(No Model.) 5 Sheets—Sheet 1.

C. SELDEN.

RAILWAY TRAIN SIGNAL APPARATUS.

No. 478,135. Patented July 5, 1892.

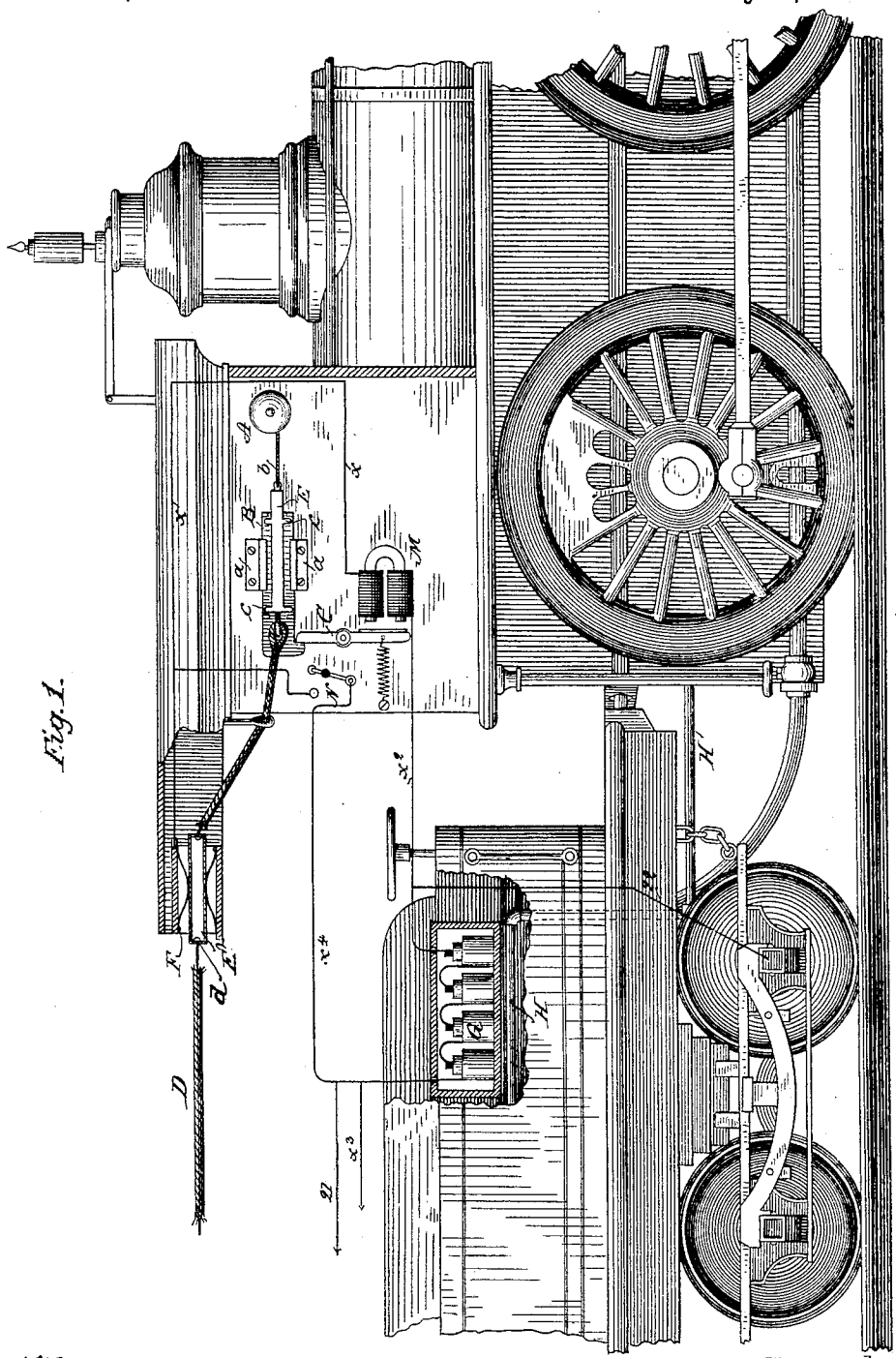


Fig. 1.

Witnesses:
Ernest Abshagen
Thos. Dooney.

Inventor:
C. Selden
By his Attorney: H. B. Townsend

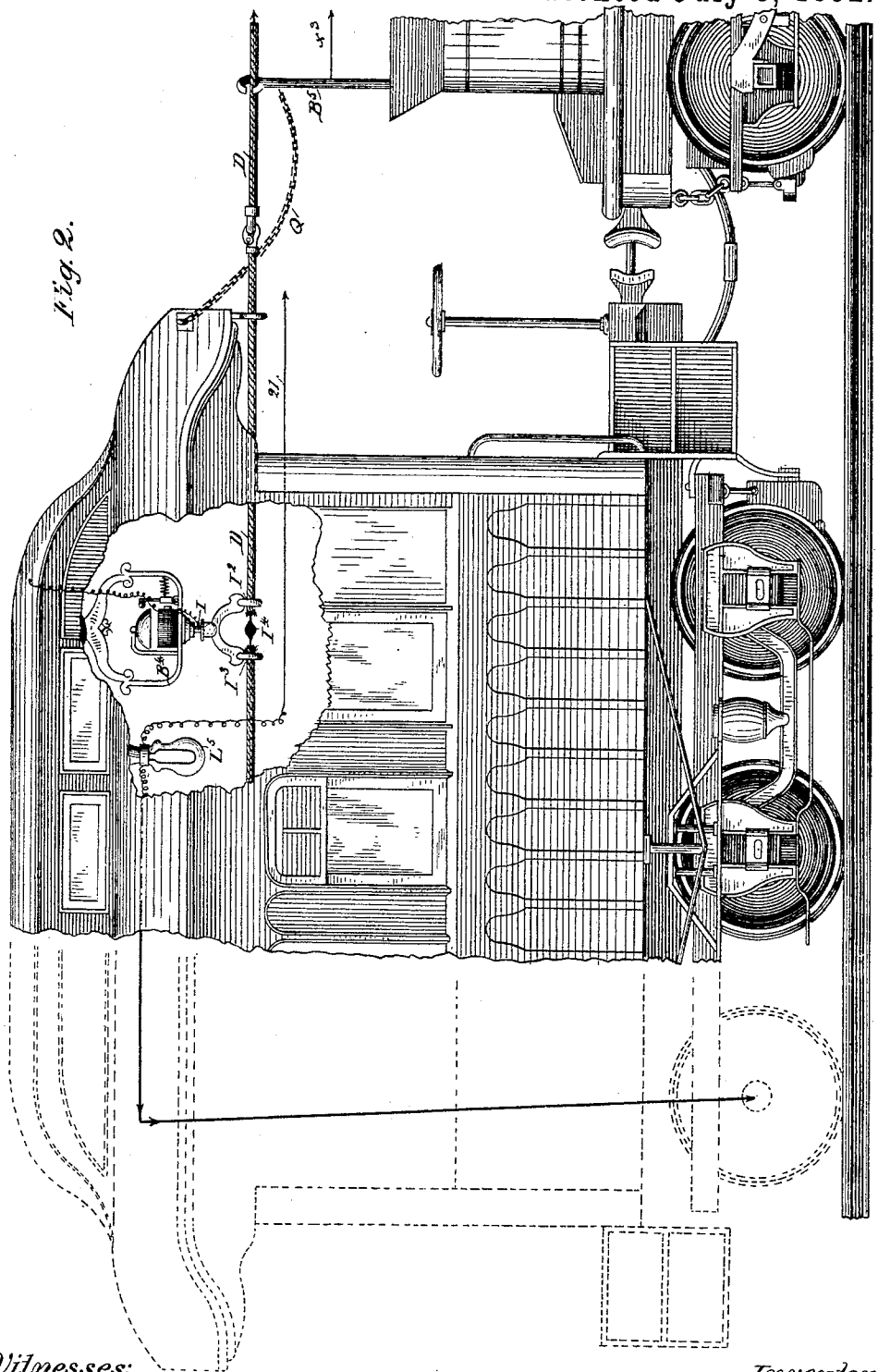
(No Model.) 5 Sheets—Sheet 2.

C. SELDEN.

RAILWAY TRAIN SIGNAL APPARATUS.

No. 478,135. Patented July 5, 1892.

Fig. 2.



Witnesses:
Ernest Abshagen
Thos. Toomey

Inventor:
C. Selden
By his Attorney: R. H. Townsend

(No Model.) 5 Sheets—Sheet 3.

C. SELDEN.

RAILWAY TRAIN SIGNAL APPARATUS.

No. 478,135. Patented July 5, 1892.

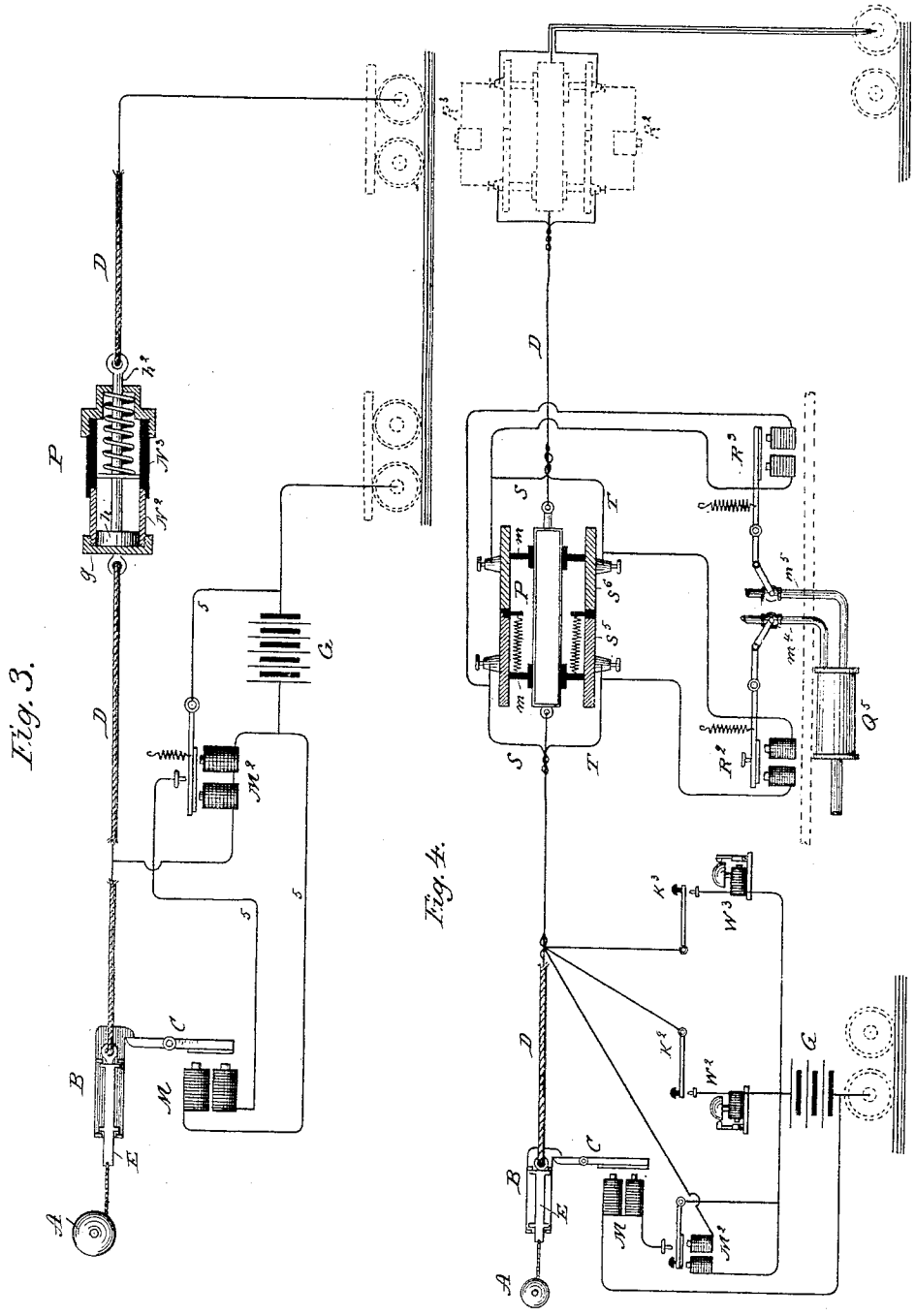


Fig. 3.

Fig. 4.

Witnesses:
Ernest Abshagen
Thos. Toomey

Inventor:
C. Selden
By his Attorney: H. B. Townsend

(No Model.) 5 Sheets—Sheet 4.

C. SELDEN.

RAILWAY TRAIN SIGNAL APPARATUS.

No. 478,135. Patented July 5, 1892.

Fig. 5.

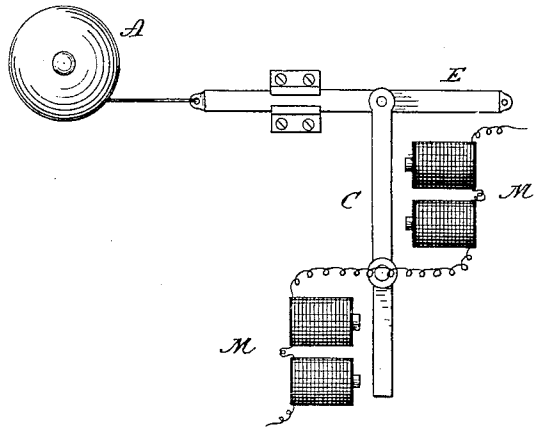


Fig. 6.

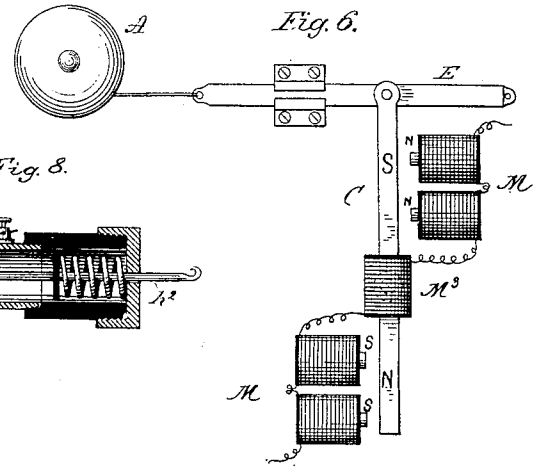
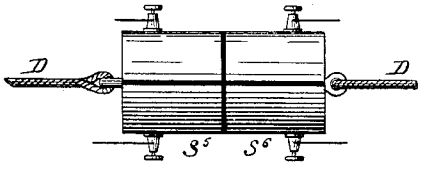


Fig. 8.

Fig. 7.



Witnesses:

Ernest Abshagen

Thos. Dorney

Inventor:

C. Selden

By his Attorney: H. B. Townsend

(No Model.)

5 Sheets—Sheet 5.

C. SELDEN.

RAILWAY TRAIN SIGNAL APPARATUS.

No. 478,135. Patented July 5, 1892.

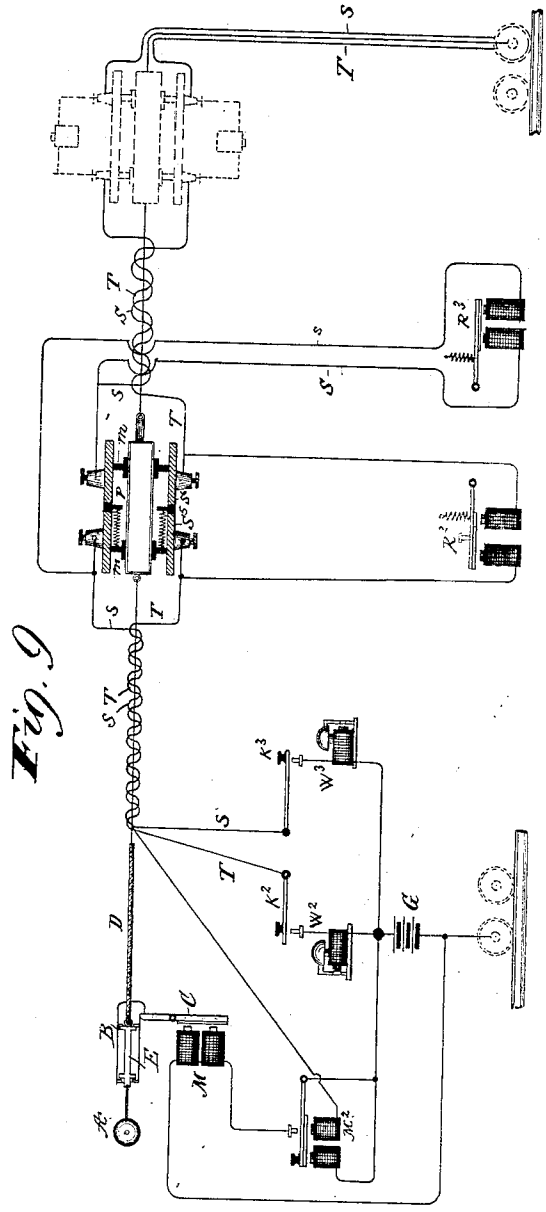


Fig. 9.

WITNESSES:

Gabriel J. W. Galster.

Wm. H. Capel.

INVENTOR

C. Selden

BY

H. B. Townsend

ATTORNEY

UNITED STATES PATENT OFFICE.

CHARLES SELDEN, OF ST. LOUIS, MISSOURI, ASSIGNOR TO THE COMBINED ELECTRIC AND TRIP BELL CORD COMPANY, OF ILLINOIS.

RAILWAY-TRAIN SIGNAL APPARATUS.

SPECIFICATION forming part of Letters Patent No. 478,135, dated July 5, 1892.

Application filed April 2, 1883. Serial No. 90,415. (No model.)

To all whom it may concern:

Be it known that I, CHARLES SELDEN, a citizen of the United States, and a resident of St. Louis, in the State of Missouri, have invented certain new and useful Improvements in Railway-Train Signal Apparatus, of which the following is a specification.

The object of my invention is to provide for the operation of the bell or whistle upon a locomotive by electrical means under the control of the conductor or other persons, while at the same time preserving the control of the bell by the mechanical means now employed—viz., the ordinary bell rope or cord.

My invention consists in the combination, with the ordinary bell mechanism, of an electro-magnet arranged, also, to operate the same and a controlling electric circuit for said magnet, which is opened or closed by the agency of the bell rope or cord used in operating the mechanical devices.

My invention consists, further, in the combinations of apparatus hereinafter claimed.

My invention further consists in certain combinations of devices and improvements in details that will be specified in the claims.

In the accompanying drawings, Figure 1 shows the apparatus upon the locomotive. Fig. 2 illustrates one form of device that may be used for closing the electric circuit passing through the bell-crank and electro-magnet in the locomotive when the bell-cord is pulled. Fig. 3 shows a form of device that may be used for breaking the circuit when the bell-cord is pulled. Fig. 4 shows the construction of circuit-closer employed when the bell-cord carries several conductors and connection is made between one or more of said conductors and fixed electro-magnets in the car for controlling an air-brake or other apparatus. Figs. 5 and 6 show other forms of electro-magnets for operating on the bell mechanism in the locomotive. Fig. 7 is a side view of the device illustrated in Fig. 4 and employed for supporting the conductors at the point where a circuit breaker or closer is interposed in the bell-cord. Fig. 8 is a longitudinal section of another form of device that may be employed for closing a circuit when the bell-cord is pulled. Fig. 9 is a diagram of the circuit.

In Fig. 1, A indicates the ordinary bell employed in the cab of the locomotive to be operated by the pulling of a bell cord or rope extending through the train. B is a sliding bar working in suitable guides *a*, properly supported and carrying within it the movable piece E, movable on supports and provided with projections *c c*, which engage with B, so that they move together. Said piece E is connected at one end by a wire or cord *b* with the bell-striking mechanism, and its other end is connected to the bell cord or pull running through the train. M indicates an electro-magnet, whose armature-lever C engages with the bar B and moves the bar and piece E in the same direction that they move under the pull of the bell-cord whenever said electro-magnet is energized by the means to be presently described. D indicates a bell-cord mechanically connected with E through a slide or cylinder E^2 of metal working in a spring-guide F, connected electrically with the coils of electro-magnet M. The cord D is provided with an internal conducting-wire, as indicated, which is attached to and in electrical connection with the end *d* of slide E^2 and through said slide and springs F with electro-magnet M by wire X. The coils of the electro-magnet M are connected by wire X^2 with one pole of a battery G, placed in the tender of the locomotive or in other suitable location, the other pole of said battery being connected by wire X^3 with a circuit through the train, as will be presently described. The same pole of the battery may by means of a switch N in the cab of the locomotive and wire X^4 be connected with wire X, so that the engineer may at any time test the condition of the battery. H indicates a steam-pipe placed within or in proximity to the box containing the battery and connected with the locomotive-boiler, whereby the action of said battery may be kept constant and intense and it may be prevented from freezing in cold weather.

In Fig. 2 the apparatus upon a car of the train is shown. I indicates a bracket, of metal, having two arms supporting at their ends the metal guides I^2 I^3, through which the bell-pull cord D passes. I^4 indicates a button, of metal, on said cord, connected electrically with the conducting-wire in the same and arranged to make electrical contact with said guides when

the pull-cord is operated to ring the bell, thus completing a circuit between said conductor and the electro-magnet which operates the bell-hammer of a bell apparatus B^4, operating in the usual way and placed in the car to give notice to the conductor that the electric circuit is in operative condition. This bell is supported in any suitable manner from the car ceiling or sides. The coils of said electro-magnet are electrically connected with the metal car-roof and the roofs of contiguous cars are electrically connected by electric coupling chains or cords *q* of any suitable construction. The roof of the car next the locomotive is connected with the wire X^3 and the battery through the bell-cord standard B^5, as indicated in Fig. 2. By this means the circuit for the operating electro-magnet M on the locomotive is completed, so that when the cord D is pulled to operate the bell A mechanically the electro-magnet M is simultaneously energized and its armature-lever C also operates the bell mechanism, the circuit of said magnet being in the following path: wire X, springs F, slide E^2, conductor in cord D, button I^4, guide I^2 or I^3, bracket I, electro-magnet of B^4, car roof or roofs, electric coupling or couplings *q*, standard B^5, wire X^3, battery G, and to the electro-magnet. I have described a return-circuit from the conductor in the bell-cord through the roofs of the cars; but I do not limit myself to such arrangement. The return-circuit from the bell-cord might be made through the car trucks and wheels to the rails, the wire X^3 being in such case connected to the trucks or wheels, or it might be made in other ways. It is of course to be understood that all or a portion only of the cars may have the bell B^4 and a connection to the car-roof, as described, or that such bell might be dispensed with and the circuit-closers placed at any desired intervals in the bell-cord.

Fig. 8 illustrates a form of circuit-closer, the same in substance as is described in another application for patent filed by me April 2, 1883, and patented January 1, 1884, No. 291,095, and that may be used in place of the circuit-closing devices shown in Fig. 2. In this figure is shown a cylinder made up of conducting and non-conducting portions, as indicated, the central portion being conducting and connected electrically with the conducting-head *g*. The piston *h* is provided with a non-conducting head and is normally held by a spring in the position shown The cord D is attached to and electrically connected on one side with the conducting-rod h^2 and on the other with the head *g*, so that when the cord is put under tension the piston is drawn into the conducting portion of the cylinder, where its conducting portion makes contact with the cylinder, thus completing the circuit. Extending from generator G is a supplemental conductor 21, which is carried through the various cars of the train by suitable electric couplings between the cars and is held in said cars through electric lights L^5 of any suitable kind for lighting the train, as shown in Fig. 2. The terminal of said conductor is preferably connected with the rails through the wheels and axles to form a return-circuit to the generator through a wire 22 on the tender similarly connected. Instead of closing the electric circuit when the cord is pulled, I may arrange for the breaking of the same, the electro-magnet M being then placed in a local or relayed circuit, so as to be energized when the main circuit is broken. Such an arrangement is shown in Fig. 3, the circuit-breaker being of the form shown in another application for patent filed by me. M^2 indicates an electro-magnet, which is in a circuit including a battery G, a circuit-breaker, (indicated at P,) and the conductor in the bell-cord D, the terminal of said conductor being suitably connected with a car wheel or axle and through the rails with the car-wheel and axle to which the battery G is connected, as indicated. The circuit-breaker P consists of a cylinder one half N^2 of metal and the other N^3 of insulating material, in which cylinder works a piston *h*, normally held in connection with the head of the conducting portion N^2. The portion N^2 is connected with magnet M^2 directly or through a portion of a bell-cord, and the portion *h* is connected on the other side with the conductor in the bell-cord, which is mechanically and electrically connected with the piston-rod. The head *h* is normally held in contact with the end N^2 by the spring shown, thus keeping the circuit closed; but when the cord is pulled the piston is drawn away from the head of N^2 and into the non-conducting portion N^3 of the cylinder, thus breaking the circuit. When this occurs, the armature of M^2 is drawn against its back contact in the usual way, and thus connects the magnet M in circuit with battery G through connections 5 in the usual way. As many circuit-breakers P can be used in the length of cord as may be deemed desirable. Under this arrangement if the train should be severed a signal would be given by magnet M.

Fig. 4 shows the arrangement whereby additional conductors may be carried by the bell-cord and used for controlling the air-brakes of the car by circuit-closers on the locomotive or for other purposes without interfering with the operations of the bell-cord, and bell-magnet conductor and circuit-breaker P. S T indicate the additional conductors which are combined with the bell-conductor before described in an insulated cable forming the bell-cord, but are suitably insulated from one another. The bell-conductor passes through the circuit-breaker P, as described. The conductors S T are connected, respectively, to the brake-controlling magnets R^3 R^2 through binding-posts mounted on a cylinder exterior to cylinder P. Insulating-supports *m m*, carried by the latter, serve to separate the exterior cylinder from the cylinder P, the exterior cylinder being made to slide to a lim-

ited extent, if desired, on said supports. The four binding-posts shown are suitably insulated from one another by subdividing the exterior cylinder by insulation, as indicated in Fig. 7 by the black lines. The two terminals of magnet R^2 are connected, respectively, to two of said posts at opposite ends of the cylinder, and to the same two posts the conductor T is connected, the latter being severed at the point where the circuit-breaker, operated by the bell-cord, is located, and the two free ends carried to the posts, as indicated. The magnet is thus interposed in the circuit of the conductor. The magnet R^3 and conductor S are similarly connected to the two other posts, so that magnet R^3 is interposed in the circuit of conductor S. It is preferable to make the conductors S T somewhat slack at the points where they are attached to the binding-posts.

The complete circuits are indicated more clearly in Fig. 9, each wire or circuit S or T and the circuit including the magnet M^2 all being kept distinct from one another throughout the train and being combined into a cable or cord in any suitable manner known to electricians for forming cables or cords containing several conductors insulated from one another. It will of course be understood that at the points where connections are made to the brake-magnets the individual conductors S T are removed from the cable for attachment to the binding-posts. Open-circuit keys or push-buttons K^2 K^3 are placed in the locomotive-cab and control the individual circuits S T separately in the manner indicated. W^2 W^3 are magnetically-operated bells of the usual construction placed in the circuits to indicate that the circuits work properly. q^5 indicates the ordinary air-brake cylinder beneath the car, and m^4 m^5 are pipes leading from the cylinder and each containing a valve under the control, respectively, of the magnets R^2 R^3, so that the engineer by closing a key K^2 or K^3 may by said magnets put the brakes on or release them. This may be accomplished by connecting one of the pipes—say m^4—with a chamber or air-duct of the automatic valve mechanism, in which the maintenance of air-pressure serves to hold the ordinary valve in such position that the brake will not be applied, but in which the relief of air-pressure will allow the air stored under pressure in the reservoir beneath the car to be applied to the brake. The other pipe m^5 is connected with the duct or pipe through which the air is allowed to escape from behind the brake-piston when the brake is to be unset. As the construction of such air-brake mechanism is well known and the manner of applying the escape-pipes to the same to produce the results specified will be readily understood by those skilled in such matters, I have not illustrated the details of such mechanism. By this means a double control of the air-brakes is given to the engineer, and in case he should find that the brakes refuse to work by the ordinary appliances he may resort to the electro-magnetic devices just described. The ends of the conductors in the bell-cord are electrically connected with the car axles and track, with which latter the battery G is connected in obvious and usual manner so as to complete the circuit. When the cord is pulled, the bell is operated on the locomotive in the manner already described, the circuit-breaker P being operated without disturbance with or from the conductor S T, the cylinder S^5 S^6 moving with the movable portions of the circuit-breaker.

In the general operation of the devices described a pull upon the bell-cord D will act to make or break the circuit through the circuit-controller P in the manner already explained, thus operating the magnet M^2, controlling the magnet which operates the bell; also, at the same time the mechanical pull upon the cord will actuate the bell mechanically in the ordinary way. Should the engineer desire to apply the brakes, he operates the circuit-controller K^2, thus causing the current from battery G to flow over the circuit T and through the magnet R^2, thereby opening or closing the valve by which the brakes are set. When he desires to unset the brakes, he may do so by operating the circuit-controller K^3, thus causing a current to flow over the circuit S and operate the magnet R^3, which controls the valve by which the brakes may be unset, as already explained. It will be seen that by this means the bell-cord acts not only mechanically and electrically to operate the bell on the locomotive, but also serves, practically, as the conductor through which the brakes may be electrically controlled. In pulling the cord the circuit-controller P, Figs. 4 and 9, is actuated in the same manner as the circuit-controller P, Fig. 3 or 8, the circuit including the magnet M^2 being made through the circuit-controlling devices in the manner already explained.

In Fig. 5 the armature-lever C is shown as connected with bar E and actuated by the combined pull of two magnets M in the same circuit, so as to actuate the bell mechanism with greater force and certainty.

In Fig. 6 the two magnets M work as in Fig. 5; but a still further increase of pull is obtained by the action of a polarizing-coil M^3 which is wound on the armature C and polarizes the same, so that its opposite ends presented to magnets M are of opposite polarity to the poles of magnets M, which latter are so wound that both pole-pieces are of the same polarity. The various polarities are indicated by the letters N and S and the coils are all by preference in the same circuit, as shown. I do not limit myself to any form of electric generator. A dynamo-machine or other source of electricity may be used in place of the battery.

I make no claim herein to the electric-light circuit in combination with the train signaling apparatus and generator; nor do I make any broad claim herein to controlling the air-

brakes on the cars by means of electro-magnets in a circuit running through the train and keys or circuit-controllers on the locomotive. These inventions form the subject of claims in another of my applications for patents.

It will be observed that by the employment of my devices the conductor or any person on the car has ready at hand two means of signaling the engineer, and in case the electric device should fail a prolonged or harder pull on the same bell-cord which is used in causing an electrical signal on the locomotive will, if the conditions will allow, result in sounding the bell on the engine in the same manner in which it is sounded by the ordinary bell-cord extending through the train.

It will be further apparent to railroad men that by putting the circuit-controller on the car and operating the same by a pull-cord on the car I am enabled to ring a bell on the locomotive no matter how far the car may be from the engine. Through this feature I not only give to the conductor or any other person on a car a means of signaling the engineer which possesses all the advantages of a pull-cord extending through the car, but I also overcome the difficulty which is found to exist in the case of ordinary bell-cords when the car on which it is desired to give a pull is at a considerable distance from the locomotive.

As is well known, it is found practically impossible, owing to the sag and friction of the ordinary bell-rope, to ring the bell on the locomotive at the end of a long train, and when a train is on a curve the difficulty is largely increased, so that even a few cars back of the locomotive a signal cannot be given. By, however, placing the circuit-controllers on the cars a pull on the cord can be made to produce the signal under any conditions, provided the electric circuits are intact.

The special arrangement Fig. 3 is included in the drawings of the present case for the purpose of showing that my invention is not confined to any special form or arrangement of devices, but may be carried out in a variety of ways, all coming within the scope of my claims. Inasmuch, however, as the arrangement Fig. 3 is specifically claimed in my patent, No. 291,095, I desire to disclaim herein such arrangement so far as already patented, but at the same time desire to be understood as including by the claims hereinafter made all other arrangements coming within the principle of my invention and the scope of such claims.

What I claim as my invention is—

1. In a train-signal apparatus, the combination, with the bell mechanism operated by the ordinary bell-cord, of an electro-magnet for actuating said mechanism and means upon a car of the train for admitting an electrical current to said electro-magnet.

2. In a train-signal apparatus, the combination, with the bell-mechanism and its pull-cord extending through the train, of an electro-magnet connected with and actuating said bell mechanism, an insulated conductor in said bell-cord, and a circuit closer or breaker for controlling the connection between said conductor and the return-conductor leading to the engine and magnet.

3. The combination, in a train-signal apparatus, of an insulated conductor in the bell-cord, a stud or projection on said cord electrically connected with said cord, and an eye or guide for the cord arranged in the path of the stud and electrically connected with a return-circuit leading to the apparatus on the engine.

4. The combination of the insulated conductor in the bell-cord, the conducting-stud, and the two conducting eyes or guides on either side of said stud.

5. In a train-signal apparatus, the combination of a mechanical signal apparatus, an operating cord or rope extending through the train, an insulated electric conductor carried by said cord, a circuit-controller controlling the circuit of said conductor and operated by a pull upon the cord, an electro-magnet responsive to the operation of the circuit-controller, and a bell or signal mechanism operated by said electro-magnet.

6. The combination, in a train-signal apparatus, of a bell mechanism on the locomotive, an electro-magnet for operating the same, a conductor extending through the train and in a car or cars of the train, and an electro-magnetic signal-bell which is normally disconnected from the conductor but is included in circuit when the connection is closed between said conductor and the return-conductor.

7. The combination, with a bracket electrically connected with the car-roof, of guides I^2 I^3, bell-cord D, and stud or button I^4, electrically connected with the conductor in said cord.

8. The combination of bracket I, guides I^2 I^3, bell-cord D, stud I^4, and bell B^4, the magnet of which is electrically connected with the bracket.

9. The combination, with the bell mechanism, the bell-cord connected to said mechanism, an electro-magnet M, and an armature-lever C, which engages with or is mechanically connected to said bell mechanism.

10. The combination of the bell-cord and the contained conductor forming a portion of the circuit of the electro-magnetically-operated bell, a yielding circuit-controller interposed in the bell-cord, additional conductors combined with said cord, and movable conducting-pieces connected with the additional conductors for completing a circuit between the same and fixed electro-magnets, as and for the purpose described.

11. The combination of the circuit-controller P, the movable pieces S^5 S^6, mounted thereon, and the bell-cord carrying the multiple insulated conductors.

12. The combination, with the bell-cord carrying a conductor which forms a portion of

the bell-circuit, of supplemental conductors connected with electro-magnets on the car, which control the operation of the car-brake, and means upon the locomotive or other portion of the train for controlling the circuits of said supplemental conductors.

13. The combination, with the circuit-controller P, interposed in the bell-cord, of the movable cylinder $S^5 S^6$, connected with a magnet R^2, and a supplemental conductor in the bell-cord connected with said cylinder.

14. The combination, with the bell mechanism, of the armature connected therewith, the magnets having each two like poles acting on opposite ends of said armature, and the polarizing-coil on said armature.

15. The combination of a bell-cord extending through the train, a mechanically-operated bell to the striking mechanism to which the bell-cord is attached, an electrical conductor carried by or forming a part of said bell-cord, and an electro-magnet on the engine electrically connected with said conductor through a sliding piece, whereby the bell may be operated mechanically by said cord without interfering with the electrical connection between the conductor and the electro-magnet.

16. In a train-signal apparatus, the combination, with an electric signal upon a locomotive, of a bell-cord on the car, a circuit-controller also on the car, connected with the bell-cord so that a pull on the latter will through the operation of the circuit-controller on the car cause a bell to ring electrically on the locomotive, and a spring for restoring the parts of the circuit-controller to their normal position when the cord is relieved of tension, whereby a repetition of the signal, as desired, may be given by alternately pulling and slackening the cord.

17. The combination, in a train-signal apparatus, of a normally-open circuit extending through the train, circuit-controlling devices on the cars of the train connected with a pull-cord on the cars and adapted to complete the connection to a return-conductor, also extending through the train through increase of tension on the cord, and a spring for restoring the circuit-controlling devices to normal condition when the cord is relieved of tension.

18. The combination, with a railway-train, of a signal-magnet upon the locomotive, an electric circuit extending through the train, and on one or more cars of the train a suitable electric-circuit-controller controlling said circuit, a cord or rope extending through the car, as an ordinary bell-rope, for actuating said circuit-controller, and a spring for restoring the circuit-controller to normal position when the pull on the cord ceases.

19. The combination of the bell-cord and its electric conductor forming a portion of a circuit for controlling an electric bell, of a yielding circuit-controller connected into the bell-cord, as described, so as to be actuated mechanically by a pull on the cord to open or close the circuit, a spring acting on the parts of the circuit-controller in opposition to the pull, a return-conductor leading to the source of electric current, and a conducting-piece connected with said return-conductor for completing a circuit between the same and the first-named conductor when the parts of the circuit-controller are extended by a pull, as and for the purpose described.

20. The combination, with a pull-cord, of two or more normally-open yielding circuit-controllers placed at various points on the cord, springs tending to hold the same open and acting in opposition to a pull, and contact-surfaces with which connection is closed on an expansion or extension of the parts of a yielding circuit-controller produced through a pull on the cord.

Signed at St. Louis, in the State of Missouri, this 21st day of March, A. D. 1883.

CHARLES SELDEN.

Witnesses:
FRANK. CONROY,
JOS. H. HAMILL.