin f^d moving the switch K, and said switch unless moved by the action of the arm F and pin f^d is held by the spring w in engagement with the contact k; but when the solenoid G^d is demagnetized the spring q is unopposed, and hence the pin f^d is free to raise the switch K to engage the stopping-peg k' when the arm F is raised. Whenever the switch K is made to engage the stopping-peg k', the spring w holds K in contact with k'. The arm L^d is fastened at one end to the switch K, and the armature y is fastened to the free end of L^d. When the solenoid M is energized, it attracts armature y and through y arm L^d and switch K with sufficient force to overcome the effort of w to hold K in contact with k', thus causing the switch K to engage the contact-piece k. Once switch k is thus made to contact with k it is not necessary that M remain energized in order to hold said contact of K to k, for the spring w holds the switch K in contact with k until w is overcome by the upward motion of f^d, as above described. With the energization of the solenoid O the armature x is attracted and the switch P is closed against the action of the spring t, thus closing the circuit through the solenoid V.

A switch J rests normally in engagement with contact-piece L. This switch is controlled by the action of the solenoid N and the spring J' or by the action of the arm F', pin f^c, and the spring J'. In case the solenoid G^c is energized it attracts the pin f^c against the action of the spring q, and the arm F' may move without the pin f^c moving switch J, and said switch, unless disturbed by the action of the arm F' and pin f^c, is held by the spring J' in engagement with the contact L; but when the solenoid G^c is demagnetized the spring q is unopposed, and hence the pin f^c is free to raise the switch J to engage the contact-piece S when the arm F' is raised. Whenever the switch J is made to engage the contact-piece S, the spring J' holds J in contact with S. The arm L^c is fastened at one end to the switch J, and the armature Z is fastened to the free end of L^c. When the solenoid N is energized, it attracts armature Z and through Z arm L^c and switch J with sufficient force to overcome the effort of J' to hold J in contact with S, thus causing the switch J to engage the contact-piece L. Once switch J is thus made to contact with L it is not necessary that N remain energized in order to hold said contact of J to L, for the spring J' holds switch J in contact with L until J' is overcome by the upward motion of f^c, as described.

An indicator u has an opening for the display of signals, the said signals being attached to an arm pd, and the arm is pivoted at pv. A spring j controls the arm to hold it in a vertical position, or the arm may be controlled by the solenoids T and W through the armatures a and h, attached to the arm, the arm moving toward the solenoid, which becomes energized.

The solenoid V is designed to attract the ar-

mature 4 on the valve v', the said valve being under the influence of a spring 2.

Fluid for operating a whistle is applied through the port m. This port m may be closed by either of two valves v' and n. The valve v' closes the port m when the former is attracted by the solenoid V. Said valve v' leaves port m open, however, when v' is moved away from V under the tension of spring 2. Another valve n for controlling the whistle is itself controlled by spring 3, the normal position of n being such as to leave m open and to leave n itself abutting against the stop 14. When the solenoid V is demagnetized and the spring 2 pulls the valve v', the whistle is blown until the engineman throws the valve n away from the stop 14 and closes the port m. When the solenoid V is again energized, the valve v' is attracted. A cam v^2 on the valve v' then abuts the valve n, and the cam with the aid of the spring 3 of said valve (which has been described) throws the valve against the pin 14, thus opening the port m with the valve n, but at the same time closing said port m with the valve v'.

In operation should a locomotive properly equipped and traveling in the direction of the arrow Y start to leave block I while block II is clear and block III is occupied the current from C′ (so long as the engine is wholly in block I) will pass to contact-pieces D′ and E′, and the contact-piece g touches danger contact E′, and current passes from E′ to g by conductor 20, to G^d by conductor 21, to M by conductor 22 through switch 10, to N by conductor 23, to wheels and axles of locomotive, to continuous rail, and to electrical source C′, and as solenoid G^d is energized the pin f^d is drawn out of the path of the switch K, and hence said switch is not disengaged from contact k, and if the switch K were open or if the switch J were contacting with S the current through the solenoids M and N would cause the switches to be closed with contacts k and L, respectively. With the switches in the last-mentioned position a current is established through the solenoid O by its conductor 24 and 25, causing the armature x to move toward O and closing the switch P and establishing a circuit from the electrical source Q through the switch 10 by conductor 26, through the switch J by conductor 27 and its contact L, by conductor 28 to the solenoid W, and by conductor 29 to solenoid V, back to the electrical source Q by conductor 30. Hence the solenoid W will attract the armature h, causing clear color W^h to appear before the opening of the indicator-cover. When the locomotive proceeds to block II, the contact-piece g' touches caution contact D^2; but solenoid G^c is not energized, as current from the battery C^2 is shunted by the wheels and axles of the car in block III. Hence as the arm F′ is pushed upward in passing over the trip d^2 the peg f^c, which is in the path of travel of the switch J, will throw switch J from contact with L to contact with S, and current will pass from electrical source Q through switch P, through switch 10 by conductor 26, through switch J by conductor 27, through contact-piece S by conductor 31, to solenoid T and to solenoid V by conductor 29 to electrical source Q by conductor 30, causing solenoid T to attract armature a and carrying caution disk G^r to the opening of the indicator. As locomotive passes on and contact-piece g engages danger contact E^2 solenoid G^d will be unable to attract pin f^d, as current from C^2 is shunted away from E^2 by the wheels and axles of car in block III, and as the arm F is pushed up in passing over e^2 and as the pin f^d has not been moved by the solenoid G^d the pin f^d carries switch K to an open position. By opening switch K the current to the solenoid O is broken, and hence the switch P is opened under the tension of the spring t and the solenoids of the indicator and that of the whistle are open-circuited. The spring j of the indicator being now unopposed, the danger color R^e will be exposed in the opening of the indicator, and the spring 2 of the valve v' being unopposed the port to the whistle will be opened to permit air to pass to the whistle and blow same, and the whistle will continue to blow until the valve n is shifted to close the port m. The spring 3 is in such relation to the valve n as to hold said valve in a position closing the port m or in contact with the peg 14. The danger-signal being given through the operation just described, it is the duty of the engineman to bring his train to a full stop, with contact-piece g touching danger contact E^2. When the car is moved out of block III to block IIII, current from battery C^2 being directed to E^2 again contact-piece g acts as a conductor to deliver current to the solenoid G^d, completing a circuit through solenoids M and N, car-axle and wheels to rail A, and back to battery C^2. Solenoids M and N are now energized and switch K is closed and switch J is drawn to contact L. The solenoid O is again energized and the switch P is closed, resulting in closing the circuit through the solenoids w and v, thus exhibiting clear-signal W^h and drawing the valve v' toward the solenoid V, this latter action resulting in closing the port m with the valve v' and throwing the valve n into contact with stop 14, as heretofore stated. Contact-posts S and L are so constructed and arranged that as switch J moves from one to the other said switch will never be out of contact with both simultaneously. Hence in each transit from the one post to the other there must be an instant when the switch J will be in engagement with both contacts S and L, and either or both contacts may consist partially of a resistance-piece r^e, so arranged that the switch J cannot simultaneously touch lower resistance parts of the contacts S and L.

The construction, operation, and advantages will, it is thought, be understood from

the foregoing desription, it being noted that various changes in the proportions and other details of construction may be resorted to for successfully carrying the invention into practice without departing from the scope.

Having fully described the invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a signaling system, a track having an electrically-continuous rail and a rail insulated to produce sections or blocks, contacts near the entrance to the blocks, contacts in the blocks, a tripping-post for each contact, a source of electricity for each block having one pole connected to the continuous rail and the other pole connected to the section of the insulated track and to contacts of predetermined sections, signals carried by a locomotive and suitable means for utilizing the current of the electricity of each block to control the operation of the signals of the locomotive.

2. In a signaling system, a track having an electrically-continuous rail and another rail insulated to produce sections or blocks, contacts at predetermined points in the blocks, tripping-posts for the contacts, arms carried by a locomotive and moved by the tripping-posts, electrical contacts carried by the arms, the said arms being so positioned as to cause the contacts of the arms to engage the contacts of the track, batteries for energizing the contacts, electromagnetic means energized when current passes through the contacts, pins carried by the arms and attracted by the electromagnetic means, suitable circuits including signal-operating means, switches moved by the pins of the arms when the electromagnetic means are demagnetized, said switches being in the circuits of the signal-operating means, a bell-circuit and switches therefor, closed with the upward movement of the arms, and means for preventing the closing of the switches when blocks in front are clear.

3. In a signaling system, a track comprising an electrically-continuous rail and a rail divided into insulated sections, a locomotive or car thereon, tripping means, a source of electricity external to the locomotive or car, a plurality of partial electrical circuits from the electrical source having their terminals included in the track and contacts, visible and audible signals on the locomotive or car in a normally closed circuit, switches in the circuit, mechanical and electrical means for controlling the circuits, said mechanical controller being operated by the tripping means, and means for regulating the action of the mechanically-operated controller.

4. In a signaling system, a track comprising an electrically-continuous rail and a rail divided into insulated sections, contacts and tripping-posts, a source of electricity external to a locomotive or car, a plurality of partial electrical circuits having their terminals including two contacts of a block and an electrically-continuous rail, and an insulated rail of the block, arms depending from a locomotive or car adapted to be thrown by the tripping-posts, a normally open circuit including an alarm-bell and switches for controlling the circuit, means on the arm for closing the switches of the alarm-bell circuit on each throw of the arm, audible and visible signals, suitable circuits and switches for the signals, means on the arms for throwing the switches, and electrically-controlled means for preventing the opening of the switches under certain conditions.

5. In a signaling system, a track, a locomotive or car thereon, tripping-posts and contacts on the road-bed, a source of electricity external to the locomotive or car, a plurality of partial electric circuits from the electric source having their terminals included in the track and contacts, visible and audible signals on the locomotive or car in a normally closed circuit, an alarm in a normally open circuit and mechanically-operated means for closing the circuit to the alarm at each trip and for operating a switch of the signals and means for controlling the action of the mechanically-operated device for throwing the switch of the signal-circuits.

6. In a signaling system, a track, tripping-posts and contacts, a plurality of partial circuits having their terminals included in the rails and contacts of the track, arms depending from a locomotive or car, means on the arms for conducting current from the contacts and completing circuits, electromagnetic means energized by the currents, a normally opened circuit including a bell, means on the arms for operating switches of the bell-circuit to close said circuit, a normally closed circuit in multiple with the bell-circuit, means on the arms for opening the circuit, the said circuit-openers being inoperative when the electromagnetic means are energized, audible and visible signal circuits and means for controlling the said circuits by the action of the arms, as and for the purpose described.

7. In a signaling system, a track, partial circuits having terminals included in the rails of the track and in contacts at suitable distances from the rails, tripping-posts for the contacts, arms actuated by the tripping-posts, means for conducting current from the contacts, electromagnetic means energized by the current, pins carried by the arms, attracted by the electromagnetic means, a normally open bell-circuit and a normally closed circuit having switches adapted to be operated by the pins, a visible signal controlled by electromagnetic means, a circuit through the solenoids and means for changing the current from one electromagnetic means to the other or for opening the circuit, substantially as described.

8. In a signaling system a track comprising an electrically-continuous rail and a rail insulated into blocks, contacts and tripping

means for each block, sources of electricity along the track corresponding to the blocks, conductors from the sources of electricity to the continuous rail, to one insulated block and to predetermined contacts in a block not connected to the source of electricity, an engine having conductors on an engine adapted to engage the contacts, and audible signal in the engine, means for sounding said signal at each trip, visible signals on the engine, solenoids for controlling the visible signal, conductors for the solenoids and means for controlling the current to the solenoids, as and for the purpose described.

9. In a signaling system, a visible signal, electromagnetic means for controlling the signal, a circuit for the electromagnetic means, a switch for controlling the current to the electromagnetic means, moving arms, pins thereon for operating the switch, electromagnetic means for controlling the pins and a circuit established under certain conditions to cause the electromagnetic means to attract the pins from contacting the switch.

10. In a signaling system, a visible signal, electromagnetic means for controlling the signal, a circuit for the electromagnetic means, a switch for controlling current to the electromagnetic means, moving arms, pins thereon adapted to operate the switch, an electromagnetic means controlling the pin of each arm, an audible signal operated in unison with the visible signal, and a circuit established under certain conditions to cause the electromagnetic means to attract the pin of the arm from contacting the switch, as and for the purpose described.

11. In a signaling system, a track and contacts, a locomotive or car thereon, a source of electricity external to the locomotive or car, a plurality of partial electric circuits from the electrical source having their terminals included in the track and contacts, visible and audible signals in the locomotive or car in a normally closed circuit, a switch for controlling the circuit, mechanical means for opening the switch, means electrically operated for controlling the action of the switch-operating device and means for energizing the said electrically-operated device, from the source of electricity external to the locomotive or car.

In testimony whereof I affix my signature, in the presence of two witnesses, this 21st day of October, 1902.

WILLIAM H. DAMMOND.

Witnesses:
ROBERT J. DE COFIELD,
CLARENCE E. THOMPSON.