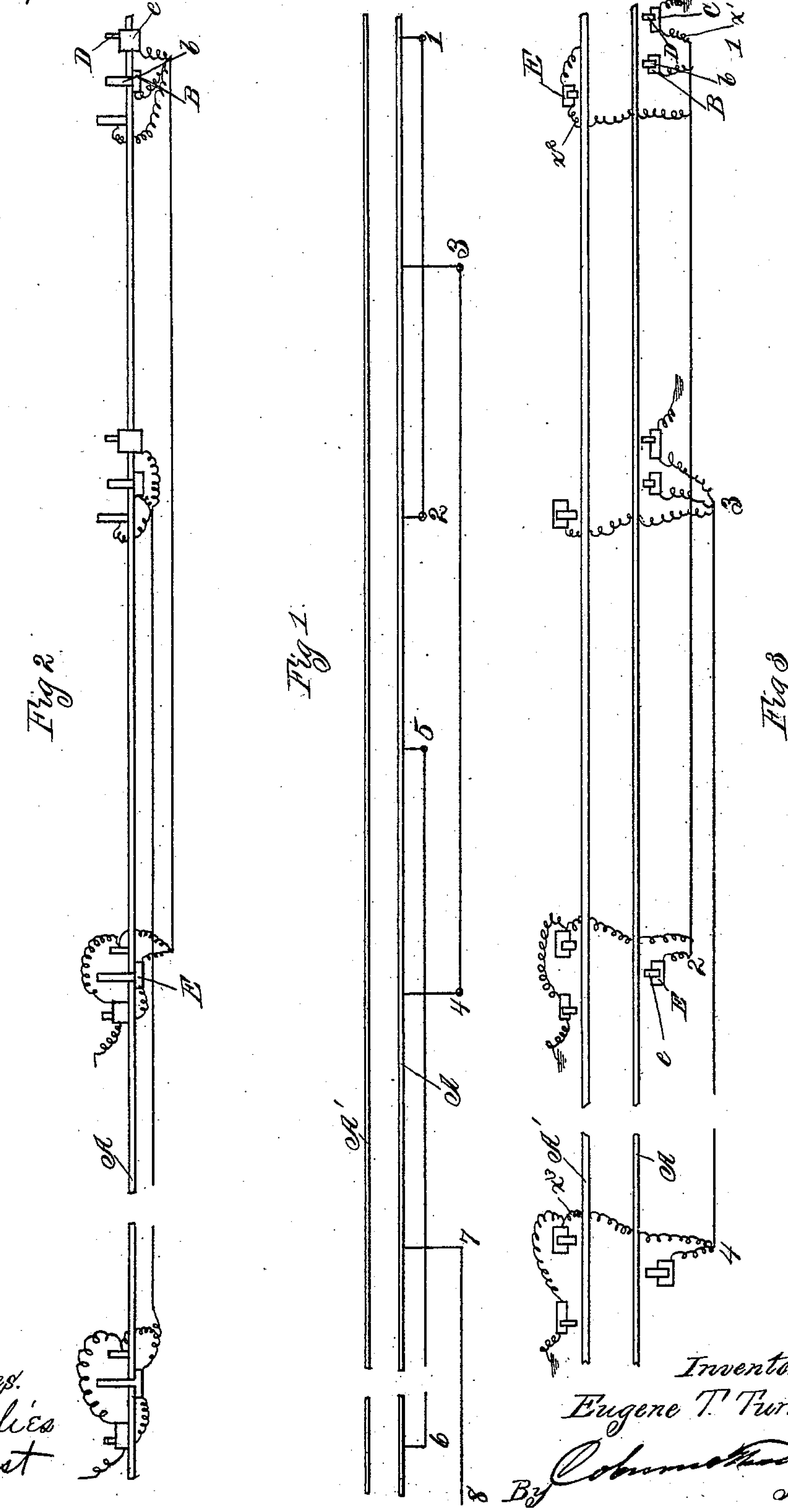
(No Model.)

3 Sheets—Sheet 1.

E. T. TURNEY.

ELECTRIC SIGNAL FOR RAILWAYS.

No. 471,296. Patented Mar. 22, 1892.



Witnesses.
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A. M. Best

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(No Model.)

3 Sheets—Sheet 2.

E. T. TURNEY.

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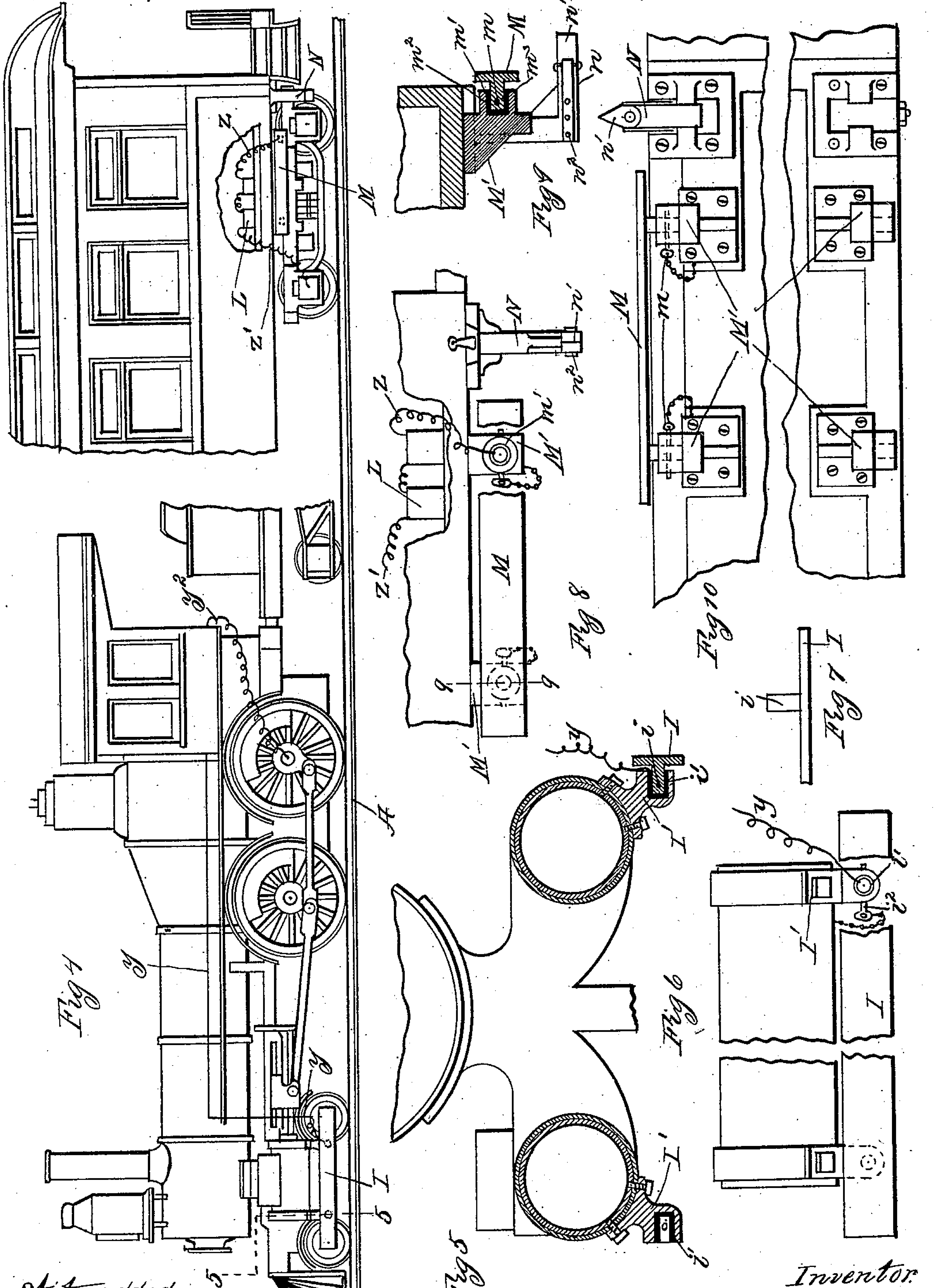

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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.) 3 Sheets—Sheet 3.

E. T. TURNEY.

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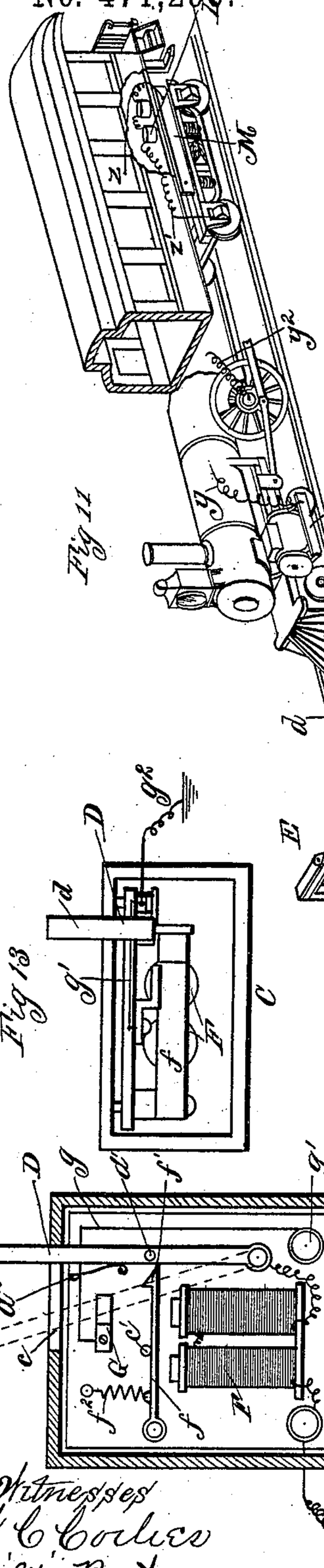

Fig 11.

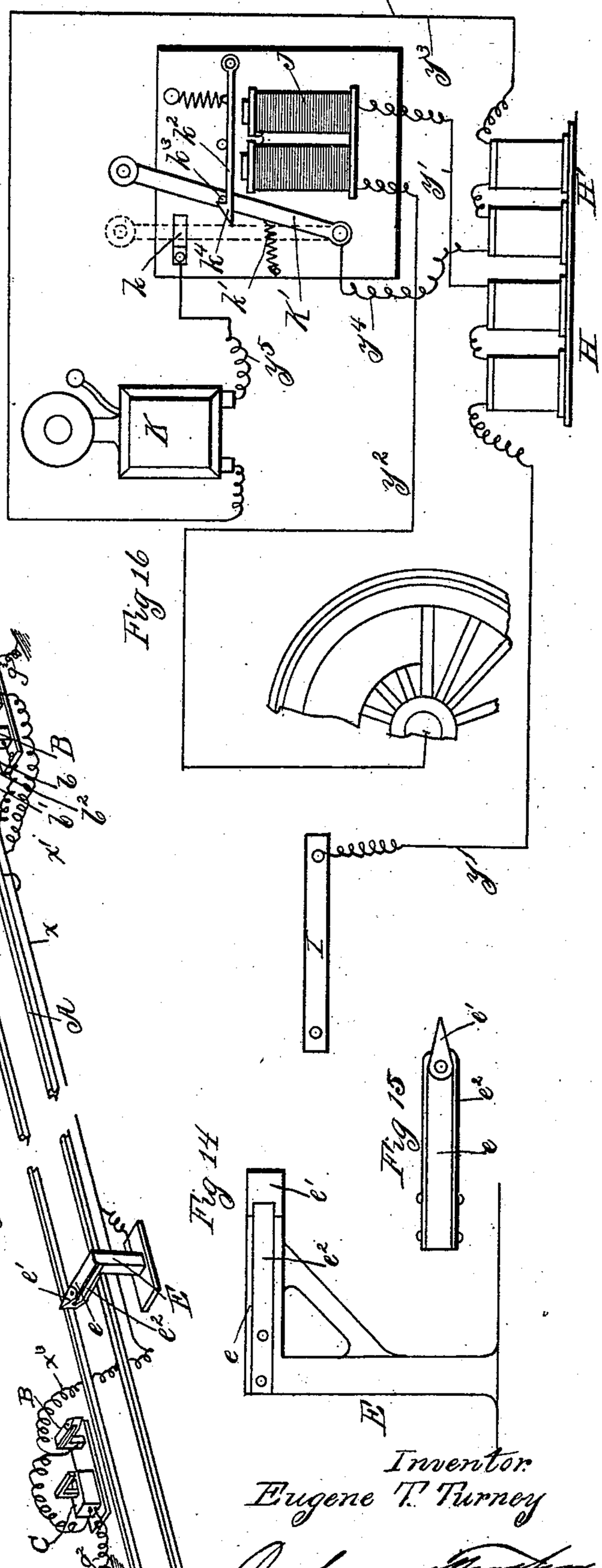

Fig 16.

Fig 13.

Fig 12.

Fig 14.

Fig 15.

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UNITED STATES PATENT OFFICE.

EUGENE T. TURNEY, OF CHICAGO, ILLINOIS.

ELECTRIC SIGNAL FOR RAILWAYS.

SPECIFICATION forming part of Letters Patent No. 471,296, dated March 22, 1892.

Application filed November 10, 1890. Serial No. 370,860. (No model.)

To all whom it may concern:

Be it known that I, EUGENE T. TURNEY, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Electric Signals for Railways, which are fully set forth in the following specification, reference being had to the accompanying drawings, in which—

Figure 1 represents a plan view illustrative of the track-rails and the arrangement of the electric stations along the same; Fig. 2, a side elevation of the same; Fig. 3, a plan view similar to Fig. 1, but showing additional details of construction; Fig. 4, a side elevation of a portion of a train, showing the engine and the rear end of the last car with appliances for the embodiment of my invention; Fig. 5, a detail section taken on the line 5 5 of Fig. 4; Fig. 6, a detail elevation of one of the engine-cylinders fitted with an electric contact-bar; Fig. 7, a detail plan of one end of the contact-bar; Fig. 8, a detail elevation of the rear corner of the last car, showing the electric contact-bar attached; Fig. 9, a detail section taken on the line 9 9 of Fig. 8; Fig. 10, a detail bottom plan of the end of the car shown in Fig. 4; Fig. 11, a perspective of a section of a railway fitted with my signaling devices and a train just entering a field; Fig. 12, a front elevation of the switch-box with the front of the casing removed; Fig. 13, a plan view of the same with the top of the casing removed; Fig. 14, a side elevation of one of the contact-posts; Fig. 15, a plan view of the same, and Fig. 16 a detail elevation of the signaling apparatus and connections in the engine-cab. Fig. 1 is upon a scale by itself, Figs. 2, 3, and 11 upon a scale somewhat enlarged from that of Fig. 1, Fig. 4 upon another scale somewhat enlarged from the last, and all the remaining figures upon the same scale, but still further enlarged.

My invention relates to electric signal apparatus for use on railways, the object being to provide means for signaling from one train to another either in front or rear thereof and on the same track for the purpose of preventing collisions.

The invention consists in certain apparatus for accomplishing this purpose, which, however, cannot be well defined in a few words, but the construction and operation of which I will proceed to describe in detail, and will then point out definitely in claims the particular improvements which I believe to be new and wish to secure by Letters Patent.

In the drawings, A A′ represent the two rails of a single railway-track. Along each of the rails and on the outside thereof I arrange a series of stations, which are connected up so as under the proper conditions to establish a series of electric fields; but these stations are arranged so that the circuits and fields lap over each other. This arrangement is illustrated by the diagram shown in Fig. 1, in which the stations and connections are shown by numerals, the successive numerals being used to indicate stations connected with each other rather than their order of succession along the track. Thus, commencing at the right, the first station is designated 1, and the station with which it is connected farther along the line is numbered 2, this pair of stations making one circuit and creating one field under the proper conditions. The next circuit and field are between the stations numbered 3 and 4, and the next between stations 5 and 6, and so on along the line. Now by consulting this diagram, Fig. 1, it will be seen that between the circuits 1 2 and 5 6 there is a gap, and that this gap is covered by the circuit 3 4, and that the latter at each end laps upon one of the first named—that is, between station 2 and station 5 there is a gap, and this is covered by the connection between station 3 and station 4—and station 3 is located about midway between stations 1 and 2, while station 4 is located about midway between stations 5 and 6, thus lapping the circuit between 3 and 4 upon the respective circuits at each end thereof. This arrangement is continued along the line, and a similar arrangement of stations is also provided along the opposite rail A′ of the track, though not shown in Fig. 1, as the illustration with one of the rails is sufficient. There is this difference, however, in the arrangement for the two rails: the order is changed so that opposite station 1 of the rail A there will be a station for the rail A′ corresponding to station 2, and opposite station 2 there will be a station at A′ corresponding to station 1, and so on throughout the whole series, these sta-

tions being of different construction, as will be hereinafter explained.

I will now describe the construction of the devices which are provided at each of these stations.

At station 1 there is a short post B suitably secured to the ground and quite near the track A, as seen in Figs. 2, 3, and 11. This post has a short horizontal arm b at its upper end extending inward toward the track and having mounted upon its extremity a wedge-shaped tip b', which is pivoted to the horizontal arm of the post. On each side of this arm is a spring b^2, fastened at one end to the arm and extending forward along each side of the arm past the pivot of the tip and with the free ends resting upon opposite sides of the latter. These springs are for the purpose of holding the tip in line with the arm to which it is attached, but at the same time permitting it to yield when a moving object comes in contact therewith, as hereinafter explained. At the same station, close by the post B, there is also a switch-box C, within which is pivoted a switch-lever D, that passes up through a slot c in the top of the box and somewhat above the latter is provided with a rigid horizontal arm d, also projecting inward toward the rail A. The construction of these parts is such that the switch-lever will vibrate in a direction lengthwise of the rail.

At station 2 there is a single post E, similar to the post B, being provided with horizontal inwardly-projecting arm e and pivoted tip e' and springs e^2, as in the former case. The relative height of these devices is an essential feature and must be carefully observed. The post B is the shortest of the three. The post E is somewhat higher than B, and the upper end of the switch-lever is between the two. These relative heights are illustrated by Fig. 2 of the drawings.

The devices at corresponding stations all along the line are the same as just described; but it must be remembered, as already stated, that the devices at stations along the opposite rails are alternately arranged—that is, opposite post B of station 1 will be a post E by the rail A′ and opposite station 2 will be a post B and switch-box C by the same rail, this arrangement being illustrated by Fig. 11 of the drawings.

These stations are connected up as follows: The post B at station 1 is connected by wire x with the post E. The switch-box at station 1, or rather a magnet therein, is connected to the wire x by a branch wire x', and the single post E at the station opposite to station 1 is also connected by a branch wire x^3 to wire x. The post and switch at the station opposite to station 2 are also connected by a branch wire x^3 to the wire x near the post E of said station. These connections are illustrated in Figs. 3 and 11, and it will be understood that like connections are made between stations 3 4, 5 6, &c., and their corresponding stations along the opposite rail.

In the switch-box C there is an electro-magnet F, which is properly connected up with the branch wire x' and the switch-lever, as seen in Fig. 12. Just above the magnet is a catch-lever f, pivoted at one end to the box and extending thence over the magnet to the switch-lever, the latter being provided with a pin d', adapted to engage with the notched end f' of the catch. A spring f^2 is arranged within the box to ordinarily hold the catch up from the magnet, this movement being stopped by a suitable pin c' in the side of the box. A spring d^2 is arranged to act upon the switch-lever with a tendency to throw it away from the catch-lever when freed from the latter. A contact-block G is also arranged within the switch-box, being connected by wire g to binding-post g', whence a wire g^2 runs out to ground. The trains of roads provided with these appliances must be fitted with certain devices adapted for work in connection therewith.

In each engine-cab is placed a double battery, or rather two separate electric batteries, H and H′ in any convenient location. The battery H is connected by wire y with a contact bar or plate I, mounted at the side of the engine in such position that as it passes by station 1 or any like station it will strike the pivoted tip of the posts B, the tip turning on its pivot, so as to always insure perfect contact. In the drawings this bar is shown mounted at the side and a little below the left-hand cylinder by means of brackets I′, which are suitably fastened to the cylinder. This bar or plate is insulated, being provided with two projecting studs i, which are set in insulating-cups i', that are in turn set in sockets or recesses in the brackets I′, and the bar is fastened in position by pins i^2, passing through the studs and sockets. These pins must of course also be insulated by any suitable well-known device. The engine-battery H is also connected by a wire y' with an electro-magnet J, suitably mounted in the cab, and connected up by a wire y^2 with some part of the engine, such as one of the axles or wheels, whereby circuit may be made through the rails to the ground. The battery H′ is connected by wire y^3 with an electric bell or other signaling device K, also mounted in the cab, and by another wire y^4 with a switch-lever K′, pivoted near the magnet J. The bell is connected by wire y^5 with a contact-point k, against which the switch-lever is thrown when free by the action of a spring k'. Immediately above the magnet J is a spring-catch k^2, pivoted at one end and extending thence over the magnet to the switch-lever K′, the latter being provided with a pin k^3, adapted to engage with the notched end k^4 of the lever. This catch-lever is held away from the magnet by a spring and against a suitable stop-pin, the same as described for the similar devices in the switch-box C, and as seen in Fig. 16. It will be seen then that when the switch-lever K′ is thrown over against the contact-point, as seen

in dotted lines in Fig. 16, a local circuit is established, which will sound the alarm in the cab of the engine continuously until the circuit is broken. The rear car of the train is also provided with certain devices, which are preferably located at the rear end thereof, and only this portion of the car is shown in the drawings. An electric battery L is mounted in any convenient place in this car and is connected by a wire *z* with a contact plate or bar M, arranged on the outside of the car near the track, as seen in Figs. 4 and 11. This battery is also connected by a wire *z'* with one of the truck axles or wheels, so as to provide for making circuit with the rails and ground. The contact-bar M must be mounted so as to be insulated in a similar way as the contact-bar I. This may be accomplished by similar means as those already explained for the bar I, the bar itself being provided with studs *m*, which are set in insulating-cups *m'*, arranged in sockets m^2 in depending hangers M', attached to the car and fastened in position by insulated pins m^3, passing through the studs and sockets, as seen in Figs. 8 and 9. This plate M is arranged at such a height that it will come in contact with the pivoted tip on the posts E as the train passes out from the field to which said post belongs. The car is also provided with a projecting arm N, a convenient form of which is right angled, as seen in Figs. 9 and 11. The vertical portion of this arm depends from the bottom of the car, and the horizontal portion *n* extends directly outward and is provided with a pivoted tip *n'*, similar to those heretofore described, and similar holding-springs n^2. This stop is arranged at such a height as to come in contact with the switch-levers D as the train passes into the field to which each lever belongs, and is intended to throw the said lever forward against its contact-point, as seen in dotted lines in Fig. 12.

The operation of this apparatus is as follows: It will be seen from the description above that in normal condition all the contact-points of the several posts and switches along the line are open. A train approaching as illustrated in Fig. 11 upon entering the field at station 1 the contact-plate I at the front of the engine will strike the point of the post B, but no electric circuit is completed by this contact, and so no noticeable effect is produced. As the rear end of the train passes by station 1 the projecting arm N strikes the switch-lever D at this station and throws it over against its contact-point into the position shown in dotted lines in Fig. 12, where it is caught by its catch-lever and held in this adjustment. If the track remains perfectly clear, the train passes entirely through this field and out at the other end thereof without any signaling effect, even though contact is made between the bar M and the post at station 2 as the train passes out of this first field. This contact serves only to release the switch-lever at station 1 from its catch. It will be seen from the connections described that this contact closes a circuit with the battery at the end of the car, in which circuit are the electro-magnet and the switch-lever within the switch-box at station 1. The said magnet therefore becomes operative and by its force pulls down the catch, thereby releasing this switch-lever, when under the effect of its spring it is thrown back into the position shown in full lines in Fig. 12, thereby breaking contact, and so destroying the circuit; but suppose after this train has passed into the field mentioned above, or, in other words, has passed by station 1, and so has set the switch-lever, as described above, a train approaching in the other direction enters the same field at the other end thereof. As this second train enters the field contact is made between its contact-bar I and the post B at its station corresponding to station 1. Now the switch-lever at station 1 being still held against its contact-point, it will be seen that as soon as this contact is made by the second or approaching train an electric circuit is closed around through the switch-lever at station 1 and that the battery H in the engine of the said approaching train will be in this circuit. Current is therefore immediately supplied to the magnet in the said engine, the effect of which is to pull down the catch-lever *f*, thereby releasing the switch-lever K', when under the action of its spring the latter will be thrown forward against its contact-point *k*, thereby completing the local circuit between the battery H' and the alarm-bell. The latter is of course at once sounded, thereby notifying the attendants in the engine-cab that a train has already entered the field at the other end thereof and is approaching. It will be seen that as the alarm is operated by a local circuit it will continue to sound until the switch-lever is forcibly moved back from contact by the attendant and caught by its retaining-catch, which of course is released from the magnet beneath as soon as contact with the engine-plate I ceases, and if the train proceeding in the direction as seen in Fig. 11 is stopped by any accident after it has entered the field, as described, it will be seen that a second train following will also receive a signal upon entering the field at station 1, for the switch at the said station having been set, as described, it will follow, of course, that as soon as contact is made with the post B by this second or following train a circuit is formed with the battery H in the engine of said train, thereby starting the alarm in said engine, as already described. It will be seen, therefore, that after a train has entered a field and set the switch at station No. 1 or any other station which corresponds therewith an alarm will be given in the engine of a train entering the same field subsequently from either direction.

In carrying out this system of signaling practically the stations must be arranged at

comparatively short distances from each other. For instance, referring to the diagram Fig. 1, let the distance between stations 1 and 2, 5 and 6, and so on be ten miles and the gap between station 2 and station 5 five miles. Then the distance between stations 3 and 4, 7 and 8, and so on will be fifteen miles, and it will be seen that with this arrangement there is a station every five miles, and it would be hardly possible for trains to come nearer each other than this distance without receiving notice by the sounding of an alarm, which being observed the train should be stopped, for it will be seen from the diagram Fig. 1 that a train having passed station 1 will set the switch at this station, so that, as described, a train coming in an opposite direction will receive a signal as soon as it reaches station 2; but this latter train has already set the switch opposite to station 4 when passing the same as the first train set the switch at station 1, and so when said first train reaches station 3 it also will receive a signal. This results from the overlapping arrangement of stations and connections, which has been described, and this feature, it will be seen at once, is very important, for with a proper arrangement of the stations it is obvious that trains cannot approach within five miles of each other without receiving a signal.

In details of construction and arrangement there may be modifications in the apparatus, as specifically described above and shown in the drawings, provided the principle of operation or system herein set forth is retained.

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

1. In an electric signaling apparatus for railways, a contact-post B, in combination with a switch-lever arranged near the former, both connected up, as described, a battery mounted on the engine, an insulated contact plate or bar also mounted on the engine, connected with said battery, and adapted to make contact with the post B, an alarm arranged on the engine and set in operation when a circuit is closed by contact between the said post and plate, and a suitable device arranged on one of the cars of the train and adapted to set the switch-lever in passing the latter, substantially as and for the purposes specified.

2. In an electric signaling apparatus for railways, the switch-lever D, in combination with an electro-magnet F, arranged in the switch-box, a catch-lever *f*, arranged above the magnet and adapted to engage the switch-lever, a contact-post E, a battery L, mounted on the train, and an insulated contact plate or bar M, connected with said battery and adapted to make contact with the post E in passing, substantially as and for the purposes specified.

3. In an electric signaling apparatus for railways, the contact-posts B, in combination with switch-levers D, connected up, as described, a device on the train adapted to set the switch-levers, the batteries H and H′ on the engine, the insulated contact-plate I, also mounted on the engine and connected up with battery H, the electro-magnet J, switch-lever K′, and electric alarm K, substantially as and for the purposes specified.

4. In an electric signaling apparatus for railways, the switch-lever D, mounted in a switch-box alongside the track, in combination with a contact-point G in said box, connected to ground, a device mounted on the train, adapted to set said switch-lever against this point, a spring catch-lever *f*, adapted to engage and retain the lever in this adjustment, an electro-magnet F, arranged to act upon said lever when charged and connected up with both the switch-lever and the main-line wire, a contact-post E, connected through the main wire with the said electro-magnet, and a battery on the train provided with a device adapted to make contact with said post, substantially as and for the purposes specified.

5. In an electric signaling apparatus for railways, a series of stations connected up in pairs at one and the same side of the track and arranged with gaps between the connections of successive pairs, which gaps are lapped by alternating pairs, the connections of which cover said gaps and overlap the adjacent connections at each end, in combination with the contact-posts B, a battery mounted on the engine, an insulated plate on the engine adapted to make contact with said posts and connected with the said battery, an alarm arranged on the engine and set in operation by contact between the said plate and one of the posts, and a switching device constructed to be operated by the train as it passes one of said stations to make the required connection for the signal-circuit, substantially as described.

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