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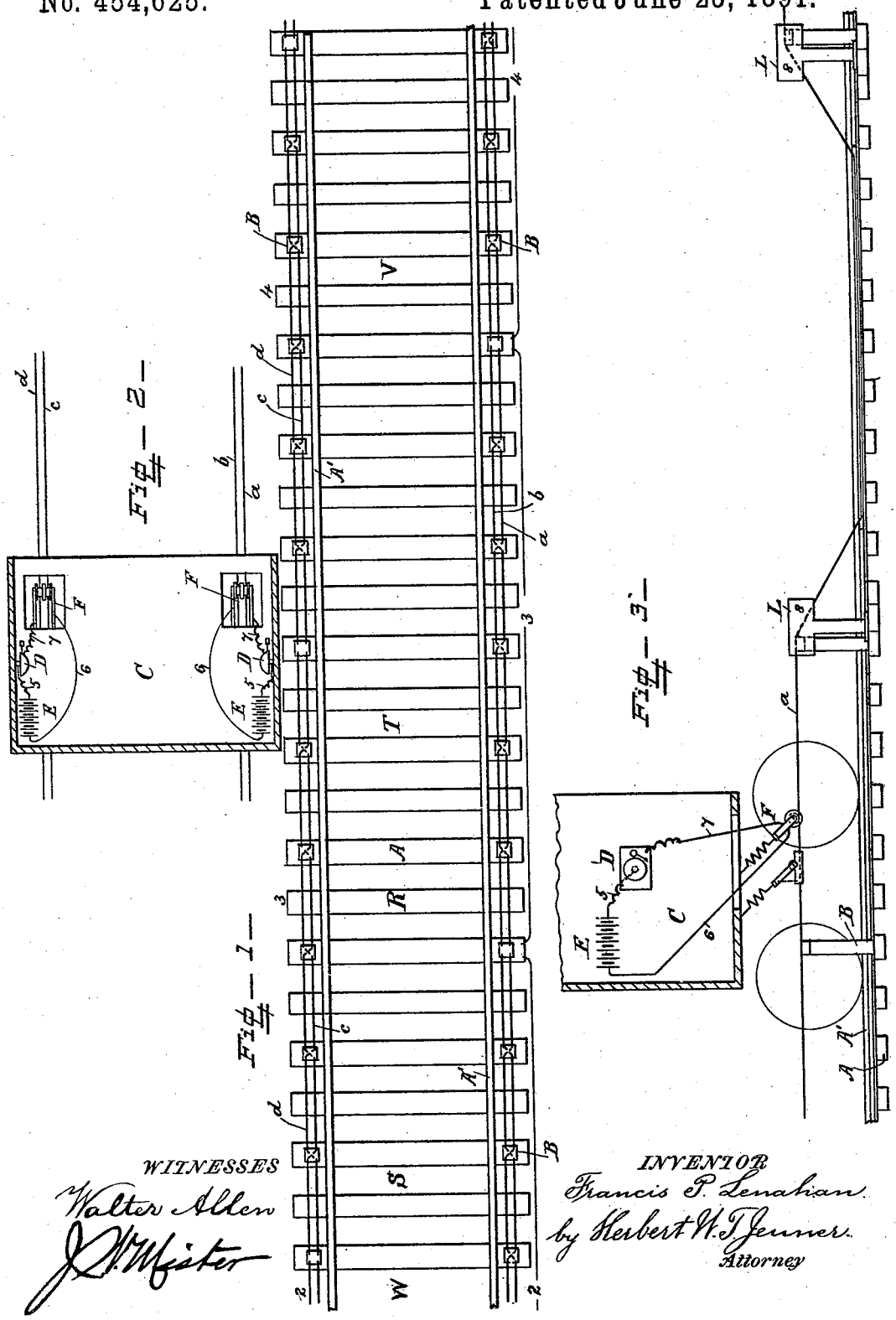
F. P. LENAHAN.

ELECTRIC SIGNAL FOR RAILWAY TRAINS.

No. 454,625. Patented June 23, 1891.



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ELECTRIC SIGNAL FOR RAILWAY TRAINS.

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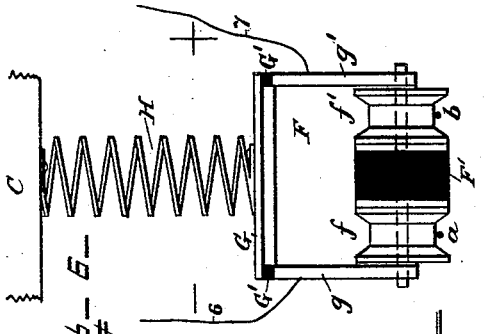

Fig. 6.

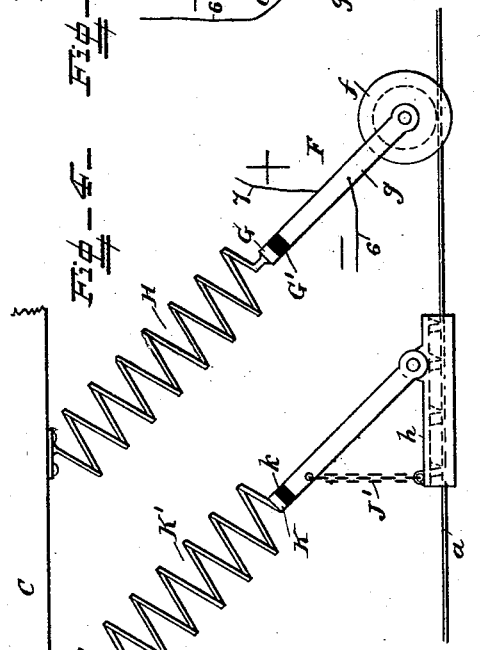

Fig. 4.

Fig. 5.

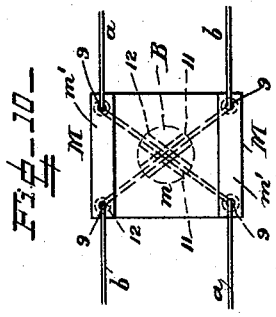

Fig. 10.

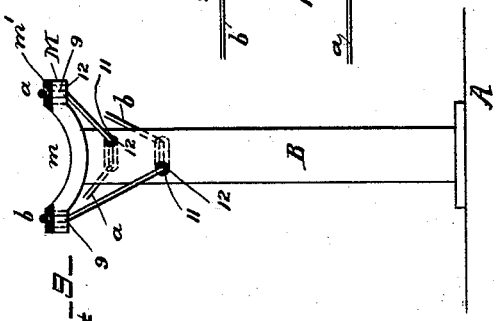

Fig. 9.

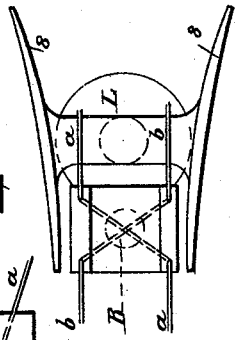

Fig. 8.

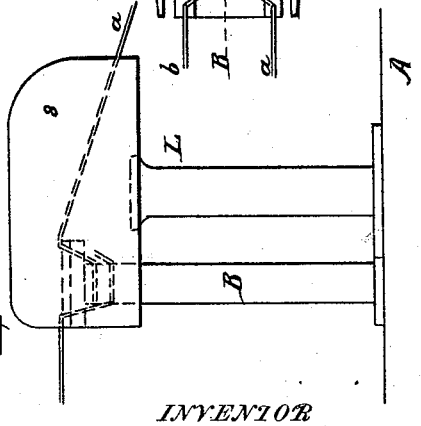

Fig. 7.

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Fig. 12.

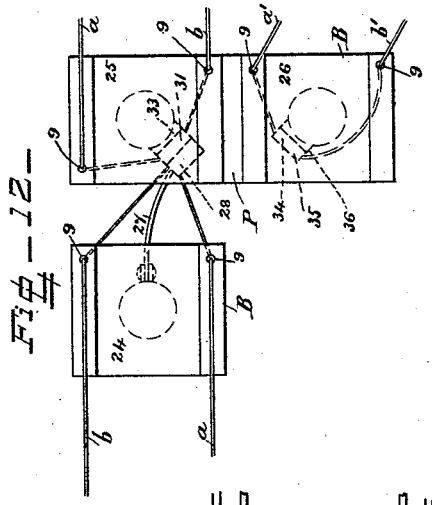


Fig. 13.

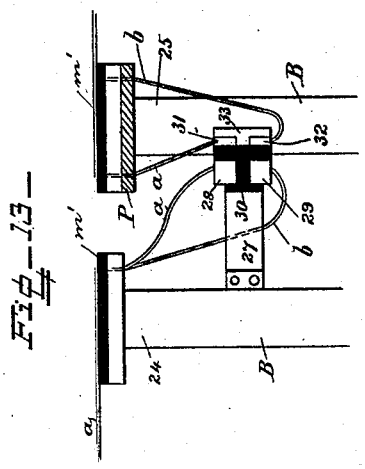
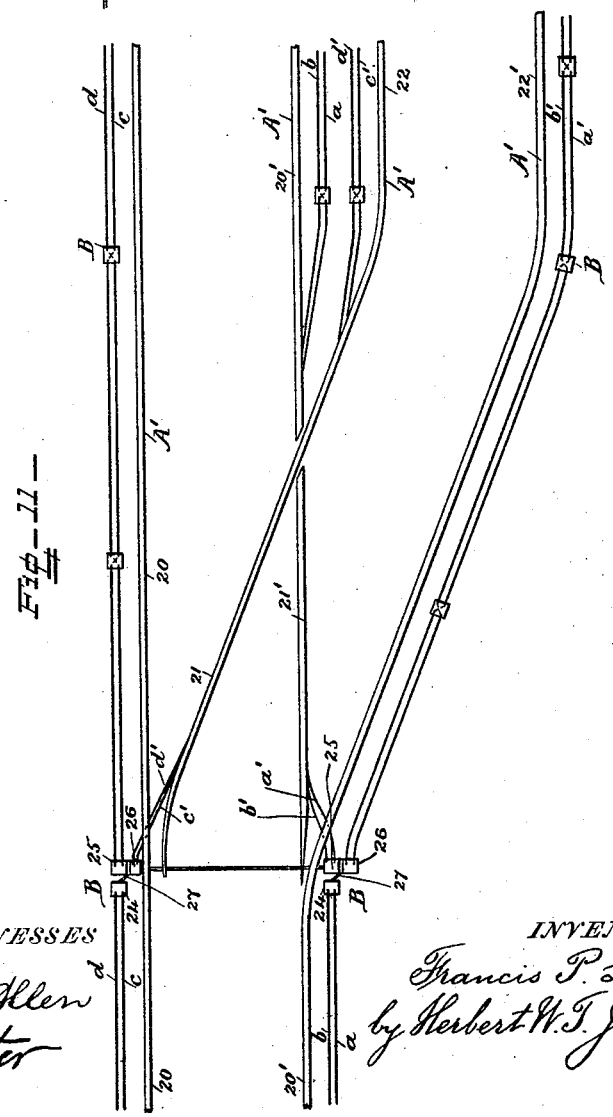


Fig. 11.



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UNITED STATES PATENT OFFICE.

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ELECTRIC SIGNAL FOR RAILWAY-TRAINS.

SPECIFICATION forming part of Letters Patent No. 454,625, dated June 23, 1891.

Application filed February 28, 1891. Serial No. 383,179. (No model.)

To all whom it may concern:

Be it known that I, FRANCIS P. LENAHAN, a citizen of the United States, residing at Wilkes-Barré, in the county of Luzerne and State of Pennsylvania, have invented certain new and useful Improvements in Electric Signals for Railway-Trains; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to electric signals for giving warning of the near approach of railway-trains upon the same line of track; and it consists in the novel construction and combination of the parts hereinafter fully described and claimed.

In the drawings, Figure 1 is a plan view of a portion of a railway-track provided with signal-wires according to this invention. Fig. 2 is a plan view of the devices attached to the engine, showing a portion of the cab in section. Fig. 3 is a sectional side view of an engine-cab, showing the battery and bell on one side, together with the trolley and scraper, also the signal-wires and the guides for the trolleys at a street-crossing. Fig. 4 is a side view of the trolley and scraper drawn to a larger scale. Fig. 5 is an end view of the scraper. Fig. 6 is an end view of the trolley. Fig. 7 is a detail side view of one of the trolley-guides at a street-crossing, and Fig. 8 is a plan view of the same. Fig. 9 is a detail side view of one of the posts which support the signal-wires, and Fig. 10 is a plan view of the same. Fig. 11 is a plan view showing the connection of the signal-wires at a siding. Fig. 12 is a detail plan view, drawn to a larger scale, of the signal-wire posts and connections shown in Fig. 11. Fig. 13 is a side view of the top portions of two of the posts shown in Fig. 12.

A is the road-bed, which may be of any approved construction, such as wooden cross-ties, and A′ are the ordinary rails secured to the road-bed in the usual manner.

Two pairs of signal-wires, *a b* and *c d*, are provided, one pair being arranged at each side of the track. These wires are supported upon posts B secured to the road-bed, and holding up the wires so that they may not be covered by snow. Each wire consists of sections 2 3 4, &c., of about a mile in length, and each section is insulated from the next adjacent sections. The ends of the sections of the separate wires forming each pair of wires are arranged to terminate at the same posts, and the ends of each pair of wires on one side of the track are arranged midway between the ends of each pair of wires on the other side of the track. The reason of this will be more fully explained hereinafter.

The supporting-posts are arranged at intervals of from fifteen to twenty feet apart, and the wires *a* and *b* (and *c* and *d*) cross each other at each supporting-post without breaking the continuity of each section of wire or coming in contact with each other.

C is a portion of the cab of an engine or other similar part of a train. A bell D and a battery E are secured at one side of the cab to operate in connection with the wires *a b*, and a similar bell and battery are secured at the other side of the cab to operate in connection with the wires *c d*. Each bell is connected to its battery by a wire 5. The contact devices are alike upon each side of the cab, and are shown in detail in Figs. 4, 5, and 6.

F is a trolley provided with two grooved rollers *f* and *f′*, adapted to run upon the wires *a* and *b*, and separated from each other by the block of insulating material F′. The rollers are journaled in the trolley-arms *g g′*, one arm *g* being connected to the battery by the wire 6 and the other arm *g′* being connected to the bell by the wire 7. The arms *g g′* are separated from the cross-piece G by insulating material G′.

H is a spring secured to the cross-piece G and to the engine-cab for supporting the trolley-rollers in contact with the wires.

A scraper for cleaning the wires is supported in front of each trolley. Each scraper consists of two flanged shoes *h* and *h′*, separated by a strip of insulating material H′, and pivoted to the arms *i i′* by the pins I. The pivot-pins are arranged behind the center of the shoes, so that the front end of each shoe may bear downward on the wires.

J are the scraper knives or brushes, sup-

ported by the shoes and bearing against the wires.

J′ is a loose chain secured to one of the arms and to the front end of the shoes to prevent the front end of the shoes from falling down too far when not supported by the wires.

The arms *i i′* are separated from the cross-piece K, which supports them by the insulating material *k*, and K′ is a spring secured to the cross-piece and to the engine-cab for carrying the scrapers.

At a grade-crossing the wires are bent downward and secured to the rails, as shown in Fig. 3, insulating material being interposed between the wires and the rails to prevent loss of current.

L are guides secured to the road-bed at each side of the crossing. These guides are provided with longitudinally-diverging flanges S on each side of the wires. The scrapers and trolleys pass between these flanges as the train goes over the crossing and are guided into their proper positions upon the wires.

The supporting-posts B are secured to the road-bed and are provided with flanges M at the top and the longitudinal furrow *m*. The wires rest in grooves in the insulating-plates *m′*, secured to the flanges M, and the wires project slightly above the tops of the insulating-plates, so that the contact of the trolley-rollers with the wires may not be broken, and the furrows *m* permit the flanges of the trolley-rollers to pass over the posts without lifting the rollers from the wires.

The wires *a* and *b* (and *c* and *d*) pass downward through the holes 9 in the flanges M and cross each other at different heights, as shown in Fig. 10. Diagonal holes 11 are provided in the posts for the passage of the wires, and all the holes 11 and 9 are lined with insulating material 12. The posts at the ends of the sections of the wires are the same as the intermediate posts, but the ends of the wires are secured in the holes 9 instead of passing onward through the holes 11.

The operation of the signal devices is as follows: When two trains are on the track, one at W on section 2 and the other at V on section 4, the signal-bells are not rung because there is no electrical connection between these sections 2 and 4 and the circuit is incomplete. When two trains are on the track, one at S and the other at T, the bells upon one side of the track are rung simultaneously in the cab of each engine, because both trains are on section 3, and the circuit is therefore complete through the wires *c* and *d* of that section. When two trains are on the track, one at R and one at T, the bells on both sides of each engine-cab will be rung simultaneously, because the electric circuit is complete on one side through the wires *c* and *d*, and on the other side through the wires *a* and *b* of section 3.

The object of placing the ends of the section of the wires *a b* midway between the ends of the sections of the wires *c d* is to prevent the trains from approaching within more than half a mile of each other without the bells of one or the other side being rung. If the ends of the sections were opposite each other, two trains might collide at the said ends without the bells being rung.

The object of crossing the wires at the posts is to insure the ringing of the bells irrespective of the direction of the trains when both are upon the same section of signal-wires. If the wires were straight, it would only be possible to arrange for the bells to ring when the trains were approaching each other in opposite directions, or else when they were approaching each other in the same direction—that is, one overtaking the other. The reason of this is because if two trains X and Y were approaching each other in opposite directions upon two straight wires *a b* the positive roller of X and the negative roller of Y would have to be upon the same wire *a* or *b* to make the circuit. Now if another train Z, similar to X, were to rapidly follow train X, and thereby approach it in the same direction, the positive roller of Z would be on the same wire as the positive roller of X and there would be no circuit established between X and Z. If the positive roller of X were made negative to adapt it to be placed in circuit with the positive roller of Z, which approaches it in the same direction, both of the said rollers being upon the same wire, there would be no circuit between X and Y, which approach each other in opposite directions, because each would have its negative roller on the same wire. By crossing the wires *a* and *b* every fifteen or twenty feet the positive and negative rollers of each train are alternately brought in contact with the wires *a* and *b* and are changed from one wire to the other every fifteen or twenty feet, thus rendering it possible for one train to make a circuit with an approaching train irrespective of the direction of the approaching train, provided both trains are upon the same section of signal-wires.

If the sections of wires are each one mile in length, the signal-bells on one side or the other will be rung in each train when the trains are from one mile to half a mile apart, and both signal-bells on each train will be rung when the trains are less than a half a mile apart irrespective of the direction in which one train approaches the other.

Figs. 11, 12, and 13 show the connection of the signal-wires at a siding. The rails A′ of the main track are marked 20 and 20′, and the corresponding rails of the points and of the siding are marked 21 21′ and 22 22′, respectively. The wires of the siding are marked *a′ b′* and *c′ d′*, corresponding, respectively, with the wires *a b* and *c d* of the main track. The supporting-posts are similar to the supporting-posts B, previously described, but have the wires connected to them in a different manner. The posts 24 of the main line are sta-

tionary, and the posts 25 and 26 are secured together and to the sliding points, so that they slide back and forth with the points and are alternately brought in front of the posts 24. Fig. 11 shows the main line open and the posts 25 in front of the posts 24. The electrical connections between each group of posts are similar and will be explained with reference to Figs. 12 and 13. The post 24 has a spring-arm 27 secured to it, and 28 and 29 are two contact-blocks secured to the other end of the arm 27, and separated from each other and from the arm by the insulating material 30. The wires *a* and *b* pass through the holes 9 in the flanges of the post 24, and have their ends secured to the contact-blocks 28 and 29, respectively. The post 25 has two contact-blocks 31 and 32 secured upon one side of it and separated from each other and from the post by the insulating material 33. The wires *a* and *b* pass through the holes 9 in the post 25 and have their ends secured to the contact-blocks 31 and 32, respectively. The contact-blocks are arranged so that the block 28 presses against the block 31, and block 29 presses against the block 32 when the line is open. The post 26 has two contact-blocks 34 and 35 secured upon its side and separated from each other and from the post by the insulating material 36. The wires *a'* and *b'* pass through the holes 9 in the post 26 and have their ends secured to the contact-blocks 34 and 35, respectively. When the points are moved over to open the siding, the blocks 28 and 29 leave the blocks 31 and 32 on the end of the spring-arm, and the blocks 34 and 35 are brought in contact with the opposite sides of the said blocks 31 and 32, respectively.

The wires are deflected below the rails where necessary to clear them and to permit the trains to pass over the rails, and the wires are insulated at those points where they are supported by the rails.

P is a plate secured to the two posts 25 and 26, and serves the double purpose of connecting the two posts together and protecting the contact-blocks from snow, &c.

The lever mechanism for operating the points is not shown in the drawings, as any approved devices for that purpose may be used.

What I claim is—

1. The combination, with a pair of insulated conducting-wires supported parallel with each other, and with a railway-track and crossing each other at intervals, of a bell and a battery on each train passing over the track, said bell and battery being in circuit with the pair of crossed wires, whereby the bells may be rung simultaneously as the trains approach each other irrespective of the direction of approach, substantially as and for the purpose set forth.

2. The combination, with two pairs of insulated conducting-wires supported at the opposite sides of the track, the ends of one pair of wires being arranged midway between the ends of the other pair, and the wires of each pair being crossed at intervals, of a bell and a battery on each side of each train passing over the track, the bells and batteries on the same side of the trains being in circuit with the pair of crossed wires upon the same side of the trains, whereby the bells upon the same side of each train may be rung simultaneously as the trains approach each other, substantially as and for the purpose set forth.

3. The combination, with a supporting-post having crossed diagonal holes through it at different heights from its base and provided with top flanges having holes through them, of the insulated conducting-wires passing downward through the holes in the flanges and through the said crossed diagonal holes in the post, substantially as and for the purpose set forth.

4. The combination, with the conducting-wires, of the insulated arms for supporting the scrapers, the flanged shoes pivoted to the said arms and insulated from each other, and the devices for cleaning the wires, such as knives or brushes, secured to the said shoes, substantially as set forth.

5. The combination, with the conducting-wires, of the insulated arms for supporting the scrapers, the flanged shoes having their rear ends pivoted to the said arms and insulated from each other, the scraping devices, such as knives or brushes, secured to the shoes, and the flexible support for the front end of the shoes, substantially as and for the purpose set forth.

6. The combination, with the stationary supporting-post, a spring-arm secured at one end to the said post, and the insulated contact-blocks carried by the said arm, of two supporting-posts adapted to be slid back and forth in front of the said stationary post, each sliding post being provided with insulated contact-blocks upon its side, which are alternately brought in contact with the said blocks carried by the spring-arm, substantially as and for the purpose set forth.

7. The combination, with a stationary post, a spring-arm secured to the said post and provided with insulated contact-blocks, and a pair of insulated conducting-wires supported by the post and connected to the said blocks, of two posts connected to the switch-points and sliding with them, two insulated contact-blocks secured to each sliding post, and a pair of insulated conducting-wires supported by each sliding post and connected to the said blocks carried by it, the blocks on the sliding posts being adapted to be alternately brought in contact with the said blocks on the spring-arm by the motion of the switch-points, substantially as and for the purpose set forth.

8. The combination, with a supporting-post provided with metallic top flanges and a furrow between the flanges, of the conducting-wires resting on the tops of the flanges, passing downward through holes in them and

crossing each other underneath the flanges, and insulating material interposed between the said wires and the metallic flanges, substantially as and for the purpose set forth.

9. An independent guide-post adapted to be secured to the road-bed at a grade-crossing and provided with longitudinally-diverging flanges adapted to straddle the conducting-wires and the post supporting the said wires, substantially as described and shown.

In testimony whereof I affix my signature in presence of two witnesses.

FRANCIS P. LENAHAN.

Witnesses:
E. H. F. KEY,
JOHN F. O'MALLEY.